



**ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
ΠΕΡΙΦΕΡΕΙΑ ΘΕΣΣΑΛΙΑΣ
ΝΟΜΟΣ ΜΑΓΝΗΣΙΑΣ
ΔΗΜΟΣ ΡΗΓΑ ΦΕΡΑΙΟΥ**

*Δ/ΝΣΗ ΤΕΧΝΙΚΩΝ ΥΠΗΡΕΣΙΩΝ &
ΠΕΡΙΒΑΛΛΟΝΤΟΣ
ΤΕΧΝΙΚΗ ΥΠΗΡΕΣΙΑ*

ΕΡΓΟ :

**ΑΝΑΒΑΘΜΙΣΗ ΤΟΥ ΕΠΑ.Λ.
ΒΕΛΕΣΤΙΝΟΥ ΤΟΥ ΔΗΜΟΥ ΡΗΓΑ
ΦΕΡΑΙΟΥ ΣΕ ΠΡΟΤΥΠΟ ΕΠΑ.Λ.**

Αρ. Μελέτης: 6 /2023

ΠΡΟΫΠΟΛΟΓΙΣΜΟΥ:480.000,00 €

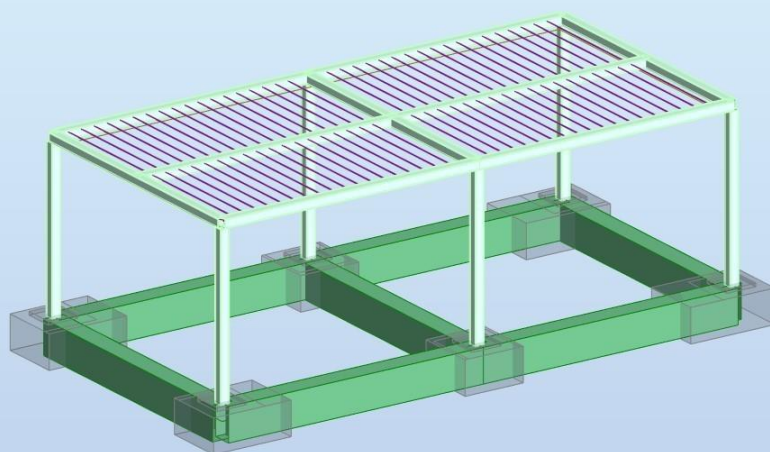
ΣΥΜΠΕΡΙΛΑΜΒΑΝΕΤΕ Ο ΦΠΑ

Αρ. Πρωτ: 530/19-01-2023

**ΧΡΗΜΑΤΟΔΟΤΗΣΗ :
ΤΑΜΕΙΟ ΑΝΑΚΑΜΨΗΣ**

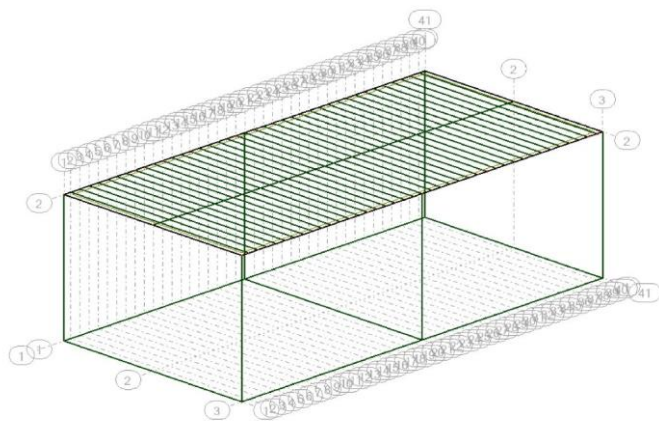
**ΣΤΑΤΙΚΗ ΜΕΛΕΤΗ ΠΕΡΓΚΟΛΑΣ
(ΑΠΟΤΕΛΕΣΜΑΤΑ ΑΝΩΔΟΜΗΣ)**

ΠΕΡΓΚΟΛΑ ΒΕΛΕΣΤΙΝΟ ΜΕ ΚΟΙΛΕΣ ΔΙΑΤΟΜΕΣ ΑΠΟΤΕΛΕΣΜΑΤΑ ΑΝΩΔΟΜΗΣ



— B R30x50
— NZSE 10x15x0.2
— TCAR 135x5

Structure View



Data - Bars

Bar	Node 1	Node 2	Section	Material	Length (m)	Gamma (Deg)	Type
1	1	2	TCAR 135x5	S275	2,40	0,0	ΥΠΟΣΤΥΛΩΜΑ
2	3	4	TCAR 135x5	S275	2,40	0,0	ΥΠΟΣΤΥΛΩΜΑ
3	5	6	TCAR 135x5	S275	2,40	0,0	ΥΠΟΣΤΥΛΩΜΑ
4	7	8	TCAR 135x5	S275	2,40	0,0	ΥΠΟΣΤΥΛΩΜΑ
5	11	12	TCAR 135x5	S275	2,40	0,0	ΥΠΟΣΤΥΛΩΜΑ
6	130	131	TCAR 135x5	S275	2,40	0,0	ΥΠΟΣΤΥΛΩΜΑ
7	6	12	TCAR 135x5	S275	3,94	0,0	Beam ΝΑΟΥΣΑ
8	12	2	TCAR 135x5	S275	3,94	0,0	Beam ΝΑΟΥΣΑ
9	8	131	TCAR 135x5	S275	3,94	0,0	Beam ΝΑΟΥΣΑ

10	131	4	TCAR 135x5	S275	3,94	0,0	Beam ΝΑΟΥΣΑ
11	9	132	TCAR 135x5	S275	3,94	0,0	Beam ΝΑΟΥΣΑ
12	132	10	TCAR 135x5	S275	3,94	0,0	Beam ΝΑΟΥΣΑ
13	12	131	TCAR 135x5	S275	3,88	0,0	Beam ΝΑΟΥΣΑ
14	6	8	TCAR 135x5	S275	3,88	0,0	Beam ΝΑΟΥΣΑ
15	2	4	TCAR 135x5	S275	3,88	0,0	Beam ΝΑΟΥΣΑ
16	7	5	B R30x5 0	C25/30	3,88	0,0	RC Beam
17	130	11	B R30x5 0	C25/30	3,88	0,0	RC Beam
18	3	1	B R30x5 0	C25/30	3,88	0,0	RC Beam
19	7	130	B R30x5 0	C25/30	3,94	0,0	RC Beam
20	130	3	B R30x5 0	C25/30	3,94	0,0	RC Beam
21	5	11	B R30x5 0	C25/30	3,94	0,0	RC Beam
22	11	1	B R30x5 0	C25/30	3,94	0,0	RC Beam
23	72	71	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
24	71	70	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
25	75	74	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
26	74	73	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
27	77	76	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
28	80	79	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
29	83	82	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
30	78	77	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
31	81	80	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
32	84	83	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
33	86	85	NZSE	S275	1,94	49,8	Simple bar

			10x15x 0.2				
34	87	86	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
35	89	88	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
36	90	89	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
37	92	91	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
38	93	92	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
39	95	94	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
40	96	95	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
41	98	97	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
42	99	98	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
43	101	100	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
44	102	101	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
45	104	103	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
46	105	104	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
47	107	106	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
48	108	107	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
49	110	109	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
50	111	110	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
51	113	112	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
52	114	113	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
53	116	115	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
54	117	116	NZSE 10x15x	S275	1,94	49,8	Simple bar

			0.2				
55	119	118	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
56	120	119	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
57	122	121	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
58	123	122	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
59	125	124	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
60	126	125	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
61	14	13	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
62	15	14	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
63	17	16	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
64	18	17	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
65	20	19	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
66	21	20	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
67	23	22	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
68	24	23	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
69	26	25	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
70	27	26	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
71	29	28	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
72	30	29	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
73	32	31	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
74	33	32	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
75	35	34	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar

76	36	35	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
77	38	37	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
78	39	38	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
79	41	40	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
80	42	41	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
81	44	43	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
82	45	44	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
83	47	46	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
84	48	47	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
85	50	49	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
86	51	50	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
87	53	52	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
88	54	53	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
89	56	55	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
90	57	56	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
91	59	58	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
92	60	59	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
93	62	61	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
94	63	62	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
95	65	64	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
96	66	65	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar
97	68	67	NZSE	S275	1,94	49,8	Simple bar

			10x15x 0.2				
98	69	68	NZSE 10x15x 0.2	S275	1,94	49,8	Simple bar

Data - Panels**Data - Sections**

	Section name	Bar list	AX (cm ²)	AY (cm ²)	AZ (cm ²)	IX (cm ⁴)	IY (cm ⁴)	IZ (cm ⁴)
	NZSE 10x15x0.2	23to98	0,38	0,26	0,31	0,00	10,75	0,05
	TCAR 135x5	1to15	25,10	11,56	11,56	1127,00	695,00	695,00
	B R30x50	16to22	1500,00	1250,00	1250,00	281631, 13	312500, 00	112500, 00

Data - Supports

	Support name	List of nodes	List of edges	List of objects	Support conditions
	NODAL ELASTIC 25000	1to7By2 11 130			UX UY KZ=25000,00 (kN/m) RX RY

Loads - Cases

Case	Label	Case name	Nature	Analysis type
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1	DL1	DL1	Structural	Static - Linear
2	DL2	DL2	Structural	Static - Linear
3	LL1	LL1	Category A	Static - Linear
4	SN1	SN1	snow	Static - Linear
5	WIND1	Wind X+ 34,64 m/s (f =1.00) Simulation	wind	Static - Linear
6	WIND2	Wind Y+ 34,64 m/s (f =1.00) Simulation	wind	Static - Linear
7	WIND3	Wind X- 34,64 m/s (f =1.00) Simulation	wind	Static - Linear
8	WIND4	Wind Y- 34,64 m/s (f =1.00) Simulation	wind	Static - Linear
9	TEMP1	TEMP (+)	temperature	Static - Linear
10	MOD10	Modal		Modal
11	SEI_X11	Seismic EC 8 Direction_X	seismic	Seismic-EC 8
12	SEI_Y12	Seismic EC 8 Direction_Y	seismic	Seismic-EC 8
13	SPE_NEW 13	1 * X 0.3 * Y	seismic	Linear Combination
14	SPE_NEW 14	1 * X -0.3 * Y	seismic	Linear Combination
15	SPE_NEW 15	0.3 * X 1 * Y	seismic	Linear Combination
16	SPE_NEW 16	0.3 * X -1 * Y	seismic	Linear Combination
17	SPE_KWA 18	1 * X 1 * Y	seismic	Signed quadratic combination
18	SPE_KWA 19	1 * X -1 * Y	seismic	Signed quadratic combination
19		ULS 1	Structural	Linear Combination
20		ULS 2	Structural	Linear Combination
21		ULS 3	Structural	Linear Combination
22		ULS 4	Structural	Linear Combination
23		ULS 5	Structural	Linear Combination
24		ULS 6	Structural	Linear Combination
25		ULS 7	Structural	Linear Combination
26		ULS 8	Structural	Linear Combination
27		ULS 9	Structural	Linear Combination
28		ULS 10	Structural	Linear Combination
29		ULS 11	Structural	Linear Combination
30		ULS 12	Structural	Linear Combination
31		ULS 13	Structural	Linear Combination
32		ULS 14	Structural	Linear Combination
33		ULS 15	Structural	Linear Combination
34		ULS 16	Structural	Linear Combination
35		ULS 17	Structural	Linear Combination

36		SEISM 1	seismic	Linear Combination
37		SEISM 2	seismic	Linear Combination
38		SEISM 3	seismic	Linear Combination
39		SEISM 4	seismic	Linear Combination
40		SEISM 5	seismic	Linear Combination
41		SEISM 6	seismic	Linear Combination
42		SEISM 7	seismic	Linear Combination
43		SEISM 8	seismic	Linear Combination
44		SEISM 9	seismic	Linear Combination
45		SLS 1	Non-structural	Linear Combination
46		SLS 2	Non-structural	Linear Combination
47		SLS 3	Non-structural	Linear Combination
48		SLS 4	Non-structural	Linear Combination
49		SLS 5	Non-structural	Linear Combination
50		SLS 6	Non-structural	Linear Combination
51		SLS 7	Non-structural	Linear Combination
52		TEMP NEGATIVE	Structural	Linear Combination
53		ULS 18	Structural	Linear Combination
54		ULS 19	Structural	Linear Combination
55		ULS 20	Structural	Linear Combination
56		ULS 21	Structural	Linear Combination
57		ULS 22	Structural	Linear Combination
58		ULS 23	Structural	Linear Combination
59		ULS 24	Structural	Linear Combination
60		ULS 25	Structural	Linear Combination
61		ULS 26	Structural	Linear Combination
62		ULS 27	Structural	Linear Combination
63		ULS 28	Structural	Linear Combination
64		ULS 29	Structural	Linear Combination
65		ULS 30	Structural	Linear Combination
66		ULS 31	Structural	Linear Combination
67		ULS 32	Structural	Linear

