

PRILOGA C: IZPIS IZ PROGRAMA SCIA ENGINEER 14

Priloga C.1: Kontrola nosilnosti in stabilnosti momentnega okvira 2 - potresno projektno stanje, faktor obnašanja $q = 1,5$

Priloga C.2: Kontrola nosilnosti in stabilnosti okvira 1 s centričnim povezjem (sistem nateznih diagonal) - potresno projektno stanje, faktor obnašanja $q = 1,5$

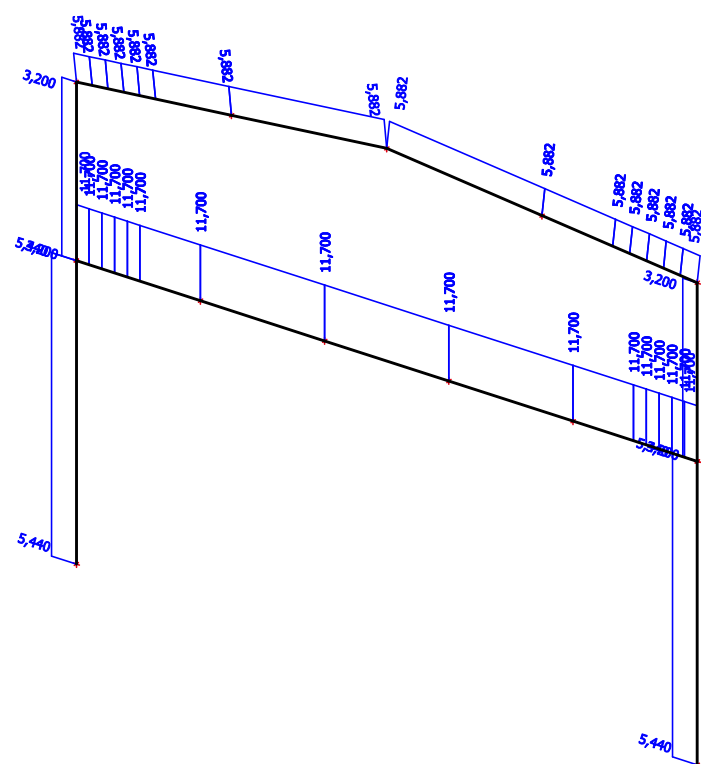
Priloga C.3: Kontrola nosilnosti in stabilnosti okvira A s centričnim povezjem (sistem nateznih diagonal) - potresno projektno stanje, faktor obnašanja $q = 1,5$

1. Priloga C.1

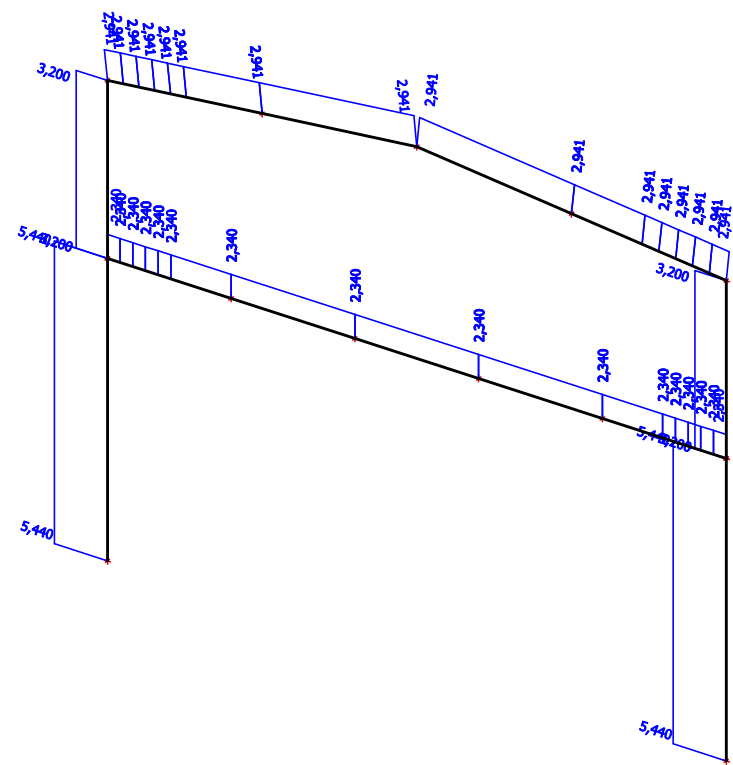
Linear calculation

Member	CS Name	Part	Sway y	Ly [m]	ky [-]	ly [m]	Lam y [-]	lyz [m]	I LTB [m]
			Sway z	Lz [m]	kz [-]	lz [m]	Lam z [-]		
B1	CS1	1	Yes	5,440	1,00	5,440	25,95	5,440	5,440
			No	5,440	1,00	5,440	75,06		
B1	CS1	2	Yes	3,200	1,00	3,200	15,27	3,200	3,200
			No	3,200	1,00	3,200	44,15		
B2	CS1	1	Yes	5,440	1,00	5,440	25,95	5,440	5,440
			No	5,440	1,00	5,440	75,06		
B2	CS1	2	Yes	3,200	1,00	3,200	15,27	3,200	3,200
			No	3,200	1,00	3,200	44,15		
B3	CS4	1	Yes	11,700	1,00	11,700	42,11	2,340	2,340
			No	2,340	1,00	2,340	32,76		
B3	CS4	2	Yes	11,700	1,00	11,700	45,68	2,340	2,340
			No	2,340	1,00	2,340	32,32		
B3	CS4	3	Yes	11,700	1,00	11,700	49,69	2,340	2,340
			No	2,340	1,00	2,340	31,86		
B3	CS4	4	Yes	11,700	1,00	11,700	54,13	2,340	2,340
			No	2,340	1,00	2,340	31,40		
B3	CS4	5	Yes	11,700	1,00	11,700	58,84	2,340	2,340
			No	2,340	1,00	2,340	30,94		
B3	CS4	6	Yes	11,700	1,00	11,700	61,84	2,340	2,340
			No	2,340	1,00	2,340	32,10		
B3	CS4	7	Yes	11,700	1,00	11,700	61,84	2,340	2,340
			No	2,340	1,00	2,340	32,10		
B3	CS4	8	Yes	11,700	1,00	11,700	61,84	2,340	2,340
			No	2,340	1,00	2,340	32,10		
B3	CS4	9	Yes	11,700	1,00	11,700	61,84	2,340	2,340
			No	2,340	1,00	2,340	32,10		
B3	CS4	10	Yes	11,700	1,00	11,700	61,84	2,340	2,340
			No	2,340	1,00	2,340	32,10		
B3	CS4	11	Yes	11,700	1,00	11,700	58,84	2,340	2,340
			No	2,340	1,00	2,340	30,94		
B3	CS4	12	Yes	11,700	1,00	11,700	54,13	2,340	2,340
			No	2,340	1,00	2,340	31,40		
B3	CS4	13	Yes	11,700	1,00	11,700	49,69	2,340	2,340
			No	2,340	1,00	2,340	31,86		
B3	CS4	14	Yes	11,700	1,00	11,700	45,68	2,340	2,340
			No	2,340	1,00	2,340	32,32		
B3	CS4	15	Yes	11,700	1,00	11,700	42,11	2,340	2,340
			No	2,340	1,00	2,340	32,76		
B4	CS7	1	Yes	5,882	1,00	5,882	31,38	2,941	2,941
			No	2,941	1,00	2,941	90,70		
B4	CS7	2	Yes	5,882	1,00	5,882	34,13	2,941	2,941
			No	2,941	1,00	2,941	88,90		
B4	CS7	3	Yes	5,882	1,00	5,882	37,25	2,941	2,941
			No	2,941	1,00	2,941	87,06		
B4	CS7	4	Yes	5,882	1,00	5,882	40,72	2,941	2,941
			No	2,941	1,00	2,941	85,19		
B4	CS7	5	Yes	5,882	1,00	5,882	44,40	2,941	2,941
			No	2,941	1,00	2,941	83,27		
B4	CS7	6	Yes	5,882	1,00	5,882	47,20	2,941	2,941
			No	2,941	1,00	2,941	87,82		
B4	CS7	7	Yes	5,882	1,00	5,882	47,20	2,941	2,941
			No	2,941	1,00	2,941	87,82		
B5	CS7	1	Yes	5,882	1,00	5,882	31,38	2,941	2,941
			No	2,941	1,00	2,941	90,70		
B5	CS7	2	Yes	5,882	1,00	5,882	34,13	2,941	2,941
			No	2,941	1,00	2,941	88,90		
B5	CS7	3	Yes	5,882	1,00	5,882	37,25	2,941	2,941
			No	2,941	1,00	2,941	87,06		
B5	CS7	4	Yes	5,882	1,00	5,882	40,72	2,941	2,941
			No	2,941	1,00	2,941	85,19		
B5	CS7	5	Yes	5,882	1,00	5,882	44,40	2,941	2,941
			No	2,941	1,00	2,941	83,27		
B5	CS7	6	Yes	5,882	1,00	5,882	47,20	2,941	2,941
			No	2,941	1,00	2,941	87,82		
B5	CS7	7	Yes	5,882	1,00	5,882	47,20	2,941	2,941
			No	2,941	1,00	2,941	87,82		

