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TITLE PAGE OF THE TECHNICAL DESIGN	Copies. •••••

Name of the project	Technical design of the modular object "Bar with a decorative Christmas tree"

Developed:	Industry:	Name and surname	Building permits	Signature
Designer	Construction	5.1, 2, e M.Sc.	**POM/0008/PBKb/21** for design without restrictions in the construction specialty	

Chojnice, 1.03.2024

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Table of contents

TECHNICAL DETAILS 5

1.0. GENERAL PART 5

1.1. Subject matter of the study 5

1.2. Scope of the study 5

1.3. General assumptions 5

2.0. DESIGNED STRUCTURAL SOLUTIONS 5

STATIC AND STRENGTH CALCULATIONS 7

2.1 Construction of the object 11

LIST OF DRAWINGS

K-1 Floor plan .....

K-2 Walls .....

K-3 Roof Plan .....

K-4 Cross-Section .....

K-5 3D view .....

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TECHNICAL DETAILS

1.0. GENERAL PART

1.1. Subject matter of the study

The subject of the study is the technical design of a temporary building (period of use up to 3 months) in a steel structure with dimensions of 5035x4450 mm in the shape of a hexagon. The designed facility consists of a bar and a decorative Christmas tree. The study includes static calculations of the structure and technical drawings

1.2. Scope of the study

This study covers:
(a) technical design in the field of construction.

1.3. General assumptions

Calculations and design were carried out using the following standards: BS-EN 1990:2004, BS-EN 1991-1-3/4:2005/2008, BS-EN 1993-1:2005/NA:2008/A1:2014 and EN-13782:2015

The facility was designed with the following assumptions in mind:

- snow load zone: III (s_k=0.32 to 0.90 kN/m2)
- Wind load zone: ($q_{p)ze)}$= 0.65 kN/m2)
- S235 grade steel

2.0. DESIGNED STRUCTURAL SOLUTIONS

The scope of the investment is the technical design of a modular facility in the construction industry. The facility was designed in a steel structure, with SHS square tubes and RHS rectangular pipes made of S235 steel. The beams and columns of the structure are welded together to the full thickness of the element. The bar consists of two parts that are bolted together with Φ16 mm grade 8.8 bolts using 8 mm thick sheets. The joints are shown in the drawings. There is a Christmas tree on the roof of the bar. Christmas tree supports welded to the roof of the bar. The Christmas tree consists of two side parts and individual modules at its height. Each module should be screwed together with Φ12 mm class 8.8 screws and using 4 mm thick sheets. Due to the considerable overturning forces, the bar floor should be weighed down with concrete blocks on its entire surface and the S1 columns should be additionally anchored to reinforced concrete glasses at the place of installation of the object, e.g. by means of chemically glued anchors. The facility has been designed for wind and snow zones in accordance with point 1.3, in the case of installation of structures in zones with higher loads, static recalculations must be carried out for the given zones.

The designed facility is a temporary facility, dismantled for a specific period of time (up to 3 months) and dismantled back and stored in a warehouse. Before each redismantling of the object, it is necessary to verify whether the structure is in good condition and whether there are no elements that would be subject to replacement. The structure of the object, joints, sheets, screws, etc., are checked.

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Static and strength calculations

1. Collecting the loads

1.1 Collecting Loads

ROOF, WALLS AND FLOOR (permanent)

L.p.	Description of the impact	The value of char. kN/m^2
1.	Planks 2x 2 cm (max. 600 kg/m3) [0,240kN/m^2]	0,24
	Σ:	**0,24**

FLOOR (utility)

L.p.	Description of the impact	The value of char. kN/m^2
1.	Payload of the floor	2.00

ROOF (snow)

L.p.	Description of the impact	The value of char. kN/m^2
1.	Snow load on the roof of the bar	0,72

CHRISTMAS TREE (fixed)

L.p.	Description of the impact	The value of char. kN/m^2
1.	Weight of decorations max. 215 kg (0.04 kN/m2) Christmas tree area 54 m2	0,04

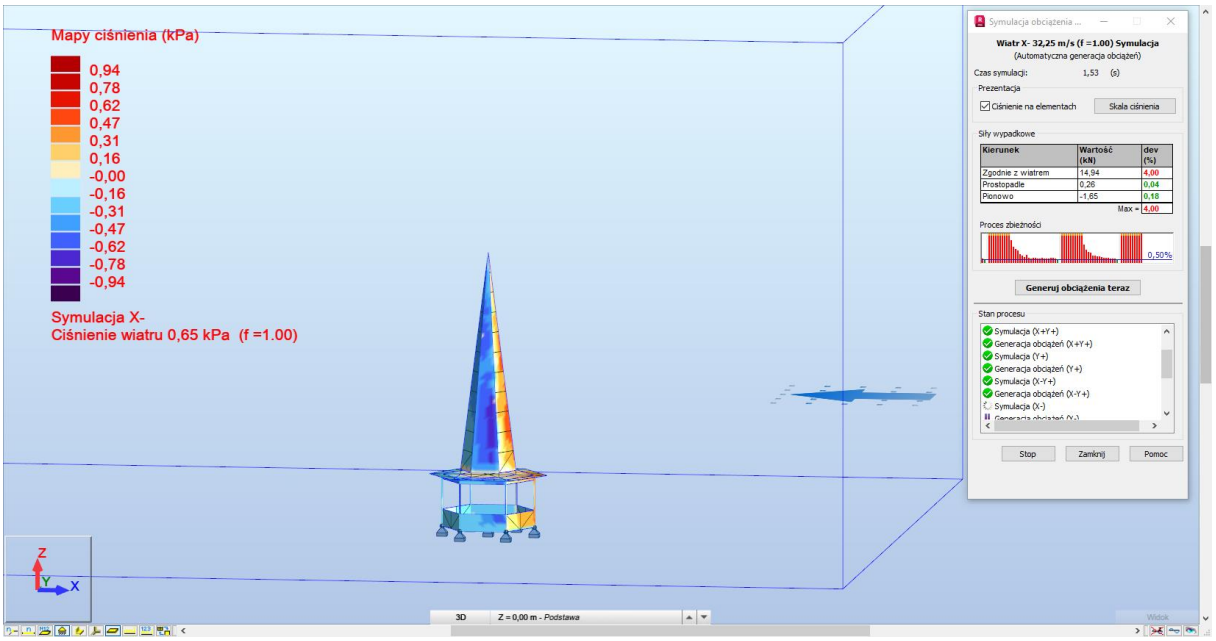
CHRISTMAS TREE (snow)

L.p.	Description of the impact	The value of char. kN/m^2
1.	Snow load on ornamental Christmas trees (4 kg/m2 of Christmas tree sheathing was assumed) Steep Christmas tree: 0.1x0.90 kN/m2=0.09 kN/m2	0,09

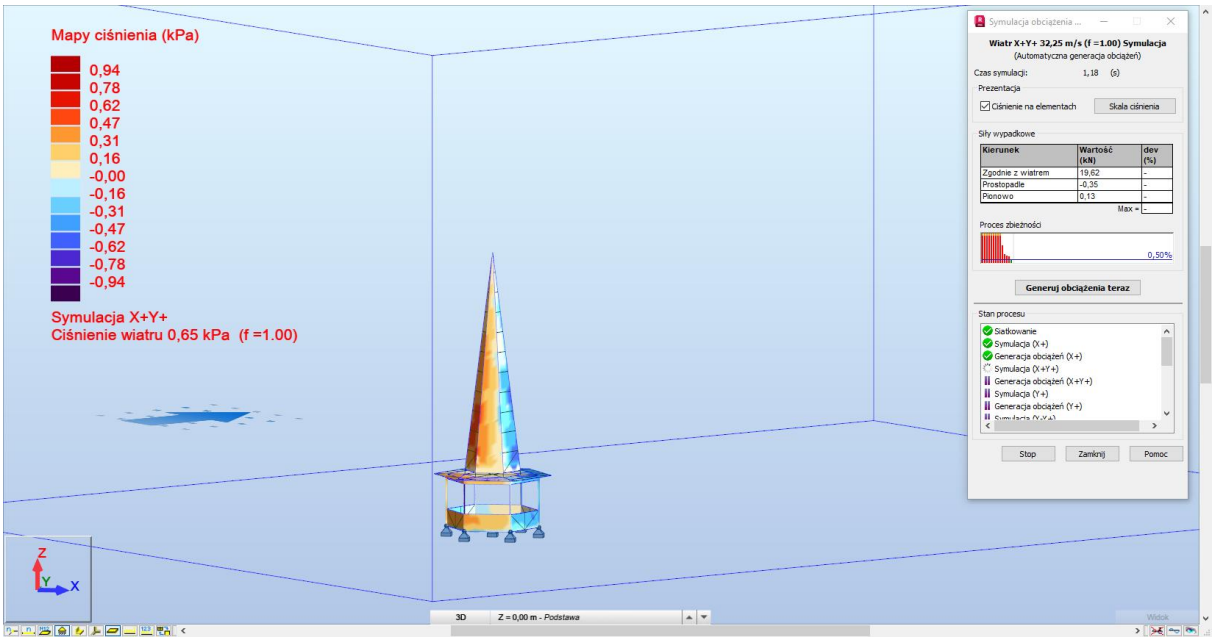
WIND

The collection of wind loads was done automatically in a computer program. An analysis of the wind flow in real conditions was performed. The peak value of wind speed pressure is q_p=0.65 kN/m2

Note: In the case of installation of the structure in wind or snow zones with load values higher than designed, it is necessary to check the static calculations for the current weather conditions in a given region.


Mapy ciśnienia (kPa)
0,94
0,78
0,62
0,47
0,31
0,16
-0,00
-0,16
-0,31
-0,47
-0,62
-0,78
-0,94
Symulacja X-
Ciśnienie wiatru 0,65 kPa (f =1.00)
Wiatr X- 32,25 m/s (f =1.00) Symulacja
Generuj obciążenia teraz
Stop
Zamknij
Pomoc

Wind 1


Mapy ciśnienia (kPa)
0,94
0,78
0,62
0,47
0,31
0,16
-0,00
-0,16
-0,31
-0,47
-0,62
-0,78
-0,94
Symulacja X+Y+
Ciśnienie wiatru 0,65 kPa (f =1.00)
Wiatr X+Y+ 32,25 m/s (f =1.00) Symulacja
Generuj obciążenia teraz
Stop
Zamknij
Pomoc

Wind 2

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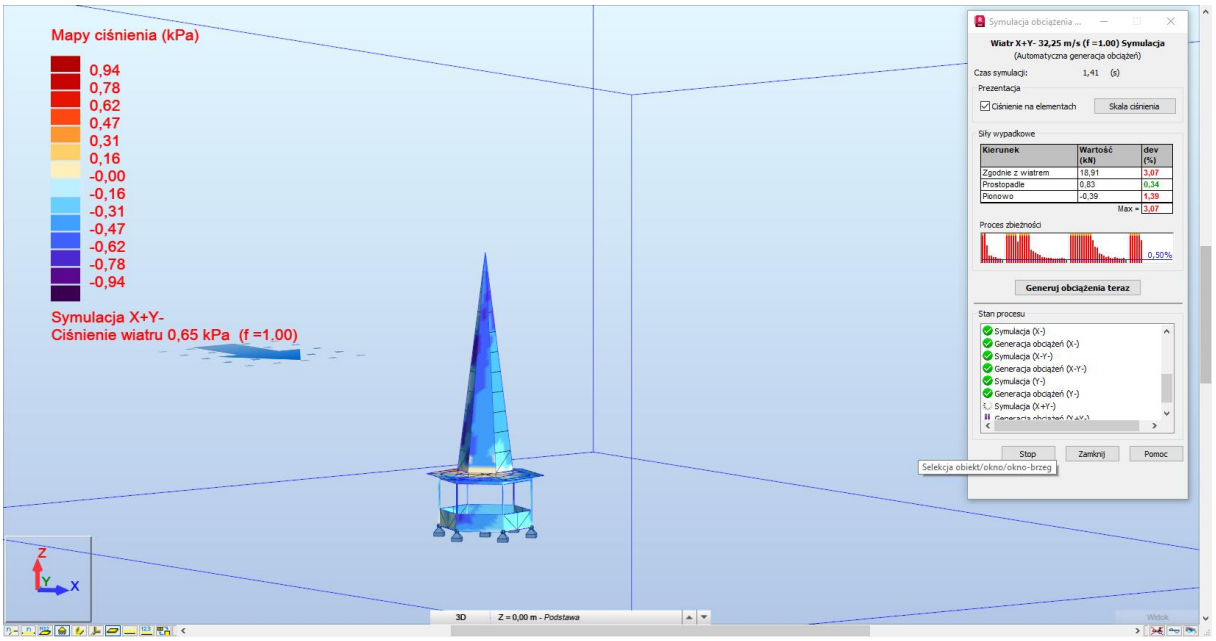
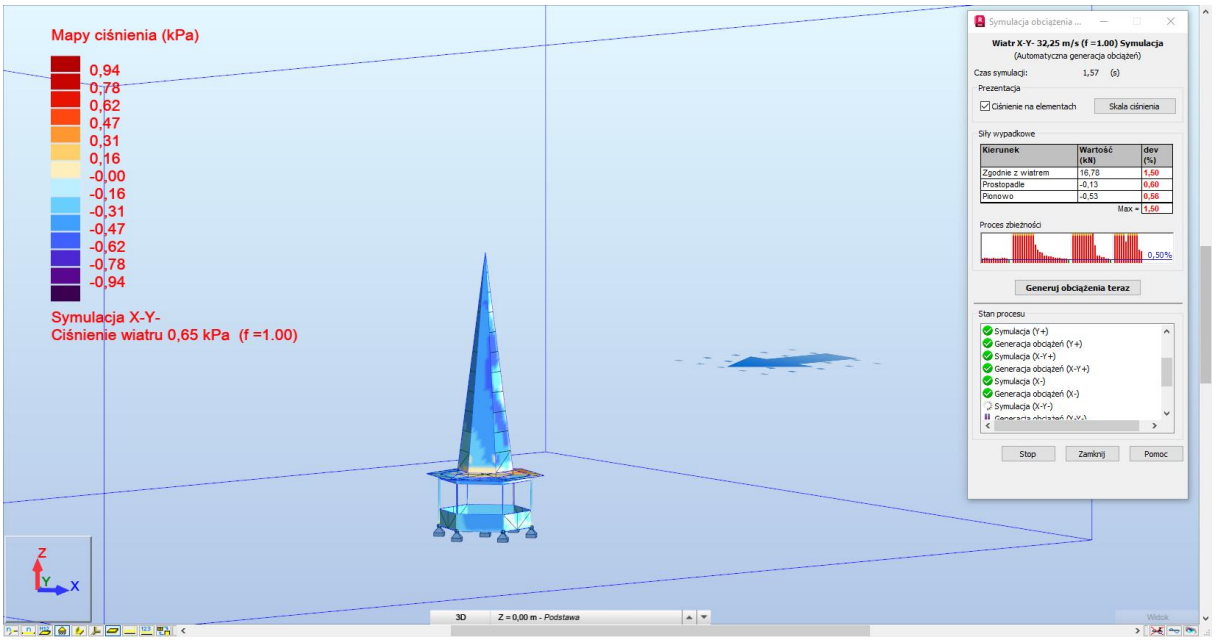
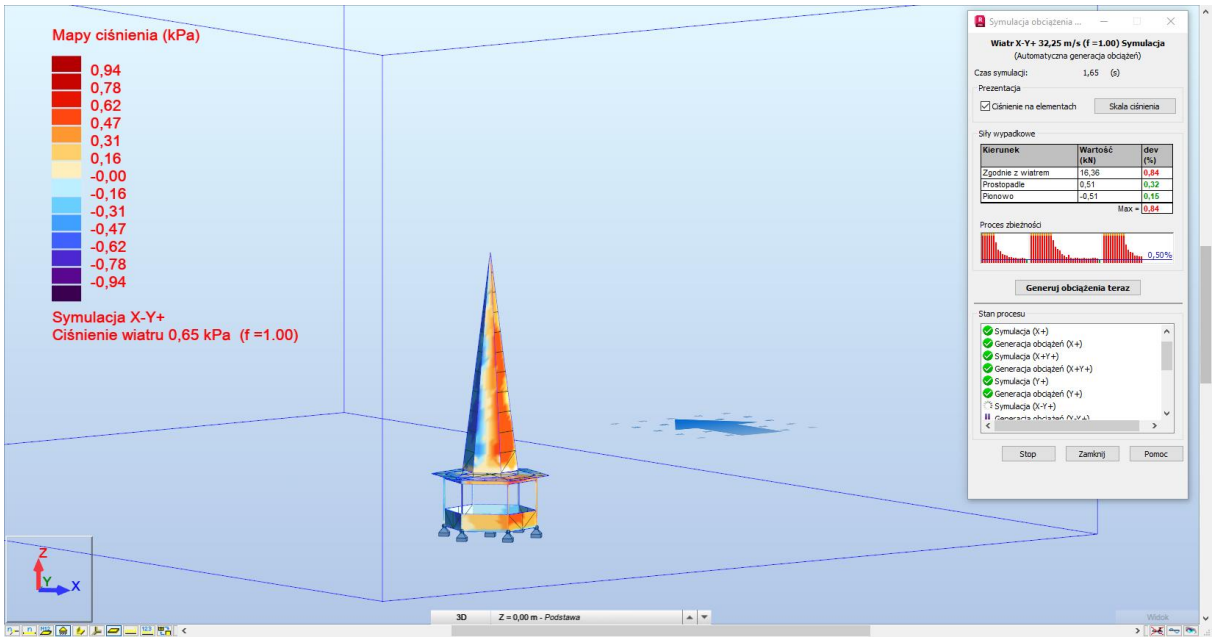