				Combination
68		ULS 33	Structural	Linear Combination
69		ULS 34	Structural	Linear Combination
70		ULS 35	Structural	Linear Combination
71		ULS 36	Structural	Linear Combination
72		ULS 37	Structural	Linear Combination
73		SLS 8	Non-structural	Linear Combination
74		SLS 9	Non-structural	Linear Combination
75		SLS 10	Non-structural	Linear Combination
76		SLS 11	Non-structural	Linear Combination
77		SLS 12	Non-structural	Linear Combination
78		SLS 13	Non-structural	Linear Combination

Loads - Values

- Cases: 1to78

	Case	Load type	List	Load values
	1	self-weight	1to98 166	PZ Negative Factor=1,00
	2	(FE) uniform	166	PZ=-0,50(kN/m2)
	3	(FE) uniform	166	PZ=-0,80(kN/m2)
	4	(FE) uniform	166	PZ=-0,80(kN/m2)
	5	uniform load	1 5 6	PY=-0,01(kN/m) PZ=-0,07(kN/m) local
	5	uniform load	2	PY=-0,01(kN/m) PZ=-0,02(kN/m) local
	5	uniform load	3	PY=0,01(kN/m) PZ=-0,07(kN/m) local
	5	uniform load	4	PY=0,00(kN/m) PZ=-0,02(kN/m) local
	5	uniform load		PY=0,03(kN/m) PZ=0,02(kN/m) local
	5	uniform load		PY=0,01(kN/m) PZ=-0,00(kN/m) local
	5	uniform load	13 14	PY=0,01(kN/m) PZ=0,01(kN/m) local
	5	uniform load	15	PY=-0,00(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=-0,00(kN/m) PZ=0,01(kN/m) local
	5	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=-0,01(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local

	5	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=0,01(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=0,01(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	5	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	5	(FE) uniform	166	PZ=0,06(kN/m2) local
	6	uniform load	1 5 6	PY=0,07(kN/m) PZ=0,01(kN/m) local
	6	uniform load	2	PY=0,07(kN/m) PZ=-0,02(kN/m) local
	6	uniform load	3	PY=0,06(kN/m) PZ=0,00(kN/m) local
	6	uniform load	4	PY=0,06(kN/m) PZ=-0,00(kN/m) local
	6	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	6	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	6	uniform load	13 14	PY=0,02(kN/m) PZ=0,00(kN/m) local
	6	uniform load	15	PY=0,06(kN/m) PZ=0,02(kN/m) local
	6	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	6	uniform load		PY=-0,00(kN/m) PZ=-0,00(kN/m) local
	6	uniform load		PY=-0,00(kN/m) PZ=-0,00(kN/m) local
	6	uniform load		PY=-0,00(kN/m) PZ=-0,00(kN/m) local
	6	uniform load		PY=-0,00(kN/m) PZ=-0,00(kN/m) local
	6	uniform load		PY=-0,00(kN/m) PZ=-0,00(kN/m) local
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	6	uniform load		PY=-0,01(kN/m) PZ=-0,00(kN/m) local
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	6	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	6	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	6	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	6	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	6	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	6	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	6	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	6	(FE) uniform	166	PZ=0,02(kN/m2) local
	7	uniform load	1 5 6	PY=-0,00(kN/m) PZ=0,02(kN/m) local
	7	uniform load	2	PY=-0,01(kN/m) PZ=0,07(kN/m) local
	7	uniform load	3	PY=0,01(kN/m) PZ=0,02(kN/m) local
	7	uniform load	4	PY=0,01(kN/m) PZ=0,07(kN/m) local
	7	uniform load		PY=-0,01(kN/m) PZ=-0,00(kN/m) local
	7	uniform load		PY=-0,03(kN/m) PZ=0,02(kN/m) local
	7	uniform load	13 14	PY=0,00(kN/m) PZ=0,00(kN/m) local
	7	uniform load	15	PY=-0,01(kN/m) PZ=0,01(kN/m) local
	7	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	7	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	7	uniform load		PY=0,00(kN/m) PZ=0,01(kN/m) local
	7	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local

	7	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	7	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	7	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	7	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	7	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	7	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	7	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	7	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	7	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	7	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	7	uniform load		PY=-0,01(kN/m) PZ=0,00(kN/m) local
	7	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	7	uniform load		PY=0,01(kN/m) PZ=0,00(kN/m) local
	7	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	7	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	7	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	7	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	7	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	7	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	7	(FE) uniform	166	PZ=0,06(kN/m2) local
	8	uniform load	1 5 6	PY=-0,06(kN/m) PZ=0,00(kN/m) local
	8	uniform load	2	PY=-0,06(kN/m) PZ=-0,00(kN/m) local
	8	uniform load	3	PY=-0,07(kN/m) PZ=0,02(kN/m) local
	8	uniform load	4	PY=-0,07(kN/m) PZ=-0,01(kN/m) local
	8	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	8	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	8	uniform load	13 14	PY=-0,06(kN/m) PZ=0,02(kN/m) local
	8	uniform load	15	PY=-0,02(kN/m) PZ=0,00(kN/m) local
	8	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	8	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	8	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	8	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	8	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	8	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	8	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	8	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	8	uniform load		PY=-0,00(kN/m) PZ=0,00(kN/m) local
	8	uniform load		PY=-0,01(kN/m) PZ=0,00(kN/m) local
	8	uniform load		PY=-0,02(kN/m) PZ=0,00(kN/m) local
	8	uniform load		PY=-0,02(kN/m) PZ=0,00(kN/m) local
	8	uniform load		PY=-0,02(kN/m) PZ=-0,00(kN/m) local
	8	uniform load		PY=-0,04(kN/m) PZ=0,01(kN/m) local
	8	uniform load		PY=-0,04(kN/m) PZ=0,01(kN/m) local
	8	uniform load		PY=0,00(kN/m) PZ=0,00(kN/m) local
	8	uniform load		PY=0,01(kN/m) PZ=0,00(kN/m) local
	8	uniform load		PY=0,01(kN/m) PZ=-0,00(kN/m) local
	8	uniform load		PY=0,01(kN/m) PZ=-0,00(kN/m) local
	8	uniform load		PY=0,01(kN/m) PZ=-0,00(kN/m) local
	8	uniform load		PY=0,01(kN/m) PZ=-0,00(kN/m) local
	8	uniform load		PY=0,00(kN/m) PZ=-0,00(kN/m) local
	8	uniform load		PY=0,00(kN/m) PZ=-0,00(kN/m) local
	8	uniform load		PY=0,00(kN/m) PZ=-0,00(kN/m) local
	8	(FE) uniform	166	PZ=0,02(kN/m2) local
	9	thermal load	1to6	TX=20,00(°C)

			13to15	
	9	thermal load	23to98	TX=20,00(°C)
	9	thermal load	7to12	TX=20,00(°C)

Manual Combinations

- Cases: 13to78

Combinations	Name	Analysis type	Combination type	Case nature	Definition
13 (C) (CQC)	1 * X 0.3 * Y	Linear Combination	ULS	seismic	11*1.00+12*0.30
14 (C) (CQC)	1 * X -0.3 * Y	Linear Combination	ULS	seismic	11*1.00+12*-0.30
15 (C) (CQC)	0.3 * X 1 * Y	Linear Combination	ULS	seismic	11*0.30+12*1.00
16 (C) (CQC)	0.3 * X -1 * Y	Linear Combination	ULS	seismic	11*0.30+12*-1.00
17 (C) (CQC)	1 * X 1 * Y	Signed quadratic combination	ULS_Q UA	seismic	SQRT((11;12)*1.00)
18 (C) (CQC)	1 * X -1 * Y	Signed quadratic combination	ULS_Q UA	seismic	SQRT(11*1.00;12*-1.00)
19 (C)	ULS 1	Linear Combination	ULS	Structural	(1+2)*1.35+3*1.50
20 (C)	ULS 2	Linear Combination	ULS	Structural	(1+2)*1.35+3*1.50+4*0.75
21 (C)	ULS 3	Linear Combination	ULS	Structural	(1+2)*1.35+3*1.50
22 (C)	ULS 4	Linear Combination	ULS	Structural	(1+2)*1.35+3*1.50+4*0.75
23 (C)	ULS 5	Linear Combination	ULS	Structural	(1+2)*1.35+3*1.50+4*0.75
24 (C)	ULS 6	Linear Combination	ULS	Structural	(1+2)*1.35+3*1.50+4*0.75
25 (C)	ULS 7	Linear Combination	ULS	Structural	(1+2)*1.35+3*0.90
26 (C)	ULS 8	Linear Combination	ULS	Structural	(1+2)*1.35+3*0.90
27 (C)	ULS 9	Linear Combination	ULS	Structural	(1+2)*1.35+3*0.90
28 (C)	ULS 10	Linear Combination	ULS	Structural	(1+2)*1.35+3*0.90+4*0.75
29 (C)	ULS 11	Linear Combination	ULS	Structural	(1+2)*1.35+3*0.90+4*0.75
30 (C)	ULS 12	Linear Combination	ULS	Structural	(1+2)*1.35+3*0.90+4*0.75
31 (C)	ULS 13	Linear Combination	ULS	Structural	(1+2)*1.35+3*0.90
32 (C)	ULS 14	Linear Combination	ULS	Structural	(1+2)*1.35+3*0.90+4*1.50
33 (C)	ULS 15	Linear Combination	ULS	Structural	(1+2)*1.35+3*0.90+4*1.50

34 (C)	ULS 16	Linear Combination	ULS	Structural	$(1+2)*1.35+3*0.90+4*1.50$
35 (C)	ULS 17	Linear Combination	ULS	Structural	$(1+2)*1.35+3*0.90+4*1.50$
36 (C)	SEISM 1	Linear Combination	AC C	seismic	$3*0.30+(1+2)*1.35$
37 (C)	SEISM 2	Linear Combination	AC C	seismic	$3*0.30+(1+2)*1.35$
38 (C)	SEISM 3	Linear Combination	AC C	seismic	$3*0.30+(1+2)*1.35$
39 (C)	SEISM 4	Linear Combination	AC C	seismic	$3*0.30+(1+2)*1.35$
40 (C)	SEISM 5	Linear Combination	AC C	seismic	$3*0.30+(1+2)*1.35$
41 (C)	SEISM 6	Linear Combination	AC C	seismic	$3*0.30+(1+2)*1.35$
42 (C)	SEISM 7	Linear Combination	AC C	seismic	$3*0.30+(1+2)*1.35$
43 (C)	SEISM 8	Linear Combination	AC C	seismic	$3*0.30+(1+2)*1.35$
44 (C)	SEISM 9	Linear Combination	AC C	seismic	$3*0.30+(1+2)*1.00$
45 (C)	SLS 1	Linear Combination	SLS	Non-structural	$(1+2+4)*1.00+3*0.70$
46 (C)	SLS 2	Linear Combination	SLS	Non-structural	$(1+2+4)*1.00+3*0.70$
47 (C)	SLS 3	Linear Combination	SLS	Non-structural	$(1+2+4)*1.00+3*0.70$
48 (C)	SLS 4	Linear Combination	SLS	Non-structural	$(1+2+3)*1.00+4*0.50$
49 (C)	SLS 5	Linear Combination	SLS	Non-structural	$(1+2+3)*1.00+4*0.50$
50 (C)	SLS 6	Linear Combination	SLS	Non-structural	$(1+2+3)*1.00+4*0.50$
51 (C)	SLS 7	Linear Combination	SLS	Non-structural	$(1+2+3)*1.00+4*0.50$
52 (C)	TEMP NEGATIVE	Linear Combination	ULS	Structural	9*-1.00
53 (C)	ULS 18	Linear Combination	ULS	Structural	$(1+2)*1.35+3*1.50+9*0.75$
54 (C)	ULS 19	Linear Combination	ULS	Structural	$(1+2)*1.35+3*1.50$
55 (C)	ULS 20	Linear Combination	ULS	Structural	$(1+2)*1.35+3*1.50+9*0.75$
56 (C)	ULS 21	Linear Combination	ULS	Structural	$(1+2)*1.35+3*1.50$
57 (C)	ULS 22	Linear Combination	ULS	Structural	$(1+2)*1.35+3*1.50+9*0.75$
58 (C)	ULS 23	Linear Combination	ULS	Structural	$(1+2)*1.35+3*1.50$
59 (C)	ULS 24	Linear Combination	ULS	Structural	$(1+2)*1.35+3*1.50+9*0.75$
60 (C)	ULS 25	Linear Combination	ULS	Structural	$(1+2)*1.35+3*1.50+59*0.75$
61 (C)	ULS 26	Linear Combination	ULS	Structural	$(1+2)*1.35+3*1.50+9*0.75$
62 (C)	ULS 27	Linear Combination	ULS	Structural	$(1+2)*1.35+3*1.50+59*0.75$
63 (C)	ULS 28	Linear Combination	ULS	Structural	$(1+2)*1.35+3*1.50+9*0.75+4*0.90$
64 (C)	ULS 29	Linear Combination	ULS	Structural	$(1+2)*1.35+3*1.50+59*0.75+4*0.90$
65 (C)	ULS 30	Linear	ULS	Structural	$(1+2)*1.35+3*0.90+9*1.50$

