

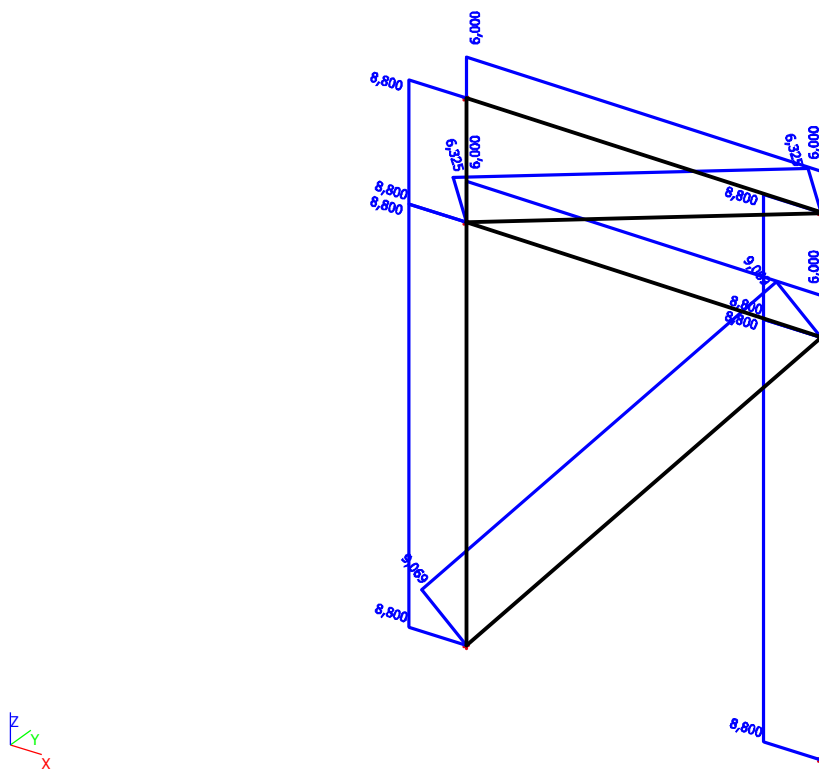
PRILOGA G: Kontrola nosilnosti in stabilnosti vertikalnega centričnega povezja

1. Steel slenderness

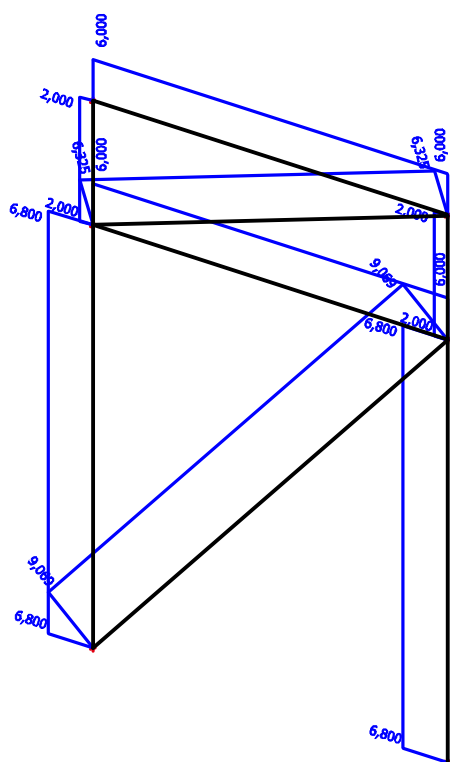
Linear calculation

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	CS15	1	Yes	8,800	1,00	8,800	57,84	6,800	6,800
			No	6,800	1,00	6,800	91,55		
B2	CS15	1	Yes	8,800	1,00	8,800	57,84	2,000	2,000
			No	2,000	1,00	2,000	26,93		
B3	CS16	1	Yes	6,000	1,00	6,000	128,81	6,000	6,000
			No	6,000	1,00	6,000	128,81		
B4	CS15	1	Yes	8,800	1,00	8,800	57,84	6,800	6,800
			No	6,800	1,00	6,800	91,55		
B5	CS15	1	Yes	8,800	1,00	8,800	57,84	2,000	2,000
			No	2,000	1,00	2,000	26,93		
B6	CS18	1	Yes	6,000	1,00	6,000	156,34	6,000	6,000
			No	6,000	1,00	6,000	156,34		
B7	CS22	1	Yes	9,069	1,00	9,069	296,73	9,069	9,069
			No	9,069	1,00	9,069	296,73		
B8	CS20	1	Yes	6,325	1,00	6,325	346,76	6,325	6,325
			No	6,325	1,00	6,325	346,76		