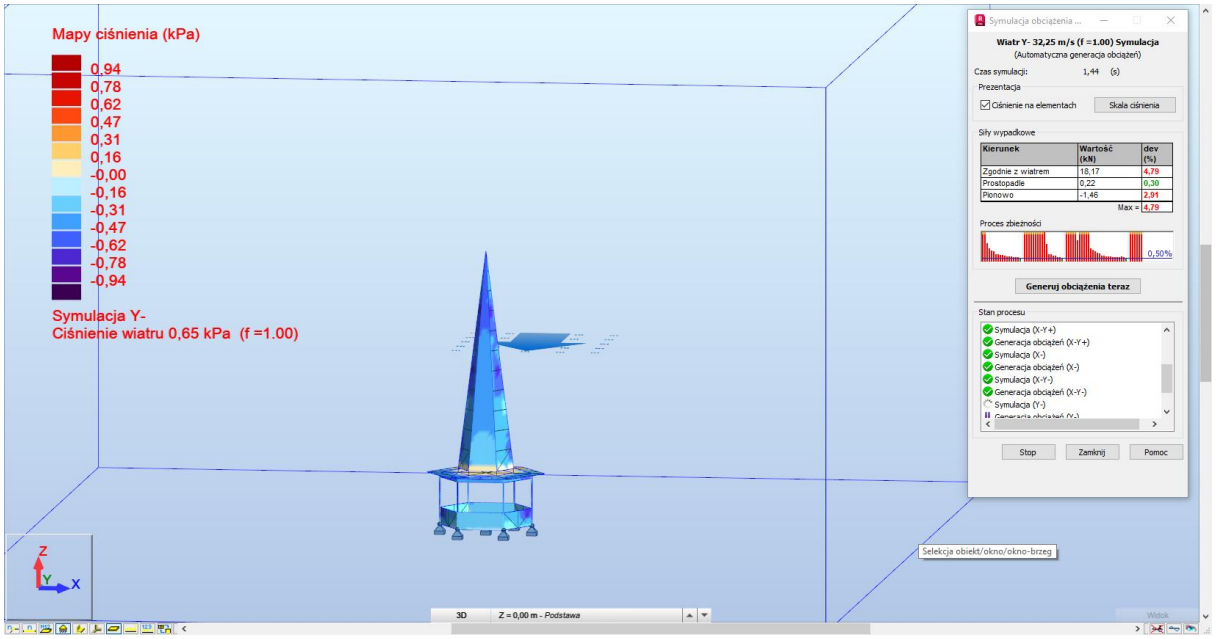
Wind 3



Wind 4


Mapy ciśnienia (kPa)
0,94
0,78
0,62
0,47
0,31
0,16
-0,00
-0,16
-0,31
-0,47
-0,62
-0,78
-0,94
Symulacja X-Y+
Ciśnienie wiatru 0,65 kPa (f =1.00)
Wiatr X-Y+ 32,25 m/s (f =1.00) Symulacja
(Automatyczna generacja obciążeń)
Czas symulacji: 1,65 (s)
Prezentacja
Ciśnienie na elementach
Skala ciśnienia
Siły wypadkowe
Kierunek
Wartość (kN)
dev (%)
Zgodnie z wiatrem 16,36 0,84
Prostopadle 0,51 0,32
Pionowo -0,51 0,15
Max = 0,84
Proces zbieżności
0,50%
Generuj obciążenia teraz
Stan procesu
Symulacja (X+)
Generacja obciążeń (X+)
Symulacja (X+Y+)
Generacja obciążeń (X+Y+)
Symulacja (Y+)
Generacja obciążeń (Y+)
Symulacja (X-Y+)
Stop
Zamknij
Pomoc
Z
Y
X
3D
Z = 0,00 m - Podstawa

Wind 5


Mapy ciśnienia (kPa)
0,94
0,78
0,62
0,47
0,31
0,16
-0,00
-0,16
-0,31
-0,47
-0,62
-0,78
-0,94
Symulacja Y-
Ciśnienie wiatru 0,65 kPa (f =1.00)
Wiatr Y- 32,25 m/s (f =1.00) Symulacja
(Automatyczna generacja obciążeń)
Czas symulacji: 1,44 (s)
Prezentacja
Ciśnienie na elementach
Skala ciśnienia
Siły wypadkowe
Kierunek
Wartość (kN)
dev (%)
Zgodnie z wiatrem 18,17 4,79
Prostopadle 0,22 0,30
Pionowo -1,46 2,91
Max = 4,79
Proces zbieżności
0,50%
Generuj obciążenia teraz
Stan procesu
Symulacja (X-Y+)
Generacja obciążeń (X-Y+)
Symulacja (X-)
Generacja obciążeń (X-)
Symulacja (X-Y-)
Generacja obciążeń (X-Y-)
Symulacja (Y-)
Stop
Zamknij
Pomoc
Selekcja obiekt/okno/okno-brzeg
Z
Y
X
3D
Z = 0,00 m - Podstawa

Wind 6

2. Results

2.1 Construction of the object

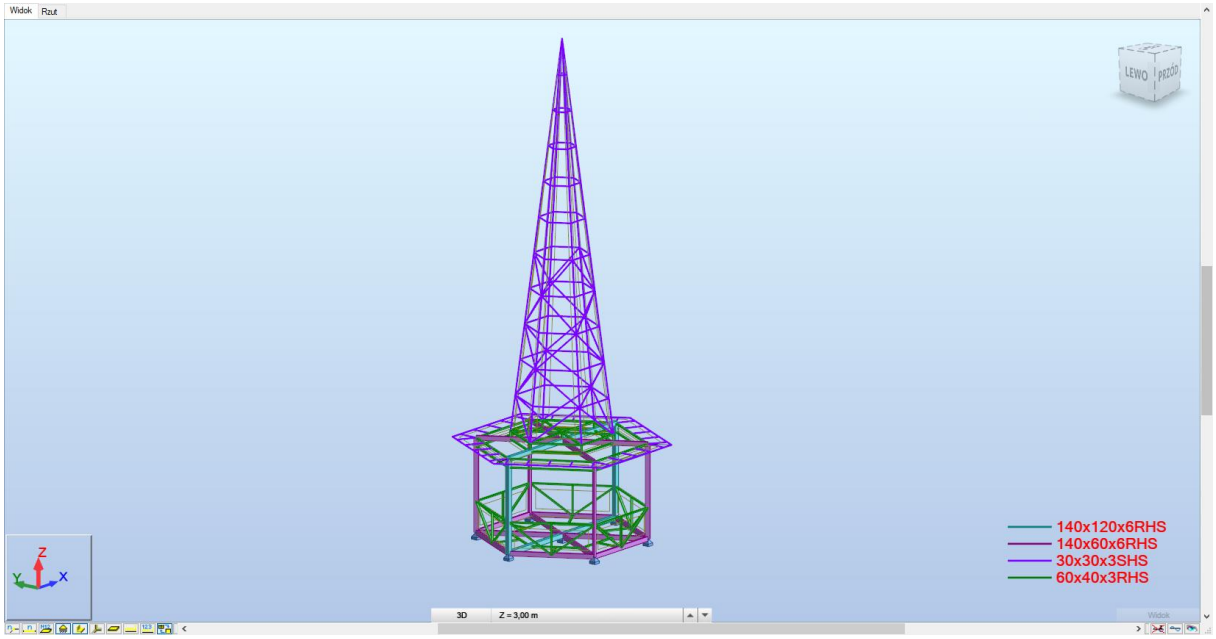


Fig. 1 Static diagram

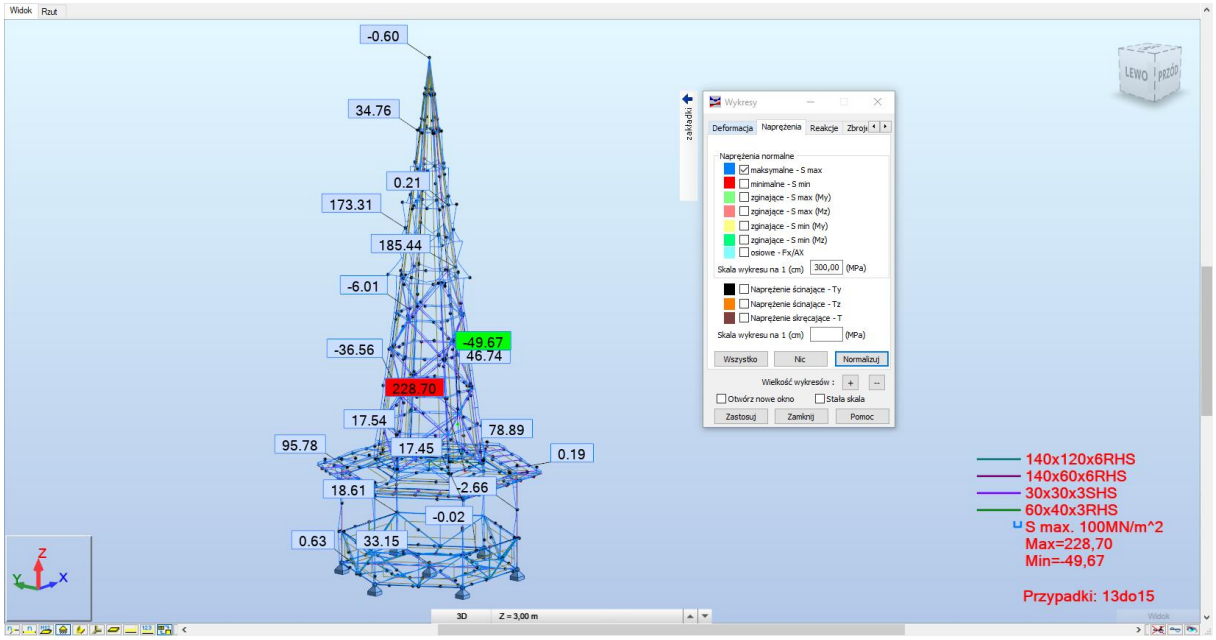


Fig. 2 Normal stresses S max [ULS]

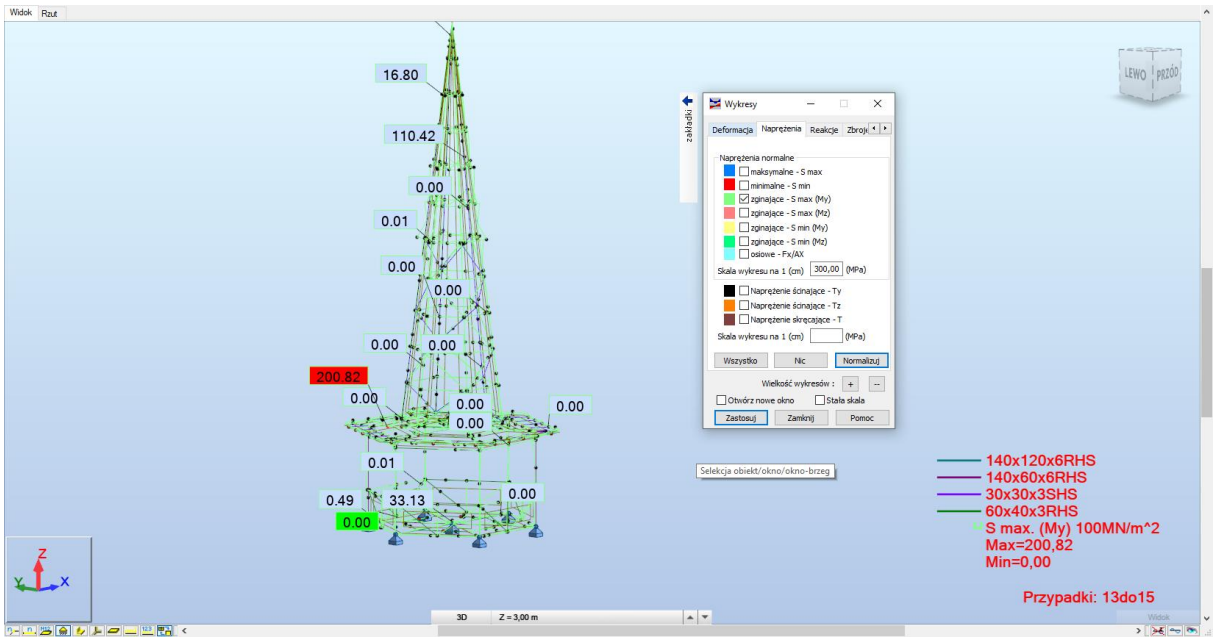


Fig. 2 Bending stresses S max My [ULS]