		Combination			
66 (C)	ULS 31	Linear Combination	ULS	Structural	$(1+2)*1.35+3*0.90+59*1.50$
67 (C)	ULS 32	Linear Combination	ULS	Structural	$(1+2)*1.35+3*1.50$
68 (C)	ULS 33	Linear Combination	ULS	Structural	$(1+2)*1.35+3*1.50+4*0.75$
69 (C)	ULS 34	Linear Combination	ULS	Structural	$(1+2)*1.35+3*0.90$
70 (C)	ULS 35	Linear Combination	ULS	Structural	$(1+2)*1.35+3*0.90+4*0.75$
71 (C)	ULS 36	Linear Combination	ULS	Structural	$(1+2)*1.35+3*0.90$
72 (C)	ULS 37	Linear Combination	ULS	Structural	$(1+2)*1.35+3*0.90+4*1.50$
73 (C)	SLS 8	Linear Combination	SLS	Non-structural	$(1+2+4)*1.00+3*0.70$
74 (C)	SLS 9	Linear Combination	SLS	Non-structural	$(1+2+3)*1.00+4*0.50$
75 (C)	SLS 10	Linear Combination	SLS	Non-structural	$(1+2+4)*1.00+3*0.70+9*0.60$
76 (C)	SLS 11	Linear Combination	SLS	Non-structural	$(1+2+3)*1.00+59*0.60+4*0.50$
77 (C)	SLS 12	Linear Combination	SLS	Non-structural	$(1+2+4)*1.00+3*0.70+9*0.60$
78 (C)	SLS 13	Linear Combination	SLS	Non-structural	$(1+2+3)*1.00+59*0.60+4*0.50$

Members - Definition

Member	Name	Components	Code group	Section	Type	Ly (m)	Lz (m)
1		1	ΚΟΛΩΝΕΣ	TCAR 135x5	ΥΠΟΣΤΥΛΩΜΑ	2,40	2,40
2		2	ΚΟΛΩΝΕΣ	TCAR 135x5	ΥΠΟΣΤΥΛΩΜΑ	2,40	2,40
3		3	ΚΟΛΩΝΕΣ	TCAR 135x5	ΥΠΟΣΤΥΛΩΜΑ	2,40	2,40
4		4	ΚΟΛΩΝΕΣ	TCAR 135x5	ΥΠΟΣΤΥΛΩΜΑ	2,40	2,40
5		5	ΚΟΛΩΝΕΣ	TCAR 135x5	ΥΠΟΣΤΥΛΩΜΑ	2,40	2,40
6		6	ΚΟΛΩΝΕΣ	TCAR 135x5	ΥΠΟΣΤΥΛΩΜΑ	2,40	2,40
7		7	ΔΟΚΟΙ	TCAR 135x5	Beam ΝΑΟΥΣΑ	3,94	3,94
8		8	ΔΟΚΟΙ	TCAR 135x5	Beam ΝΑΟΥΣΑ	3,94	3,94
9		9	ΔΕΥΤΕΡΕΥΟΥΣΕΣ ΔΟΚΟΙ	TCAR 135x5	Beam ΝΑΟΥΣΑ	3,94	3,94
10		10	ΔΟΚΟΙ	TCAR 135x5	Beam ΝΑΟΥΣΑ	3,94	3,94
11		11	ΔΟΚΟΙ	TCAR 135x5	Beam ΝΑΟΥΣΑ	3,94	3,94
12		12	ΔΟΚΟΙ	TCAR 135x5	Beam ΝΑΟΥΣΑ	3,94	3,94

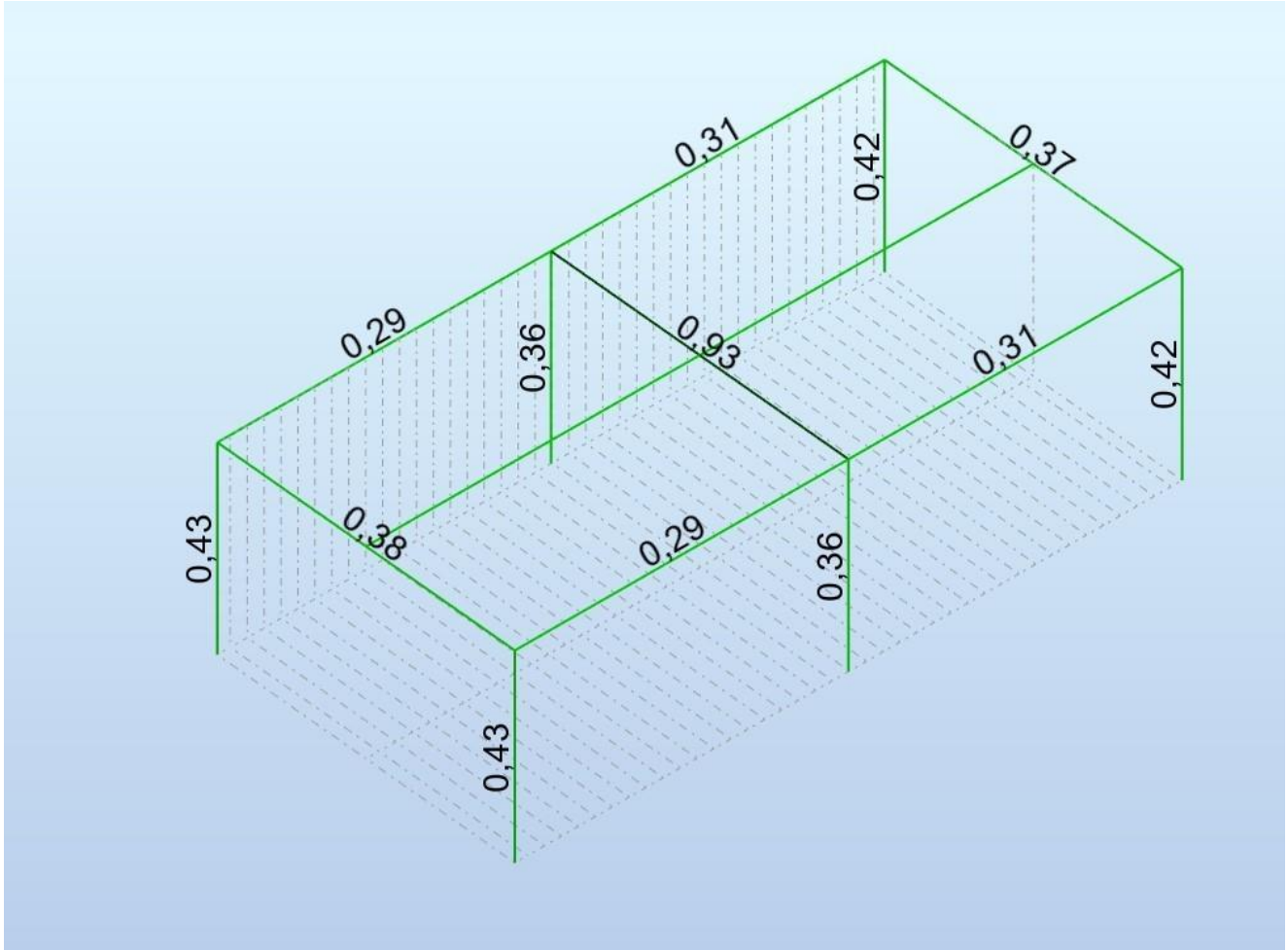
13		13	ΔΕΥΤΕΡΕΥ ΟΥΣΕΣ ΔΟΚΟΙ	TCAR 135x5	Beam ΝΑΟΥΣΑ	3,88	3,88
14		14	ΔΟΚΟΙ	TCAR 135x5	Beam ΝΑΟΥΣΑ	3,88	3,88
15		15	ΔΟΚΟΙ	TCAR 135x5	Beam ΝΑΟΥΣΑ	3,88	3,88
16		16	(N/A)	B R30x5 0	RC Beam	(N/A)	(N/A)
17		17	(N/A)	B R30x5 0	RC Beam	(N/A)	(N/A)
18		18	(N/A)	B R30x5 0	RC Beam	(N/A)	(N/A)
19		19	(N/A)	B R30x5 0	RC Beam	(N/A)	(N/A)
20		20	(N/A)	B R30x5 0	RC Beam	(N/A)	(N/A)
21		21	(N/A)	B R30x5 0	RC Beam	(N/A)	(N/A)
22		22	(N/A)	B R30x5 0	RC Beam	(N/A)	(N/A)
23		23	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
24		24	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
25		25	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
26		26	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
27		27	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
28		28	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
29		29	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
30		30	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
31		31	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
32		32	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
33		33	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
34		34	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94

35		35	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
36		36	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
37		37	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
38		38	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
39		39	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
40		40	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
41		41	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
42		42	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
43		43	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
44		44	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
45		45	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
46		46	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
47		47	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
48		48	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
49		49	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
50		50	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
51		51	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
52		52	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
53		53	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
54		54	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
55		55	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
56		56	(N/A)	NZSE	Simple bar	1,94	1,94

				10x15x 0.2			
57		57	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
58		58	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
59		59	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
60		60	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
61		61	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
62		62	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
63		63	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
64		64	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
65		65	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
66		66	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
67		67	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
68		68	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
69		69	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
70		70	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
71		71	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
72		72	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
73		73	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
74		74	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
75		75	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
76		76	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
77		77	(N/A)	NZSE 10x15x	Simple bar	1,94	1,94

				0.2			
78		78	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
79		79	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
80		80	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
81		81	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
82		82	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
83		83	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
84		84	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
85		85	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
86		86	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
87		87	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
88		88	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
89		89	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
90		90	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
91		91	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
92		92	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
93		93	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
94		94	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
95		95	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
96		96	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
97		97	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94
98		98	(N/A)	NZSE 10x15x 0.2	Simple bar	1,94	1,94

Steel Member Verification



STEEL DESIGN

CODE: EN 1993-1:2005/A1:2014, Eurocode 3: Design of steel structures.

ANALYSIS TYPE: Member Verification

CODE GROUP:

MEMBER: 1

POINT: 1

COORDINATE: x = 0.00 L = 0.00 m

LOADS:

Governing Load Case: 17 1 * X 1 * Y SQRT(11;12)*1.00)

MATERIAL:

S275 (S275) $f_y = 275.00$ MPa



SECTION PARAMETERS: T CAR 135x5

h=13.5 cm	gM0=1.00	gM1=1.00	
b=13.5 cm	Ay=12.55 cm ²	Az=12.55 cm ²	Ax=25.10 cm ²
tw=0.5 cm	Iy=695.00 cm ⁴	Iz=695.00 cm ⁴	Ix=1127.00 cm ⁴
tf=0.5 cm	Wply=126.81 cm ³	Wplz=126.81 cm ³	

INTERNAL FORCES AND CAPACITIES:

N _{Ed} = 3.25 kN	My _{Ed} = -9.13 kN*m	Mz _{Ed} = 10.83 kN*m	Vy _{Ed} = 6.74 kN
N _{c,Rd} = 690.25 kN	My _{Ed,max} = -9.13 kN*m	Mz _{Ed,max} = 10.83 kN*m	Vy _{T,Rd} = 196.66 kN
Nb _{Rd} = 632.41 kN	My _{c,Rd} = 34.87 kN*m	Mz _{c,Rd} = 34.87 kN*m	Vz _{Ed} = 6.36 kN
	MN _{y,Rd} = 34.87 kN*m	MN _{z,Rd} = 34.87 kN*m	Vz _{T,Rd} = 196.66 kN
			Tt _{Ed} = 0.35 kN*m
			Class of section = 1



LATERAL BUCKLING PARAMETERS:

BUCKLING PARAMETERS:



About y axis:

Ly = 2.40 m	Lam _y = 0.53
Lcr,y = 2.40 m	Xy = 0.92
Lamy = 45.61	kzy = 0.56



About z axis:

Lz = 2.40 m	Lam _z = 0.53
Lcr,z = 2.40 m	Xz = 0.92
Lamz = 45.61	kzz = 0.89

VERIFICATION FORMULAS:

Section strength check:

$$N_{Ed}/N_{c,Rd} = 0.00 < 1.00 \quad (6.2.4.(1))$$

$$M_{y,Ed}/M_{N,y,Rd} = 0.26 < 1.00 \quad (6.2.9.1.(2))$$

$$M_{z,Ed}/M_{N,z,Rd} = 0.31 < 1.00 \quad (6.2.9.1.(2))$$

$$(M_{y,Ed}/M_{N,y,Rd})^{1.66} + (M_{z,Ed}/M_{N,z,Rd})^{1.66} = 0.25 < 1.00 \quad (6.2.9.1.(6))$$

$$V_{y,Ed}/V_{y,T,Rd} = 0.03 < 1.00 \quad (6.2.6-7)$$

$$V_{z,Ed}/V_{z,T,Rd} = 0.03 < 1.00 \quad (6.2.6-7)$$

$$\tau_{xy,Ed}/(f_y/(\sqrt{3} \cdot gM0)) = 0.01 < 1.00 \quad (6.2.6)$$

$$\tau_{xz,Ed}/(f_y/(\sqrt{3} \cdot gM0)) = 0.01 < 1.00 \quad (6.2.6)$$

Global stability check of member:

$$\lambda_{y,Ed} = 45.61 < \lambda_{y,max} = 210.00 \quad \lambda_{z,Ed} = 45.61 < \lambda_{z,max} = 210.00 \quad \text{STABLE}$$

$$N_{Ed}/(X_y \cdot N_{Rk}/gM1) + k_{yy} \cdot M_{y,Ed,max}/(X_{LT} \cdot M_{y,Rk}/gM1) + k_{yz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.42 < 1.00 \quad (6.3.3.(4))$$

$$N_{Ed}/(X_z \cdot N_{Rk}/gM1) + k_{zy} \cdot M_{y,Ed,max}/(X_{LT} \cdot M_{y,Rk}/gM1) + k_{zz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.43 < 1.00 \quad (6.3.3.(4))$$

LIMIT DISPLACEMENTS



Deflections (LOCAL SYSTEM): Not analyzed



Displacements (GLOBAL SYSTEM):

$v_x = 0.8 \text{ cm} < v_x \text{ max} = L/150.00 = 1.6 \text{ cm}$

Verified

Governing Load Case: 11 Seismic EC 8 Direction_X

$v_y = 1.1 \text{ cm} < v_y \text{ max} = L/150.00 = 1.6 \text{ cm}$

Verified

Governing Load Case: 12 Seismic EC 8 Direction_Y

Section OK !!!