2. Iy



3. Iz



4. Result classes

4.1. Result classes - RC1

Name	List
RC1	Skupaj

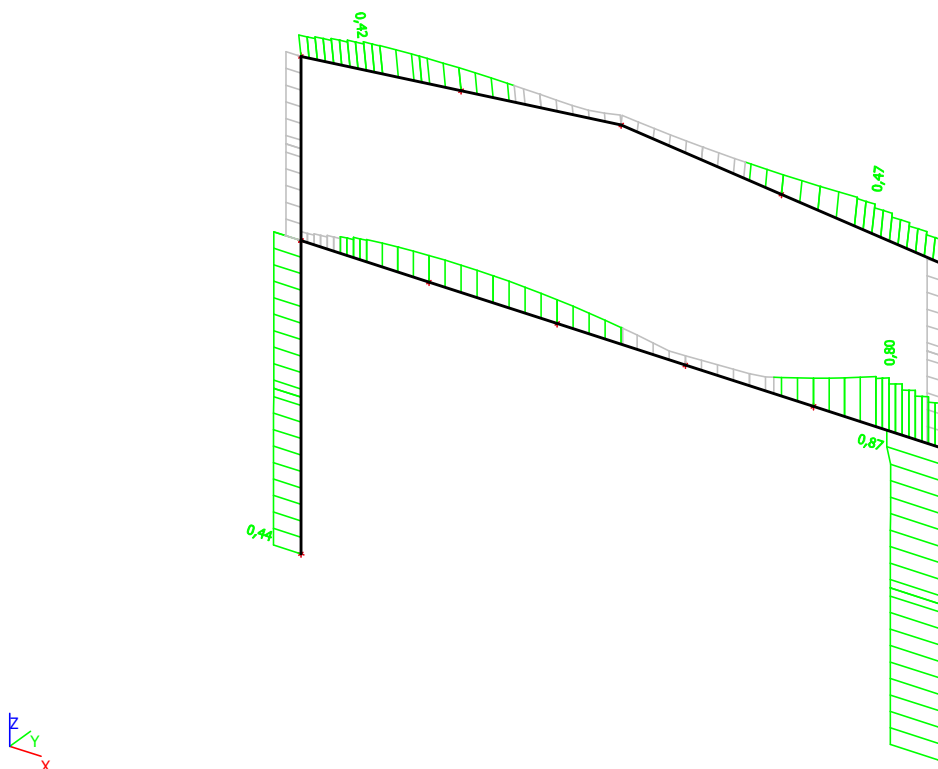
4.1.1. Check of steel

Nonlinear calculation, Extreme : Member

Selection : All

Class : RC1

Member	css	mat	Case	dx [m]	un.check [-]	sec.check [-]	stab.check [-]
B1	CS1 - HEA500	S 235	Skupaj	0,000	0,44	0,07	0,44
B2	CS1 - HEA500	S 235	Skupaj	5,154	0,87	0,68	0,87
B3	CS4 - I + I var	S 235	Skupaj	10,740	0,80	0,80	0,80
B4	CS7 - I + I var	S 235	Skupaj	1,200	0,42	0,38	0,42
B5	CS7 - I + I var	S 235	Skupaj	1,280	0,47	0,37	0,47



Nonlinear calculation, Extreme : Cross-section

Selection : All

Class : RC1

Member B2	8,640 m	HEA500	S 235	Skupaj	0,87 -
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Partial safety factors	
Gamma M0 for resistance of cross-sections	1,00
Gamma M1 for resistance to instability	1,00
Gamma M2 for resistance of net sections	1,25

Material		
Yield strength f_y	23,5	kN/cm ²
Ultimate strength f_u	36,0	kN/cm ²
Fabrication	Rolled	

....SECTION CHECK:....

Classification for cross-section design

According to EN 1993-1-1 article 5.5.2

Classification of Internal Compression parts

According to EN 1993-1-1 Table 5.2 Sheet 1

Maximum width-to-thickness ratio	32,50
Class 1 Limit	53,67
Class 2 Limit	61,80
Class 3 Limit	103,16

=> Internal Compression parts Class 1

Classification of Outstand Flanges

According to EN 1993-1-1 Table 5.2 Sheet 2

Maximum width-to-thickness ratio	5,09
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Class 1 Limit	9,00
Class 2 Limit	10,00
Class 3 Limit	13,77

=> Outstand Flanges Class 1

=> Section classified as Class 1 for cross-section design

The critical check is on position 5.154 m

Internal forces	Calculated	Unit
N _{Ed}	-317,77	kN
V _{y,Ed}	0,00	kN
V _{z,Ed}	120,65	kN
T _{Ed}	0,00	kNm
M _{y,Ed}	632,27	kNm
M _{z,Ed}	0,00	kNm

Compression check

According to EN 1993-1-1 article 6.2.4 and formula (6.9)

A	198,0000	cm ²
N _{c,Rd}	4653,00	kN
Unity check	0,07	-

Bending moment check for M_y

According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

W _{pl,y}	3950,0000	cm ³
M _{pl,y,Rd}	928,25	kNm
Unity check	0,68	-

Shear check for V_z

According to EN 1993-1-1 article 6.2.6 and formula (6.17)

E _t	1,20	
A _v	75,1800	cm ²
V _{pl,z,Rd}	1020,02	kN
Unity check	0,12	-

Combined bending, axial force and shear force check

According to EN 1993-1-1 article 6.2.9.1 and formula (6.31)

M _{pl,y,Rd}	928,25	kNm
Unity check	0,68	-

Note: Since the shear forces are less than half the plastic shear resistances their effect on the moment resistances is neglected.

Note: Since the axial force satisfies both criteria (6.33) and (6.34) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the y-y axis is neglected.

The member satisfies the section check.

.....STABILITY CHECK:....

Classification for member buckling design

Decisive position for stability classification: 0,000 m

Classification of Internal Compression parts

According to EN 1993-1-1 Table 5.2 Sheet 1

Maximum width-to-thickness ratio	32,50
Class 1 Limit	33,00
Class 2 Limit	38,00
Class 3 Limit	42,00

=> Internal Compression parts Class 1

Classification of Outstand Flanges

According to EN 1993-1-1 Table 5.2 Sheet 2

Maximum width-to-thickness ratio	5,09
Class 1 Limit	9,00
Class 2 Limit	10,00
Class 3 Limit	14,00

=> Outstand Flanges Class 1

=> Section classified as Class 1 for member buckling design

Flexural Buckling Check

According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters	yy	zz	
Sway type	sway	non-sway	
System length L	5,440	5,440	m
Buckling factor k	1,00	1,00	
Buckling length L _{cr}	5,440	5,440	m
Critical Euler load N _{cr}	60931,31	7283,74	kN

Buckling parameters	yy	zz	
Slenderness Lambda	25,95	75,06	
Relative slenderness Lambda,rel	0,28	0,80	
Limit slenderness Lambda,rel,0	0,20	0,20	
Buckling curve	a	b	
Imperfection Alpha	0,21	0,34	
Reduction factor Chi	0,98	0,72	
Buckling resistance Nb,Rd	4573,72	3373,00	kN

Flexural Buckling verification		
Cross-section area A	198,0000	cm ²
Buckling resistance Nb,Rd	3373,00	kN
Unity check	0,09	-

Lateral Torsional Buckling Check

According to article EN 1993-1-1 : 6.3.2.1. and formula (6.54)

LTB Parameters		
Method for LTB curve	Art. 6.3.2.2.	
Wy	3950.0000	cm ³
Elastic critical moment Mcr	3820.43	kNm
Relative slenderness Lambda,LT	0.49	
Limit slenderness Lambda,LT,0	0.40	
LTB curve	a	
Imperfection Alpha,LT	0.21	
Reduction factor Chi,LT	0.93	
Buckling resistance Mb,Rd	859.98	kNm
Unity check	0.74	-

Mcr Parameters		
LTB length	5.440	m
k	1.00	
kw	1.00	
C1	1.76	
C2	0.00	
C3	1.00	

Note: C Parameters according to ECCS 119 2006 / Galea 2002
load in center of gravity

Compression and bending check

According to article EN 1993-1-1 : 6.3.3. and formula (6.61), (6.62)
Interaction Method 1

Table of values		
kyy	1.036	
kyz	1.021	
kzy	0.542	
kzz	1.090	
Delta My	0.00	kNm
Delta Mz	0.00	kNm
A	198.0000	cm ²
Wy	3950.0000	cm ³
Wz	1058.3300	cm ³
NRk	4653.00	kN
My,Rk	928.25	kNm
Mz,Rk	248.71	kNm
My,Ed	666.81	kNm
Mz,Ed	0.00	kNm
Interaction Method 1		
Mcr0	2167.14	kNm
reduced slenderness 0	0.65	
Psi y	0.000	
Psi z	1.000	
Cmy,0	0.998	
Cmz,0	1.011	
Cmy	1.000	
Cmz	1.011	
CmLT	1.031	
muy	1.000	
muz	0.988	
wy	1.113	
wz	1.500	
npl	0.068	
aLT	0.996	
bLT	0.000	
cLT	0.612	

Table of values		
dLT	0.000	
eLT	1.693	
Cyy	0.999	
Cyz	0.721	
Czy	0.975	
Czz	0.957	

Unity check (6.61) = 0.07 + 0.80 + 0.00 = 0.87

Unity check (6.62) = 0.09 + 0.42 + 0.00 = 0.51

Shear buckling check

in buckling field 1

According to article EN 1993-1-5 : 5. & 7.1. and formula (5.10) & (7.1)

Table of values	
hw/t	37.000

The web slenderness is such that the Shear Buckling Check is not required.

The member satisfies the stability check.

Member B3	11,700 m	I + I var	S 235	Skupaj	0,80 -
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Partial safety factors	
Gamma M0 for resistance of cross-sections	1,00
Gamma M1 for resistance to instability	1,00
Gamma M2 for resistance of net sections	1,25

Material		
Yield strength fy	23,5	kN/cm ²
Ultimate strength fu	36,0	kN/cm ²
Fabrication	Welded	

Warning: Strength reduction in function of the thickness is not supported for this type of cross-section.

....SECTION CHECK:....

Classification for cross-section design

According to EN 1993-1-1 article 5.5.2

Warning: Classification is not supported for this type of cross-section.

The section is checked as elastic, class 3.

The critical check is on position 10.740 m

Internal forces	Calculated	Unit
N,Ed	-29,09	kN
Vy,Ed	0,00	kN
Vz,Ed	-243,45	kN
T,Ed	0,00	kNm
My,Ed	-624,19	kNm
Mz,Ed	0,00	kNm

Section properties

A	2.481155e+004 mm ²		
Ay/A	0.731	Az/A	0.243
Iy	9.809805e+008 mm ⁴	Iz	1.419644e+008 mm ⁴
Iyz	-4.035583e-007 mm ⁴	It	3.018046e+006 mm ⁴
Iw	6.333249e+012 mm ⁶		
Wely	3.340527e+006 mm ³	Welz	9.464291e+005 mm ³
Wply	4.109909e+006 mm ³	Wplz	1.443077e+006 mm ³
cy	200.25 mm	cz	150.00 mm
dy	-0.00 mm	dz	-13.60 mm

Compression check

According to EN 1993-1-1 article 6.2.4 and formula (6.9)

A	248,1155	cm ²
Nc,Rd	5830,71	kN
Unity check	0,00	-

Bending moment check for My

According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.14)

Wel,y,min	3340,5268	cm ³
Mel,y,Rd	785,02	kNm
Unity check	0,80	-

Shear check for Vz

According to EN 1993-1-1 article 6.2.6 and formula (6.19)

Tau,Vz,Ed	5,0	kN/cm ²
Tau,Rd	13,6	kN/cm ²
Unity check	0,37	-

Note: No shear area is given for this section/fabrication, therefore the plastic shear resistance cannot be determined. As a result the elastic shear resistance according to EN 1993-1-1 article 6.2.6(4) is verified.