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4. Result classes

4.1. Result classes - RC1 potres

Name	List
RC1 potres	NC2 potres

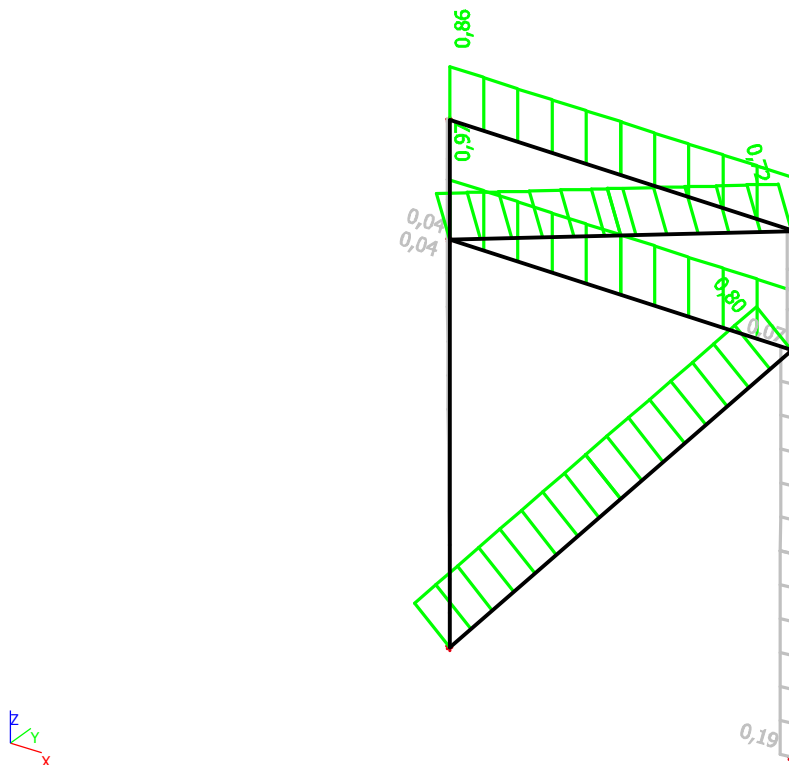
4.1.1. Check of steel

Nonlinear calculation, Extreme : Member

Selection : All

Class : RC1 potres

Member	css	mat	Case	dx [m]	un.check [-]	sec.check [-]	stab.check [-]
B1	CS15 - HEA360	S 235	NC2 potres	6,800	0,04	0,04	0,00
B2	CS15 - HEA360	S 235	NC2 potres	0,000	0,04	0,04	0,04
B3	CS16 - VHP120/120x5.0	S 235	NC2 potres	0,000	0,97	0,35	0,97
B4	CS15 - HEA360	S 235	NC2 potres	0,000	0,19	0,08	0,19
B5	CS15 - HEA360	S 235	NC2 potres	0,000	0,07	0,06	0,07
B6	CS18 - VHP100/100x5.0	S 235	NC2 potres	0,000	0,86	0,23	0,86
B7	CS22 - L100X8	S 235	NC2 potres	9,069	0,80	0,80	0,00
B8	CS20 - L60X5	S 235	NC2 potres	6,325	0,72	0,72	0,00



Nonlinear calculation, Extreme : Cross-section

Selection : All

Class : RC1 potres

Member B4	6,800 m	HEA360	S 235	NC2 potres	0,19 -
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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	26,10
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	6,74
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	-259,39	kN
Vy,Ed	-1,72	kN
Vz,Ed	0,00	kN

Internal forces	Calculated	Unit
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	1,4300e-02	m ²
Nc,Rd	3360,50	kN
Unity check	0,08	-

Shear check for Vy

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

Eta	1,20	
Av	1,0870e-02	m ²
Vpl,y,Rd	1474,81	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	26,10
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	6,74
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	8,800	6,800	m
Buckling factor k	1,00	1,00	
Buckling length Lcr	8,800	6,800	m
Critical Euler load Ncr	8858,94	3536,54	kN
Slenderness Lambda	57,84	91,55	
Relative slenderness Lambda,rel	0,62	0,97	
Limit slenderness Lambda,rel,0	0,20	0,20	
Buckling curve	b	c	
Imperfection Alpha	0,34	0,49	
Reduction factor Chi	0,83	0,55	
Buckling resistance Nb,Rd	2785,85	1864,06	kN

Flexural Buckling verification		
Cross-section area A	1,4300e-02	m ²
Buckling resistance Nb,Rd	1864,06	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		
kyy	1.109	
kyz	0.566	
kzy	0.580	
kzz	0.792	
Delta My	0.00	kNm
Delta Mz	0.00	kNm
A	1.4300e-02	m ²