STEEL DESIGN

CODE: EN 1993-1:2005/A1:2014, Eurocode 3: Design of steel structures.

ANALYSIS TYPE: Member Verification

CODE GROUP:

MEMBER: 2

POINT: 1

COORDINATE: x = 0.00 L = 0.00 m

LOADS:

Governing Load Case: 17 1 * X 1 * Y SQRT(11;12)*1.00)

MATERIAL:

S275 (S275) $f_y = 275.00$ MPa



SECTION PARAMETERS: TCAR 135x5

h=13.5 cm	gM0=1.00	gM1=1.00	
b=13.5 cm	Ay=12.55 cm ²	Az=12.55 cm ²	Ax=25.10 cm ²
tw=0.5 cm	Iy=695.00 cm ⁴	Iz=695.00 cm ⁴	Ix=1127.00 cm ⁴
tf=0.5 cm	Wply=126.81 cm ³	Wplz=126.81 cm ³	

INTERNAL FORCES AND CAPACITIES:

N,Ed = 3.25 kN	My,Ed = -9.12 kN*m	Mz,Ed = 10.83 kN*m	Vy,Ed = 6.74 kN
Nc,Rd = 690.25 kN	My,Ed,max = -9.12 kN*m	Mz,Ed,max = 10.83 kN*m	Vy,T,Rd = 196.66 kN
Nb,Rd = 632.41 kN	My,c,Rd = 34.87 kN*m	Mz,c,Rd = 34.87 kN*m	Vz,Ed = 6.36 kN
	MN,y,Rd = 34.87 kN*m	MN,z,Rd = 34.87 kN*m	Vz,T,Rd = 196.66 kN
			Tt,Ed = 0.35 kN*m
			Class of section = 1



LATERAL BUCKLING PARAMETERS:

BUCKLING PARAMETERS:



About y axis:

Ly = 2.40 m	Lam_y = 0.53
Lcr,y = 2.40 m	Xy = 0.92
Lamy = 45.61	kzy = 0.56



About z axis:

Lz = 2.40 m	Lam_z = 0.53
Lcr,z = 2.40 m	Xz = 0.92
Lamz = 45.61	kzz = 0.89

VERIFICATION FORMULAS:

Section strength check:

$$N_{Ed}/N_{c,Rd} = 0.00 < 1.00 \quad (6.2.4.(1))$$

$$M_{y,Ed}/M_{N,y,Rd} = 0.26 < 1.00 \quad (6.2.9.1.(2))$$

$$M_{z,Ed}/M_{N,z,Rd} = 0.31 < 1.00 \quad (6.2.9.1.(2))$$

$$(M_{y,Ed}/M_{N,y,Rd})^{1.66} + (M_{z,Ed}/M_{N,z,Rd})^{1.66} = 0.25 < 1.00 \quad (6.2.9.1.(6))$$

$$V_{y,Ed}/V_{y,T,Rd} = 0.03 < 1.00 \quad (6.2.6-7)$$

$$V_{z,Ed}/V_{z,T,Rd} = 0.03 < 1.00 \quad (6.2.6-7)$$

$$\tau_{ty,Ed}/(f_y/(\sqrt{3} \cdot gM0)) = 0.01 < 1.00 \quad (6.2.6)$$

$$\tau_{tz,Ed}/(f_y/(\sqrt{3} \cdot gM0)) = 0.01 < 1.00 \quad (6.2.6)$$

Global stability check of member:

$$\lambda_{bda,y} = 45.61 < \lambda_{bda,max} = 210.00 \quad \lambda_{bda,z} = 45.61 < \lambda_{bda,max} = 210.00 \quad \text{STABLE}$$

$$N_{Ed}/(X_y \cdot N_{Rk}/gM1) + k_{yy} \cdot M_{y,Ed,max}/(XLT \cdot M_{y,Rk}/gM1) + k_{yz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.42 < 1.00 \quad (6.3.3.(4))$$

$$N_{Ed}/(X_z \cdot N_{Rk}/gM1) + k_{zy} \cdot M_{y,Ed,max}/(XLT \cdot M_{y,Rk}/gM1) + k_{zz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.43 < 1.00 \quad (6.3.3.(4))$$

LIMIT DISPLACEMENTS



Deflections (LOCAL SYSTEM): *Not analyzed*



Displacements (GLOBAL SYSTEM):

$v_x = 0.8 \text{ cm} < v_{x \text{ max}} = L/150.00 = 1.6 \text{ cm}$

Verified

Governing Load Case: 11 Seismic EC 8 Direction_X

$v_y = 1.1 \text{ cm} < v_{y \text{ max}} = L/150.00 = 1.6 \text{ cm}$

Verified

Governing Load Case: 12 Seismic EC 8 Direction_Y

Section OK !!!

STEEL DESIGN

CODE: EN 1993-1:2005/A1:2014, Eurocode 3: Design of steel structures.

ANALYSIS TYPE: Member Verification

CODE GROUP:

MEMBER: 3

POINT: 1

COORDINATE: x = 0.00 L = 0.00 m

LOADS:

Governing Load Case: 17 1 * X 1 * Y SQRT(11;12)*1.00)

MATERIAL:

S275 (S275) $f_y = 275.00$ MPa



SECTION PARAMETERS: TCAR 135x5

h=13.5 cm	gM0=1.00	gM1=1.00	
b=13.5 cm	Ay=12.55 cm ²	Az=12.55 cm ²	Ax=25.10 cm ²
tw=0.5 cm	Iy=695.00 cm ⁴	Iz=695.00 cm ⁴	Ix=1127.00 cm ⁴
tf=0.5 cm	Wply=126.81 cm ³	Wplz=126.81 cm ³	

INTERNAL FORCES AND CAPACITIES:

N _{Ed} = 2.94 kN	My _{Ed} = -8.99 kN*m	Mz _{Ed} = 10.80 kN*m	Vy _{Ed} = 6.71 kN
N _{c,Rd} = 690.25 kN	My _{Ed,max} = -8.99 kN*m	Mz _{Ed,max} = 10.80 kN*m	Vy _{T,Rd} = 196.57 kN
Nb _{Rd} = 632.41 kN	My _{c,Rd} = 34.87 kN*m	Mz _{c,Rd} = 34.87 kN*m	Vz _{Ed} = 6.20 kN
	MN _{y,Rd} = 34.87 kN*m	MN _{z,Rd} = 34.87 kN*m	Vz _{T,Rd} = 196.57 kN
			Tt _{Ed} = 0.36 kN*m
			Class of section = 1



LATERAL BUCKLING PARAMETERS:

BUCKLING PARAMETERS:



About y axis:

Ly = 2.40 m	Lam_y = 0.53
Lcr,y = 2.40 m	Xy = 0.92
Lamy = 45.61	kzy = 0.56



About z axis:

Lz = 2.40 m	Lam_z = 0.53
Lcr,z = 2.40 m	Xz = 0.92
Lamz = 45.61	kzz = 0.89

VERIFICATION FORMULAS:

Section strength check:

$$N_{Ed}/N_{c,Rd} = 0.00 < 1.00 \quad (6.2.4.(1))$$

$$M_{y,Ed}/M_{N,y,Rd} = 0.26 < 1.00 \quad (6.2.9.1.(2))$$

$$M_{z,Ed}/M_{N,z,Rd} = 0.31 < 1.00 \quad (6.2.9.1.(2))$$

$$(M_{y,Ed}/M_{N,y,Rd})^{1.66} + (M_{z,Ed}/M_{N,z,Rd})^{1.66} = 0.25 < 1.00 \quad (6.2.9.1.(6))$$

$$V_{y,Ed}/V_{y,T,Rd} = 0.03 < 1.00 \quad (6.2.6-7)$$

$$V_{z,Ed}/V_{z,T,Rd} = 0.03 < 1.00 \quad (6.2.6-7)$$

$$\tau_{xy,Ed}/(f_y/(\sqrt{3} \cdot gM0)) = 0.01 < 1.00 \quad (6.2.6)$$

$$\tau_{xz,Ed}/(f_y/(\sqrt{3} \cdot gM0)) = 0.01 < 1.00 \quad (6.2.6)$$

Global stability check of member:

$$\lambda_{y,Ed} = 45.61 < \lambda_{y,max} = 210.00 \quad \lambda_{z,Ed} = 45.61 < \lambda_{z,max} = 210.00 \quad \text{STABLE}$$

$$N_{Ed}/(X_y \cdot N_{Rk}/gM1) + k_{yy} \cdot M_{y,Ed,max}/(XLT \cdot M_{y,Rk}/gM1) + k_{yz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.41 < 1.00 \quad (6.3.3.(4))$$

$$N_{Ed}/(X_z \cdot N_{Rk}/gM1) + k_{zy} \cdot M_{y,Ed,max}/(XLT \cdot M_{y,Rk}/gM1) + k_{zz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.42 < 1.00 \quad (6.3.3.(4))$$

LIMIT DISPLACEMENTS



Deflections (LOCAL SYSTEM): Not analyzed



Displacements (GLOBAL SYSTEM):

$v_x = 0.8 \text{ cm} < v_x \text{ max} = L/150.00 = 1.6 \text{ cm}$

Verified

Governing Load Case: 11 Seismic EC 8 Direction_X

$v_y = 1.1 \text{ cm} < v_y \text{ max} = L/150.00 = 1.6 \text{ cm}$

Verified

Governing Load Case: 12 Seismic EC 8 Direction_Y

Section OK !!!

STEEL DESIGN

CODE: EN 1993-1:2005/A1:2014, Eurocode 3: Design of steel structures.