Combined bending, axial force and shear force check

According to EN 1993-1-1 article 6.2.1(5) and formula (6.1)

Elastic verification		
Fibre	14	
Sigma,N,Ed	0,1	kN/cm ²
Sigma,My,Ed	-18,7	kN/cm ²
Sigma,Mz,Ed	0,0	kN/cm ²
Sigma,tot,Ed	-18,6	kN/cm ²
Tau,Vy,Ed	0,0	kN/cm ²
Tau,Vz,Ed	1,1	kN/cm ²
Tau,t,Ed	0,0	kN/cm ²
Tau,tot,Ed	1,1	kN/cm ²
Sigma,von Mises,Ed	18,7	kN/cm ²
Unity check	0,79	-

The member satisfies the section check.

....STABILITY CHECK:....

Flexural Buckling Check

According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters	yy	zz	
Sway type	sway	non-sway	
System length L	11,700	2,340	m
Buckling factor k	1,00	1,00	
Buckling length Lcr	11,700	2,340	m
Critical Euler load Ncr	14852,78	53736,17	kN
Slenderness Lambda	58,84	30,94	
Relative slenderness Lambda,rel	0,63	0,33	
Limit slenderness Lambda,rel,0	0,20	0,20	

Note: The slenderness or compression force is such that Flexural Buckling effects may be ignored according to EN 1993-1-1 article 6.3.1.2(4).

Torsional (-Flexural) Buckling check

According to article EN 1993-1-1 : 6.3.1.1. and formula (6.46)

Table of values		
Torsional Buckling length	2.340	m
Ncr,T	58112.87	kN
Ncr,TF	51953.46	kN
Relative slenderness Lambda,T	0.34	
Limit slenderness Lambda,0	0.20	

The slenderness or compression force is such that Torsional (-Flexural) Buckling effects may be ignored according to EN 1993-1-1 article 6.3.1.2(4)

Lateral Torsional Buckling Check

According to article EN 1993-1-1 : 6.3.2.1. and formula (6.54)

LTB Parameters		
Method for LTB curve	Art. 6.3.2.2.	
Wy	3340.5268	cm ³
Elastic critical moment Mcr	17422.98	kNm
Relative slenderness Lambda,LT	0.21	
Limit slenderness Lambda,LT,0	0.40	

Mcr Parameters		
LTB length	2.340	m
k	1.00	
kw	1.00	
C1	1.46	
C2	0.01	
C3	1.00	

The slenderness or bending moment is such that Lateral Torsional Buckling effects may be ignored according to EN 1993-1-1 article 6.3.2.2(4)

Compression and bending check

According to article EN 1993-1-1 : 6.3.3. and formula (6.61), (6.62)

Interaction Method 1

Table of values		
kyy	1.002	
kzy	1.001	

Table of values		
kzy	1.002	
kzz	1.001	
Delta My	0.00	kNm
Delta Mz	0.00	kNm
A	248.1155	cm ²
Wy	3340.5268	cm ³
Wz	946.4291	cm ³
NRk	5830.71	kN
My,Rk	785.02	kNm
Mz,Rk	222.41	kNm
My,Ed	-624.19	kNm
Mz,Ed	0.00	kNm
Interaction Method 1		
Mcr0	11912.94	kNm
reduced slenderness 0	0.26	
Psi y	-0.186	
Psi z	1.000	
Cmy,0	0.999	
Cmz,0	1.000	
Cmy	1.000	
Cmz	1.000	
CmLT	1.000	
muy	1.000	
muz	1.000	
wy	1.230	
wz	1.500	
npl	0.005	
aLT	0.997	
bLT	0.000	
cLT	0.085	
dLT	0.000	
eLT	2.516	
Cyy	1.001	
Cyz	0.961	
Czy	1.000	
Czz	0.996	

Unity check (6.61) = 0.00 + 0.80 + 0.00 = 0.80

Unity check (6.62) = 0.00 + 0.80 + 0.00 = 0.80

The member satisfies the stability check.

Member B5	5,882 m	I + I var	S 235	Skupaj	0,47 -
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Partial safety factors	
Gamma M0 for resistance of cross-sections	1,00
Gamma M1 for resistance to instability	1,00
Gamma M2 for resistance of net sections	1,25

Material		
Yield strength fy	23,5	kN/cm ²
Ultimate strength fu	36,0	kN/cm ²
Fabrication	Welded	

Warning: Strength reduction in function of the thickness is not supported for this type of cross-section.

.....SECTION CHECK:....

Classification for cross-section design

According to EN 1993-1-1 article 5.5.2

Warning: Classification is not supported for this type of cross-section.

The section is checked as elastic, class 3.

The critical check is on position 1.280 m

Internal forces	Calculated	Unit
N,Ed	-92,89	kN
Vy,Ed	0,00	kN
Vz,Ed	18,15	kN
T,Ed	0,00	kNm
My,Ed	-55,96	kNm
Mz,Ed	0,00	kNm

Section properties

A	7.258121e+003 mm ²		
Ay/A	0.656	Az/A	0.341
Iy	1.273700e+008 mm ⁴	Iz	9.053786e+006 mm ⁴
Iyz	-1.036027e-007 mm ⁴	It	2.224037e+005 mm ⁴
Iw	1.904247e+011 mm ⁶		

Wely	6.506732e+005 mm ³	Welz	1.207171e+005 mm ³
Wply	8.373645e+005 mm ³	Wplz	1.864229e+005 mm ³
cy	138.89 mm	cz	75.00 mm
dy	-0.00 mm	dz	-13.72 mm

Compression check

According to EN 1993-1-1 article 6.2.4 and formula (6.9)

A	72,5812	cm ²
Nc,Rd	1705,66	kN
Unity check	0,05	-

Bending moment check for My

According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.14)

Wel,y,min	650,6732	cm ³
Mel,y,Rd	152,91	kNm
Unity check	0,37	-

Shear check for Vz

According to EN 1993-1-1 article 6.2.6 and formula (6.19)

Tau,Vz,Ed	0,9	kN/cm ²
Tau,Rd	13,6	kN/cm ²
Unity check	0,07	-

Note: No shear area is given for this section/fabrication, therefore the plastic shear resistance cannot be determined. As a result the elastic shear resistance according to EN 1993-1-1 article 6.2.6(4) is verified.

Combined bending, axial force and shear force check

According to EN 1993-1-1 article 6.2.1(5) and formula (6.1)

Elastic verification		
Fibre	26	
Sigma,N,Ed	1,3	kN/cm ²
Sigma,My,Ed	6,1	kN/cm ²
Sigma,Mz,Ed	0,0	kN/cm ²
Sigma,tot,Ed	7,4	kN/cm ²
Tau,Vy,Ed	0,0	kN/cm ²
Tau,Vz,Ed	0,1	kN/cm ²
Tau,t,Ed	0,0	kN/cm ²
Tau,tot,Ed	0,1	kN/cm ²
Sigma,von Mises,Ed	7,4	kN/cm ²
Unity check	0,31	-

The member satisfies the section check.

....STABILITY CHECK:....

Flexural Buckling Check

According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters	yy	zz	
Sway type	sway	non-sway	
System length L	5,882	2,941	m
Buckling factor k	1,00	1,00	
Buckling length Lcr	5,882	2,941	m
Critical Euler load Ncr	7630,93	2169,71	kN
Slenderness Lambda	44,40	83,27	
Relative slenderness Lambda,rel	0,47	0,89	
Limit slenderness Lambda,rel,0	0,20	0,20	
Buckling curve	b	c	
Imperfection Alpha	0,34	0,49	
Reduction factor Chi	0,90	0,61	
Buckling resistance Nb,Rd	1528,41	1037,15	kN

Flexural Buckling verification		
Cross-section area A	72,5812	cm ²
Buckling resistance Nb,Rd	1037,15	kN
Unity check	0,09	-

Torsional (-Flexural) Buckling check

According to article EN 1993-1-1 : 6.3.1.1. and formula (6.46)

Table of values		
Torsional Buckling length	2.941	m
Ncr,T	3349.89	kN
Ncr,TF	2132.66	kN
Relative slenderness Lambda,T	0.89	
Limit slenderness Lambda,0	0.20	

Table of values		
Buckling curve	c	
Imperfection Alpha	0.49	
A	72.5812	cm ²
Reduction factor Chi	0.60	
Buckling resistance Nb,Rd	1029.08	kN
Unity check	0.09	-

Lateral Torsional Buckling Check

According to article EN 1993-1-1 : 6.3.2.1. and formula (6.54)

LTB Parameters		
Method for LTB curve	Art. 6.3.2.2.	
Wy	650.6732	cm ³
Elastic critical moment Mcr	523.16	kNm
Relative slenderness Lambda,LT	0.54	
Limit slenderness Lambda,LT,0	0.40	

Mcr Parameters		
LTB length	2.941	m
k	1.00	
kw	1.00	
C1	1.41	
C2	0.02	
C3	1.00	

The slenderness or bending moment is such that Lateral Torsional Buckling effects may be ignored according to EN 1993-1-1 article 6.3.2.2(4)

Compression and bending check

According to article EN 1993-1-1 : 6.3.3. and formula (6.61), (6.62)

Interaction Method 1

Table of values		
kyy	1.044	
kyz	1.054	
kzy	1.027	
kzz	1.037	
Delta My	0.00	kNm
Delta Mz	0.00	kNm
A	72.5812	cm ²
Wy	650.6732	cm ³
Wz	120.7171	cm ³
NRk	1705.66	kN
My,Rk	152.91	kNm
Mz,Rk	28.37	kNm
My,Ed	-55.96	kNm
Mz,Ed	0.00	kNm
Interaction Method 1		
Mcr0	371.47	kNm
reduced slenderness 0	0.64	
Psi y	0.135	
Psi z	1.000	
Cmy,0	0.997	
Cmz,0	1.010	
Cmy	0.999	
Cmz	1.010	
CmLT	1.033	
muy	0.999	
muz	0.983	
wy	1.287	
wz	1.500	
npl	0.054	
aLT	0.998	
bLT	0.000	
cLT	0.208	
dLT	0.000	
eLT	0.432	
Cyy	0.999	
Cyz	0.910	
Czy	0.983	
Czz	0.993	