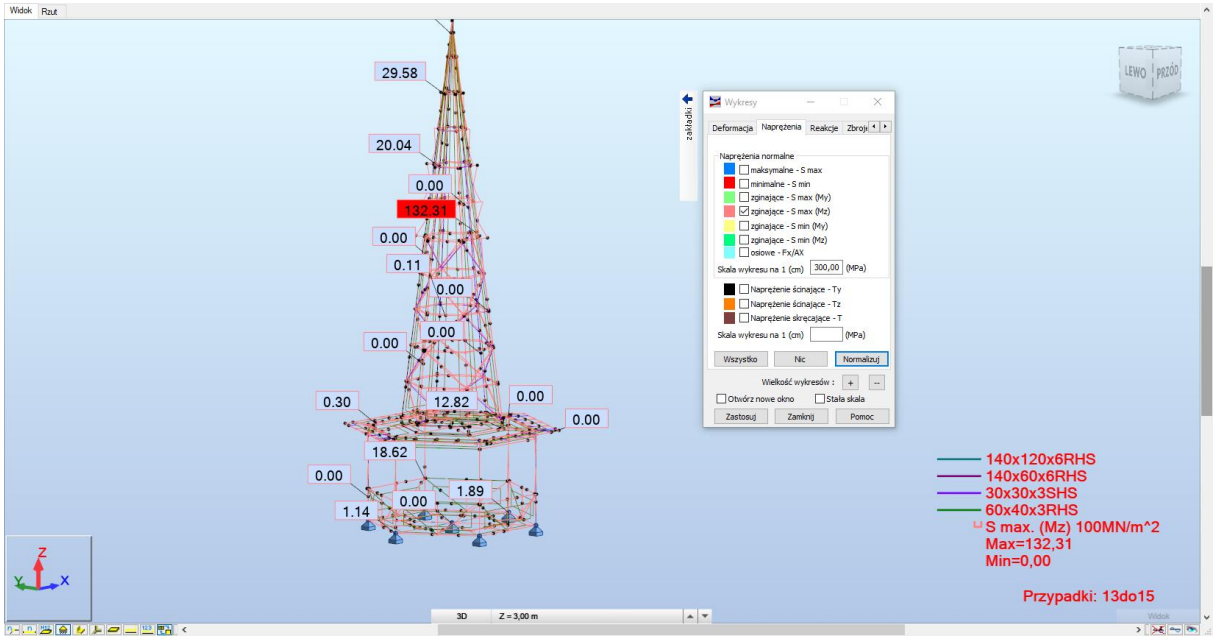


Fig. 3 Bending stresses S max Mz [ULS]

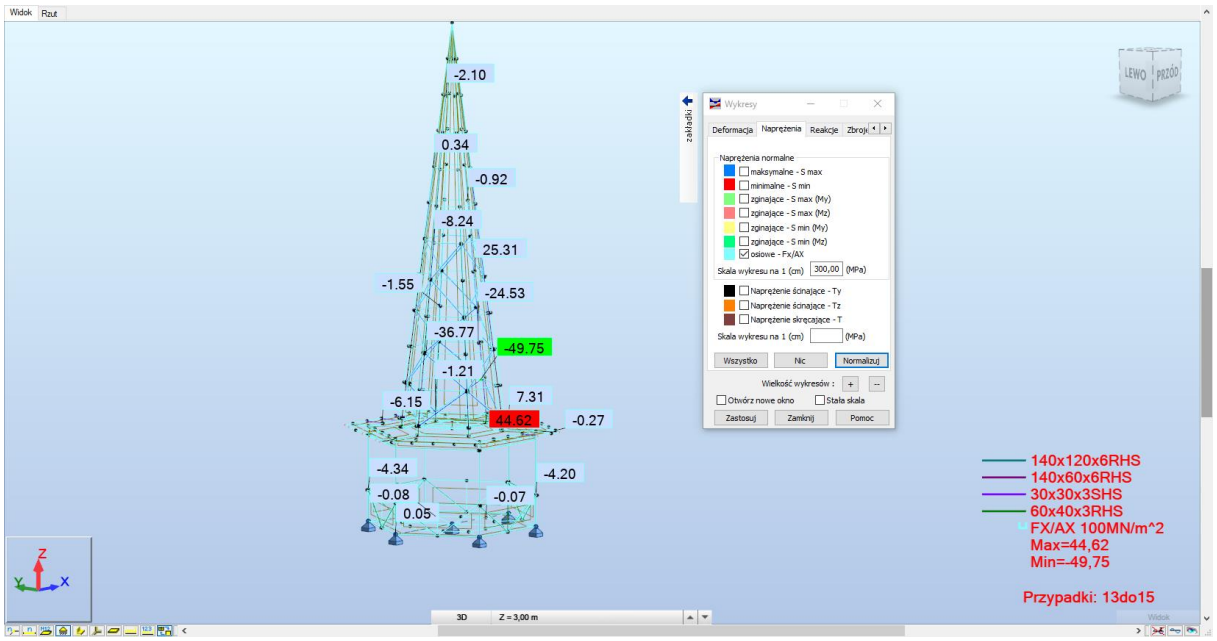


Fig. 4 Axial stresses Fx [SGN]

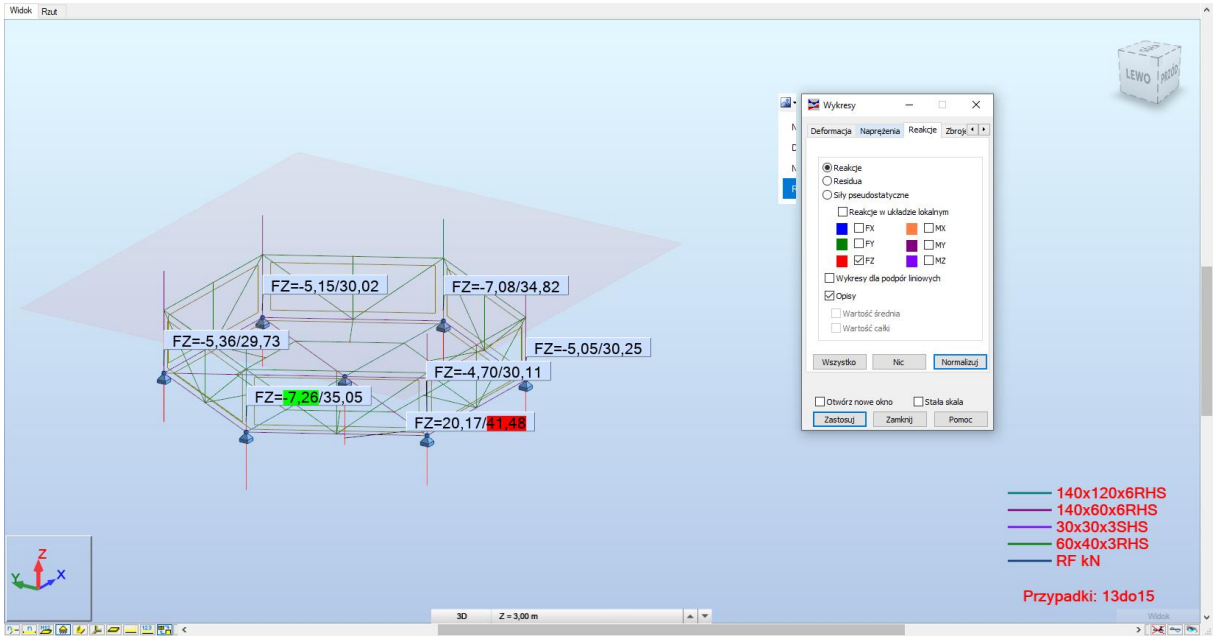


Fig. 5 Support reactions [ULS]

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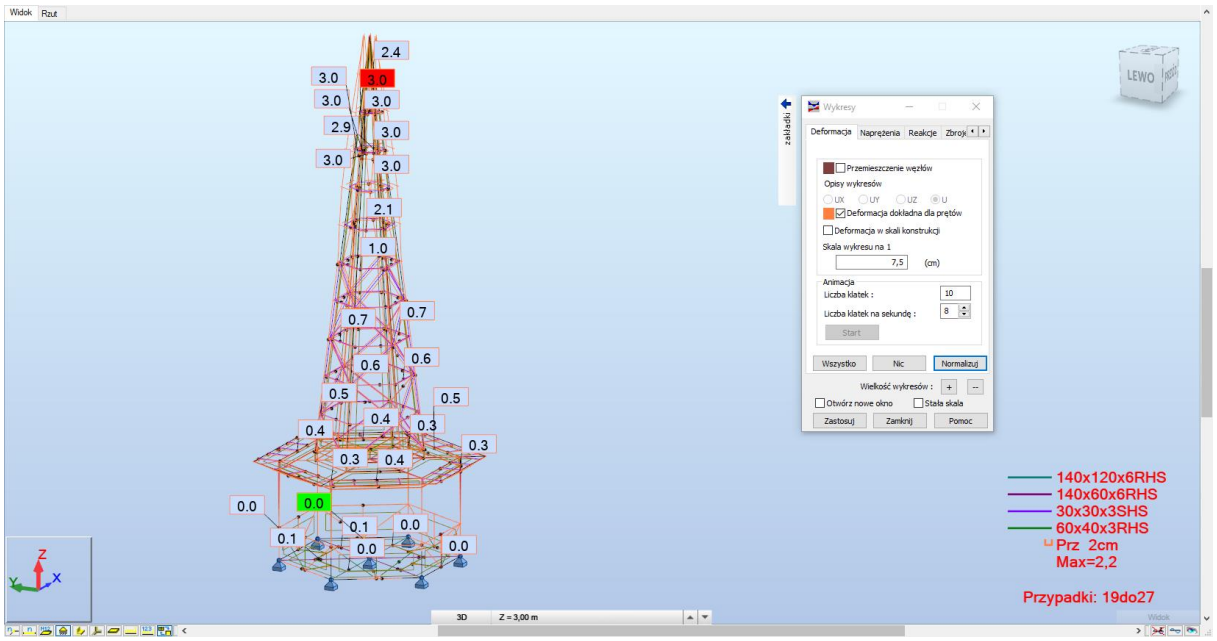


Fig. 6 Displacements [SGU]

BS-EN 1993-1:2005/NA:2008/A1:2014 - Member Verification (SLS ; ULS) 8 10 17 18 42do47 54 58 63 68 74do104K10 77 90 91 110 117do135K6 142 166 190 194 229 233 234 241 242 257 263 275do293K6 294

Results | Messages

Member		Section	Material	Lay	Laz	Ratio	Case	Ratio(uy)	Case (uy)	Ratio(uz)	Case (uz)	Ratio(vx)	Case (vx)	Ratio(vy)	Case (vy)
8 belki_8	OK	140x60x6RHS	S 235	51.43	102.57	0.10	13 SGN /81/	0.00	16 SGU /37/	0.06	16 SGU /13/	-	-	-	-
10 belki_10	OK	140x60x6RHS	S 235	51.43	102.57	0.04	13 SGN /126/	0.00	16 SGU /27/	0.01	16 SGU /3/	-	-	-	-
17 slupy_17	OK	140x120x6RH	S 235	52.75	5.47	0.26	13 SGN /119/	-	-	-	-	0.20	16 SGU /36/	0.21	16 SGU /32/
18 slupy_18	OK	140x60x6RHS	S 235	58.22	10.67	0.31	13 SGN /137/	-	-	-	-	0.20	16 SGU /29/	0.21	16 SGU /33/
42 belki małe_42	OK	60x40x3RHS	S 235	71.24	98.36	0.11	13 SGN /165/	0.02	16 SGU /43/	0.02	16 SGU /20/	0.02	16 SGU /23/	0.04	16 SGU /25/
43 belki małe_43	OK	60x40x3RHS	S 235	71.24	98.36	0.11	13 SGN /174/	0.02	16 SGU /51/	0.02	16 SGU /28/	0.05	16 SGU /21/	0.02	16 SGU /25/
44 belki górne słu	OK	60x40x3RHS	S 235	114.31	157.83	0.39	13 SGN /191/	0.28	16 SGU /64/	0.01	16 SGU /38/	0.01	16 SGU /42/	0.01	16 SGU /48/
45 belki górne słu	OK	60x40x3RHS	S 235	114.31	157.83	0.13	13 SGN /146/	0.03	16 SGU /48/	0.01	16 SGU /39/	0.01	16 SGU /40/	0.02	16 SGU /48/
46 belki małe_46	OK	60x40x3RHS	S 235	114.31	78.91	0.22	13 SGN /112/	0.01	16 SGU /35/	0.03	16 SGU /22/	0.02	16 SGU /21/	0.02	16 SGU /23/
47 slupki małe_47	OK	60x40x3RHS	S 235	42.52	58.71	0.07	13 SGN /85/	-	-	-	-	0.16	16 SGU /21/	0.10	16 SGU /23/
54 belki_54	OK	140x120x6RH	S 235	93.20	105.20	0.28	13 SGN /119/	0.00	16 SGU /32/	0.07	16 SGU /44/	-	-	-	-
58 belki_58	OK	140x60x6RHS	S 235	51.43	102.57	0.34	13 SGN /137/	0.00	16 SGU /42/	0.09	16 SGU /48/	-	-	-	-
63 belki małe_63	OK	60x40x3RHS	S 235	39.60	54.67	0.29	13 SGN /81/	0.04	16 SGU /6/	0.00	16 SGU /28/	0.00	16 SGU /26/	0.00	16 SGU /42/
68 belki małe_68	OK	60x40x3RHS	S 235	68.58	94.70	0.10	13 SGN /129/	0.07	16 SGU /67/	0.00	16 SGU /32/	0.00	16 SGU /26/	0.00	16 SGU /48/
74 belki małe_74	OK	60x40x3RHS	S 235	34.29	94.70	0.41	13 SGN /87/	0.20	16 SGU /6/	0.01	16 SGU /27/	0.00	16 SGU /35/	0.00	16 SGU /23/
77 łącznik choinki	OK	60x40x3RHS	S 235	11.43	15.78	0.67	13 SGN /135/	-	-	-	-	0.24	16 SGU /20/	0.27	16 SGU /32/
84 łącznik choinki	OK	60x40x3RHS	S 235	11.43	15.78	0.71	13 SGN /137/	-	-	-	-	0.21	16 SGU /20/	0.25	16 SGU /24/
90 skosne choink	OK	60x40x3RHS	S 235	68.58	94.70	0.09	13 SGN /139/	0.01	16 SGU /46/	0.01	16 SGU /22/	0.01	16 SGU /44/	0.01	16 SGU /48/
91 skosne choink	OK	60x40x3RHS	S 235	137.17	189.40	0.18	13 SGN /127/	0.05	16 SGU /36/	0.00	16 SGU /50/	0.01	16 SGU /36/	0.00	16 SGU /43/
94 skosne choink	OK	60x40x3RHS	S 235	68.58	94.70	0.11	13 SGN /137/	0.03	16 SGU /46/	0.00	16 SGU /20/	0.00	16 SGU /27/	0.00	16 SGU /44/
104 podluzne ch	OK	30x30x3SHS	S 235	124.95	124.95	0.13	13 SGN /128/	0.11	16 SGU /22/	0.02	16 SGU /38/	0.14	16 SGU /28/	0.08	16 SGU /28/
110 podluzne ch	OK	30x30x3SHS	S 235	112.45	112.45	0.09	13 SGN /113/	0.10	16 SGU /22/	0.02	16 SGU /22/	0.20	16 SGU /28/	0.11	16 SGU /28/
117 podluzne ch	OK	30x30x3SHS	S 235	99.96	99.96	0.10	13 SGN /119/	0.09	16 SGU /22/	0.01	16 SGU /22/	0.32	16 SGU /28/	0.19	16 SGU /28/
123 podluzne ch	OK	30x30x3SHS	S 235	87.46	87.46	0.10	13 SGN /119/	0.08	16 SGU /22/	0.01	16 SGU /28/	0.36	16 SGU /28/	0.21	16 SGU /28/
129 podluzne ch	OK	30x30x3SHS	S 235	74.97	74.97	0.26	13 SGN /174/	0.08	16 SGU /22/	0.05	16 SGU /27/	0.48	16 SGU /28/	0.28	16 SGU /28/
135 podluzne ch	OK	30x30x3SHS	S 235	62.47	62.47	0.53	13 SGN /174/	0.05	16 SGU /22/	0.08	16 SGU /49/	0.26	16 SGU /20/	0.15	16 SGU /20/
142 podluzne ch	OK	30x30x3SHS	S 235	49.98	49.98	0.39	13 SGN /174/	0.03	16 SGU /22/	0.05	16 SGU /49/	0.13	16 SGU /20/	0.07	16 SGU /20/
166 podluzne ch	OK	30x30x3SHS	S 235	164.29	164.29	0.32	13 SGN /115/	0.12	16 SGU /23/	0.04	16 SGU /20/	0.12	16 SGU /44/	0.18	16 SGU /41/
190	OK	30x30x3SHS	S 235	54.98	54.98	0.35	13 SGN /178/	0.01	16 SGU /21/	0.65	16 SGU /55/	0.01	16 SGU /21/	0.01	16 SGU /21/
194	OK	30x30x3SHS	S 235	54.98	54.98	0.16	13 SGN /178/	0.01	16 SGU /25/	0.69	16 SGU /55/	0.01	16 SGU /25/	0.02	16 SGU /25/