Table of values		
Wy	2.0875e-03	m ³
Wz	8.0417e-04	m ³
NRk	3360.50	kN
My,Rk	490.56	kNm
Mz,Rk	188.98	kNm
My,Ed	0.00	kNm
Mz,Ed	-11.72	kNm
Interaction Method 1		
Mcr0	877.86	kNm
reduced slenderness 0	0.75	
Psi y	1.000	
Psi z	0.000	
Cmy,0	1.007	
Cmz,0	0.781	
Cmy	1.007	
Cmz	0.781	
CmLT	1.067	
muy	0.995	
muz	0.966	
wy	1.104	
wz	1.500	
npl	0.077	
aLT	0.995	
bLT	0.000	
cLT	0.000	
dLT	0.000	
eLT	0.000	
Cyy	0.993	
Cyz	1.036	
Czy	0.950	
Czz	1.029	

Unity check (6.61) = 0.09 + 0.00 + 0.04 = 0.13

Unity check (6.62) = 0.14 + 0.00 + 0.05 = 0.19

The member satisfies the stability check.

Member B3	6,000 m	VHP120/120x5.0	S 235	NC2 potres	0,97 -
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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 of Internal Compression parts

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

Maximum width-to-thickness ratio	21,00
Class 1 Limit	33,00
Class 2 Limit	38,00
Class 3 Limit	42,00

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

The critical check is on position 0.000 m

Internal forces	Calculated	Unit
N,Ed	-183,78	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	2,2400e-03	m ²
Nc,Rd	526,40	kN
Unity check	0,35	-

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	21,00
Class 1 Limit	33,00
Class 2 Limit	38,00
Class 3 Limit	42,00

=> 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	6.000	6.000	m
Buckling factor k	1.00	1.00	
Buckling length Lcr	6.000	6.000	m
Critical Euler load Ncr	279.80	279.80	kN
Slenderness	128.81	128.81	
Relative slenderness Lambda	1.37	1.37	
Limit slenderness Lambda,0	0.20	0.20	
Buckling curve	c	c	
Imperfection Alpha	0.49	0.49	
Reduction factor Chi	0.36	0.36	
Buckling resistance Nb,Rd	189.47	189.47	kN

Table of values		
A	2.2400e-03	m ²
Buckling resistance Nb,Rd	189.47	kN
Unity check	0.97	-

The member satisfies the stability check.

Member B6	6,000 m	VHP100/100x5.0	S 235	NC2 potres	0,86 -
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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 1993-1-3 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 of Internal Compression parts

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

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

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

The critical check is on position 0.000 m

Internal forces	Calculated	Unit
N,Ed	-99,46	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	1,8400e-03	m ²
N _{c,Rd}	432,40	kN
Unity check	0,23	-

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	17,00
Class 1 Limit	33,00
Class 2 Limit	38,00
Class 3 Limit	42,00

=> 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	6.000	6.000	m
Buckling factor k	1.00	1.00	
Buckling length L _{cr}	6.000	6.000	m
Critical Euler load N _{cr}	156.02	156.02	kN
Slenderness	156.34	156.34	
Relative slenderness Lambda	1.66	1.66	
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 N _{b,Rd}	115.30	115.30	kN

Table of values

A	1.8400e-03	m ²
Buckling resistance N _{b,Rd}	115.30	kN
Unity check	0.86	-

The member satisfies the stability check.

Member B7	9,069 m	L100X8	S 235	NC2 potres	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 f _y	23,5	kN/cm ²
Ultimate strength f _u	36,0	kN/cm ²
Fabrication	Rolled	

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

The critical check is on position 9.069 m

Axis definition :

- principal y- axis in this code check is referring to the principal z axis in Scia Engineer
- principal z- axis in this code check is referring to the principal y axis in Scia Engineer

Internal forces	Calculated	Unit
N _{Ed}	289,64	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

Tension check

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

A	1,5500e-03	m ²
N _{pl,Rd}	364,25	kN
N _{u,Rd}	401,76	kN
N _{t,Rd}	364,25	kN
Unity check	0,80	-

The member satisfies the section check.

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

The member satisfies the stability check.

Member B8	6,325 m	L60X5	S 235	NC2 potres	0,72 -
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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 **6.325 m**

Axis definition :

- principal y- axis in this code check is referring to the principal z axis in Scia Engineer
- principal z- axis in this code check is referring to the principal y axis in Scia Engineer

Internal forces	Calculated	Unit
N,Ed	98,71	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	5,8200e-04	m ²
Npl,Rd	136,77	kN
Nu,Rd	150,85	kN
Nt,Rd	136,77	kN
Unity check	0,72	-

The member satisfies the section check.

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

The member satisfies the stability check.