Unity check (6.61) = 0.06 + 0.38 + 0.00 = 0.44

Unity check (6.62) = 0.09 + 0.38 + 0.00 = 0.47

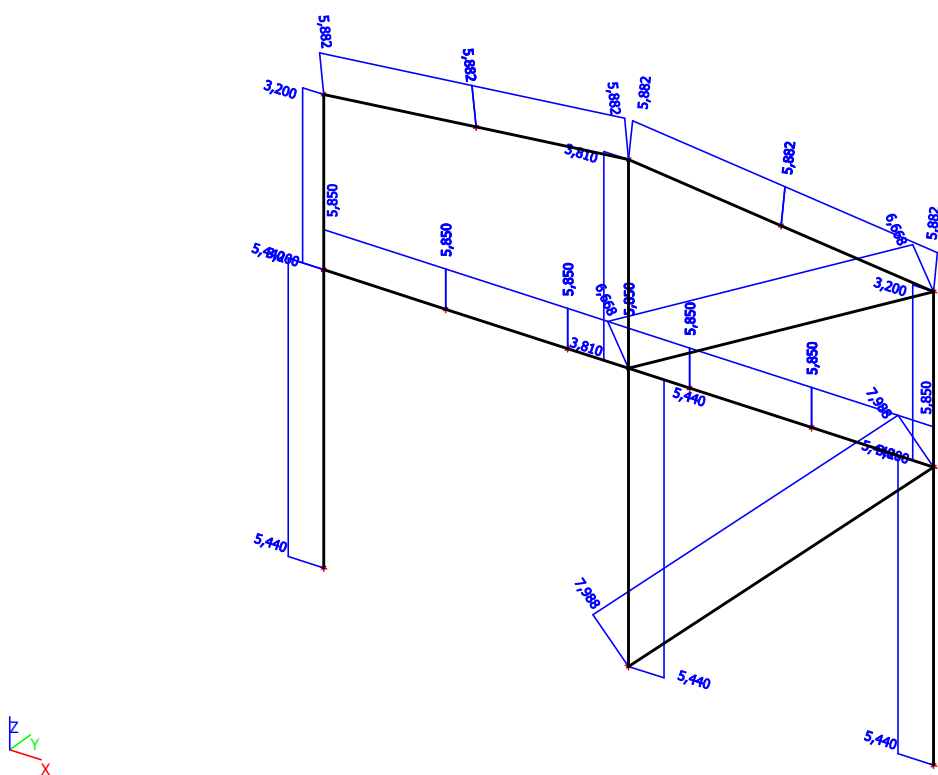
The member satisfies the stability check.

1. Priloga C.2

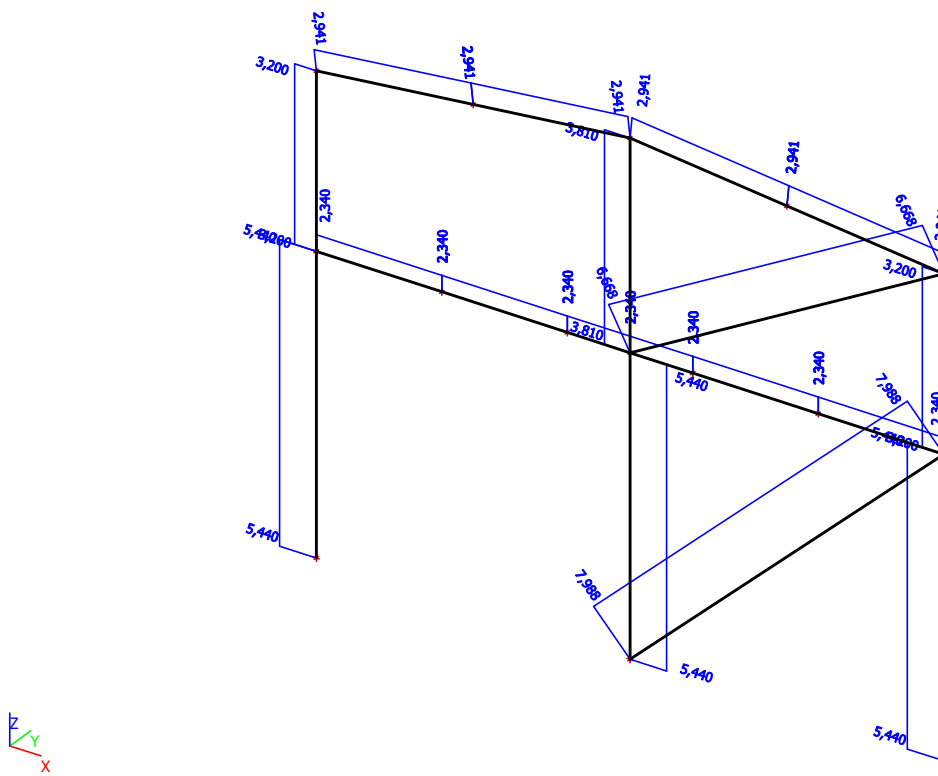
Linear calculation

Member	CS Name	Part	Sway y	Ly [m]	ky [-]	ly [m]	Lam y [-]	lyz [m]	I LTB [m]
			Sway z	Lz [m]	kz [-]	lz [m]	Lam z [-]		
B1	CS8	1	Yes	5,440	1,00	5,440	59,31	5,440	5,440
			No	5,440	1,00	5,440	98,53		
B1	CS8	2	Yes	3,200	1,00	3,200	34,89	3,200	3,200
			No	3,200	1,00	3,200	57,96		
B2	CS8	1	Yes	5,440	1,00	5,440	59,31	5,440	5,440
			No	5,440	1,00	5,440	98,53		
B2	CS8	2	Yes	3,200	1,00	3,200	34,89	3,200	3,200
			No	3,200	1,00	3,200	57,96		
B3	CS8	1	Yes	5,850	1,00	5,850	63,78	2,340	2,340
			No	2,340	1,00	2,340	42,38		
B3	CS8	2	Yes	5,850	1,00	5,850	63,78	2,340	2,340
			No	2,340	1,00	2,340	42,38		
B3	CS8	3	Yes	5,850	1,00	5,850	63,78	2,340	2,340
			No	2,340	1,00	2,340	42,38		
B3	CS8	4	Yes	5,850	1,00	5,850	63,78	2,340	2,340
			No	2,340	1,00	2,340	42,38		
B3	CS8	5	Yes	5,850	1,00	5,850	63,78	2,340	2,340
			No	2,340	1,00	2,340	42,38		
B3	CS8	6	Yes	5,850	1,00	5,850	63,78	2,340	2,340
			No	2,340	1,00	2,340	42,38		
B4	CS11	1	Yes	5,882	1,00	5,882	79,23	2,941	2,941
			No	2,941	1,00	2,941	143,06		
B4	CS11	2	Yes	5,882	1,00	5,882	79,23	2,941	2,941
			No	2,941	1,00	2,941	143,06		
B5	CS11	1	Yes	5,882	1,00	5,882	79,23	2,941	2,941
			No	2,941	1,00	2,941	143,06		
B5	CS11	2	Yes	5,882	1,00	5,882	79,23	2,941	2,941
			No	2,941	1,00	2,941	143,06		
B6	CS10	1	Yes	3,810	1,00	3,810	66,34	3,810	3,810
			No	3,810	1,00	3,810	230,26		
B7	CS9	1	Yes	5,440	1,00	5,440	82,92	5,440	5,440
			No	5,440	1,00	5,440	136,53		
B8	CS12	1	Yes	7,988	1,00	7,988	316,57	7,988	7,988
			No	7,988	1,00	7,988	639,29		
B9	CS13	1	Yes	6,668	1,00	6,668	1133,78	6,668	6,668
			No	6,668	1,00	6,668	1133,78		

2. Iy



3. Iz



4. Result classes

4.1. Result classes - RC1

Name	List
RC1	Skupaj

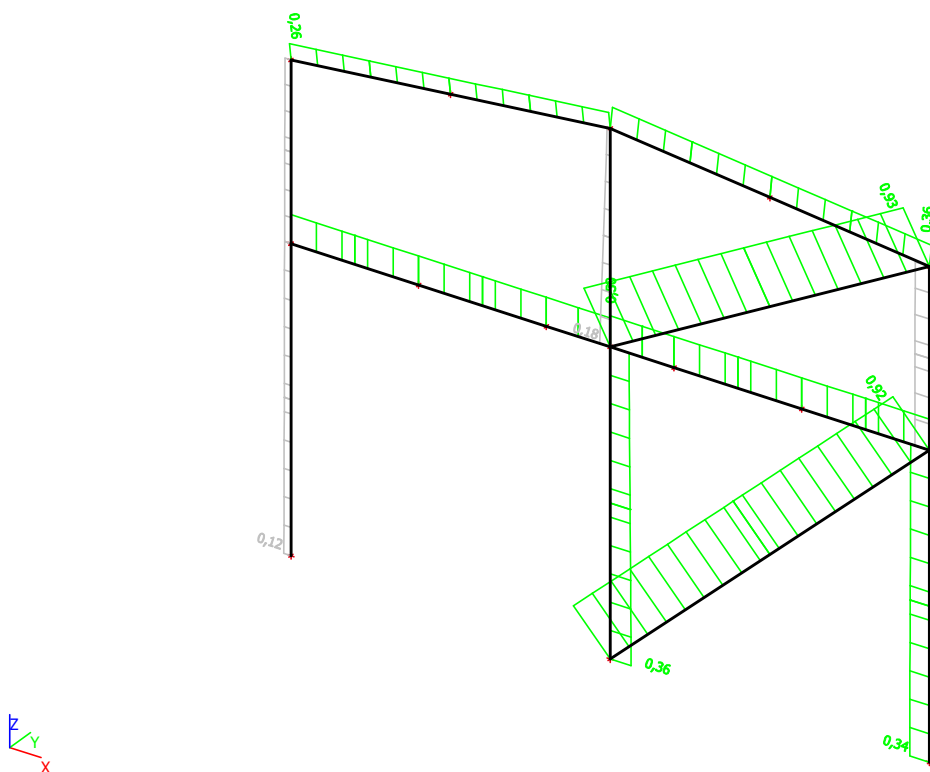
4.1.1. Check of steel

Nonlinear calculation, Extreme : Member

Selection : All

Class : RC1

Member	css	mat	Case	dx [m]	un.check [-]	sec.check [-]	stab.check [-]
B1	CS8 - HEA220	S 235	Skupaj	0,000	0,12	0,04	0,12
B2	CS8 - HEA220	S 235	Skupaj	0,000	0,34	0,14	0,34
B3	CS8 - HEA220	S 235	Skupaj	5,850	0,50	0,39	0,50
B4	CS11 - IPE180	S 235	Skupaj	0,000	0,26	0,06	0,26
B5	CS11 - IPE180	S 235	Skupaj	0,000	0,36	0,25	0,36
B6	CS10 - IPE140	S 235	Skupaj	0,000	0,18	0,03	0,18
B7	CS9 - HEA160	S 235	Skupaj	5,440	0,36	0,12	0,36
B8	CS12 - U65	S 235	Skupaj	7,988	0,92	0,92	0,00
B9	CS13 - L20X3	S 235	Skupaj	6,668	0,93	0,93	0,00



Nonlinear calculation, Extreme : Cross-section

Selection : All

Class : RC1

Member B3	11,700 m	HEA220	S 235	Skupaj	0,50 -
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Partial safety factors	
Gamma M0 for resistance of cross-sections	1,00
Gamma M1 for resistance to instability	1,00
Gamma M2 for resistance of net sections	1,25

Material	
Yield strength f_y	23,5 kN/cm ²
Ultimate strength f_u	36,0 kN/cm ²
Fabrication	Rolled

....SECTION CHECK:....