Table 1 Results of steel structure (part of the results)

STEEL DESIGN

CODE: *BS-EN 1993-1:2005/NA:2008/A1:2014, Eurocode 3: Design of steel structures.*
ANALYSIS TYPE: Member Verification

CODE GROUP:
MEMBER: 8 belki_8 **POINT:** **COORDINATE:** x = 1.00 L = 2.50 m

---

LOADS:
Governing Load Case: 13 ULN /81/ 1*1.15 + 2*1.15 + 3*1.50 + 4*0.75 + 8*0.90

MATERIAL:
S 235 (S 235) fy = 235.00 MPa

SECTION PARAMETERS: 140x60x6RHS

h=14.0 cm	gM0=1.00	gM1=1.00	
b=6.0 cm	Ay=5.76 cm2	Az=15.36 cm2	Ax=22.56 cm2
tw=0.6 cm	Iy=533.14 cm4	Iz=134.04 cm4	Ix=336.92 cm4
tf=0.6 cm	Impact=97.39 cm3	Wplz=52.27 cm3	

INTERNAL FORCES AND CAPACITIES:

N,Ed = 0.05 kN	My,Ed = -2.08 kN*m	Mz,Ed = -0.05 kN*m	Vy,Ed = 0.09 kN
Nc,Rd = 530.16 kN	My,Ed,max = -2.08 kN*m	Mz,Ed,max = -0.05 kN*m	Vy,T,Rd = 78.12 kN
Nb,Rd = 530.16 kN	My,c,Rd = 22.89 kN*m	Mz,c,Rd = 12.28 kN*m	Vz,Ed = -5.59 kN
	MN,y,Rd = 22.89 kN*m	MN,z,Rd = 12.28 kN*m	Vz,T,Rd = 208.33 kN
	Mb,Rd = 22.31 kN*m		Tt,Ed = -0.00 kN*m
			Class of section = 1

LATERAL BUCKLING PARAMETERS:

z = 1.00	Mcr = 376.47 kN*m	Curve,LT - d	XLT = 0.96
Lcr,low=2.50 m	Lam_LT = 0.25	fi,LT = 0.55	XLT,mod = 0.97

BUCKLING PARAMETERS:

About y axis: kyy = 1.00

About z axis: kzz = 1.00

VERIFICATION FORMULAS:
Section strength check:
N,Ed/Nc,Rd = 0.00 < 1.00 (6.2.4.(1))
My,Ed/MN,y,Rd = 0.09 < 1.00 (6.2.9.1.(2))
Mz,Ed/MN,z,Rd = 0.00 < 1.00 (6.2.9.1.(2))
(My,Ed/MN,y,Rd)^ 1.66 + (Mz,Ed/MN,z,Rd)^1.66 = 0.02 < 1.00 (6.2.9.1.(6))
Vy,Ed/Vy,T,Rd = 0.00 < 1.00 (6.2.6-7)
Vz,Ed/Vz,T,Rd = 0.03 < 1.00 (6.2.6-7)
Tau,you,Ed/(fy/(sqrt(3)*gM0)) = 0.00 < 1.00 (6.2.6)
Tau,tz,Ed/(fy/(sqrt(3)*gM0)) = 0.00 < 1.00 (6.2.6)
Global stability check of member:
My,Ed,max/Mb,Rd = 0.09 < 1.00 (6.3.2.1.(1))
N,Ed/(Xy*N,Rk/gM1) + kyy*My,Ed,max/(XLT*My,Rk/gM1) + kyz*Mz,Ed,max/(Mz,Rk/gM1) = 0.10 < 1.00 (6.3.3.(4))
N,Ed/(Xz*N,Rk/gM1) + kzy*My,Ed,max/(XLT*My,Rk/gM1) + kzz*Mz,Ed,max/(Mz,Rk/gM1) = 0.10 < 1.00 (6.3.3.(4))

LIMIT DISPLACEMENTS

Deflections (LOCAL SYSTEM):
uy = 0.0 cm < uy max = L/200.00 = 1.2 cm Verified
Governing Load Case: 16 SGU /37/ 1*1.00 + 2*1.00 + 5*1.00
uz = 0.1 cm < uz max = L/200.00 = 1.2 cm Verified
Governing Load Case: 16 SGU /13/ 1*1.00 + 2*1.00 + 3*1.00 + 4*0.50 + 10*0.60

Displacements (GLOBAL SYSTEM): *Not analyzed*

Section OK !!

STEEL DESIGN

CODE: *BS-EN 1993-1:2005/NA:2008/A1:2014, Eurocode 3: Design of steel structures.*
ANALYSIS TYPE: Member Verification

CODE GROUP:
MEMBER: 10 belki_10 **POINT:** **COORDINATE:** x = 0.76 L = 1.90 m

---

LOADS:
Governing Load Case: 13 ULN /126/ 1*1.15 + 2*1.15 + 3*1.05 + 12*1.50

MATERIAL:
S 235 (S 235) fy = 235.00 MPa



SECTION PARAMETERS: 140x60x6RHS

h=14.0 cm	gM0=1.00	gM1=1.00	
b=6.0 cm	Ay=5.76 cm2	Az=15.36 cm2	Ax=22.56 cm2
tw=0.6 cm	Iy=533.14 cm4	Iz=134.04 cm4	Ix=336.92 cm4
tf=0.6 cm	Impact=97.39 cm3	Wplz=52.27 cm3	

INTERNAL FORCES AND CAPACITIES:

N,Ed = 6.53 kN	My,Ed = 0.51 kN*m	Mz,Ed = 0.01 kN*m	Vy,Ed = -0.07 kN
Nc,Rd = 530.16 kN	My,Ed,max = 0.51 kN*m	Mz,Ed,max = 0.03 kN*m	Vy,T,Rd = 77.37 kN
Nb,Rd = 530.16 kN	My,c,Rd = 22.89 kN*m	Mz,c,Rd = 12.28 kN*m	Vz,Ed = -0.03 kN
	MN,y,Rd = 22.89 kN*m	MN,z,Rd = 12.28 kN*m	Vz,T,Rd = 206.33 kN
	Mb,Rd = 22.31 kN*m		Tt,Ed = -0.12 kN*m
			Class of section = 1



LATERAL BUCKLING PARAMETERS:

z = 1.00	Mcr = 376.47 kN*m	Curve,LT - d	XLT = 0.96
Lcr,upp=2.50 m	Lam_LT = 0.25	fi,LT = 0.55	XLT,mod = 0.97

BUCKLING PARAMETERS:



About y axis: kyy = 1.00



About z axis: kzz = 1.00

VERIFICATION FORMULAS:
Section strength check:
N,Ed/Nc,Rd = 0.01 < 1.00 (6.2.4.(1))
My,Ed/MN,y,Rd = 0.02 < 1.00 (6.2.9.1.(2))
Mz,Ed/MN,z,Rd = 0.00 < 1.00 (6.2.9.1.(2))
(My,Ed/MN,y,Rd)^ 1.66 + (Mz,Ed/MN,z,Rd)^1.66 = 0.00 < 1.00 (6.2.9.1.(6))
Vy,Ed/Vy,T,Rd = 0.00 < 1.00 (6.2.6-7)
Vz,Ed/Vz,T,Rd = 0.00 < 1.00 (6.2.6-7)
Tau,you,Ed/(fy/(sqrt(3)*gM0)) = 0.01 < 1.00 (6.2.6)
Tau,tz,Ed/(fy/(sqrt(3)*gM0)) = 0.01 < 1.00 (6.2.6)
Global stability check of member:
My,Ed,max/Mb,Rd = 0.02 < 1.00 (6.3.2.1.(1))
N,Ed/(Xy*N,Rk/gM1) + kyy*My,Ed,max/(XLT*My,Rk/gM1) + kyz*Mz,Ed,max/(Mz,Rk/gM1) = 0.04 < 1.00 (6.3.3.(4))
N,Ed/(Xz*N,Rk/gM1) + kzy*My,Ed,max/(XLT*My,Rk/gM1) + kzz*Mz,Ed,max/(Mz,Rk/gM1) = 0.04 < 1.00 (6.3.3.(4))

LIMIT DISPLACEMENTS



Deflections (LOCAL SYSTEM):
uy = 0.0 cm < uy max = L/200.00 = 1.2 cm Verified
Governing Load Case: 16 SGU /27/ 1*1.00 + 2*1.00 + 3*0.70 + 8*1.00
uz = 0.0 cm < uz max = L/200.00 = 1.2 cm Verified
Governing Load Case: 16 SGU /3/ 1*1.00 + 2*1.00 + 3*1.00 + 4*0.50 + 5*0.60



Displacements (GLOBAL SYSTEM): *Not analyzed*

Section OK !!

STEEL DESIGN

CODE: *BS-EN 1993-1:2005/NA:2008/A1:2014, Eurocode 3: Design of steel structures.*
ANALYSIS TYPE: Member Verification

CODE GROUP:
MEMBER: 17 slupy_17 **POINT:** **COORDINATE:** x = 1.00 L = 2.83 m

---

LOADS:
Governing Load Case: 13 ULS /119/ 1*1.15 + 2*1.15 + 3*1.05 + 4*0.75 + 9*1.50

MATERIAL:
S 235 (S 235) fy = 235.00 MPa

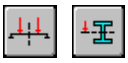


SECTION PARAMETERS: 140x120x6RHS

h=14.0 cm	gM0=1.00	gM1=1.00	
b=12.0 cm	Ay=12.96 cm2	Az=15.36 cm2	Ax=29.76 cm2
tw=0.6 cm	Iy=856.56 cm4	Iz=672.31 cm4	Ix=1132.71 cm4
tf=0.6 cm	Impact=145.63 cm3	Wplz=130.75 cm3	

INTERNAL FORCES AND CAPACITIES:

N,Ed = 17.53 kN	My,Ed = -8.97 kN*m	Mz,Ed = -0.05 kN*m	Vy,Ed = 0.18 kN
Nc,Rd = 699.36 kN	My,Ed,max = -8.97 kN*m	Mz,Ed,max = -0.05 kN*m	Vy,T,Rd = 175.80 kN
Nb,Rd = 632.18 kN	My,c,Rd = 34.22 kN*m	Mz,c,Rd = 30.73 kN*m	Vz,Ed = -12.81 kN
	MN,y,Rd = 34.22 kN*m	MN,z,Rd = 30.73 kN*m	Vz,T,Rd = 208.35 kN
	Mb,Rd = 34.22 kN*m		Tt,Ed = 0.01 kN*m
			Class of section = 1



LATERAL BUCKLING PARAMETERS:

z = 0.00	Mcr = 2745.04 kN*m	Curve,LT - d	XLT = 1.00
Lcr,low=2.83 m	Lam_LT = 0.11	fi,LT = 0.47	XLT,mod = 1.00

BUCKLING PARAMETERS:



About y axis:



About z axis:

Ly = 2.83 m	Lam_y = 0.56	Lz = 2.83 m	Lam_z = 0.06
Lcr,y = 2.83 m	Xy = 0.90	Lcr,z = 0.26 m	Xz = 1.00
Llamas in 52.75	kyy = 0.75	Lamz = 5.47	kyz = 0.47

VERIFICATION FORMULAS:

Section strength check:

N,Ed/Nc,Rd = 0.03 < 1.00 (6.2.4.(1))
My,Ed/MN,y,Rd = 0.26 < 1.00 (6.2.9.1.(2))
Mz,Ed/MN,z,Rd = 0.00 < 1.00 (6.2.9.1.(2))
(My,Ed/MN,y,Rd)^ 1.66 + (Mz,Ed/MN,z,Rd)^1.66 = 0.11 < 1.00 (6.2.9.1.(6))
Vy,Ed/Vy,T,Rd = 0.00 < 1.00 (6.2.6-7)
Vz,Ed/Vz,T,Rd = 0.06 < 1.00 (6.2.6-7)
Tau,you,Ed/(fy/(sqrt(3)*gM0)) = 0.00 < 1.00 (6.2.6)
Tau,tz,Ed/(fy/(sqrt(3)*gM0)) = 0.00 < 1.00 (6.2.6)

Global stability check of member:

Lambda,y = 52.75 < Lambda,max = 210.00 Lambda,z = 5.47 < Lambda,max = 210.00 STABLE
My,Ed,max/Mb,Rd = 0.26 < 1.00 (6.3.2.1.(1))
N,Ed/(Xy*N,Rk/gM1) + kyy*My,Ed,max/(XLT*My,Rk/gM1) + kyz*Mz,Ed,max/(Mz,Rk/gM1) = 0.22 < 1.00 (6.3.3.(4))
N,Ed/(Xz*N,Rk/gM1) + kzy*My,Ed,max/(XLT*My,Rk/gM1) + kzz*Mz,Ed,max/(Mz,Rk/gM1) = 0.15 < 1.00 (6.3.3.(4))

LIMIT DISPLACEMENTS



Deflections (LOCAL SYSTEM): *Not analyzed*



Displacements (GLOBAL SYSTEM):

vx = 0.2 cm < vx max = L/300.00 = 0.9 cm Verified
Governing Load Case: 16 SGU /36/ 1*1.00 + 2*1.00 + 4*0.50 + 5*1.00
vy = 0.2 cm < vy max = L/300.00 = 0.9 cm Verified
Governing Load Case: 16 SGU /32/ 1*1.00 + 2*1.00 + 3*0.70 + 4*0.50 + 11*1.00

Section OK !!