ANALYSIS TYPE: Member Verification

CODE GROUP:

MEMBER: 4

POINT: 1

COORDINATE: x = 0.00 L = 0.00 m

LOADS:

Governing Load Case: 17 1 * X 1 * Y SQRT(11;12)*1.00)

MATERIAL:

S275 (S275) $f_y = 275.00$ MPa



SECTION PARAMETERS: TCR 135x5

h=13.5 cm	gM0=1.00	gM1=1.00	
b=13.5 cm	Ay=12.55 cm ²	Az=12.55 cm ²	Ax=25.10 cm ²
tw=0.5 cm	Iy=695.00 cm ⁴	Iz=695.00 cm ⁴	Ix=1127.00 cm ⁴
tf=0.5 cm	Wply=126.81 cm ³	Wplz=126.81 cm ³	

INTERNAL FORCES AND CAPACITIES:

N _{Ed} = 2.94 kN	My _{Ed} = -8.99 kN*m	Mz _{Ed} = 10.80 kN*m	Vy _{Ed} = 6.71 kN
N _{c,Rd} = 690.25 kN	My _{Ed,max} = -8.99 kN*m	Mz _{Ed,max} = 10.80 kN*m	Vy _{T,Rd} = 196.57 kN
Nb _{Rd} = 632.41 kN	My _{c,Rd} = 34.87 kN*m	Mz _{c,Rd} = 34.87 kN*m	Vz _{Ed} = 6.20 kN
	MN _{y,Rd} = 34.87 kN*m	MN _{z,Rd} = 34.87 kN*m	Vz _{T,Rd} = 196.57 kN
			Tt _{Ed} = 0.36 kN*m
			Class of section = 1



LATERAL BUCKLING PARAMETERS:

BUCKLING PARAMETERS:



About y axis:

Ly = 2.40 m	Lam_y = 0.53
Lcr,y = 2.40 m	Xy = 0.92
Lamy = 45.61	kzy = 0.56



About z axis:

Lz = 2.40 m	Lam_z = 0.53
Lcr,z = 2.40 m	Xz = 0.92
Lamz = 45.61	kzz = 0.89

VERIFICATION FORMULAS:

Section strength check:

$$N_{Ed}/N_{c,Rd} = 0.00 < 1.00 \quad (6.2.4.(1))$$

$$M_{y,Ed}/M_{N,y,Rd} = 0.26 < 1.00 \quad (6.2.9.1.(2))$$

$$M_{z,Ed}/M_{N,z,Rd} = 0.31 < 1.00 \quad (6.2.9.1.(2))$$

$$(M_{y,Ed}/M_{N,y,Rd})^{1.66} + (M_{z,Ed}/M_{N,z,Rd})^{1.66} = 0.25 < 1.00 \quad (6.2.9.1.(6))$$

$$V_{y,Ed}/V_{y,T,Rd} = 0.03 < 1.00 \quad (6.2.6-7)$$

$$V_{z,Ed}/V_{z,T,Rd} = 0.03 < 1.00 \quad (6.2.6-7)$$

$$\tau_{xy,Ed}/(f_y/(\sqrt{3} \cdot gM0)) = 0.01 < 1.00 \quad (6.2.6)$$

$$\tau_{xz,Ed}/(f_y/(\sqrt{3} \cdot gM0)) = 0.01 < 1.00 \quad (6.2.6)$$

Global stability check of member:

$$\lambda_{y,Ed} = 45.61 < \lambda_{y,max} = 210.00 \quad \lambda_{z,Ed} = 45.61 < \lambda_{z,max} = 210.00 \quad \text{STABLE}$$

$$N_{Ed}/(X_y \cdot N_{Rk}/gM1) + k_{yy} \cdot M_{y,Ed,max}/(X_{LT} \cdot M_{y,Rk}/gM1) + k_{yz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.41 < 1.00 \quad (6.3.3.(4))$$

$$N_{Ed}/(X_z \cdot N_{Rk}/gM1) + k_{zy} \cdot M_{y,Ed,max}/(X_{LT} \cdot M_{y,Rk}/gM1) + k_{zz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.42 < 1.00 \quad (6.3.3.(4))$$

LIMIT DISPLACEMENTS



Deflections (LOCAL SYSTEM): Not analyzed



Displacements (GLOBAL SYSTEM):

$v_x = 0.8 \text{ cm} < v_x \text{ max} = L/150.00 = 1.6 \text{ cm}$

Verified

Governing Load Case: 11 Seismic EC 8 Direction_X

$v_y = 1.1 \text{ cm} < v_y \text{ max} = L/150.00 = 1.6 \text{ cm}$

Verified

Governing Load Case: 12 Seismic EC 8 Direction_Y

Section OK !!!

STEEL DESIGN

CODE: EN 1993-1:2005/A1:2014, Eurocode 3: Design of steel structures.

ANALYSIS TYPE: Member Verification

CODE GROUP:

MEMBER: 5

POINT: 1

COORDINATE: x = 0.00 L = 0.00 m

LOADS:

Governing Load Case: 17 1 * X 1 * Y SQRT(11;12)*1.00)

MATERIAL:

S275 (S275) $f_y = 275.00$ MPa



SECTION PARAMETERS: TCAR 135x5

h=13.5 cm	gM0=1.00	gM1=1.00	
b=13.5 cm	Ay=12.55 cm ²	Az=12.55 cm ²	Ax=25.10 cm ²
tw=0.5 cm	Iy=695.00 cm ⁴	Iz=695.00 cm ⁴	Ix=1127.00 cm ⁴
tf=0.5 cm	Wply=126.81 cm ³	Wplz=126.81 cm ³	

INTERNAL FORCES AND CAPACITIES:

N _{Ed} = 0.36 kN	M _{y,Ed} = -10.70 kN*m	M _{z,Ed} = 8.52 kN*m	V _{y,Ed} = 3.55 kN
N _{c,Rd} = 690.25 kN	M _{y,Ed,max} = -10.70 kN*m	M _{z,Ed,max} = 8.52 kN*m	V _{y,c,Rd} = 199.26 kN
N _{b,Rd} = 632.41 kN	M _{y,c,Rd} = 34.87 kN*m	M _{z,c,Rd} = 34.87 kN*m	V _{z,Ed} = 4.46 kN
	MN _{y,Rd} = 34.87 kN*m	MN _{z,Rd} = 34.87 kN*m	V _{z,c,Rd} = 199.26 kN
			Class of section = 1



LATERAL BUCKLING PARAMETERS:

BUCKLING PARAMETERS:



About y axis:

L _y = 2.40 m	Lam _y = 0.53
L _{cr,y} = 2.40 m	X _y = 0.92
Lam _y = 45.61	k _{yy} = 0.79



About z axis:

L _z = 2.40 m	Lam _z = 0.53
L _{cr,z} = 2.40 m	X _z = 0.92
Lam _z = 45.61	k _{yz} = 0.47

VERIFICATION FORMULAS:

Section strength check:

$$N_{Ed}/N_{c,Rd} = 0.00 < 1.00 \quad (6.2.4.(1))$$

$$M_{y,Ed}/M_{N,y,Rd} = 0.31 < 1.00 \quad (6.2.9.1.(2))$$

$$M_{z,Ed}/M_{N,z,Rd} = 0.24 < 1.00 \quad (6.2.9.1.(2))$$

$$(M_{y,Ed}/M_{N,y,Rd})^{1.66} + (M_{z,Ed}/M_{N,z,Rd})^{1.66} = 0.24 < 1.00 \quad (6.2.9.1.(6))$$

$$V_{y,Ed}/V_{y,c,Rd} = 0.02 < 1.00 \quad (6.2.6.(1))$$

$$V_{z,Ed}/V_{z,c,Rd} = 0.02 < 1.00 \quad (6.2.6.(1))$$

Global stability check of member:

$$\lambda_{y} = 45.61 < \lambda_{y,max} = 210.00 \quad \lambda_{z} = 45.61 < \lambda_{z,max} = 210.00 \quad \text{STABLE}$$

$$N_{Ed}/(X_y \cdot N_{Rk}/gM1) + k_{yy} \cdot M_{y,Ed,max}/(XLT \cdot M_{y,Rk}/gM1) + k_{yz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.36 < 1.00 \quad (6.3.3.(4))$$

$$N_{Ed}/(X_z \cdot N_{Rk}/gM1) + k_{zy} \cdot M_{y,Ed,max}/(XLT \cdot M_{y,Rk}/gM1) + k_{zz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.34 < 1.00 \quad (6.3.3.(4))$$

LIMIT DISPLACEMENTS



Deflections (LOCAL SYSTEM): Not analyzed



Displacements (GLOBAL SYSTEM):

$$v_x = 1.4 \text{ cm} < v_{x,max} = L/150.00 = 1.6 \text{ cm}$$

Verified

Governing Load Case: 11 Seismic EC 8 Direction_X

Autodesk Robot Structural Analysis Professional 2021
Author:
Address:

File: **ΒΕΛΕΣΤΙΝΟ ΠΕΡΓΚΟΛΑ ΜΕ ΚΟΙΛΕΣ ΔΙΑΤΟΜΕΣ.rtd**
Project: ΒΕΛΕΣΤΙΝΟ ΠΕΡΓΚΟΛΑ ΜΕ ΚΟΙΛΕΣ ΔΙΑΤΟΜΕΣ

$v_y = 1.1 \text{ cm} < v_{y \text{ max}} = L/150.00 = 1.6 \text{ cm}$

Verified

Governing Load Case: 12 Seismic EC 8 Direction_Y

Section OK !!!

STEEL DESIGN

CODE: EN 1993-1:2005/A1:2014, Eurocode 3: Design of steel structures.

ANALYSIS TYPE: Member Verification

CODE GROUP:

MEMBER: 6

POINT: 1

COORDINATE: x = 0.00 L = 0.00 m

LOADS:

Governing Load Case: 17 1 * X 1 * Y SQRT(11;12)*1.00)

MATERIAL:

S275 (S275) $f_y = 275.00$ MPa



SECTION PARAMETERS: TCAR 135x5

h=13.5 cm	gM0=1.00	gM1=1.00	
b=13.5 cm	Ay=12.55 cm ²	Az=12.55 cm ²	Ax=25.10 cm ²
tw=0.5 cm	Iy=695.00 cm ⁴	Iz=695.00 cm ⁴	Ix=1127.00 cm ⁴
tf=0.5 cm	Wply=126.81 cm ³	Wplz=126.81 cm ³	

INTERNAL FORCES AND CAPACITIES:

N _{Ed} = 0.36 kN	M _{y,Ed} = -10.70 kN*m	M _{z,Ed} = 8.52 kN*m	V _{y,Ed} = 3.55 kN
N _{c,Rd} = 690.25 kN	M _{y,Ed,max} = -10.70 kN*m	M _{z,Ed,max} = 8.52 kN*m	V _{y,c,Rd} = 199.26 kN
N _{b,Rd} = 632.41 kN	M _{y,c,Rd} = 34.87 kN*m	M _{z,c,Rd} = 34.87 kN*m	V _{z,Ed} = 4.46 kN
	MN _{y,Rd} = 34.87 kN*m	MN _{z,Rd} = 34.87 kN*m	V _{z,c,Rd} = 199.26 kN
			Class of section = 1



LATERAL BUCKLING PARAMETERS:

BUCKLING PARAMETERS:



About y axis:

L _y = 2.40 m	Lam _y = 0.53
L _{cr,y} = 2.40 m	X _y = 0.92
Lam _y = 45.61	k _{yy} = 0.79



About z axis:

L _z = 2.40 m	Lam _z = 0.53
L _{cr,z} = 2.40 m	X _z = 0.92
Lam _z = 45.61	k _{yz} = 0.47

VERIFICATION FORMULAS:

Section strength check:

$$N_{Ed}/N_{c,Rd} = 0.00 < 1.00 \quad (6.2.4.(1))$$

$$M_{y,Ed}/M_{N,y,Rd} = 0.31 < 1.00 \quad (6.2.9.1.(2))$$

$$M_{z,Ed}/M_{N,z,Rd} = 0.24 < 1.00 \quad (6.2.9.1.(2))$$

$$(M_{y,Ed}/M_{N,y,Rd})^{1.66} + (M_{z,Ed}/M_{N,z,Rd})^{1.66} = 0.24 < 1.00 \quad (6.2.9.1.(6))$$

$$V_{y,Ed}/V_{y,c,Rd} = 0.02 < 1.00 \quad (6.2.6.(1))$$

$$V_{z,Ed}/V_{z,c,Rd} = 0.02 < 1.00 \quad (6.2.6.(1))$$

Global stability check of member:

$$\lambda_{y} = 45.61 < \lambda_{y,max} = 210.00 \quad \lambda_{z} = 45.61 < \lambda_{z,max} = 210.00 \quad \text{STABLE}$$

$$N_{Ed}/(X_y \cdot N_{Rk}/gM1) + k_{yy} \cdot M_{y,Ed,max}/(XLT \cdot M_{y,Rk}/gM1) + k_{yz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.36 < 1.00 \quad (6.3.3.(4))$$

$$N_{Ed}/(X_z \cdot N_{Rk}/gM1) + k_{zy} \cdot M_{y,Ed,max}/(XLT \cdot M_{y,Rk}/gM1) + k_{zz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.34 < 1.00 \quad (6.3.3.(4))$$

LIMIT DISPLACEMENTS



Deflections (LOCAL SYSTEM): Not analyzed



Displacements (GLOBAL SYSTEM):

$$v_x = 1.4 \text{ cm} < v_{x,max} = L/150.00 = 1.6 \text{ cm}$$

Verified

Governing Load Case: 11 Seismic EC 8 Direction_X

Autodesk Robot Structural Analysis Professional 2021
Author:
Address:

File: **ΒΕΛΕΣΤΙΝΟ ΠΕΡΓΚΟΛΑ ΜΕ ΚΟΙΛΕΣ ΔΙΑΤΟΜΕΣ.rtd**
Project: ΒΕΛΕΣΤΙΝΟ ΠΕΡΓΚΟΛΑ ΜΕ ΚΟΙΛΕΣ ΔΙΑΤΟΜΕΣ

$v_y = 1.1 \text{ cm} < v_{y \text{ max}} = L/150.00 = 1.6 \text{ cm}$

Verified

Governing Load Case: 12 Seismic EC 8 Direction_Y

Section OK !!!

STEEL DESIGN

CODE: EN 1993-1:2005/A1:2014, Eurocode 3: Design of steel structures.