Classification for cross-section design

According to EN 1993-1-1 article 5.5.2

Classification of Internal Compression parts

According to EN 1993-1-1 Table 5.2 Sheet 1

Maximum width-to-thickness ratio	21,71
Class 1 Limit	44,27
Class 2 Limit	50,97
Class 3 Limit	86,36

=> Internal Compression parts Class 1

Classification of Outstand Flanges

According to EN 1993-1-1 Table 5.2 Sheet 2

Maximum width-to-thickness ratio	8,05
Class 1 Limit	9,00
Class 2 Limit	10,00
Class 3 Limit	13,77

=> Outstand Flanges Class 1

=> Section classified as Class 1 for cross-section design

The critical check is on position 5.850 m

Internal forces	Calculated	Unit
N _{Ed}	-132,55	kN
V _{y,Ed}	0,00	kN
V _{z,Ed}	47,30	kN
T _{Ed}	0,00	kNm
M _{y,Ed}	-51,50	kNm
M _{z,Ed}	0,00	kNm

Compression check

According to EN 1993-1-1 article 6.2.4 and formula (6.9)

A	64,3000	cm ²
N _{c,Rd}	1511,05	kN
Unity check	0,09	-

Bending moment check for M_y

According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

W _{pl,y}	566,6670	cm ³
M _{pl,y,Rd}	133,17	kNm
Unity check	0,39	-

Shear check for V_z

According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Eta	1,20	
A _v	20,6300	cm ²
V _{pl,z,Rd}	279,90	kN
Unity check	0,17	-

Combined bending, axial force and shear force check

According to EN 1993-1-1 article 6.2.9.1 and formula (6.31)

M _{pl,y,Rd}	133,17	kNm
Unity check	0,39	-

Note: Since the shear forces are less than half the plastic shear resistances their effect on the moment resistances is neglected.

Note: Since the axial force satisfies both criteria (6.33) and (6.34) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the y-y axis is neglected.

The member satisfies the section check.

.....STABILITY CHECK:.....

Classification for member buckling design

Decisive position for stability classification: 4,680 m

Classification of Internal Compression parts

According to EN 1993-1-1 Table 5.2 Sheet 1

Maximum width-to-thickness ratio	21,71
Class 1 Limit	33,00
Class 2 Limit	38,00
Class 3 Limit	46,38

=> Internal Compression parts Class 1

Classification of Outstand Flanges

According to EN 1993-1-1 Table 5.2 Sheet 2

Maximum width-to-thickness ratio	8,05
Class 1 Limit	9,00
Class 2 Limit	10,00
Class 3 Limit	13,77

=> Outstand Flanges Class 1

=> Section classified as Class 1 for member buckling design

Flexural Buckling Check

According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters	yy	zz	
Sway type	sway	non-sway	
System length L	5,850	2,340	m
Buckling factor k	1,00	1,00	
Buckling length Lcr	5,850	2,340	m
Critical Euler load Ncr	3276,46	7418,97	kN
Slenderness Lambda	63,78	42,38	
Relative slenderness Lambda,rel	0,68	0,45	
Limit slenderness Lambda,rel,0	0,20	0,20	
Buckling curve	b	c	
Imperfection Alpha	0,34	0,49	
Reduction factor Chi	0,80	0,87	
Buckling resistance Nb,Rd	1201,86	1314,36	kN

Flexural Buckling verification		
Cross-section area A	64,3000	cm ²
Buckling resistance Nb,Rd	1201,86	kN
Unity check	0,11	-

Torsional (-Flexural) Buckling check

According to article EN 1993-1-1 : 6.3.1.1. and formula (6.46)

Table of values		
Torsional Buckling length	2.340	m
Ncr,T	8390.37	kN
Ncr,TF	3276.46	kN
Relative slenderness Lambda,T	0.68	
Limit slenderness Lambda,0	0.20	
Buckling curve	c	
Imperfection Alpha	0.49	
A	64.3000	cm ²
Reduction factor Chi	0.74	
Buckling resistance Nb,Rd	1114.52	kN
Unity check	0.12	-

Lateral Torsional Buckling Check

According to article EN 1993-1-1 : 6.3.2.1. and formula (6.54)

LTB Parameters		
Method for LTB curve	Art. 6.3.2.2.	
Wy	566.6670	cm ³
Elastic critical moment Mcr	1111.02	kNm
Relative slenderness Lambda,LT	0.35	
Limit slenderness Lambda,LT,0	0.40	

Mcr Parameters		
LTB length	2.340	m
k	1.00	
kw	1.00	
C1	1.32	
C2	0.50	
C3	0.41	

The slenderness or bending moment is such that Lateral Torsional Buckling effects may be ignored according to EN 1993-1-1 article 6.3.2.2(4)

Compression and bending check

According to article EN 1993-1-1 : 6.3.3. and formula (6.61), (6.62)

Interaction Method 1

Table of values		
kyy	1.020	
kyz	0.718	
kzy	0.538	
kzz	1.071	
Delta My	0.00	kNm
Delta Mz	0.00	kNm
A	64.3000	cm ²
Wy	566.6670	cm ³
Wz	270.4170	cm ³
NRk	1511.05	kN
My,Rk	133.17	kNm
Mz,Rk	63.55	kNm
My,Ed	-51.50	kNm
Mz,Ed	0.00	kNm
Interaction Method 1		
Mcr0	844.70	kNm

Table of values		
reduced slenderness	0	0.40
Psi y		0.830
Psi z		1.000
Cmy,0		0.970
Cmz,0		1.004
Cmy		0.991
Cmz		1.004
CmLT		1.000
muy		0.991
muz		0.998
wy		1.100
wz		1.500
npl		0.088
aLT		0.995
bLT		0.000
cLT		0.121
dLT		0.000
eLT		1.853
Cyy		1.003
Cyz		0.989
Czy		0.983
Czz		0.953

Unity check (6.61) = 0.11 + 0.39 + 0.00 = 0.50

Unity check (6.62) = 0.12 + 0.21 + 0.00 = 0.33

Shear buckling check

in buckling field 1

According to article EN 1993-1-5 : 5. & 7.1. and formula (5.10) & (7.1)

Table of values	
hw/t	26.857

The web slenderness is such that the Shear Buckling Check is not required.

The member satisfies the stability check.

Member B5	5,882 m	IPE180	S 235	Skupaj	0,36 -
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Partial safety factors	
Gamma M0 for resistance of cross-sections	1,00
Gamma M1 for resistance to instability	1,00
Gamma M2 for resistance of net sections	1,25

Material		
Yield strength fy	23,5	kN/cm ²
Ultimate strength fu	36,0	kN/cm ²
Fabrication	Rolled	

.....SECTION CHECK:....

Classification for cross-section design

According to EN 1993-1-1 article 5.5.2

Classification of Internal Compression parts

According to EN 1993-1-1 Table 5.2 Sheet 1

Maximum width-to-thickness ratio	27,55
Class 1 Limit	58,70
Class 2 Limit	67,59
Class 3 Limit	87,12

=> Internal Compression parts Class 1

Classification of Outstand Flanges

According to EN 1993-1-1 Table 5.2 Sheet 2

Maximum width-to-thickness ratio	4,23
Class 1 Limit	9,00
Class 2 Limit	10,00
Class 3 Limit	13,77

=> Outstand Flanges Class 1

=> Section classified as Class 1 for cross-section design

The critical check is on position 0.000 m

Internal forces	Calculated	Unit
N,Ed	-34,87	kN
Vy,Ed	0,00	kN
Vz,Ed	5,92	kN
T,Ed	0,00	kNm
My,Ed	-9,60	kNm

Internal forces	Calculated	Unit
Mz,Ed	0,00	kNm

Compression check

According to EN 1993-1-1 article 6.2.4 and formula (6.9)

A	23,9000	cm ²
Nc,Rd	561,65	kN
Unity check	0,06	-

Bending moment check for My

According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Wpl,y	166,0000	cm ³
Mpl,y,Rd	39,01	kNm
Unity check	0,25	-

Shear check for Vz

According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Eta	1,20	
Av	11,2040	cm ²
Vpl,z,Rd	152,01	kN
Unity check	0,04	-

Combined bending, axial force and shear force check

According to EN 1993-1-1 article 6.2.9.1 and formula (6.41)

Mpl,y,Rd	39,01	kNm
Alpha	2,00	
Mpl,z,Rd	8,13	kNm
Beta	1,00	

Unity check (6.41) = 0,06 + 0,00 = 0,06 -

Note: Since the shear forces are less than half the plastic shear resistances their effect on the moment resistances is neglected.

Note: Since the axial force satisfies both criteria (6.33) and (6.34) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the y-y axis is neglected.

Note: Since the axial force satisfies criteria (6.35) of EN 1993-1-1 article 6.2.9.1(4) its effect on the moment resistance about the z-z axis is neglected.

The member satisfies the section check.

.....STABILITY CHECK:.....