STEEL DESIGN

CODE: *BS-EN 1993-1:2005/NA:2008/A1:2014, Eurocode 3: Design of steel structures.*
ANALYSIS TYPE: Member Verification

CODE GROUP:
MEMBER: 18 slupy_18 **POINT:** **COORDINATE:** x = 1.00 L = 2.83 m

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LOADS:
Governing Load Case: 13 SGN /137/ 1*1.15 + 2*1.15 + 4*0.75 + 10*1.50

MATERIAL:
S 235 (S 235) fy = 235.00 MPa



SECTION PARAMETERS: 140x60x6RHS

h=14.0 cm	gM0=1.00	gM1=1.00	
b=6.0 cm	Ay=5.76 cm2	Az=15.36 cm2	Ax=22.56 cm2

tw=0.6 cm	Iy=533.14 cm4	Iz=134.04 cm4	Ix=336.92 cm4
tf=0.6 cm	Impact=97.39 cm3	Wplz=52.27 cm3	

INTERNAL FORCES AND CAPACITIES:

N,Ed = 14.80 kN	My,Ed = -7.08 kN*m	Mz,Ed = 0.00 kN*m	Vy,Ed = 0.76 kN
Nc,Rd = 530.16 kN	My,Ed,max = -7.08 kN*m	Mz,Ed,max = 0.22 kN*m	Vy,T,Rd = 78.09 kN
Nb,Rd = 467.76 kN	My,c,Rd = 22.89 kN*m	Mz,c,Rd = 12.28 kN*m	Vz,Ed = -12.68 kN
	MN,y,Rd = 22.89 kN*m	MN,z,Rd = 12.28 kN*m	Vz,T,Rd = 208.24 kN
	Mb,Rd = 22.89 kN*m		Tt,Ed = -0.01 kN*m
			Class of section = 1

LATERAL BUCKLING PARAMETERS:

z = 0.00	Mcr = 627.40 kN*m	Curve,LT - d	XLT = 1.00
Lcr,low=2.83 m	Lam_LT = 0.19	fi,LT = 0.51	XLT,mod = 1.00

BUCKLING PARAMETERS:

About y axis: About z axis:

Ly = 2.83 m	Lam_y = 0.62	Lz = 2.83 m	Lam_z = 0.11
Lcr,y = 2.83 m	Xy = 0.88	Lcr,z = 0.26 m	Xz = 1.00
Llamas = 58.22	kyy = 0.76	Lamz = 10.67	kyz = 0.45

VERIFICATION FORMULAS:

Section strength check:

N,Ed/Nc,Rd = 0.03 < 1.00 (6.2.4.(1))
My,Ed/MN,y,Rd = 0.31 < 1.00 (6.2.9.1.(2))
Mz,Ed/MN,z,Rd = 0.00 < 1.00 (6.2.9.1.(2))
(My,Ed/MN,y,Rd)^ 1.66 + (Mz,Ed/MN,z,Rd)^1.66 = 0.14 < 1.00 (6.2.9.1.(6))
Vy,Ed/Vy,T,Rd = 0.01 < 1.00 (6.2.6-7)
Vz,Ed/Vz,T,Rd = 0.06 < 1.00 (6.2.6-7)
Tau,you,Ed/(fy/(sqrt(3)*gM0)) = 0.00 < 1.00 (6.2.6)
Tau,tz,Ed/(fy/(sqrt(3)*gM0)) = 0.00 < 1.00 (6.2.6)

Global stability check of member:

Lambda,y = 58.22 < Lambda,max = 210.00 Lambda,z = 10.67 < Lambda,max = 210.00 STABLE
My,Ed,max/Mb,Rd = 0.31 < 1.00 (6.3.2.1.(1))
N,Ed/(Xy*N,Rk/gM1) + kyy*My,Ed,max/(XLT*My,Rk/gM1) + kyz*Mz,Ed,max/(Mz,Rk/gM1) = 0.28 < 1.00 (6.3.3.(4))
N,Ed/(Xz*N,Rk/gM1) + kzy*My,Ed,max/(XLT*My,Rk/gM1) + kzz*Mz,Ed,max/(Mz,Rk/gM1) = 0.19 < 1.00 (6.3.3.(4))

LIMIT DISPLACEMENTS

Deflections (LOCAL SYSTEM): *Not analyzed*

Displacements (GLOBAL SYSTEM):

vx = 0.2 cm < vx max = L/300.00 = 0.9 cm Verified
Governing Load Case: 16 SGU /29/ 1*1.00 + 2*1.00 + 3*0.70 + 9*1.00
vy = 0.2 cm < vy max = L/300.00 = 0.9 cm Verified
Governing Load Case: 16 SGU /33/ 1*1.00 + 2*1.00 + 3*0.70 + 11*1.00

Section OK !!

STEEL DESIGN

CODE: *BS-EN 1993-1:2005/NA:2008/A1:2014, Eurocode 3: Design of steel structures.*
ANALYSIS TYPE: Member Verification

CODE GROUP:
MEMBER: 42 beams small e_42 **POINT:** **COORDINATE:** x = 0.00 L = 0.00 m

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LOADS:
Governing Load Case: 13 SGN /165/ 1*1.00 + 2*1.00 + 4*0.75 + 8*1.50

MATERIAL:
S 235 (S 235) fy = 235.00 MPa

SECTION PARAMETERS: 60x40x3RHS

h=6.0 cm	gM0=1.00	gM1=1.00	
b=4.0 cm	Ay=2.22 cm2	Az=3.32 cm2	Ax=5.54 cm2
tw=0.3 cm	Iy=26.50 cm4	Iz=13.90 cm4	Ix=28.56 cm4
tf=0.3 cm	Influence=10.53 cm3	Wplz=7.94 cm3	

INTERNAL FORCES AND CAPACITIES:

N,Ed = 6.09 kN	My,Ed = 0.05 kN*m	Mz,Ed = 0.04 kN*m	Vy,Ed = 0.11 kN

Nc,Rd = 130.19 kN
Nb,Rd = 82.34 kN
My,Ed,max = 0.05 kN*m
My,c,Rd = 2.47 kN*m
MN,y,Rd = 2.47 kN*m
Mb,Rd = 2.47 kN*m
Mz,Ed,max = 0.04 kN*m
Mz,c,Rd = 1.87 kN*m
MN,z,Rd = 1.87 kN*m
Vy,T,Rd = 29.88 kN
Vz,Ed = -0.09 kN
Vz,T,Rd = 44.82 kN
Tt,Ed = -0.01 kN*m
Class of section = 1

LATERAL BUCKLING PARAMETERS:

z = 1.00
Lcr,upp=1.56 m
Mcr = 57.18 kN*m
Lam_LT = 0.21
Curve,LT - d
fi,LT = 0.44
XLT = 1.00
XLT,mod = 1.00

BUCKLING PARAMETERS:

About y axis:

Ly = 1.56 m
Lcr,y = 1.56 m
Llamas = 71.24
Lam_y = 0.76
Xy = 0.82
kzy = 0.64

About z axis:

Lz = 1.56 m
Lcr,z = 1.56 m
Lamz = 98.36
Lam_z = 1.05
Xz = 0.63
kzz = 1.04

VERIFICATION FORMULAS:

Section strength check:

N,Ed/Nc,Rd = 0.05 < 1.00 (6.2.4.(1))
My,Ed/MN,y,Rd = 0.02 < 1.00 (6.2.9.1.(2))
Mz,Ed/MN,z,Rd = 0.02 < 1.00 (6.2.9.1.(2))
(My,Ed/MN,y,Rd)^ 1.66 + (Mz,Ed/MN,z,Rd)^1.66 = 0.00 < 1.00 (6.2.9.1.(6))
Vy,Ed/Vy,T,Rd = 0.00 < 1.00 (6.2.6-7)
Vz,Ed/Vz,T,Rd = 0.00 < 1.00 (6.2.6-7)
Tau,you,Ed/(fy/(sqrt(3)*gM0)) = 0.01 < 1.00 (6.2.6)
Tau,tz,Ed/(fy/(sqrt(3)*gM0)) = 0.01 < 1.00 (6.2.6)

Global stability check of member:

Lambda,y = 71.24 < Lambda,max = 210.00 Lambda,z = 98.36 < Lambda,max = 210.00 STABLE
My,Ed,max/Mb,Rd = 0.02 < 1.00 (6.3.2.1.(1))
N,Ed/(Xy*N,Rk/gM1) + kyy*My,Ed,max/(XLT*My,Rk/gM1) + kyz*Mz,Ed,max/(Mz,Rk/gM1) = 0.09 < 1.00 (6.3.3.(4))
N,Ed/(Xz*N,Rk/gM1) + kzy*My,Ed,max/(XLT*My,Rk/gM1) + kzz*Mz,Ed,max/(Mz,Rk/gM1) = 0.11 < 1.00 (6.3.3.(4))

LIMIT DISPLACEMENTS

Deflections (LOCAL SYSTEM):

uy = 0.0 cm < uy max = L/200.00 = 0.8 cm Verified
Governing Load Case: 16 SGU /43/ 1*1.00 + 2*1.00 + 8*1.00
uz = 0.0 cm < uz max = L/200.00 = 0.8 cm Verified
Governing Load Case: 16 SGU /20/ 1*1.00 + 2*1.00 + 3*0.70 + 4*0.50 + 5*1.00

Displacements (GLOBAL SYSTEM):

vx = 0.0 cm < vx max = L/300.00 = 0.5 cm Verified
Governing Load Case: 16 SGU /23/ 1*1.00 + 2*1.00 + 3*0.70 + 6*1.00
vy = 0.0 cm < vy max = L/300.00 = 0.5 cm Verified
Governing Load Case: 16 SGU /25/ 1*1.00 + 2*1.00 + 3*0.70 + 7*1.00

Section OK !!

STEEL DESIGN

CODE: *BS-EN 1993-1:2005/NA:2008/A1:2014, Eurocode 3: Design of steel structures.*
ANALYSIS TYPE: Member Verification

CODE GROUP:
MEMBER: 43 beams small e_43 **POINT:** **COORDINATE:** x = 0.00 L = 0.00 m

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LOADS:
Governing Load Case: 13 ULN /174/ 1*1.00 + 2*1.00 + 12*1.50

MATERIAL:
S 235 (S 235) fy = 235.00 MPa

SECTION PARAMETERS: 60x40x3RHS

h=6.0 cm
b=4.0 cm
tw=0.3 cm
tf=0.3 cm
gM0=1.00
Ay=2.22 cm2
Iy=26.50 cm4
Influence=10.53 cm3
gM1=1.00
Az=3.32 cm2
Iz=13.90 cm4
Wplz=7.94 cm3
Ax=5.54 cm2
Ix=28.56 cm4

INTERNAL FORCES AND CAPACITIES:

N,Ed = 6.46 kN
My,Ed = -0.03 kN*m
Mz,Ed = 0.04 kN*m
Vy,Ed = 0.11 kN

Nc,Rd = 130.19 kN	My,Ed,max = -0.03 kN*m	Mz,Ed,max = 0.04 kN*m	Vy,T,Rd = 29.98 kN
Nb,Rd = 82.34 kN	My,c,Rd = 2.47 kN*m	Mz,c,Rd = 1.87 kN*m	Vz,Ed = 0.03 kN
	MN,y,Rd = 2.47 kN*m	MN,z,Rd = 1.87 kN*m	Vz,T,Rd = 44.98 kN
	Mb,Rd = 2.47 kN*m		Tt,Ed = 0.00 kN*m
			Class of section = 1

LATERAL BUCKLING PARAMETERS:

z = 1.00	Mcr = 57.18 kN*m	Curve,LT - d	XLT = 1.00
Lcr,low=1.56 m	Lam_LT = 0.21	fi,LT = 0.44	XLT,mod = 1.00

BUCKLING PARAMETERS:

About y axis: About z axis:

Ly = 1.56 m	Lam_y = 0.76	Lz = 1.56 m	Lam_z = 1.05
Lcr,y = 1.56 m	Xy = 0.82	Lcr,z = 1.56 m	Xz = 0.63
Llamas = 71.24	kzy = 0.65	Lamz = 98.36	kzz = 1.04

VERIFICATION FORMULAS:

Section strength check:

N,Ed/Nc,Rd = 0.05 < 1.00 (6.2.4.(1))
My,Ed/MN,y,Rd = 0.01 < 1.00 (6.2.9.1.(2))
Mz,Ed/MN,z,Rd = 0.02 < 1.00 (6.2.9.1.(2))
(My,Ed/MN,y,Rd)^ 1.66 + (Mz,Ed/MN,z,Rd)^1.66 = 0.00 < 1.00 (6.2.9.1.(6))
Vy,Ed/Vy,T,Rd = 0.00 < 1.00 (6.2.6-7)
Vz,Ed/Vz,T,Rd = 0.00 < 1.00 (6.2.6-7)
Tau,you,Ed/(fy/(sqrt(3)*gM0)) = 0.00 < 1.00 (6.2.6)
Tau,tz,Ed/(fy/(sqrt(3)*gM0)) = 0.00 < 1.00 (6.2.6)

Global stability check of member:

Lambda,y = 71.24 < Lambda,max = 210.00 Lambda,z = 98.36 < Lambda,max = 210.00 STABLE
My,Ed,max/Mb,Rd = 0.01 < 1.00 (6.3.2.1.(1))
N,Ed/(Xy*N,Rk/gM1) + kyy*My,Ed,max/(XLT*My,Rk/gM1) + kyz*Mz,Ed,max/(Mz,Rk/gM1) = 0.09 < 1.00 (6.3.3.(4))
N,Ed/(Xz*N,Rk/gM1) + kzy*My,Ed,max/(XLT*My,Rk/gM1) + kzz*Mz,Ed,max/(Mz,Rk/gM1) = 0.11 < 1.00 (6.3.3.(4))

LIMIT DISPLACEMENTS

Deflections (LOCAL SYSTEM):

uy = 0.0 cm < uy max = L/200.00 = 0.8 cm Verified
Governing Load Case: 16 SGU /51/ 1*1.00 + 2*1.00 + 12*1.00
uz = 0.0 cm < uz max = L/200.00 = 0.8 cm Verified
Governing Load Case: 16 SGU /28/ 1*1.00 + 2*1.00 + 3*0.70 + 4*0.50 + 9*1.00

Displacements (GLOBAL SYSTEM):

vx = 0.0 cm < vx max = L/300.00 = 0.5 cm Verified
Governing Load Case: 16 SGU /21/ 1*1.00 + 2*1.00 + 3*0.70 + 5*1.00
vy = 0.0 cm < vy max = L/300.00 = 0.5 cm Verified
Governing Load Case: 16 SGU /25/ 1*1.00 + 2*1.00 + 3*0.70 + 7*1.00

Section OK !!