ANALYSIS TYPE: Member Verification

CODE GROUP:

MEMBER: 7

POINT: 3

COORDINATE: x = 1.00 L = 3.94 m

LOADS:

Governing Load Case: 66 ULS 31 (1+2)*1.35+3*0.90+59*1.50

MATERIAL:

S275 (S275) $f_y = 275.00$ MPa



SECTION PARAMETERS: TCAR 135x5

h=13.5 cm	gM0=1.00	gM1=1.00	
b=13.5 cm	Ay=12.55 cm ²	Az=12.55 cm ²	Ax=25.10 cm ²
tw=0.5 cm	Iy=695.00 cm ⁴	Iz=695.00 cm ⁴	Ix=1127.00 cm ⁴
tf=0.5 cm	Wply=126.81 cm ³	Wplz=126.81 cm ³	

INTERNAL FORCES AND CAPACITIES:

N _{Ed} = 5.39 kN	M _{y,Ed} = -7.99 kN*m	M _{z,Ed} = -1.53 kN*m	V _{y,Ed} = 2.84 kN
N _{c,Rd} = 690.25 kN	M _{y,Ed,max} = -7.99 kN*m	M _{z,Ed,max} = -1.53 kN*m	V _{y,T,Rd} = 192.37 kN
N _{b,Rd} = 523.30 kN	M _{y,c,Rd} = 34.87 kN*m	M _{z,c,Rd} = 34.87 kN*m	V _{z,Ed} = -10.58 kN
	MN _{y,Rd} = 34.87 kN*m	MN _{z,Rd} = 34.87 kN*m	V _{z,T,Rd} = 192.37 kN
			T _{t,Ed} = 0.93 kN*m
			Class of section = 1



LATERAL BUCKLING PARAMETERS:

BUCKLING PARAMETERS:



About y axis:

L _y = 3.94 m	Lam _y = 0.86
L _{cr,y} = 3.94 m	X _y = 0.76
Lam _y = 74.88	k _{yy} = 1.00



About z axis:

L _z = 3.94 m	Lam _z = 0.05
L _{cr,z} = 0.21 m	X _z = 1.00
Lam _z = 4.02	k _{yz} = 0.60

VERIFICATION FORMULAS:

Section strength check:

$$N_{Ed}/N_{c,Rd} = 0.01 < 1.00 \quad (6.2.4.(1))$$

$$M_{y,Ed}/M_{N,y,Rd} = 0.23 < 1.00 \quad (6.2.9.1.(2))$$

$$M_{z,Ed}/M_{N,z,Rd} = 0.04 < 1.00 \quad (6.2.9.1.(2))$$

$$(M_{y,Ed}/M_{N,y,Rd})^{1.66} + (M_{z,Ed}/M_{N,z,Rd})^{1.66} = 0.09 < 1.00 \quad (6.2.9.1.(6))$$

$$V_{y,Ed}/V_{y,T,Rd} = 0.01 < 1.00 \quad (6.2.6-7)$$

$$V_{z,Ed}/V_{z,T,Rd} = 0.05 < 1.00 \quad (6.2.6-7)$$

$$\tau_{ty,Ed}/(f_y/(\sqrt{3})gM0) = 0.03 < 1.00 \quad (6.2.6)$$

$$\tau_{tz,Ed}/(f_y/(\sqrt{3})gM0) = 0.03 < 1.00 \quad (6.2.6)$$

Global stability check of member:

$$\lambda_{b,y} = 74.88 < \lambda_{b,max} = 210.00 \quad \lambda_{b,z} = 4.02 < \lambda_{b,max} = 210.00 \quad \text{STABLE}$$

$$N_{Ed}/(X_y \cdot N_{Rk}/gM1) + k_{yy} \cdot M_{y,Ed,max}/(XLT \cdot M_{y,Rk}/gM1) + k_{yz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.27 < 1.00 \quad (6.3.3.(4))$$

$$N_{Ed}/(X_z \cdot N_{Rk}/gM1) + k_{zy} \cdot M_{y,Ed,max}/(XLT \cdot M_{y,Rk}/gM1) + k_{zz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.19 < 1.00 \quad (6.3.3.(4))$$

LIMIT DISPLACEMENTS



Deflections (LOCAL SYSTEM):

$u_y = 0.1 \text{ cm} < u_{y \text{ max}} = L/200.00 = 2.0 \text{ cm}$

Verified

Governing Load Case: 11 Seismic EC 8 Direction_X

$u_z = 0.4 \text{ cm} < u_{z \text{ max}} = L/200.00 = 2.0 \text{ cm}$

Verified

Governing Load Case: 12 Seismic EC 8 Direction_Y

$u_{\text{inst},z} = 0.1 \text{ cm} < u_{\text{inst,max},z} = L/200.00 = 2.0 \text{ cm}$

Verified

Governing Load Case: $1.9*3 + 0.5*4 + 0.45*9$



Displacements (GLOBAL SYSTEM): *Not analyzed*

Section OK !!!

STEEL DESIGN

CODE: EN 1993-1:2005/A1:2014, Eurocode 3: Design of steel structures.

ANALYSIS TYPE: Member Verification

CODE GROUP:

MEMBER: 8

POINT: 3

COORDINATE: x = 1.00 L = 3.94 m

LOADS:

Governing Load Case: 66 ULS 31 (1+2)*1.35+3*0.90+59*1.50

MATERIAL:

S275 (S275) $f_y = 275.00$ MPa



SECTION PARAMETERS: TCR 135x5

h=13.5 cm	gM0=1.00	gM1=1.00	
b=13.5 cm	Ay=12.55 cm ²	Az=12.55 cm ²	Ax=25.10 cm ²
tw=0.5 cm	Iy=695.00 cm ⁴	Iz=695.00 cm ⁴	Ix=1127.00 cm ⁴
tf=0.5 cm	Wply=126.81 cm ³	Wplz=126.81 cm ³	

INTERNAL FORCES AND CAPACITIES:

N _{Ed} = 6.00 kN	M _{y,Ed} = -3.90 kN*m	M _{z,Ed} = -1.01 kN*m	V _{y,Ed} = 1.28 kN
N _{c,Rd} = 690.25 kN	M _{y,Ed,max} = -8.02 kN*m	M _{z,Ed,max} = -1.01 kN*m	V _{y,T,Rd} = 152.88 kN
N _{b,Rd} = 523.30 kN	M _{y,c,Rd} = 34.87 kN*m	M _{z,c,Rd} = 34.87 kN*m	V _{z,Ed} = -8.53 kN
	MN _{y,Rd} = 34.87 kN*m	MN _{z,Rd} = 34.87 kN*m	V _{z,T,Rd} = 152.88 kN
			T _{t,Ed} = -6.24 kN*m
			Class of section = 1



LATERAL BUCKLING PARAMETERS:

BUCKLING PARAMETERS:



About y axis:

L _y = 3.94 m	Lam _y = 0.86
L _{cr,y} = 3.94 m	X _y = 0.76
Lam _y = 74.88	k _{yy} = 1.01



About z axis:

L _z = 3.94 m	Lam _z = 0.03
L _{cr,z} = 0.15 m	X _z = 1.00
Lam _z = 2.88	k _{yz} = 0.60

VERIFICATION FORMULAS:

Section strength check:

$$N_{Ed}/N_{c,Rd} = 0.01 < 1.00 \quad (6.2.4.(1))$$

$$M_{y,Ed}/M_{N,y,Rd} = 0.11 < 1.00 \quad (6.2.9.1.(2))$$

$$M_{z,Ed}/M_{N,z,Rd} = 0.03 < 1.00 \quad (6.2.9.1.(2))$$

$$(M_{y,Ed}/M_{N,y,Rd})^{1.66} + (M_{z,Ed}/M_{N,z,Rd})^{1.66} = 0.03 < 1.00 \quad (6.2.9.1.(6))$$

$$V_{y,Ed}/V_{y,T,Rd} = 0.01 < 1.00 \quad (6.2.6-7)$$

$$V_{z,Ed}/V_{z,T,Rd} = 0.06 < 1.00 \quad (6.2.6-7)$$

$$\tau_{ty,Ed}/(f_y/(\sqrt{3})gM0) = 0.23 < 1.00 \quad (6.2.6)$$

$$\tau_{tz,Ed}/(f_y/(\sqrt{3})gM0) = 0.23 < 1.00 \quad (6.2.6)$$

Global stability check of member:

$$\lambda_{b,y} = 74.88 < \lambda_{b,max} = 210.00 \quad \lambda_{b,z} = 2.88 < \lambda_{b,max} = 210.00 \quad \text{STABLE}$$

$$N_{Ed}/(X_y \cdot N_{Rk}/gM1) + k_{yy} \cdot M_{y,Ed,max}/(XLT \cdot M_{y,Rk}/gM1) + k_{yz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.26 < 1.00 \quad (6.3.3.(4))$$

$$N_{Ed}/(X_z \cdot N_{Rk}/gM1) + k_{zy} \cdot M_{y,Ed,max}/(XLT \cdot M_{y,Rk}/gM1) + k_{zz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.18 < 1.00 \quad (6.3.3.(4))$$

LIMIT DISPLACEMENTS



Deflections (LOCAL SYSTEM):

Autodesk Robot Structural Analysis Professional 2021
Author:
Address:

File: **ΒΕΛΕΣΤΙΝΟ ΠΕΡΙΓΚΟΛΑ ΜΕ ΚΟΙΛΕΣ ΔΙΑΤΟΜΕΣ.rtd**
Project: ΒΕΛΕΣΤΙΝΟ ΠΕΡΙΓΚΟΛΑ ΜΕ ΚΟΙΛΕΣ ΔΙΑΤΟΜΕΣ

$u_y = 0.1 \text{ cm} < u_{y \text{ max}} = L/200.00 = 2.0 \text{ cm}$

Verified

Governing Load Case: 11 Seismic EC 8 Direction_X

$u_z = 0.3 \text{ cm} < u_{z \text{ max}} = L/200.00 = 2.0 \text{ cm}$

Verified

Governing Load Case: 12 Seismic EC 8 Direction_Y

$u_{\text{inst},z} = 0.1 \text{ cm} < u_{\text{inst,max},z} = L/200.00 = 2.0 \text{ cm}$

Verified

Governing Load Case: $1.9*3 + 0.5*4 + 0.45*9$



Displacements (GLOBAL SYSTEM): *Not analyzed*

Section OK !!!

STEEL DESIGN

CODE: EN 1993-1:2005/A1:2014, Eurocode 3: Design of steel structures.

ANALYSIS TYPE: Member Verification

CODE GROUP:

MEMBER: 9

POINT: 3

COORDINATE: x = 1.00 L = 3.94 m

LOADS:

Governing Load Case: 66 ULS 31 (1+2)*1.35+3*0.90+59*1.50

MATERIAL:

S275 (S275) $f_y = 275.00$ MPa



SECTION PARAMETERS: TCAR 135x5

h=13.5 cm	gM0=1.00	gM1=1.00	
b=13.5 cm	Ay=12.55 cm ²	Az=12.55 cm ²	Ax=25.10 cm ²
tw=0.5 cm	Iy=695.00 cm ⁴	Iz=695.00 cm ⁴	Ix=1127.00 cm ⁴
tf=0.5 cm	Wply=126.81 cm ³	Wplz=126.81 cm ³	

INTERNAL FORCES AND CAPACITIES:

N _{Ed} = 5.39 kN	M _{y,Ed} = -7.99 kN*m	M _{z,Ed} = 1.53 kN*m	V _{y,Ed} = -2.84 kN
N _{c,Rd} = 690.25 kN	M _{y,Ed,max} = -7.99 kN*m	M _{z,Ed,max} = 1.53 kN*m	V _{y,T,Rd} = 192.37 kN
N _{b,Rd} = 523.30 kN	M _{y,c,Rd} = 34.87 kN*m	M _{z,c,Rd} = 34.87 kN*m	V _{z,Ed} = -10.58 kN
	MN _{y,Rd} = 34.87 kN*m	MN _{z,Rd} = 34.87 kN*m	V _{z,T,Rd} = 192.37 kN
			T _{t,Ed} = -0.93 kN*m
			Class of section = 1



LATERAL BUCKLING PARAMETERS:

BUCKLING PARAMETERS:



About y axis:

Ly = 3.94 m	Lam_y = 0.86
Lcr,y = 3.94 m	Xy = 0.76
Lamy = 74.88	ky = 1.00



About z axis:

Lz = 3.94 m	Lam_z = 0.05
Lcr,z = 0.21 m	Xz = 1.00
Lamz = 4.02	kyz = 0.60

VERIFICATION FORMULAS:

Section strength check:

$$N_{Ed}/N_{c,Rd} = 0.01 < 1.00 \quad (6.2.4.(1))$$

$$M_{y,Ed}/M_{N,y,Rd} = 0.23 < 1.00 \quad (6.2.9.1.(2))$$

$$M_{z,Ed}/M_{N,z,Rd} = 0.04 < 1.00 \quad (6.2.9.1.(2))$$

$$(M_{y,Ed}/M_{N,y,Rd})^{1.66} + (M_{z,Ed}/M_{N,z,Rd})^{1.66} = 0.09 < 1.00 \quad (6.2.9.1.(6))$$

$$V_{y,Ed}/V_{y,T,Rd} = 0.01 < 1.00 \quad (6.2.6-7)$$

$$V_{z,Ed}/V_{z,T,Rd} = 0.05 < 1.00 \quad (6.2.6-7)$$

$$\tau_{ty,Ed}/(f_y/(\sqrt{3} \cdot gM0)) = 0.03 < 1.00 \quad (6.2.6)$$

$$\tau_{tz,Ed}/(f_y/(\sqrt{3} \cdot gM0)) = 0.03 < 1.00 \quad (6.2.6)$$

Global stability check of member:

$$\lambda_{b,y} = 74.88 < \lambda_{b,max} = 210.00 \quad \lambda_{b,z} = 4.02 < \lambda_{b,max} = 210.00 \quad \text{STABLE}$$

$$N_{Ed}/(X_y \cdot N_{Rk}/gM1) + k_{yy} \cdot M_{y,Ed,max}/(XLT \cdot M_{y,Rk}/gM1) + k_{yz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.27 < 1.00 \quad (6.3.3.(4))$$

$$N_{Ed}/(X_z \cdot N_{Rk}/gM1) + k_{zy} \cdot M_{y,Ed,max}/(XLT \cdot M_{y,Rk}/gM1) + k_{zz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.19 < 1.00 \quad (6.3.3.(4))$$

LIMIT DISPLACEMENTS



Deflections (LOCAL SYSTEM):

Autodesk Robot Structural Analysis Professional 2021
Author:
Address:

File: **ΒΕΛΕΣΤΙΝΟ ΠΕΡΙΓΚΟΛΑ ΜΕ ΚΟΙΛΕΣ ΔΙΑΤΟΜΕΣ.rtd**
Project: ΒΕΛΕΣΤΙΝΟ ΠΕΡΙΓΚΟΛΑ ΜΕ ΚΟΙΛΕΣ ΔΙΑΤΟΜΕΣ

$u_y = 0.1 \text{ cm} < u_{y \text{ max}} = L/200.00 = 2.0 \text{ cm}$

Verified

Governing Load Case: 11 Seismic EC 8 Direction_X

$u_z = 0.4 \text{ cm} < u_{z \text{ max}} = L/200.00 = 2.0 \text{ cm}$

Verified

Governing Load Case: 12 Seismic EC 8 Direction_Y

$u_{\text{inst},z} = 0.1 \text{ cm} < u_{\text{inst,max},z} = L/200.00 = 2.0 \text{ cm}$

Verified

Governing Load Case: $1.9*3 + 0.5*4 + 0.45*9$



Displacements (GLOBAL SYSTEM): Not analyzed

Section OK !!!

STEEL DESIGN

CODE: EN 1993-1:2005/A1:2014, Eurocode 3: Design of steel structures.

ANALYSIS TYPE: Member Verification

CODE GROUP:

MEMBER: 10

POINT: 3

COORDINATE: x = 1.00 L = 3.94 m

LOADS:

Governing Load Case: 66 ULS 31 (1+2)*1.35+3*0.90+59*1.50

MATERIAL:

S275 (S275) $f_y = 275.00$ MPa



SECTION PARAMETERS: TCAR 135x5

h=13.5 cm	gM0=1.00	gM1=1.00	
b=13.5 cm	Ay=12.55 cm ²	Az=12.55 cm ²	Ax=25.10 cm ²
tw=0.5 cm	Iy=695.00 cm ⁴	Iz=695.00 cm ⁴	Ix=1127.00 cm ⁴
tf=0.5 cm	Wply=126.81 cm ³	Wplz=126.81 cm ³	

INTERNAL FORCES AND CAPACITIES:

N _{Ed} = 6.00 kN	M _{y,Ed} = -3.90 kN*m	M _{z,Ed} = 1.01 kN*m	V _{y,Ed} = -1.28 kN
N _{c,Rd} = 690.25 kN	M _{y,Ed,max} = -8.02 kN*m	M _{z,Ed,max} = 1.01 kN*m	V _{y,T,Rd} = 152.88 kN
N _{b,Rd} = 523.30 kN	M _{y,c,Rd} = 34.87 kN*m	M _{z,c,Rd} = 34.87 kN*m	V _{z,Ed} = -8.53 kN
	MN _{y,Rd} = 34.87 kN*m	MN _{z,Rd} = 34.87 kN*m	V _{z,T,Rd} = 152.88 kN
			T _{t,Ed} = 6.24 kN*m
			Class of section = 1



LATERAL BUCKLING PARAMETERS:

BUCKLING PARAMETERS:



About y axis:

Ly = 3.94 m	Lam_y = 0.86
Lcr,y = 3.94 m	Xy = 0.76
Lamy = 74.88	ky = 1.01



About z axis:

Lz = 3.94 m	Lam_z = 0.03
Lcr,z = 0.15 m	Xz = 1.00
Lamz = 2.88	kyz = 0.60

VERIFICATION FORMULAS:

Section strength check:

$N_{Ed}/N_{c,Rd} = 0.01 < 1.00$ (6.2.4.(1))
 $M_{y,Ed}/M_{N,y,Rd} = 0.11 < 1.00$ (6.2.9.1.(2))
 $M_{z,Ed}/M_{N,z,Rd} = 0.03 < 1.00$ (6.2.9.1.(2))
 $(M_{y,Ed}/M_{N,y,Rd})^{1.66} + (M_{z,Ed}/M_{N,z,Rd})^{1.66} = 0.03 < 1.00$ (6.2.9.1.(6))
 $V_{y,Ed}/V_{y,T,Rd} = 0.01 < 1.00$ (6.2.6-7)
 $V_{z,Ed}/V_{z,T,Rd} = 0.06 < 1.00$ (6.2.6-7)
 $\tau_{xy,Ed}/(f_y/(\sqrt{3} \cdot gM0)) = 0.23 < 1.00$ (6.2.6)
 $\tau_{tz,Ed}/(f_y/(\sqrt{3} \cdot gM0)) = 0.23 < 1.00$ (6.2.6)

Global stability check of member:

$\lambda_{b,y} = 74.88 < \lambda_{b,max} = 210.00$ $\lambda_{b,z} = 2.88 < \lambda_{b,max} = 210.00$ STABLE
 $N_{Ed}/(X_y \cdot N_{Rk}/gM1) + k_{yy} \cdot M_{y,Ed,max}/(XLT \cdot M_{y,Rk}/gM1) + k_{yz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.26 < 1.00$ (6.3.3.(4))
 $N_{Ed}/(X_z \cdot N_{Rk}/gM1) + k_{zy} \cdot M_{y,Ed,max}/(XLT \cdot M_{y,Rk}/gM1) + k_{zz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.18 < 1.00$ (6.3.3.(4))

LIMIT DISPLACEMENTS



Deflections (LOCAL SYSTEM):

Autodesk Robot Structural Analysis Professional 2021
Author:
Address:

File: **ΒΕΛΕΣΤΙΝΟ ΠΕΡΙΓΚΟΛΑ ΜΕ ΚΟΙΛΕΣ ΔΙΑΤΟΜΕΣ.rtd**
Project: ΒΕΛΕΣΤΙΝΟ ΠΕΡΙΓΚΟΛΑ ΜΕ ΚΟΙΛΕΣ ΔΙΑΤΟΜΕΣ

$u_y = 0.1 \text{ cm} < u_{y \text{ max}} = L/200.00 = 2.0 \text{ cm}$

Verified

Governing Load Case: 11 Seismic EC 8 Direction_X

$u_z = 0.3 \text{ cm} < u_{z \text{ max}} = L/200.00 = 2.0 \text{ cm}$

Verified

Governing Load Case: 12 Seismic EC 8 Direction_Y

$u_{\text{inst},z} = 0.1 \text{ cm} < u_{\text{inst,max},z} = L/200.00 = 2.0 \text{ cm}$

Verified

Governing Load Case: $1.9*3 + 0.5*4 + 0.45*9$



Displacements (GLOBAL SYSTEM): *Not analyzed*

Section OK !!!

STEEL DESIGN

CODE: EN 1993-1:2005/A1:2014, Eurocode 3: Design of steel structures.

ANALYSIS TYPE: Member Verification

CODE GROUP:

MEMBER: 11

POINT: 3

COORDINATE: $x = 0.49 L = 1.93 \text{ m}$

LOADS:

Governing Load Case: 66 ULS 31 (1+2)*1.35+3*0.90+59*1.50

MATERIAL:

S275 (S275) $f_y = 275.00 \text{ MPa}$



SECTION PARAMETERS: TCAR 135x5

$h=13.5 \text{ cm}$	$gM0=1.00$	$gM1=1.00$	
$b=13.5 \text{ cm}$	$A_y=12.55 \text{ cm}^2$	$A_z=12.55 \text{ cm}^2$	$A_x=25.10 \text{ cm}^2$
$tw=0.5 \text{ cm}$	$I_y=695.00 \text{ cm}^4$	$I_z=695.00 \text{ cm}^4$	$I_x=1127.00 \text{ cm}^4$
$tf=0.5 \text{ cm}$	$W_{ply}=126.81 \text{ cm}^3$	$W_{plz}=126.81 \text{ cm}^3$	

INTERNAL FORCES AND CAPACITIES:

$N_{Ed} = 0.99 \text{ kN}$	$M_{y,Ed} = 8.78 \text{ kN}\cdot\text{m}$	
$N_{c,Rd} = 690.25 \text{ kN}$	$M_{y,Ed,max} = 8.78 \text{ kN}\cdot\text{m}$	
$N_{b,Rd} = 523.30 \text{ kN}$	$M_{y,c,Rd} = 34.87 \text{ kN}\cdot\text{m}$	$V_{z,Ed} = 1.43 \text{ kN}$
	$M_{N,y,Rd} = 34.87 \text{ kN}\cdot\text{m}$	$V_{z,c,Rd} = 199.26 \text{ kN}$
		Class of section = 1



LATERAL BUCKLING PARAMETERS:

BUCKLING PARAMETERS:



About y axis:

$L_y = 3.94 \text{ m}$	$\Lambda_{m,y} = 0.86$
$L_{cr,y} = 3.94 \text{ m}$	$X_y = 0.76$
$\Lambda_{m,y} = 74.88$	$k_{yy} = 1.00$



About z axis:

$L_z = 3.94 \text{ m}$	$\Lambda_{m,z} = 0.04$
$L_{cr,z} = 0.20 \text{ m}$	$X_z = 1.00$
$\Lambda_{m,z} = 3.80$	$k_{zy} = 0.60$

VERIFICATION FORMULAS:

Section strength check:

$$N_{Ed}/N_{c,Rd} = 0.00 < 1.00 \quad (6.2.4.(1))$$

$$M_{y,Ed}/M_{y,c,Rd} = 0.25 < 1.00 \quad (6.2.5.(1))$$

$$V_{z,Ed}/V_{z,c,Rd} = 0.01 < 1.00 \quad (6.2.6.(1))$$

Global stability check of member:

$$\Lambda_{m,y} = 74.88 < \Lambda_{m,max} = 210.00 \quad \Lambda_{m,z} = 3.80 < \Lambda_{m,max} = 210.00 \quad \text{STABLE}$$

$$N_{Ed}/(X_y \cdot N_{Rk}/gM1) + k_{yy} \cdot M_{y,Ed,max}/(XLT \cdot M_{y,Rk}/gM1) = 0.25 < 1.00 \quad (6.3.3.(4))$$

$$N_{Ed}/(X_z \cdot N_{Rk}/gM1) + k_{zy} \cdot M_{y,Ed,max}/(XLT \cdot M_{y,Rk}/gM1) = 0.15 < 1.00 \quad (6.3.3.(4))$$

LIMIT DISPLACEMENTS



Deflections (LOCAL SYSTEM):

$$u_y = 0.1 \text{ cm} < u_{y,max} = L/200.00 = 2.0 \text{ cm} \quad \text{Verified}$$

Governing Load Case: 11 Seismic EC 8 Direction_X

$$u_z = 0.5 \text{ cm} < u_{z,max} = L/200.00 = 2.0 \text{ cm} \quad \text{Verified}$$

Governing Load Case: 76 SLS 11 (1+2+3)*1.00+59*0.60+4*0.50

$$u_{inst,z} = 0.3 \text{ cm} < u_{inst,max,z} = L/200.00 = 2.0 \text{ cm} \quad \text{Verified}$$

Governing Load Case: $1.9 \cdot 3 + 0.5 \cdot 4 + 0.45 \cdot 9$



Displacements (GLOBAL SYSTEM): Not analyzed

Section OK !!!

STEEL DESIGN

CODE: EN 1993-1:2005/A1:2014, Eurocode 3: Design of steel structures.