Classification for member buckling design

Decisive position for stability classification: 0,000 m

Classification of Internal Compression parts

According to EN 1993-1-1 Table 5.2 Sheet 1

Maximum width-to-thickness ratio	27,55
Class 1 Limit	58,70
Class 2 Limit	67,59
Class 3 Limit	87,12

=> Internal Compression parts Class 1

Classification of Outstand Flanges

According to EN 1993-1-1 Table 5.2 Sheet 2

Maximum width-to-thickness ratio	4,23
Class 1 Limit	9,00
Class 2 Limit	10,00
Class 3 Limit	13,77

=> Outstand Flanges Class 1

=> Section classified as Class 1 for member buckling design

Flexural Buckling Check

According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters	yy	zz	
Sway type	sway	non-sway	
System length L	5,882	2,941	m
Buckling factor k	1,00	1,00	
Buckling length Lcr	5,882	2,941	m
Critical Euler load Ncr	789,04	242,04	kN
Slenderness Lambda	79,23	143,06	
Relative slenderness Lambda,rel	0,84	1,52	
Limit slenderness Lambda,rel,0	0,20	0,20	
Buckling curve	a	b	
Imperfection Alpha	0,21	0,34	

Buckling parameters	yy	zz	
Reduction factor Chi	0,77	0,33	
Buckling resistance Nb,Rd	432,36	187,48	kN

Flexural Buckling verification		
Cross-section area A	23,9000	cm ²
Buckling resistance Nb,Rd	187,48	kN
Unity check	0,19	-

Lateral Torsional Buckling Check

According to article EN 1993-1-1 : 6.3.2.1. and formula (6.54)

LTB Parameters		
Method for LTB curve	Art. 6.3.2.2.	
Wy	166.0000	cm ³
Elastic critical moment Mcr	88.93	kNm
Relative slenderness Lambda,LT	0.66	
Limit slenderness Lambda,LT,0	0.40	

Mcr Parameters		
LTB length	2.941	m
k	1.00	
kw	1.00	
C1	2.40	
C2	0.15	
C3	1.00	

The slenderness or bending moment is such that Lateral Torsional Buckling effects may be ignored according to EN 1993-1-1 article 6.3.2.2(4)

Compression and bending check

According to article EN 1993-1-1 : 6.3.3. and formula (6.61), (6.62)

Interaction Method 1

Table of values		
kyy	1.126	
kyz	1.038	
kzy	0.594	
kzz	1.177	
Delta My	0.00	kNm
Delta Mz	0.00	kNm
A	23.9000	cm ²
Wy	166.0000	cm ³
Wz	34.6000	cm ³
NRk	561.65	kN
My,Rk	39.01	kNm
Mz,Rk	8.13	kNm
My,Ed	-9.60	kNm
Mz,Ed	0.00	kNm
Interaction Method 1		
Mcr0	36.98	kNm
reduced slenderness 0	1.03	
Psi y	0.486	
Psi z	1.000	
Cmy,0	0.962	
Cmz,0	1.035	
Cmy	0.988	
Cmz	1.035	
CmLT	1.071	
muy	0.989	
muz	0.899	
wy	1.137	
wz	1.500	
npl	0.062	
aLT	0.996	
bLT	0.000	
cLT	0.252	
dLT	0.000	
eLT	0.079	
Cyy	0.972	
Cyz	0.794	
Czy	0.875	
Czz	0.923	

Unity check (6.61) = 0.08 + 0.28 + 0.00 = 0.36

Unity check (6.62) = 0.19 + 0.15 + 0.00 = 0.33

Shear buckling check

in buckling field 1

According to article EN 1993-1-5 : 5. & 7.1. and formula (5.10) & (7.1)

Table of values	
hw/t	30.943

The web slenderness is such that the Shear Buckling Check is not required.

The member satisfies the stability check.

Member B6	3,810 m	IPE140	S 235	Skupaj	0,18 -
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Partial safety factors	
Gamma M0 for resistance of cross-sections	1,00
Gamma M1 for resistance to instability	1,00
Gamma M2 for resistance of net sections	1,25

Material		
Yield strength fy	23,5	kN/cm ²
Ultimate strength fu	36,0	kN/cm ²
Fabrication	Rolled	

....SECTION CHECK:....

Classification for cross-section design

According to EN 1993-1-1 article 5.5.2

Classification of Internal Compression parts

According to EN 1993-1-1 Table 5.2 Sheet 1

Maximum width-to-thickness ratio	23,87
Class 1 Limit	33,00
Class 2 Limit	38,00
Class 3 Limit	42,00

=> Internal Compression parts Class 1

Classification of Outstand Flanges

According to EN 1993-1-1 Table 5.2 Sheet 2

Maximum width-to-thickness ratio	3,93
Class 1 Limit	9,00
Class 2 Limit	10,00
Class 3 Limit	14,00

=> Outstand Flanges Class 1

=> Section classified as Class 1 for cross-section design

The critical check is on position 0.000 m

Internal forces	Calculated	Unit
N,Ed	-9,96	kN
Vy,Ed	0,00	kN
Vz,Ed	0,00	kN
T,Ed	0,00	kNm
My,Ed	0,00	kNm
Mz,Ed	0,00	kNm

Compression check

According to EN 1993-1-1 article 6.2.4 and formula (6.9)

A	16,4000	cm ²
Nc,Rd	385,40	kN
Unity check	0,03	-

The member satisfies the section check.

....STABILITY CHECK:....

Classification for member buckling design

Decisive position for stability classification: 0,000 m

Classification of Internal Compression parts

According to EN 1993-1-1 Table 5.2 Sheet 1

Maximum width-to-thickness ratio	23,87
Class 1 Limit	33,00
Class 2 Limit	38,00
Class 3 Limit	42,00

=> Internal Compression parts Class 1

Classification of Outstand Flanges

According to EN 1993-1-1 Table 5.2 Sheet 2

Maximum width-to-thickness ratio	3,93
Class 1 Limit	9,00
Class 2 Limit	10,00
Class 3 Limit	14,00

=> Outstand Flanges Class 1
=> Section classified as Class 1 for member buckling design

Flexural Buckling Check

According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters	yy	zz	
Sway type	sway	non-sway	
System length L	3,810	3,810	m
Buckling factor k	1,00	1,00	
Buckling length L _{cr}	3,810	3,810	m
Critical Euler load N _{cr}	772,44	64,11	kN
Slenderness Lambda	66,34	230,26	
Relative slenderness Lambda _{rel}	0,71	2,45	
Limit slenderness Lambda _{rel,0}	0,20	0,20	
Buckling curve	a	b	
Imperfection Alpha	0,21	0,34	
Reduction factor Chi	0,84	0,14	
Buckling resistance N _{b,Rd}	325,56	55,80	kN

Warning: Slenderness 230,26 is larger than the limit value of 200,00.

Flexural Buckling verification		
Cross-section area A	16,4000	cm ²
Buckling resistance N _{b,Rd}	55,80	kN
Unity check	0,18	-

The member satisfies the stability check.

Member B7	5,440 m	HEA160	S 235	Skupaj	0,36 -
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Partial safety factors	
Gamma M0 for resistance of cross-sections	1,00
Gamma M1 for resistance to instability	1,00
Gamma M2 for resistance of net sections	1,25

Material		
Yield strength f _y	23,5	kN/cm ²
Ultimate strength f _u	36,0	kN/cm ²
Fabrication	Rolled	

....SECTION CHECK:....

Classification for cross-section design

According to EN 1993-1-1 article 5.5.2

Classification of Internal Compression parts

According to EN 1993-1-1 Table 5.2 Sheet 1

Maximum width-to-thickness ratio	17,33
Class 1 Limit	33,00
Class 2 Limit	38,00
Class 3 Limit	42,00

=> Internal Compression parts Class 1

Classification of Outstand Flanges

According to EN 1993-1-1 Table 5.2 Sheet 2

Maximum width-to-thickness ratio	6,89
Class 1 Limit	9,00
Class 2 Limit	10,00
Class 3 Limit	14,00

=> Outstand Flanges Class 1

=> Section classified as Class 1 for cross-section design

The critical check is on position 5.440 m

Internal forces	Calculated	Unit
N _{Ed}	-107,80	kN
V _{y,Ed}	0,00	kN
V _{z,Ed}	0,00	kN
T _{Ed}	0,00	kNm
M _{y,Ed}	0,00	kNm
M _{z,Ed}	0,00	kNm

Compression check

According to EN 1993-1-1 article 6.2.4 and formula (6.9)

A	38,8000	cm ²
N _{c,Rd}	911,80	kN
Unity check	0,12	-

The member satisfies the section check.

....:STABILITY CHECK:....

Classification for member buckling design

Decisive position for stability classification: 0,000 m

Classification of Internal Compression parts

According to EN 1993-1-1 Table 5.2 Sheet 1

Maximum width-to-thickness ratio	17,33
Class 1 Limit	33,00
Class 2 Limit	38,00
Class 3 Limit	42,00

=> Internal Compression parts Class 1

Classification of Outstand Flanges

According to EN 1993-1-1 Table 5.2 Sheet 2

Maximum width-to-thickness ratio	6,89
Class 1 Limit	9,00
Class 2 Limit	10,00
Class 3 Limit	14,00

=> Outstand Flanges Class 1

=> Section classified as Class 1 for member buckling design

Flexural Buckling Check

According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters	yy	zz	
Sway type	sway	non-sway	
System length L	5,440	5,440	m
Buckling factor k	1,00	1,00	
Buckling length Lcr	5,440	5,440	m
Critical Euler load Ncr	1169,60	431,42	kN
Slenderness Lambda	82,92	136,53	
Relative slenderness Lambda,rel	0,88	1,45	
Limit slenderness Lambda,rel,0	0,20	0,20	
Buckling curve	b	c	
Imperfection Alpha	0,34	0,49	
Reduction factor Chi	0,67	0,33	
Buckling resistance Nb,Rd	612,85	300,88	kN

Flexural Buckling verification		
Cross-section area A	38,8000	cm ²
Buckling resistance Nb,Rd	300,88	kN
Unity check	0,36	-

The member satisfies the stability check.

Member B8	7,988 m	U65	S 235	Skupaj	0,92 -
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Partial safety factors	
Gamma M0 for resistance of cross-sections	1,00
Gamma M1 for resistance to instability	1,00
Gamma M2 for resistance of net sections	1,25

Material		
Yield strength fy	23,5	kN/cm ²
Ultimate strength fu	36,0	kN/cm ²
Fabrication	Rolled	

....:SECTION CHECK:....

The critical check is on position 7.988 m

Internal forces	Calculated	Unit
N,Ed	195,58	kN
Vy,Ed	0,00	kN
Vz,Ed	0,00	kN
T,Ed	0,00	kNm
My,Ed	0,00	kNm
Mz,Ed	0,00	kNm

Tension check

According to EN 1993-1-1 article 6.2.3 and formula (6.5)

A	9,0300	cm ²
Npl,Rd	212,21	kN
Nu,Rd	234,06	kN
Nt,Rd	212,21	kN
Unity check	0,92	-

The member satisfies the section check.

.....STABILITY CHECK:.....

The member satisfies the stability check.

Member B9	6,668 m	L20X3	S 235	Skupaj	0,93 -
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Partial safety factors		
Gamma M0 for resistance of cross-sections	1,00	
Gamma M1 for resistance to instability	1,00	
Gamma M2 for resistance of net sections	1,25	

Material		
Yield strength fy	23,5	kN/cm ²
Ultimate strength fu	36,0	kN/cm ²
Fabrication	Rolled	

.....SECTION CHECK:.....