STEEL DESIGN

CODE: *BS-EN 1993-1:2005/NA:2008/A1:2014, Eurocode 3: Design of steel structures.*
ANALYSIS TYPE: Member Verification

CODE GROUP:
MEMBER: 44 upper beams upa_44 **POINT:** **COORDINATE:** x = 1.00 L = 2.50 m

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LOADS:
Governing Load Case: 13 SGN /191/ 1*1.15 + 2*1.15 + 4*1.50 + 11*0.90

MATERIAL:
S 235 (S 235) fy = 235.00 MPa

SECTION PARAMETERS: 60x40x3RHS

h=6.0 cm	gM0=1.00	gM1=1.00	
b=4.0 cm	Ay=2.22 cm2	Az=3.32 cm2	Ax=5.54 cm2
tw=0.3 cm	Iy=26.50 cm4	Iz=13.90 cm4	Ix=28.56 cm4
tf=0.3 cm	Influence=10.53 cm3	Wplz=7.94 cm3	

INTERNAL FORCES AND CAPACITIES:

N,Ed = 2.37 kN	My,Ed = -0.02 kN*m	Mz,Ed = 0.55 kN*m	Vy,Ed = -1.20 kN

Nc,Rd = 130.19 kN
Nb,Rd = 39.79 kN
My,Ed,max = -0.02 kN*m
My,c,Rd = 2.47 kN*m
MN,y,Rd = 2.47 kN*m
Mb,Rd = 2.47 kN*m
Mz,Ed,max = 0.59 kN*m
Mz,c,Rd = 1.87 kN*m
MN,z,Rd = 1.87 kN*m
Vy,T,Rd = 27.99 kN
Vz,Ed = -0.04 kN
Vz,T,Rd = 41.99 kN
Tt,Ed = -0.12 kN*m
Class of section = 1

LATERAL BUCKLING PARAMETERS:

z = 1.00
Lcr,low=2.50 m
Mcr = 36.05 kN*m
Lam_LT = 0.26
Curve,LT - d
fi,LT = 0.47
XLT = 1.00
XLT,mod = 1.00

BUCKLING PARAMETERS:

About y axis:

Ly = 2.50 m
Lcr,y = 2.50 m
Llamas = 114.31
Lam_y = 1.22
Xy = 0.52
kzy = 0.64

About z axis:

Lz = 2.50 m
Lcr,z = 2.50 m
Lamz = 157.83
Lam_z = 1.68
Xz = 0.31
kzz = 1.03

VERIFICATION FORMULAS:

Section strength check:

N,Ed/Nc,Rd = 0.02 < 1.00 (6.2.4.(1))
My,Ed/MN,y,Rd = 0.01 < 1.00 (6.2.9.1.(2))
Mz,Ed/MN,z,Rd = 0.30 < 1.00 (6.2.9.1.(2))
(My,Ed/MN,y,Rd)^ 1.66 + (Mz,Ed/MN,z,Rd)^1.66 = 0.13 < 1.00 (6.2.9.1.(6))
Vy,Ed/Vy,T,Rd = 0.04 < 1.00 (6.2.6-7)
Vz,Ed/Vz,T,Rd = 0.00 < 1.00 (6.2.6-7)
Tau,you,Ed/(fy/(sqrt(3)*gM0)) = 0.07 < 1.00 (6.2.6)
Tau,tz,Ed/(fy/(sqrt(3)*gM0)) = 0.07 < 1.00 (6.2.6)

Global stability check of member:

Lambda,y = 114.31 < Lambda,max = 210.00 Lambda,z = 157.83 < Lambda,max = 210.00 STABLE
My,Ed,max/Mb,Rd = 0.01 < 1.00 (6.3.2.1.(1))
N,Ed/(Xy*N,Rk/gM1) + kyy*My,Ed,max/(XLT*My,Rk/gM1) + kyz*Mz,Ed,max/(Mz,Rk/gM1) = 0.25 < 1.00 (6.3.3.(4))
N,Ed/(Xz*N,Rk/gM1) + kzy*My,Ed,max/(XLT*My,Rk/gM1) + kzz*Mz,Ed,max/(Mz,Rk/gM1) = 0.39 < 1.00 (6.3.3.(4))

LIMIT DISPLACEMENTS

Deflections (LOCAL SYSTEM):

uy = 0.3 cm < uy max = L/200.00 = 1.2 cm Verified
Governing Load Case: 16 SGU /64/ 1*1.00 + 2*1.00 + 4*1.00 + 7*0.60
uz = 0.0 cm < uz max = L/200.00 = 1.2 cm Verified
Governing Load Case: 16 SGU /38/ 1*1.00 + 2*1.00 + 4*0.50 + 6*1.00

Displacements (GLOBAL SYSTEM):

vx = 0.0 cm < vx max = L/300.00 = 0.8 cm Verified
Governing Load Case: 16 SGU /42/ 1*1.00 + 2*1.00 + 4*0.50 + 8*1.00
vy = 0.0 cm < vy max = L/300.00 = 0.8 cm Verified
Governing Load Case: 16 SGU /48/ 1*1.00 + 2*1.00 + 4*0.50 + 11*1.00

Section OK !!

STEEL DESIGN

CODE: *BS-EN 1993-1:2005/NA:2008/A1:2014, Eurocode 3: Design of steel structures.*
ANALYSIS TYPE: Member Verification

CODE GROUP:
MEMBER: 45 upper beams d upa_45 **POINT:** **COORDINATE:** x = 1.00 L = 2.50 m

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LOADS:
Governing Load Case: 13 SGN /146/ 1*1.00 + 2*1.00 + 3*1.05 + 6*1.50

MATERIAL:
S 235 (S 235) fy = 235.00 MPa

SECTION PARAMETERS: 60x40x3RHS

h=6.0 cm
b=4.0 cm
tw=0.3 cm
tf=0.3 cm
gM0=1.00
Ay=2.22 cm2
Iy=26.50 cm4
Influence=10.53 cm3
gM1=1.00
Az=3.32 cm2
Iz=13.90 cm4
Wplz=7.94 cm3
Ax=5.54 cm2
Ix=28.56 cm4

INTERNAL FORCES AND CAPACITIES:

N,Ed = 3.12 kN
My,Ed = 0.07 kN*m
Mz,Ed = 0.05 kN*m
Vy,Ed = -0.07 kN

Nc,Rd = 130.19 kN	My,Ed,max = 0.07 kN*m	Mz,Ed,max = 0.06 kN*m	Vy,T,Rd = 30.01 kN
Nb,Rd = 39.79 kN	My,c,Rd = 2.47 kN*m	Mz,c,Rd = 1.87 kN*m	Vz,Ed = 0.15 kN
	MN,y,Rd = 2.47 kN*m	MN,z,Rd = 1.87 kN*m	Vz,T,Rd = 45.01 kN
	Mb,Rd = 2.47 kN*m		Tt,Ed = -0.00 kN*m
			Class of section = 1

LATERAL BUCKLING PARAMETERS:

z = 1.00	Mcr = 36.05 kN*m	Curve,LT - d	XLT = 1.00
Lcr,upp=2.50 m	Lam_LT = 0.26	fi,LT = 0.47	XLT,mod = 1.00

BUCKLING PARAMETERS:

About y axis: About z axis:

Ly = 2.50 m	Lam_y = 1.22	Lz = 2.50 m	Lam_z = 1.68
Lcr,y = 2.50 m	Xy = 0.52	Lcr,z = 2.50 m	Xz = 0.31
Llamas = 114.31	kzy = 0.65	Lamz = 157.83	kzz = 1.04

VERIFICATION FORMULAS:

Section strength check:

N,Ed/Nc,Rd = 0.02 < 1.00 (6.2.4.(1))
My,Ed/MN,y,Rd = 0.03 < 1.00 (6.2.9.1.(2))
Mz,Ed/MN,z,Rd = 0.03 < 1.00 (6.2.9.1.(2))
(My,Ed/MN,y,Rd)^ 1.66 + (Mz,Ed/MN,z,Rd)^1.66 = 0.01 < 1.00 (6.2.9.1.(6))
Vy,Ed/Vy,T,Rd = 0.00 < 1.00 (6.2.6-7)
Vz,Ed/Vz,T,Rd = 0.00 < 1.00 (6.2.6-7)
Tau,you,Ed/(fy/(sqrt(3)*gM0)) = 0.00 < 1.00 (6.2.6)
Tau,tz,Ed/(fy/(sqrt(3)*gM0)) = 0.00 < 1.00 (6.2.6)

Global stability check of member:

Lambda,y = 114.31 < Lambda,max = 210.00 Lambda,z = 157.83 < Lambda,max = 210.00 STABLE
My,Ed,max/Mb,Rd = 0.03 < 1.00 (6.3.2.1.(1))
N,Ed/(Xy*N,Rk/gM1) + kyy*My,Ed,max/(XLT*My,Rk/gM1) + kyz*Mz,Ed,max/(Mz,Rk/gM1) = 0.10 < 1.00 (6.3.3.(4))
N,Ed/(Xz*N,Rk/gM1) + kzy*My,Ed,max/(XLT*My,Rk/gM1) + kzz*Mz,Ed,max/(Mz,Rk/gM1) = 0.13 < 1.00 (6.3.3.(4))

LIMIT DISPLACEMENTS

Deflections (LOCAL SYSTEM):

uy = 0.0 cm < uy max = L/200.00 = 1.2 cm Verified
Governing Load Case: 16 SGU /48/ 1*1.00 + 2*1.00 + 4*0.50 + 11*1.00
uz = 0.0 cm < uz max = L/200.00 = 1.2 cm Verified
Governing Load Case: 16 SGU /39/ 1*1.00 + 2*1.00 + 6*1.00

Displacements (GLOBAL SYSTEM):

vx = 0.0 cm < vx max = L/300.00 = 0.8 cm Verified
Governing Load Case: 16 SGU /40/ 1*1.00 + 2*1.00 + 4*0.50 + 7*1.00
vy = 0.0 cm < vy max = L/300.00 = 0.8 cm Verified
Governing Load Case: 16 SGU /48/ 1*1.00 + 2*1.00 + 4*0.50 + 11*1.00

Section OK !!

STEEL DESIGN

CODE: *BS-EN 1993-1:2005/NA:2008/A1:2014, Eurocode 3: Design of steel structures.*
ANALYSIS TYPE: Member Verification

CODE GROUP:
MEMBER: 54 belki_54 **POINT:** **COORDINATE:** x = 0.00 L = 0.00 m

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LOADS:
Governing Load Case: 13 ULS /119/ 1*1.15 + 2*1.15 + 3*1.05 + 4*0.75 + 9*1.50

MATERIAL:
S 235 (S 235) fy = 235.00 MPa

SECTION PARAMETERS: 140x120x6RHS

h=14.0 cm	gM0=1.00	gM1=1.00	
b=12.0 cm	Ay=12.96 cm2	Az=15.36 cm2	Ax=29.76 cm2
tw=0.6 cm	Iy=856.56 cm4	Iz=672.31 cm4	Ix=1132.71 cm4
tf=0.6 cm	Impact=145.63 cm3	Wplz=130.75 cm3	

INTERNAL FORCES AND CAPACITIES:

N,Ed = 10.19 kN	My,Ed = -8.97 kN*m	Mz,Ed = 0.01 kN*m	Vy,Ed = 0.01 kN
Nc,Rd = 699.36 kN	My,Ed,max = -8.97 kN*m	Mz,Ed,max = -0.12 kN*m	Vy,T,Rd = 175.83 kN

Nb,Rd = 699.36 kN	My,c,Rd = 34.22 kN*m MN,y,Rd = 34.22 kN*m Mb,Rd = 34.22 kN*m	Mz,c,Rd = 30.73 kN*m MN,z,Rd = 30.73 kN*m	Vz,Ed = 14.97 kN Vz,T,Rd = 208.40 kN Tt,Ed = 0.00 kN*m Class of section = 1

LATERAL BUCKLING PARAMETERS:

z = 1.00	Mcr = 785.07 kN*m	Curve,LT - d	XLT = 0.99
Lcr,low=5.00 m	Lam_LT = 0.21	fi,LT = 0.53	XLT,mod = 1.00

BUCKLING PARAMETERS:

About y axis: kyy = 1.00

About z axis: kzz = 1.00

VERIFICATION FORMULAS:

Section strength check:

N,Ed/Nc,Rd = 0.01 < 1.00 (6.2.4.(1))
My,Ed/MN,y,Rd = 0.26 < 1.00 (6.2.9.1.(2))
Mz,Ed/MN,z,Rd = 0.00 < 1.00 (6.2.9.1.(2))
(My,Ed/MN,y,Rd)^ 1.66 + (Mz,Ed/MN,z,Rd)^1.66 = 0.11 < 1.00 (6.2.9.1.(6))
Vy,Ed/Vy,T,Rd = 0.00 < 1.00 (6.2.6-7)
Vz,Ed/Vz,T,Rd = 0.07 < 1.00 (6.2.6-7)
Tau,you,Ed/(fy/(sqrt(3)*gM0)) = 0.00 < 1.00 (6.2.6)
Tau,tz,Ed/(fy/(sqrt(3)*gM0)) = 0.00 < 1.00 (6.2.6)

Global stability check of member:

My,Ed,max/Mb,Rd = 0.26 < 1.00 (6.3.2.1.(1))
N,Ed/(Xy*N,Rk/gM1) + kyy*My,Ed,max/(XLT*My,Rk/gM1) + kyz*Mz,Ed,max/(Mz,Rk/gM1) = 0.28 < 1.00 (6.3.3.(4))
N,Ed/(Xz*N,Rk/gM1) + kzy*My,Ed,max/(XLT*My,Rk/gM1) + kzz*Mz,Ed,max/(Mz,Rk/gM1) = 0.28 < 1.00 (6.3.3.(4))

LIMIT DISPLACEMENTS

Deflections (LOCAL SYSTEM):

uy = 0.0 cm < uy max = L/200.00 = 2.5 cm Verified
Governing Load Case: 16 SGU /32/ 1*1.00 + 2*1.00 + 3*0.70 + 4*0.50 + 11*1.00
uz = 0.2 cm < uz max = L/200.00 = 2.5 cm Verified
Governing Load Case: 16 SGU /44/ 1*1.00 + 2*1.00 + 4*0.50 + 9*1.00

Displacements (GLOBAL SYSTEM): *Not analyzed*

Section OK !!

STEEL DESIGN

CODE: *BS-EN 1993-1:2005/NA:2008/A1:2014, Eurocode 3: Design of steel structures.*
ANALYSIS TYPE: Member Verification

CODE GROUP:
MEMBER: 58 belki_58 **POINT:** **COORDINATE:** x = 1.00 L = 2.50 m

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LOADS:
Governing Load Case: 13 SGN /137/ 1*1.15 + 2*1.15 + 4*0.75 + 10*1.50

MATERIAL:
S 235 (S 235) fy = 235.00 MPa

SECTION PARAMETERS: 140x60x6RHS

h=14.0 cm	gM0=1.00	gM1=1.00	
b=6.0 cm	Ay=5.76 cm2	Az=15.36 cm2	Ax=22.56 cm2
tw=0.6 cm	Iy=533.14 cm4	Iz=134.04 cm4	Ix=336.92 cm4
tf=0.6 cm	Impact=97.39 cm3	Wplz=52.27 cm3	

INTERNAL FORCES AND CAPACITIES:

N,Ed = 8.91 kN	My,Ed = -7.08 kN*m	Mz,Ed = 0.01 kN*m	Vy,Ed = -0.02 kN
Nc,Rd = 530.16 kN	My,Ed,max = -7.08 kN*m	Mz,Ed,max = 0.04 kN*m	Vy,T,Rd = 78.12 kN
Nb,Rd = 530.16 kN	My,c,Rd = 22.89 kN*m	Mz,c,Rd = 12.28 kN*m	Vz,Ed = -12.57 kN
	MN,y,Rd = 22.89 kN*m	MN,z,Rd = 12.28 kN*m	Vz,T,Rd = 208.31 kN
	Mb,Rd = 22.31 kN*m		Tt,Ed = 0.00 kN*m
			Class of section = 1

LATERAL BUCKLING PARAMETERS:

z = 1.00	Mcr = 376.47 kN*m	Curve,LT - d	XLT = 0.96

Lcr,low=2.50 m	Lam_LT = 0.25	fi,LT = 0.55	XLT,mod = 0.97

BUCKLING PARAMETERS:

About y axis: kyy = 1.00

About z axis: kzz = 1.00

VERIFICATION FORMULAS:

Section strength check:

N,Ed/Nc,Rd = 0.02 < 1.00 (6.2.4.(1))
My,Ed/MN,y,Rd = 0.31 < 1.00 (6.2.9.1.(2))
Mz,Ed/MN,z,Rd = 0.00 < 1.00 (6.2.9.1.(2))
(My,Ed/MN,y,Rd)^ 1.66 + (Mz,Ed/MN,z,Rd)^1.66 = 0.14 < 1.00 (6.2.9.1.(6))
Vy,Ed/Vy,T,Rd = 0.00 < 1.00 (6.2.6-7)
Vz,Ed/Vz,T,Rd = 0.06 < 1.00 (6.2.6-7)
Tau,you,Ed/(fy/(sqrt(3)*gM0)) = 0.00 < 1.00 (6.2.6)
Tau,tz,Ed/(fy/(sqrt(3)*gM0)) = 0.00 < 1.00 (6.2.6)

Global stability check of member:

My,Ed,max/Mb,Rd = 0.32 < 1.00 (6.3.2.1.(1))
N,Ed/(Xy*N,Rk/gM1) + kyy*My,Ed,max/(XLT*My,Rk/gM1) + kyz*Mz,Ed,max/(Mz,Rk/gM1) = 0.34 < 1.00 (6.3.3.(4))
N,Ed/(Xz*N,Rk/gM1) + kzy*My,Ed,max/(XLT*My,Rk/gM1) + kzz*Mz,Ed,max/(Mz,Rk/gM1) = 0.34 < 1.00 (6.3.3.(4))

LIMIT DISPLACEMENTS

Deflections (LOCAL SYSTEM):

uy = 0.0 cm < uy max = L/200.00 = 1.2 cm Verified
Governing Load Case: 16 SGU /42/ 1*1.00 + 2*1.00 + 4*0.50 + 8*1.00
uz = 0.1 cm < uz max = L/200.00 = 1.2 cm Verified
Governing Load Case: 16 SGU /48/ 1*1.00 + 2*1.00 + 4*0.50 + 11*1.00

Displacements (GLOBAL SYSTEM): *Not analyzed*

Section OK !!

STEEL DESIGN

CODE: *BS-EN 1993-1:2005/NA:2008/A1:2014, Eurocode 3: Design of steel structures.*
ANALYSIS TYPE: Member Verification

CODE GROUP:
MEMBER: 77 choinki_77 connector **POINT:** **COORDINATE:** x = 0.00 L = 0.00 m

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LOADS:
Governing Load Case: 13 SGN /135/ 1*1.15 + 2*1.15 + 4*0.75 + 9*1.50

MATERIAL:
S 235 (S 235) fy = 235.00 MPa

SECTION PARAMETERS: 60x40x3RHS

h=6.0 cm	gM0=1.00	gM1=1.00	
b=4.0 cm	Ay=2.22 cm2	Az=3.32 cm2	Ax=5.54 cm2
tw=0.3 cm	Iy=26.50 cm4	Iz=13.90 cm4	Ix=28.56 cm4
tf=0.3 cm	Influence=10.53 cm3	Wplz=7.94 cm3	

INTERNAL FORCES AND CAPACITIES:

N,Ed = 14.53 kN	My,Ed = 1.66 kN*m	Mz,Ed = 0.00 kN*m	Vy,Ed = 0.02 kN
Nc,Rd = 130.19 kN	My,Ed,max = 1.66 kN*m	Mz,Ed,max = 0.00 kN*m	Vy,T,Rd = 30.07 kN
Nb,Rd = 130.19 kN	My,c,Rd = 2.47 kN*m	Mz,c,Rd = 1.87 kN*m	Vz,Ed = -7.68 kN
	MN,y,Rd = 2.47 kN*m	MN,z,Rd = 1.87 kN*m	Vz,T,Rd = 45.10 kN
	Mb,Rd = 2.47 kN*m		Tt,Ed = -0.00 kN*m
			Class of section = 1

LATERAL BUCKLING PARAMETERS:

z = 0.00	Mcr = 689.09 kN*m	Curve,LT - d	XLT = 1.00
Lcr,upp=0.25 m	Lam_LT = 0.06	fi,LT = 0.37	XLT,mod = 1.00

BUCKLING PARAMETERS:

About y axis:

Ly = 0.25 m	Lam_y = 0.12	Lz = 0.25 m	Lam_z = 0.17
Lcr,y = 0.25 m	Xy = 1.00	Lcr,z = 0.25 m	Xz = 1.00

About z axis:

Llamas = 11.43 kyy = 0.73 Lamz = 15.78 kyz = 0.45

VERIFICATION FORMULAS:

Section strength check:

N,Ed/Nc,Rd = 0.11 < 1.00 (6.2.4.(1))
My,Ed/MN,y,Rd = 0.67 < 1.00 (6.2.9.1.(2))
Mz,Ed/MN,z,Rd = 0.00 < 1.00 (6.2.9.1.(2))
(My,Ed/MN,y,Rd)^ 1.68 + (Mz,Ed/MN,z,Rd)^1.68 = 0.51 < 1.00 (6.2.9.1.(6))
Vy,Ed/Vy,T,Rd = 0.00 < 1.00 (6.2.6-7)
Vz,Ed/Vz,T,Rd = 0.17 < 1.00 (6.2.6-7)
Tau,you,Ed/(fy/(sqrt(3)*gM0)) = 0.00 < 1.00 (6.2.6)
Tau,tz,Ed/(fy/(sqrt(3)*gM0)) = 0.00 < 1.00 (6.2.6)

Global stability check of member:

Lambda,y = 11.43 < Lambda,max = 210.00 Lambda,z = 15.78 < Lambda,max = 210.00 STABLE
My,Ed,max/Mb,Rd = 0.67 < 1.00 (6.3.2.1.(1))
N,Ed/(Xy*N,Rk/gM1) + kyy*My,Ed,max/(XLT*My,Rk/gM1) + kyz*Mz,Ed,max/(Mz,Rk/gM1) = 0.60 < 1.00 (6.3.3.(4))
N,Ed/(Xz*N,Rk/gM1) + kzy*My,Ed,max/(XLT*My,Rk/gM1) + kzz*Mz,Ed,max/(Mz,Rk/gM1) = 0.41 < 1.00 (6.3.3.(4))

LIMIT DISPLACEMENTS

Deflections (LOCAL SYSTEM): *Not analyzed*

Displacements (GLOBAL SYSTEM):

vx = 0.0 cm < vx max = L/300.00 = 0.1 cm Verified
Governing Load Case: 16 SGU /20/ 1*1.00 + 2*1.00 + 3*0.70 + 4*0.50 + 5*1.00
vy = 0.0 cm < vy max = L/300.00 = 0.1 cm Verified
Governing Load Case: 16 SGU /32/ 1*1.00 + 2*1.00 + 3*0.70 + 4*0.50 + 11*1.00

Section OK !!

STEEL DESIGN

CODE: *BS-EN 1993-1:2005/NA:2008/A1:2014, Eurocode 3: Design of steel structures.*
ANALYSIS TYPE: Member Verification

CODE GROUP:
MEMBER: 84 choinki_84 connector **POINT:** **COORDINATE:** x = 0.00 L = 0.00 m

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LOADS:
Governing Load Case: 13 SGN /137/ 1*1.15 + 2*1.15 + 4*0.75 + 10*1.50

MATERIAL:
S 235 (S 235) fy = 235.00 MPa

SECTION PARAMETERS: 60x40x3RHS

h=6.0 cm	gM0=1.00	gM1=1.00	
b=4.0 cm	Ay=2.22 cm2	Az=3.32 cm2	Ax=5.54 cm2
tw=0.3 cm	Iy=26.50 cm4	Iz=13.90 cm4	Ix=28.56 cm4
tf=0.3 cm	Influence=10.53 cm3	Wplz=7.94 cm3	

INTERNAL FORCES AND CAPACITIES:

N,Ed = 12.90 kN	My,Ed = 1.76 kN*m	Mz,Ed = -0.03 kN*m	Vy,Ed = -0.24 kN
Nc,Rd = 130.19 kN	My,Ed,max = 1.76 kN*m	Mz,Ed,max = -0.04 kN*m	Vy,T,Rd = 30.06 kN
Nb,Rd = 130.19 kN	My,c,Rd = 2.47 kN*m	Mz,c,Rd = 1.87 kN*m	Vz,Ed = -7.87 kN
	MN,y,Rd = 2.47 kN*m	MN,z,Rd = 1.87 kN*m	Vz,T,Rd = 45.09 kN
	Mb,Rd = 2.47 kN*m		Tt,Ed = 0.00 kN*m
			Class of section = 1

LATERAL BUCKLING PARAMETERS:

z = 0.00	Mcr = 670.87 kN*m	Curve,LT - d	XLT = 1.00
Lcr,upp=0.25 m	Lam_LT = 0.06	fi,LT = 0.37	XLT,mod = 1.00

BUCKLING PARAMETERS:

About y axis: About z axis:

Ly = 0.25 m	Lam_y = 0.12	Lz = 0.25 m	Lam_z = 0.17
Lcr,y = 0.25 m	Xy = 1.00	Lcr,z = 0.25 m	Xz = 1.00
Llamas = 11.43	kyy = 0.74	Lamz = 15.78	kyz = 0.34

VERIFICATION FORMULAS:

Section strength check:

N,Ed/Nc,Rd = 0.10 < 1.00 (6.2.4.(1))

My,Ed/MN,y,Rd = 0.71 < 1.00 (6.2.9.1.(2))
Mz,Ed/MN,z,Rd = 0.02 < 1.00 (6.2.9.1.(2))
(My,Ed/MN,y,Rd)^ 1.68 + (Mz,Ed/MN,z,Rd)^1.68 = 0.56 < 1.00 (6.2.9.1.(6))
Vy,Ed/Vy,T,Rd = 0.01 < 1.00 (6.2.6-7)
Vz,Ed/Vz,T,Rd = 0.17 < 1.00 (6.2.6-7)
Tau,you,Ed/(fy/(sqrt(3)*gM0)) = 0.00 < 1.00 (6.2.6)
Tau,tz,Ed/(fy/(sqrt(3)*gM0)) = 0.00 < 1.00 (6.2.6)
Global stability check of member:
Lambda,y = 11.43 < Lambda,max = 210.00 Lambda,z = 15.78 < Lambda,max = 210.00 STABLE
My,Ed,max/Mb,Rd = 0.71 < 1.00 (6.3.2.1.(1))
N,Ed/(Xy*N,Rk/gM1) + kyy*My,Ed,max/(XLT*My,Rk/gM1) + kyz*Mz,Ed,max/(Mz,Rk/gM1) = 0.63 < 1.00 (6.3.3.(4))
N,Ed/(Xz*N,Rk/gM1) + kzy*My,Ed,max/(XLT*My,Rk/gM1) + kzz*Mz,Ed,max/(Mz,Rk/gM1) = 0.43 < 1.00 (6.3.3.(4))

LIMIT DISPLACEMENTS

Deflections (LOCAL SYSTEM): *Not analyzed*

Displacements (GLOBAL SYSTEM):
vx = 0.0 cm < vx max = L/300.00 = 0.1 cm Verified
Governing Load Case: 16 SGU /20/ 1*1.00 + 2*1.00 + 3*0.70 + 4*0.50 + 5*1.00
vy = 0.0 cm < vy max = L/300.00 = 0.1 cm Verified
Governing Load Case: 16 SGU /24/ 1*1.00 + 2*1.00 + 3*0.70 + 4*0.50 + 7*1.00

Section OK !!

STEEL DESIGN

CODE: *BS-EN 1993-1:2005/NA:2008/A1:2014, Eurocode 3: Design of steel structures.*
ANALYSIS TYPE: Member Verification

CODE GROUP:
MEMBER: 129 longitudinal choinki_129 **POINT:** **COORDINATE:** x = 1.00 L = 0.82 m

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LOADS:
Governing Load Case: 13 ULN /174/ 1*1.00 + 2*1.00 + 12*1.50

MATERIAL:
S 235 (S 235) fy = 235.00 MPa

SECTION PARAMETERS: 30x30x3SHS

h=3.0 cm	gM0=1.00	gM1=1.00	
b=3.0 cm	Ay=1.57 cm2	Az=1.57 cm2	Ax=3.14 cm2
tw=0.3 cm	Iy=3.74 cm4	Iz=3.74 cm4	Ix=6.00 cm4
tf=0.3 cm	Impact=3.14 cm3	Wplz=3.14 cm3	

INTERNAL FORCES AND CAPACITIES:

N,Ed = 1.00 kN	My,Ed = 0.16 kN*m	Mz,Ed = 0.04 kN*m	Vy,Ed = 0.03 kN
Nc,Rd = 73.79 kN	My,Ed,max = 0.16 kN*m	Mz,Ed,max = 0.04 kN*m	Vy,T,Rd = 21.03 kN
Nb,Rd = 48.94 kN	My,c,Rd = 0.74 kN*m	Mz,c,Rd = 0.74 kN*m	Vz,Ed = 0.35 kN
	MN,y,Rd = 0.74 kN*m	MN,z,Rd = 0.74 kN*m	Vz,T,Rd = 21.03 kN
	Mb,Rd = 0.74 kN*m		Tt,Ed = -0.01 kN*m
			Class of section = 1

LATERAL BUCKLING PARAMETERS:

z = 1.00	Mcr = 25.83 kN*m	Curve,LT - c	XLT = 1.00
Lcr,upp=0.82 m	Lam_LT = 0.17	fi,LT = 0.45	XLT,mod = 1.00

BUCKLING PARAMETERS:

About y axis: About z axis:

Ly = 0.82 m	Lam_y = 0.80	Lz = 0.82 m	Lam_z = 0.80
Lcr,y = 0.82 m	Xy = 0.66	Lcr,z = 0.82 m	Xz = 0.66
Llamas in 74.97	kyy = 1.01	Lamz = 74.97	kyz = 0.61

VERIFICATION FORMULAS:
Section strength check:
N,Ed/Nc,Rd = 0.01 < 1.00 (6.2.4.(1))
My,Ed/MN,y,Rd = 0.21 < 1.00 (6.2.9.1.(2))
Mz,Ed/MN,z,Rd = 0.05 < 1.00 (6.2.9.1.(2))
(My,Ed/MN,y,Rd)^ 1.66 + (Mz,Ed/MN,z,Rd)^1.66 = 0.08 < 1.00 (6.2.9.1.(6))
Vy,Ed/Vy,T,Rd = 0.00 < 1.00 (6.2.6-7)

Vz,Ed/Vz,T,Rd = 0.02 < 1.00 (6.2.6-7)
Tau,you,Ed/(fy/(sqrt(3)*gM0)) = 0.01 < 1.00 (6.2.6)
Tau,tz,Ed/(fy/(sqrt(3)*gM0)) = 0.01 < 1.00 (6.2.6)
Global stability check of member:
Lambda,y = 74.97 < Lambda,max = 210.00 Lambda,z = 74.97 < Lambda,max = 210.00 STABLE
My,Ed,max/Mb,Rd = 0.21 < 1.00 (6.3.2.1.(1))
N,Ed/(Xy*N,Rk/gM1) + kyy*My,Ed,max/(XLT*My,Rk/gM1) + kyz*Mz,Ed,max/(Mz,Rk/gM1) = 0.26 < 1.00 (6.3.3.(4))
N,Ed/(Xz*N,Rk/gM1) + kzy*My,Ed,max/(XLT*My,Rk/gM1) + kzz*Mz,Ed,max/(Mz,Rk/gM1) = 0.20 < 1.00 (6.3.3.(4))

LIMIT DISPLACEMENTS



Deflections (LOCAL SYSTEM):
uy = 0.0 cm < uy max = L/200.00 = 0.4 cm Verified
Governing Load Case: 16 SGU /22/ 1*1.00 + 2*1.00 + 3*0.70 + 4*0.50 + 6*1.00
uz = 0.0 cm < uz max = L/200.00 = 0.4 cm Verified
Governing Load Case: 16 SGU /27/ 1*1.00 + 2*1.00 + 3*0.70 + 8*1.00



Displacements (GLOBAL SYSTEM):
vx = 0.1 cm < vx max = L/300.00 = 0.3 cm Verified
Governing Load Case: 16 SGU /28/ 1*1.00 + 2*1.00 + 3*0.70 + 4*0.50 + 9*1.00
vy = 0.1 cm < vy max = L/300.00 = 0.3 cm Verified
Governing Load Case: 16 SGU /28/ 1*1.00 + 2*1.00 + 3*0.70 + 4*0.50 + 9*1.00

Section OK !!