The critical check is on position **6.668 m**

Internal forces	Calculated	Unit
N,Ed	24,57	kN
Vy,Ed	0,00	kN
Vz,Ed	0,00	kN
T,Ed	0,00	kNm
My,Ed	0,00	kNm
Mz,Ed	0,00	kNm

Tension check

According to EN 1993-1-1 article 6.2.3 and formula (6.5)

A	1,1200	cm ²
Npl,Rd	26,32	kN
Nu,Rd	29,03	kN
Nt,Rd	26,32	kN
Unity check	0,93	-

The member satisfies the section check.

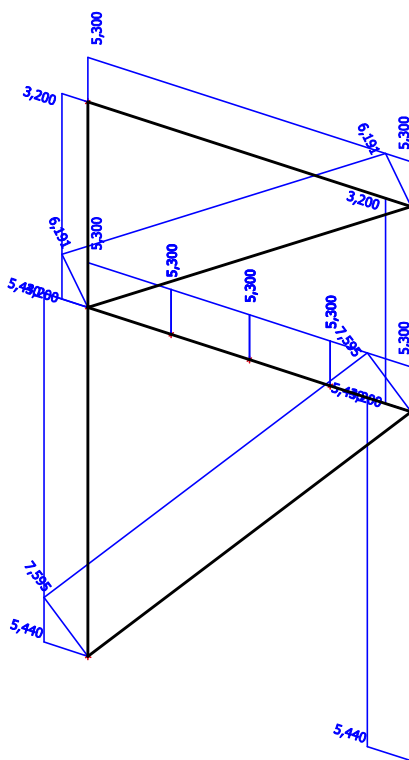
.....STABILITY CHECK:.....

The member satisfies the stability check.

Second Order calculation

Second Order calculation

2. ly



3. Iz



4. Result classes

4.1. Result classes - RC1

Name	List
RC1	Ovojnica

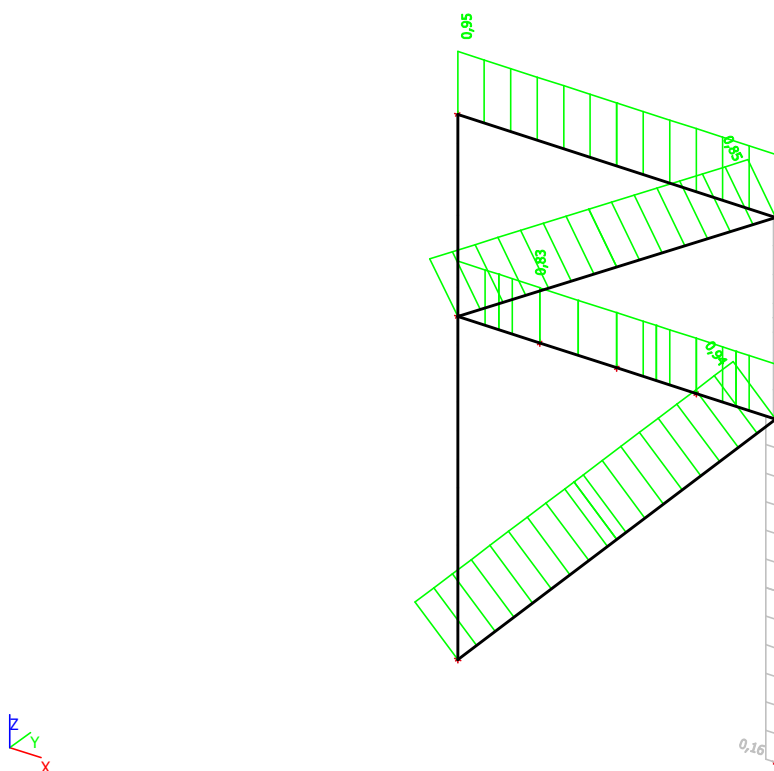
4.1.1. Check of steel

Nonlinear calculation, Extreme : Member

Selection : All

Class : RC1

Member	css	mat	Case	dx [m]	un.check [-]	sec.check [-]	stab.check [-]
B1	CS11 - HEA500	S 235	Ovojnica	5,440	0,00	0,00	0,00
B2	CS11 - HEA500	S 235	Ovojnica	0,000	0,16	0,10	0,16
B5	CS8 - IPE240	S 235	Ovojnica	1,367	0,83	0,40	0,83
B6	CS12 - CFCHS101.6X4	S 235	Ovojnica	0,000	0,95	0,26	0,95
B7	CS13 - L50X40X5	S 235	Ovojnica	6,191	0,85	0,85	0,00
B8	CS9 - U160	S 235	Ovojnica	7,595	0,94	0,94	0,00



Nonlinear calculation, Extreme : Cross-section
 Selection : All
 Class : RC1

Member B2	8,640 m	HEA500	S 235	Ovojnica	0,16 -
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Partial safety factors	
Gamma M0 for resistance of cross-sections	1,00
Gamma M1 for resistance to instability	1,00
Gamma M2 for resistance of net sections	1,25

Material		
Yield strength f_y	23,5	kN/cm ²
Ultimate strength f_u	36,0	kN/cm ²
Fabrication	Rolled	

....SECTION CHECK:....

Classification for cross-section design

According to EN 1993-1-1 article 5.5.2

Classification of Internal Compression parts

According to EN 1993-1-1 Table 5.2 Sheet 1

Maximum width-to-thickness ratio	32,50
Class 1 Limit	33,00
Class 2 Limit	38,00
Class 3 Limit	42,00

=> Internal Compression parts Class 1

Classification of Outstand Flanges

According to EN 1993-1-1 Table 5.2 Sheet 2

Maximum width-to-thickness ratio	5,09
Class 1 Limit	9,00
Class 2 Limit	10,00
Class 3 Limit	14,00

=> Outstand Flanges Class 1

=> Section classified as Class 1 for cross-section design

The critical check is on position 0.000 m

Internal forces	Calculated	Unit
N_{Ed}	-456,55	kN
$V_{y,Ed}$	-1,20	kN
$V_{z,Ed}$	0,00	kN
T_{Ed}	0,00	kNm
$M_{y,Ed}$	0,00	kNm
$M_{z,Ed}$	0,00	kNm

Compression check

According to EN 1993-1-1 article 6.2.4 and formula (6.9)

A	198,0000	cm ²
N _{c,Rd}	4653,00	kN
Unity check	0,10	-

Shear check for V_y

According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Eta	1,20	
Av	142,6800	cm ²
V _{pl,y,Rd}	1935,84	kN
Unity check	0,00	-

The member satisfies the section check.

....:STABILITY CHECK:....

Classification for member buckling design

Decisive position for stability classification: 0,000 m

Classification of Internal Compression parts

According to EN 1993-1-1 Table 5.2 Sheet 1

Maximum width-to-thickness ratio	32,50
Class 1 Limit	33,00
Class 2 Limit	38,00
Class 3 Limit	42,00

=> Internal Compression parts Class 1

Classification of Outstand Flanges

According to EN 1993-1-1 Table 5.2 Sheet 2

Maximum width-to-thickness ratio	5,09
Class 1 Limit	9,00
Class 2 Limit	10,00
Class 3 Limit	14,00

=> Outstand Flanges Class 1

=> Section classified as Class 1 for member buckling design

Flexural Buckling Check

According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters	yy	zz	
Sway type	sway	non-sway	
System length L	5,440	5,440	m
Buckling factor k	1,00	1,00	
Buckling length L _{cr}	5,440	5,440	m
Critical Euler load N _{cr}	60931,31	7283,74	kN
Slenderness Lambda	25,95	75,06	
Relative slenderness Lambda _{rel}	0,28	0,80	
Limit slenderness Lambda _{rel,0}	0,20	0,20	
Buckling curve	a	b	
Imperfection Alpha	0,21	0,34	
Reduction factor Chi	0,98	0,72	
Buckling resistance N _{b,Rd}	4573,72	3373,00	kN

Flexural Buckling verification		
Cross-section area A	198,0000	cm ²
Buckling resistance N _{b,Rd}	3373,00	kN
Unity check	0,14	-

Compression and bending check

According to article EN 1993-1-1 : 6.3.3. and formula (6.61), (6.62)

Interaction Method 1

Table of values		
k _{yy}	1.062	
k _{yz}	0.698	
k _{zy}	0.559	
k _{zz}	1.000	
Delta M _y	0.00	kNm
Delta M _z	0.00	kNm
A	198.0000	cm ²
W _y	3950.0000	cm ³
W _z	1058.3300	cm ³
N _{Rk}	4653.00	kN
M _{y,Rk}	928.25	kNm
M _{z,Rk}	248.71	kNm
M _{y,Ed}	0.00	kNm
M _{z,Ed}	-5.90	kNm

Table of values		
Interaction Method 1		
Mcr0	2167.14	kNm
reduced slenderness 0	0.65	
Psi y	1.000	
Psi z	0.000	
Cmy,0	1.002	
cmz,0	0.979	
Cmy	1.002	
cmz	0.979	
CmLT	1.051	
muy	1.000	
muz	0.982	
wy	1.113	
wz	1.500	
npl	0.098	
aLT	0.996	
bLT	0.000	
cLT	0.000	
dLT	0.000	
eLT	0.000	
Cyy	0.999	
Cyz	1.043	
Czy	0.964	
Czz	1.026	

Unity check (6.61) = 0.10 + 0.00 + 0.02 = 0.12

Unity check (6.62) = 0.14 + 0.00 + 0.02 = 0.16

The member satisfies the stability check.

Member B5	5,300 m	IPE240	S 235	Ovojnica	0,83 -
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Partial safety factors	
Gamma M0 for resistance of cross-sections	1,00
Gamma M1 for resistance to instability	1,00
Gamma M2 for resistance of net sections	1,25

Material		
Yield strength fy	23,5	kN/cm ²
Ultimate strength fu	36,0	kN/cm ²
Fabrication	Rolled	

....SECTION CHECK:....

Classification for cross-section design

According to EN 1993-1-1 article 5.5.2

Classification of Internal Compression parts

According to EN 1993-1-1 Table 5.2 Sheet 1

Maximum width-to-thickness ratio	30,71
Class 1 Limit	33,00
Class 2 Limit	38,00
Class 3 Limit	54,87

=> Internal Compression parts Class 1

Classification of Outstand Flanges

According to EN 1993-1-1 Table 5.2 Sheet 2

Maximum width-to-thickness ratio	4,28
Class 1 Limit	9,00
Class 2 Limit	10,00
Class 3 Limit	13,77

=> Outstand Flanges Class 1

=> Section classified as Class 1 for cross-section design

The critical check is on position 1.367 m

Internal forces	Calculated	Unit
N _{Ed}	-367,15	kN
V _{y,Ed}	0,00	kN
V _{z,Ed}	10,27	kN
T _{Ed}	0,00	kNm
M _{y,Ed}	21,16	kNm
M _{z,Ed}	0,00	kNm

Compression check

According to EN 1993-1-1 article 6.2.4 and formula (6.9)

A	39,1000	cm ²
N _{c,Rd}	918,85	kN
Unity check	0,40	-

Bending moment check for My

According to EN 1993-1-1 article 6.2.5 and formula (6.12),(6.13)

Wpl,y	367,0000	cm ³
Mpl,y,Rd	86,25	kNm
Unity check	0,25	-

Shear check for Vz

According to EN 1993-1-1 article 6.2.6 and formula (6.17)

Eta	1,20	
Av	19,1276	cm ²
Vpl,z,Rd	259,52	kN
Unity check	0,04	-

Combined bending, axial force and shear force check

According to EN 1993-1-1 article 6.2.9.1 and formula (6.31)

MN,y,Rd	64,67	kNm
Unity check	0,33	-

Note: Since the shear forces are less than half the plastic shear resistances their effect on the moment resistances is neglected.

The member satisfies the section check.

....STABILITY CHECK:....**Classification for member buckling design**

Decisive position for stability classification: 0,000 m

Classification of Internal Compression parts

According to EN 1993-1-1 Table 5.2 Sheet 1

Maximum width-to-thickness ratio	30,71
Class 1 Limit	33,00
Class 2 Limit	38,00
Class 3 Limit	42,00

=> Internal Compression parts Class 1

Classification of Outstand Flanges

According to EN 1993-1-1 Table 5.2 Sheet 2

Maximum width-to-thickness ratio	4,28
Class 1 Limit	9,00
Class 2 Limit	10,00
Class 3 Limit	14,00

=> Outstand Flanges Class 1

=> Section classified as Class 1 for member buckling design

Flexural Buckling Check

According to EN 1993-1-1 article 6.3.1.1 and formula (6.46)

Buckling parameters	yy	zz	
Sway type	sway	non-sway	
System length L	5,300	1,367	m
Buckling factor k	1,00	1,00	
Buckling length Lcr	5,300	1,367	m
Critical Euler load Ncr	2871,71	3148,08	kN
Slenderness Lambda	53,12	50,74	
Relative slenderness Lambda,rel	0,57	0,54	
Limit slenderness Lambda,rel,0	0,20	0,20	
Buckling curve	a	b	
Imperfection Alpha	0,21	0,34	
Reduction factor Chi	0,90	0,87	
Buckling resistance Nb,Rd	829,31	795,67	kN

Flexural Buckling verification

Cross-section area A	39,1000	cm ²
Buckling resistance Nb,Rd	795,67	kN
Unity check	0,46	-

Torsional (-Flexural) Buckling check

According to article EN 1993-1-1 : 6.3.1.1. and formula (6.46)

Table of values		
Torsional Buckling length	1.367	m
Ncr,T	4856.96	kN
Ncr,TF	2871.71	kN
Relative slenderness Lambda,T	0.57	
Limit slenderness Lambda,0	0.20	
Buckling curve	b	
Imperfection Alpha	0.34	

Table of values		
A	39.1000	cm ²
Reduction factor Chi	0.85	
Buckling resistance Nb,Rd	784.63	kN
Unity check	0.47	-

Lateral Torsional Buckling Check

According to article EN 1993-1-1 : 6.3.2.1. and formula (6.54)

LTB Parameters		
Method for LTB curve	Art. 6.3.2.2.	
Wy	367.0000	cm ³
Elastic critical moment Mcr	645.07	kNm
Relative slenderness Lambda,LT	0.37	
Limit slenderness Lambda,LT,0	0.40	

Mcr Parameters		
LTB length	1.367	m
k	1.00	
kw	1.00	
C1	1.60	
C2	0.05	
C3	1.00	

The slenderness or bending moment is such that Lateral Torsional Buckling effects may be ignored according to EN 1993-1-1 article 6.3.2.2(4)

Compression and bending check

According to article EN 1993-1-1 : 6.3.3. and formula (6.61), (6.62)

Interaction Method 1

Table of values		
kyy	1.207	
kyz	0.656	
kzy	0.666	
kzz	1.232	
Delta My	0.00	kNm
Delta Mz	0.00	kNm
A	39.1000	cm ²
Wy	367.0000	cm ³
Wz	73.9000	cm ³
NRk	918.85	kN
My,Rk	86.25	kNm
Mz,Rk	17.37	kNm
My,Ed	27.81	kNm
Mz,Ed	0.00	kNm
Interaction Method 1		
Mcr0	404.12	kNm
reduced slenderness 0	0.46	
Psi y	1.000	
Psi z	1.000	
Cmy,0	1.004	
Cmz,0	1.028	
Cmy	1.002	
Cmz	1.028	
CmLT	1.107	
muy	0.986	
muz	0.983	
wy	1.133	
wz	1.500	
npl	0.400	
aLT	0.997	
bLT	0.000	
cLT	0.135	
dLT	0.000	
eLT	1.360	
Cyy	1.039	
Cyz	1.208	
Czy	0.978	
Czz	0.928	

Unity check (6.61) = 0.44 + 0.39 + 0.00 = 0.83

Unity check (6.62) = 0.47 + 0.21 + 0.00 = 0.68

Shear buckling check

in buckling field 1

According to article EN 1993-1-5 : 5. & 7.1. and formula (5.10) & (7.1)

Table of values	
hw/t	35.548

The web slenderness is such that the Shear Buckling Check is not required.

The member satisfies the stability check.

Member B6	5,300 m	CFCHS101.6X4	S 235	Ovojnica	0,95 -
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Note: EN 1993-1-3 article 1.1(3) specifies that this part does not apply to cold formed CHS and RHS sections.
The default EN 1993-1-1 code check is executed instead of the EN 1993-1-3 code check.

Partial safety factors	
Gamma M0 for resistance of cross-sections	1,00
Gamma M1 for resistance to instability	1,00
Gamma M2 for resistance of net sections	1,25

Material		
Yield strength fy	23,5	kN/cm ²
Ultimate strength fu	36,0	kN/cm ²
Fabrication	Cold formed	

....SECTION CHECK:....

Classification for cross-section design

According to EN 1993-1-1 article 5.5.2

Classification for Tubular Sections

According to EN 1993-1-1 Table 5.2 Sheet 3

Maximum width-to-thickness ratio	25,40
Class 1 Limit	50,00
Class 2 Limit	70,00
Class 3 Limit	90,00

=> Section classified as Class 1 for cross-section design

The critical check is on position 0.000 m

Internal forces	Calculated	Unit
N,Ed	-75,06	kN
Vy,Ed	0,00	kN
Vz,Ed	0,00	kN
T,Ed	0,00	kNm
My,Ed	0,00	kNm
Mz,Ed	0,00	kNm

Compression check

According to EN 1993-1-1 article 6.2.4 and formula (6.9)

A	12,2600	cm ²
Nc,Rd	288,11	kN
Unity check	0,26	-

The member satisfies the section check.

....STABILITY CHECK:....

Classification for member buckling design

Decisive position for stability classification: 0,000 m

Classification for Tubular Sections

According to EN 1993-1-1 Table 5.2 Sheet 3

Maximum width-to-thickness ratio	25,40
Class 1 Limit	50,00
Class 2 Limit	70,00
Class 3 Limit	90,00

=> Section classified as Class 1 for member buckling design

Flexural Buckling Check

According to article EN 1993-1-1 : 6.3.1.1. and formula (6.46)

Buckling parameters	yy	zz	
Sway type	sway	non-sway	
System Length L	5.300	5.300	m
Buckling factor k	1.00	1.00	
Buckling length Lcr	5.300	5.300	m
Critical Euler load Ncr	107.93	107.93	kN
Slenderness	153.44	153.44	
Relative slenderness Lambda	1.63	1.63	
Limit slenderness Lambda,0	0.20	0.20	
Buckling curve	c	c	
Imperfection Alpha	0.49	0.49	
Reduction factor Chi	0.27	0.27	
Buckling resistance Nb,Rd	79.19	79.19	kN

Table of values		
A	12.2600	cm ²
Buckling resistance Nb,Rd	79.19	kN
Unity check	0.95	-

The member satisfies the stability check.

Member B7	6,191 m	L50X40X5	S 235	Ovojnica	0,85 -
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Partial safety factors		
Gamma M0 for resistance of cross-sections		1,00
Gamma M1 for resistance to instability		1,00
Gamma M2 for resistance of net sections		1,25

Material		
Yield strength fy	23,5	kN/cm ²
Ultimate strength fu	36,0	kN/cm ²
Fabrication	Rolled	

....SECTION CHECK:....

The critical check is on position **6.191 m**

Internal forces	Calculated	Unit
N,Ed	85,71	kN
Vy,Ed	0,00	kN
Vz,Ed	0,00	kN
T,Ed	0,00	kNm
My,Ed	0,00	kNm
Mz,Ed	0,00	kNm

Tension check

According to EN 1993-1-1 article 6.2.3 and formula (6.5)

A	4,2700	cm ²
Npl,Rd	100,35	kN
Nu,Rd	110,68	kN
Nt,Rd	100,35	kN
Unity check	0,85	-

The member satisfies the section check.

....STABILITY CHECK:....

The member satisfies the stability check.

Member B8	7,595 m	U160	S 235	Ovojnica	0,94 -
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Partial safety factors		
Gamma M0 for resistance of cross-sections		1,00
Gamma M1 for resistance to instability		1,00
Gamma M2 for resistance of net sections		1,25

Material		
Yield strength fy	23,5	kN/cm ²
Ultimate strength fu	36,0	kN/cm ²
Fabrication	Rolled	

....SECTION CHECK:....

The critical check is on position **7.595 m**

Internal forces	Calculated	Unit
N,Ed	531,47	kN
Vy,Ed	0,00	kN
Vz,Ed	0,00	kN
T,Ed	0,00	kNm
My,Ed	0,00	kNm
Mz,Ed	0,00	kNm

Tension check

According to EN 1993-1-1 article 6.2.3 and formula (6.5)

A	24,0000	cm ²
Npl,Rd	564,00	kN
Nu,Rd	622,08	kN
Nt,Rd	564,00	kN
Unity check	0,94	-

The member satisfies the section check.

....STABILITY CHECK:....

The member satisfies the stability check.