STEEL DESIGN

CODE: *BS-EN 1993-1:2005/NA:2008/A1:2014, Eurocode 3: Design of steel structures.*
ANALYSIS TYPE: Member Verification

CODE GROUP:
MEMBER: 135 longitudinal choinki_135 **POINT:** **COORDINATE:** x = 1.00 L = 0.68 m

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LOADS:
Governing Load Case: 13 ULN /174/ 1*1.00 + 2*1.00 + 12*1.50

MATERIAL:
S 235 (S 235) fy = 235.00 MPa



SECTION PARAMETERS: 30x30x3SHS

h=3.0 cm	gM0=1.00	gM1=1.00	
b=3.0 cm	Ay=1.57 cm2	Az=1.57 cm2	Ax=3.14 cm2
tw=0.3 cm	Iy=3.74 cm4	Iz=3.74 cm4	Ix=6.00 cm4
tf=0.3 cm	Impact=3.14 cm3	Wplz=3.14 cm3	

INTERNAL FORCES AND CAPACITIES:

N,Ed = 0.10 kN	My,Ed = 0.37 kN*m	Mz,Ed = 0.04 kN*m	Vy,Ed = -0.02 kN
Nc,Rd = 73.79 kN	My,Ed,max = 0.37 kN*m	Mz,Ed,max = 0.04 kN*m	Vy,T,Rd = 20.49 kN
Nb,Rd = 55.05 kN	My,c,Rd = 0.74 kN*m	Mz,c,Rd = 0.74 kN*m	Vz,Ed = 1.05 kN
	MN,y,Rd = 0.74 kN*m	MN,z,Rd = 0.74 kN*m	Vz,T,Rd = 20.49 kN
	Mb,Rd = 0.74 kN*m		Tt,Ed = -0.02 kN*m
			Class of section = 1



LATERAL BUCKLING PARAMETERS:

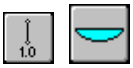
z = 1.00	Mcr = 30.79 kN*m	Curve,LT - c	XLT = 1.00
Lcr,upp=0.68 m	Lam_LT = 0.15	fi,LT = 0.45	XLT,mod = 1.00

BUCKLING PARAMETERS:



About y axis:

Ly = 0.68 m	Lam_y = 0.67	Lz = 0.68 m	Lam_z = 0.67
Lcr,y = 0.68 m	Xy = 0.75	Lcr,z = 0.68 m	Xz = 0.75
Llamas = 62.47	kyy = 1.00	Lamz = 62.47	kyz = 0.60



About z axis:

VERIFICATION FORMULAS:
Section strength check:
N,Ed/Nc,Rd = 0.00 < 1.00 (6.2.4.(1))
My,Ed/MN,y,Rd = 0.50 < 1.00 (6.2.9.1.(2))
Mz,Ed/MN,z,Rd = 0.06 < 1.00 (6.2.9.1.(2))
(My,Ed/MN,y,Rd)^ 1.66 + (Mz,Ed/MN,z,Rd)^1.66 = 0.32 < 1.00 (6.2.9.1.(6))
Vy,Ed/Vy,T,Rd = 0.00 < 1.00 (6.2.6-7)

Vz,Ed/Vz,T,Rd = 0.05 < 1.00 (6.2.6-7)
Tau,you,Ed/(fy/(sqrt(3)*gM0)) = 0.04 < 1.00 (6.2.6)
Tau,tz,Ed/(fy/(sqrt(3)*gM0)) = 0.04 < 1.00 (6.2.6)
Global stability check of member:
Lambda,y = 62.47 < Lambda,max = 210.00 Lambda,z = 62.47 < Lambda,max = 210.00 STABLE
My,Ed,max/Mb,Rd = 0.50 < 1.00 (6.3.2.1.(1))
N,Ed/(Xy*N,Rk/gM1) + kyy*My,Ed,max/(XLT*My,Rk/gM1) + kyz*Mz,Ed,max/(Mz,Rk/gM1) = 0.53 < 1.00 (6.3.3.(4))
N,Ed/(Xz*N,Rk/gM1) + kzy*My,Ed,max/(XLT*My,Rk/gM1) + kzz*Mz,Ed,max/(Mz,Rk/gM1) = 0.36 < 1.00 (6.3.3.(4))

LIMIT DISPLACEMENTS



Deflections (LOCAL SYSTEM):
uy = 0.0 cm < uy max = L/200.00 = 0.3 cm Verified
Governing Load Case: 16 SGU /22/ 1*1.00 + 2*1.00 + 3*0.70 + 4*0.50 + 6*1.00
uz = 0.0 cm < uz max = L/200.00 = 0.3 cm Verified
Governing Load Case: 16 SGU /49/ 1*1.00 + 2*1.00 + 11*1.00



Displacements (GLOBAL SYSTEM):
vx = 0.1 cm < vx max = L/300.00 = 0.2 cm Verified
Governing Load Case: 16 SGU /20/ 1*1.00 + 2*1.00 + 3*0.70 + 4*0.50 + 5*1.00
vy = 0.0 cm < vy max = L/300.00 = 0.2 cm Verified
Governing Load Case: 16 SGU /20/ 1*1.00 + 2*1.00 + 3*0.70 + 4*0.50 + 5*1.00

Section OK !!

STEEL DESIGN

CODE: *BS-EN 1993-1:2005/NA:2008/A1:2014, Eurocode 3: Design of steel structures.*
ANALYSIS TYPE: Member Verification

CODE GROUP:
MEMBER: 142 longitudinal choinki_142 **POINT:** **COORDINATE:** x = 1.00 L = 0.55 m

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LOADS:
Governing Load Case: 13 ULN /174/ 1*1.00 + 2*1.00 + 12*1.50

MATERIAL:
S 235 (S 235) fy = 235.00 MPa

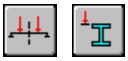


SECTION PARAMETERS: 30x30x3SHS

h=3.0 cm	gM0=1.00	gM1=1.00	
b=3.0 cm	Ay=1.57 cm2	Az=1.57 cm2	Ax=3.14 cm2
tw=0.3 cm	Iy=3.74 cm4	Iz=3.74 cm4	Ix=6.00 cm4
tf=0.3 cm	Impact=3.14 cm3	Wplz=3.14 cm3	

INTERNAL FORCES AND CAPACITIES:

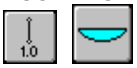
N,Ed = 0.08 kN	My,Ed = 0.27 kN*m	Mz,Ed = 0.03 kN*m	Vy,Ed = -0.03 kN
Nc,Rd = 73.79 kN	My,Ed,max = 0.27 kN*m	Mz,Ed,max = 0.03 kN*m	Vy,T,Rd = 20.70 kN
Nb,Rd = 60.86 kN	My,c,Rd = 0.74 kN*m	Mz,c,Rd = 0.74 kN*m	Vz,Ed = 0.96 kN
	MN,y,Rd = 0.74 kN*m	MN,z,Rd = 0.74 kN*m	Vz,T,Rd = 20.70 kN
	Mb,Rd = 0.74 kN*m		Tt,Ed = -0.02 kN*m
			Class of section = 1



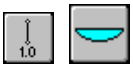
LATERAL BUCKLING PARAMETERS:

z = 1.00	Mcr = 38.10 kN*m	Curve,LT - c	XLT = 1.00
Lcr,upp=0.55 m	Lam_LT = 0.14	fi,LT = 0.44	XLT,mod = 1.00

BUCKLING PARAMETERS:



About y axis:



About z axis:

Ly = 0.55 m	Lam_y = 0.53	Lz = 0.55 m	Lam_z = 0.53
Lcr,y = 0.55 m	Xy = 0.82	Lcr,z = 0.55 m	Xz = 0.82
Llamas in 49.98	kyy = 1.00	Lamz = 49.98	kyz = 0.60

VERIFICATION FORMULAS:
Section strength check:
N,Ed/Nc,Rd = 0.00 < 1.00 (6.2.4.(1))
My,Ed/MN,y,Rd = 0.36 < 1.00 (6.2.9.1.(2))
Mz,Ed/MN,z,Rd = 0.04 < 1.00 (6.2.9.1.(2))
(My,Ed/MN,y,Rd)^ 1.66 + (Mz,Ed/MN,z,Rd)^1.66 = 0.19 < 1.00 (6.2.9.1.(6))
Vy,Ed/Vy,T,Rd = 0.00 < 1.00 (6.2.6-7)

Vz,Ed/Vz,T,Rd = 0.05 < 1.00 (6.2.6-7)
Tau,you,Ed/(fy/(sqrt(3)*gM0)) = 0.03 < 1.00 (6.2.6)
Tau,tz,Ed/(fy/(sqrt(3)*gM0)) = 0.03 < 1.00 (6.2.6)
Global stability check of member:
Lambda,y = 49.98 < Lambda,max = 210.00 Lambda,z = 49.98 < Lambda,max = 210.00 STABLE
My,Ed,max/Mb,Rd = 0.36 < 1.00 (6.3.2.1.(1))
N,Ed/(Xy*N,Rk/gM1) + kyy*My,Ed,max/(XLT*My,Rk/gM1) + kyz*Mz,Ed,max/(Mz,Rk/gM1) = 0.39 < 1.00 (6.3.3.(4))
N,Ed/(Xz*N,Rk/gM1) + kzy*My,Ed,max/(XLT*My,Rk/gM1) + kzz*Mz,Ed,max/(Mz,Rk/gM1) = 0.26 < 1.00 (6.3.3.(4))

LIMIT DISPLACEMENTS



Deflections (LOCAL SYSTEM):
uy = 0.0 cm < uy max = L/200.00 = 0.3 cm Verified
Governing Load Case: 16 SGU /22/ 1*1.00 + 2*1.00 + 3*0.70 + 4*0.50 + 6*1.00
uz = 0.0 cm < uz max = L/200.00 = 0.3 cm Verified
Governing Load Case: 16 SGU /49/ 1*1.00 + 2*1.00 + 11*1.00



Displacements (GLOBAL SYSTEM):
vx = 0.0 cm < vx max = L/300.00 = 0.2 cm Verified
Governing Load Case: 16 SGU /20/ 1*1.00 + 2*1.00 + 3*0.70 + 4*0.50 + 5*1.00
vy = 0.0 cm < vy max = L/300.00 = 0.2 cm Verified
Governing Load Case: 16 SGU /20/ 1*1.00 + 2*1.00 + 3*0.70 + 4*0.50 + 5*1.00

Section OK !!

STEEL DESIGN

CODE: *BS-EN 1993-1:2005/NA:2008/A1:2014, Eurocode 3: Design of steel structures.*
ANALYSIS TYPE: Member Verification

CODE GROUP:
MEMBER: 242 longitudinal choinki_242 **POINT:** 2 **COORDINATE:** x = 0.50 L = 0.70 m

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LOADS:
Governing Load Case: 13 SGN /117/ 1*1.15 + 2*1.15 + 3*1.05 + 4*0.75 + 8*1.50

MATERIAL:
S 235 (S 235) fy = 235.00 MPa

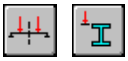


SECTION PARAMETERS: 30x30x3SHS

h=3.0 cm	gM0=1.00	gM1=1.00	
b=3.0 cm	Ay=1.57 cm2	Az=1.57 cm2	Ax=3.14 cm2
tw=0.3 cm	Iy=3.74 cm4	Iz=3.74 cm4	Ix=6.00 cm4
tf=0.3 cm	Impact=3.14 cm3	Wplz=3.14 cm3	

INTERNAL FORCES AND CAPACITIES:

N,Ed = 2.63 kN	My,Ed = 0.01 kN*m	Mz,Ed = -0.03 kN*m	Vy,Ed = 0.04 kN
Nc,Rd = 73.79 kN	My,Ed,max = 0.01 kN*m	Mz,Ed,max = -0.03 kN*m	Vy,T,Rd = 20.97 kN
Nb,Rd = 26.82 kN	My,c,Rd = 0.74 kN*m	Mz,c,Rd = 0.74 kN*m	Vz,Ed = 0.03 kN
	MN,y,Rd = 0.74 kN*m	MN,z,Rd = 0.74 kN*m	Vz,T,Rd = 20.97 kN
	Mb,Rd = 0.74 kN*m		Tt,Ed = -0.01 kN*m
			Class of section = 1



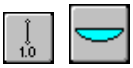
LATERAL BUCKLING PARAMETERS:

z = 1.00	Mcr = 15.34 kN*m	Curve,LT - c	XLT = 1.00
Lcr,upp=1.40 m	Lam_LT = 0.22	fi,LT = 0.47	XLT,mod = 1.00

BUCKLING PARAMETERS:



About y axis:



About z axis:

Ly = 1.40 m	Lam_y = 1.36	Lz = 1.40 m	Lam_z = 1.36
Lcr,y = 1.40 m	Xy = 0.36	Lcr,z = 1.40 m	Xz = 0.36
Llamas in 127.96	kzy = 0.65	Lamz = 127.96	kzz = 1.05

VERIFICATION FORMULAS:
Section strength check:
N,Ed/Nc,Rd = 0.04 < 1.00 (6.2.4.(1))
My,Ed/MN,y,Rd = 0.02 < 1.00 (6.2.9.1.(2))
Mz,Ed/MN,z,Rd = 0.04 < 1.00 (6.2.9.1.(2))
(My,Ed/MN,y,Rd)^ 1.66 + (Mz,Ed/MN,z,Rd)^1.66 = 0.01 < 1.00 (6.2.9.1.(6))
Vy,Ed/Vy,T,Rd = 0.00 < 1.00 (6.2.6-7)

Vz,Ed/Vz,T,Rd = 0.00 < 1.00 (6.2.6-7)
Tau,ty,Ed/(fy/(sqrt(3)*gM0)) = 0.02 < 1.00 (6.2.6)
Tau,tz,Ed/(fy/(sqrt(3)*gM0)) = 0.02 < 1.00 (6.2.6)
Global stability check of member:
Lambda,y = 127.96 < Lambda,max = 210.00 Lambda,z = 127.96 < Lambda,max = 210.00 STABLE
My,Ed,max/Mb,Rd = 0.02 < 1.00 (6.3.2.1.(1))
N,Ed/(Xy*N,Rk/gM1) + kyy*My,Ed,max/(XLT*My,Rk/gM1) + kyz*Mz,Ed,max/(Mz,Rk/gM1) = 0.14 < 1.00 (6.3.3.(4))
N,Ed/(Xz*N,Rk/gM1) + kzy*My,Ed,max/(XLT*My,Rk/gM1) + kzz*Mz,Ed,max/(Mz,Rk/gM1) = 0.15 < 1.00 (6.3.3.(4))

LIMIT DISPLACEMENTS


Deflections (LOCAL SYSTEM):
uy = 0.0 cm < uy max = L/200.00 = 0.7 cm Verified
Governing Load Case: 16 SGU /43/ 1*1.00 + 2*1.00 + 8*1.00
uz = 0.0 cm < uz max = L/200.00 = 0.7 cm Verified
Governing Load Case: 16 SGU /51/ 1*1.00 + 2*1.00 + 12*1.00


Displacements (GLOBAL SYSTEM):
vx = 0.2 cm < vx max = L/300.00 = 0.5 cm Verified
Governing Load Case: 16 SGU /28/ 1*1.00 + 2*1.00 + 3*0.70 + 4*0.50 + 9*1.00
vy = 0.2 cm < vy max = L/300.00 = 0.5 cm Verified
Governing Load Case: 16 SGU /41/ 1*1.00 + 2*1.00 + 7*1.00

Section OK !!