ANALYSIS TYPE: Member Verification

CODE GROUP:

MEMBER: 12

POINT: 1

COORDINATE: x = 0.00 L = 0.00 m

LOADS:

Governing Load Case: 66 ULS 31 (1+2)*1.35+3*0.90+59*1.50

MATERIAL:

S275 (S275) $f_y = 275.00$ MPa



SECTION PARAMETERS: TCAR 135x5

h=13.5 cm	gM0=1.00	gM1=1.00	
b=13.5 cm	Ay=12.55 cm ²	Az=12.55 cm ²	Ax=25.10 cm ²
tw=0.5 cm	Iy=695.00 cm ⁴	Iz=695.00 cm ⁴	Ix=1127.00 cm ⁴
tf=0.5 cm	Wply=126.81 cm ³	Wplz=126.81 cm ³	

INTERNAL FORCES AND CAPACITIES:

N _{Ed} = 1.47 kN	My _{Ed} = -6.79 kN*m	Vy _{Ed} = 0.00 kN
Nc,Rd = 690.25 kN	My _{Ed,max} = 8.69 kN*m	Vy,T,Rd = 199.26 kN
Nb,Rd = 523.30 kN	My,c,Rd = 34.87 kN*m	Vz _{Ed} = 15.37 kN
	MN _{y,Rd} = 34.87 kN*m	Vz,T,Rd = 199.26 kN
		Tt _{Ed} = 0.00 kN*m
		Class of section = 1



LATERAL BUCKLING PARAMETERS:

BUCKLING PARAMETERS:



About y axis:

Ly = 3.94 m	Lam_y = 0.86
Lcr,y = 3.94 m	Xy = 0.76
Lamy = 74.88	kyy = 1.00



About z axis:

Lz = 3.94 m	Lam_z = 0.04
Lcr,z = 0.19 m	Xz = 1.00
Lamz = 3.58	kzy = 0.60

VERIFICATION FORMULAS:

Section strength check:

$N_{Ed}/N_{c,Rd} = 0.00 < 1.00$ (6.2.4.(1))
 $M_{y,Ed}/M_{y,c,Rd} = 0.19 < 1.00$ (6.2.5.(1))
 $V_{y,Ed}/V_{y,T,Rd} = 0.00 < 1.00$ (6.2.6-7)
 $V_{z,Ed}/V_{z,T,Rd} = 0.08 < 1.00$ (6.2.6-7)
 $\tau_{ty,Ed}/(f_y/(\sqrt{3}*gM0)) = 0.00 < 1.00$ (6.2.6)
 $\tau_{tz,Ed}/(f_y/(\sqrt{3}*gM0)) = 0.00 < 1.00$ (6.2.6)

Global stability check of member:

$\lambda_{y,Ed} = 74.88 < \lambda_{y,max} = 210.00$ $\lambda_{z,Ed} = 3.58 < \lambda_{z,max} = 210.00$ STABLE
 $N_{Ed}/(X_y*N_{Rk}/gM1) + k_{yy}*M_{y,Ed,max}/(XLT*M_{y,Rk}/gM1) = 0.25 < 1.00$ (6.3.3.(4))
 $N_{Ed}/(X_z*N_{Rk}/gM1) + k_{zy}*M_{y,Ed,max}/(XLT*M_{y,Rk}/gM1) = 0.15 < 1.00$ (6.3.3.(4))

LIMIT DISPLACEMENTS



Deflections (LOCAL SYSTEM):

uy = 0.1 cm < uy max = L/200.00 = 2.0 cm

Verified

Governing Load Case: 11 Seismic EC 8 Direction_X

$$u_z = 0.5 \text{ cm} < u_{z \text{ max}} = L/200.00 = 2.0 \text{ cm}$$

Verified

Governing Load Case: 76 SLS 11 (1+2+3)*1.00+59*0.60+4*0.50

$$u_{\text{inst},z} = 0.3 \text{ cm} < u_{\text{inst,max},z} = L/200.00 = 2.0 \text{ cm}$$

Verified

Governing Load Case: 1.9*3 + 0.5*4 + 0.45*9



Displacements (GLOBAL SYSTEM): Not analyzed

Section OK !!!

STEEL DESIGN

CODE: EN 1993-1:2005/A1:2014, Eurocode 3: Design of steel structures.

ANALYSIS TYPE: Member Verification

CODE GROUP:

MEMBER: 13

POINT: 1

COORDINATE: $x = 0.50 L = 1.94 \text{ m}$

LOADS:

Governing Load Case: 66 ULS 31 (1+2)*1.35+3*0.90+59*1.50

MATERIAL:

S275 (S275) $f_y = 275.00 \text{ MPa}$



SECTION PARAMETERS: TCAR 135x5

$h=13.5 \text{ cm}$	$gM0=1.00$	$gM1=1.00$	
$b=13.5 \text{ cm}$	$A_y=12.55 \text{ cm}^2$	$A_z=12.55 \text{ cm}^2$	$A_x=25.10 \text{ cm}^2$
$tw=0.5 \text{ cm}$	$I_y=695.00 \text{ cm}^4$	$I_z=695.00 \text{ cm}^4$	$I_x=1127.00 \text{ cm}^4$
$tf=0.5 \text{ cm}$	$W_{ply}=126.81 \text{ cm}^3$	$W_{plz}=126.81 \text{ cm}^3$	

INTERNAL FORCES AND CAPACITIES:

$N_{Ed} = 5.18 \text{ kN}$	$M_{y,Ed} = 29.95 \text{ kN*m}$	$M_{z,Ed} = 1.46 \text{ kN*m}$	$V_{y,Ed} = 1.38 \text{ kN}$
$N_{c,Rd} = 690.25 \text{ kN}$	$M_{y,Ed,max} = 29.95 \text{ kN*m}$	$M_{z,Ed,max} = 1.46 \text{ kN*m}$	$V_{y,T,Rd} = 199.03 \text{ kN}$
$N_{b,Rd} = 528.95 \text{ kN}$	$M_{y,c,Rd} = 34.87 \text{ kN*m}$	$M_{z,c,Rd} = 34.87 \text{ kN*m}$	$V_{z,Ed} = -14.94 \text{ kN}$
	$MN_{y,Rd} = 34.87 \text{ kN*m}$	$MN_{z,Rd} = 34.87 \text{ kN*m}$	$V_{z,T,Rd} = 199.03 \text{ kN}$
			$T_{t,Ed} = -0.03 \text{ kN*m}$
			Class of section = 1



LATERAL BUCKLING PARAMETERS:

BUCKLING PARAMETERS:



About y axis:

$L_y = 3.88 \text{ m}$	$\Lambda_{m,y} = 0.85$
$L_{cr,y} = 3.88 \text{ m}$	$X_y = 0.77$
$\Lambda_{m,y} = 73.74$	$k_{yy} = 1.00$



About z axis:

$L_z = 3.88 \text{ m}$	$\Lambda_{m,z} = 0.42$
$L_{cr,z} = 1.94 \text{ m}$	$X_z = 0.95$
$\Lambda_{m,z} = 36.87$	$k_{yz} = 0.60$

VERIFICATION FORMULAS:

Section strength check:

$$N_{Ed}/N_{c,Rd} = 0.01 < 1.00 \quad (6.2.4.(1))$$

$$M_{y,Ed}/M_{N,y,Rd} = 0.86 < 1.00 \quad (6.2.9.1.(2))$$

$$M_{z,Ed}/M_{N,z,Rd} = 0.04 < 1.00 \quad (6.2.9.1.(2))$$

$$(M_{y,Ed}/M_{N,y,Rd})^{1.66} + (M_{z,Ed}/M_{N,z,Rd})^{1.66} = 0.78 < 1.00 \quad (6.2.9.1.(6))$$

$$V_{y,Ed}/V_{y,T,Rd} = 0.01 < 1.00 \quad (6.2.6-7)$$

$$V_{z,Ed}/V_{z,T,Rd} = 0.08 < 1.00 \quad (6.2.6-7)$$

$$\tau_{xy,Ed}/(f_y/(\sqrt{3} \cdot gM0)) = 0.00 < 1.00 \quad (6.2.6)$$

$$\tau_{tz,Ed}/(f_y/(\sqrt{3} \cdot gM0)) = 0.00 < 1.00 \quad (6.2.6)$$

Global stability check of member:

$$\Lambda_{m,y} = 73.74 < \Lambda_{m,y,max} = 210.00 \quad \Lambda_{m,z} = 36.87 < \Lambda_{m,z,max} = 210.00 \quad \text{STABLE}$$

$$N_{Ed}/(X_y \cdot N_{Rk}/gM1) + k_{yy} \cdot M_{y,Ed,max}/(XLT \cdot M_{y,Rk}/gM1) + k_{yz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.90 < 1.00 \quad (6.3.3.(4))$$

$$N_{Ed}/(X_z \cdot N_{Rk}/gM1) + k_{zy} \cdot M_{y,Ed,max}/(XLT \cdot M_{y,Rk}/gM1) + k_{zz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.57 < 1.00 \quad (6.3.3.(4))$$

LIMIT DISPLACEMENTS



Deflections (LOCAL SYSTEM):

$u_y = 0.1 \text{ cm} < u_{y \text{ max}} = L/200.00 = 1.9 \text{ cm}$

Verified

Governing Load Case: 12 Seismic EC 8 Direction_Y

$u_z = 1.7 \text{ cm} < u_{z \text{ max}} = L/200.00 = 1.9 \text{ cm}$

Verified

Governing Load Case: 76 SLS 11 $(1+2+3)*1.00+59*0.60+4*0.50$

$u_{\text{inst},z} = 1.0 \text{ cm} < u_{\text{inst,max},z} = L/200.00 = 1.9 \text{ cm}$

Verified

Governing Load Case: $1.9*3 + 0.5*4 + 0.45*9$



Displacements (GLOBAL SYSTEM): Not analyzed

Section OK !!!

STEEL DESIGN

CODE: EN 1993-1:2005/A1:2014, Eurocode 3: Design of steel structures.

ANALYSIS TYPE: Member Verification

CODE GROUP:

MEMBER: 14

POINT: 3

COORDINATE: $x = 0.50 L = 1.94 \text{ m}$

LOADS:

Governing Load Case: 66 ULS 31 (1+2)*1.35+3*0.90+59*1.50

MATERIAL:

S275 (S275) $f_y = 275.00 \text{ MPa}$



SECTION PARAMETERS: TCAR 135x5

$h=13.5 \text{ cm}$	$gM0=1.00$	$gM1=1.00$	
$b=13.5 \text{ cm}$	$A_y=12.55 \text{ cm}^2$	$A_z=12.55 \text{ cm}^2$	$A_x=25.10 \text{ cm}^2$
$tw=0.5 \text{ cm}$	$I_y=695.00 \text{ cm}^4$	$I_z=695.00 \text{ cm}^4$	$I_x=1127.00 \text{ cm}^4$
$tf=0.5 \text{ cm}$	$W_{ply}=126.81 \text{ cm}^3$	$W_{plz}=126.81 \text{ cm}^3$	

INTERNAL FORCES AND CAPACITIES:

$N_{Ed} = 6.63 \text{ kN}$	$M_{y,Ed} = 11.59 \text{ kN*m}$	$M_{z,Ed} = 1.33 \text{ kN*m}$	$V_{y,Ed} = -1.14 \text{ kN}$
$N_{c,Rd} = 690.25 \text{ kN}$	$M_{y,Ed,max} = 11.59 \text{ kN*m}$	$M_{z,Ed,max} = 1.33 \text{ kN*m}$	$V_{y,T,Rd} = 173.73 \text{ kN}$
$N_{b,Rd} = 528.95 \text{ kN}$	$M_{y,c,Rd} = 34.87 \text{ kN*m}$	$M_{z,c,Rd} = 34.87 \text{ kN*m}$	$V_{z,Ed} = 8.07 \text{ kN}$
	$MN_{y,Rd} = 34.87 \text{ kN*m}$	$MN_{z,Rd} = 34.87 \text{ kN*m}$	$V_{z,T,Rd} = 173.73 \text{ kN}$
			$T_{t,Ed} = -3.44 \text{ kN*m}$
			Class of section = 1



LATERAL BUCKLING PARAMETERS:

BUCKLING PARAMETERS:



About y axis:

$L_y = 3.88 \text{ m}$	$\lambda_{m,y} = 0.85$
$L_{cr,y} = 3.88 \text{ m}$	$X_y = 0.77$
$\lambda_{m,y} = 73.74$	$k_{yy} = 1.01$



About z axis:

$L_z = 3.88 \text{ m}$	$\lambda_{m,z} = 0.42$
$L_{cr,z} = 1.94 \text{ m}$	$X_z = 0.95$
$\lambda_{m,z} = 36.87$	$k_{yz} = 0.60$

VERIFICATION FORMULAS:

Section strength check:

$$N_{Ed}/N_{c,Rd} = 0.01 < 1.00 \quad (6.2.4.(1))$$

$$M_{y,Ed}/M_{N,y,Rd} = 0.33 < 1.00 \quad (6.2.9.1.(2))$$

$$M_{z,Ed}/M_{N,z,Rd} = 0.04 < 1.00 \quad (6.2.9.1.(2))$$

$$(M_{y,Ed}/M_{N,y,Rd})^{1.66} + (M_{z,Ed}/M_{N,z,Rd})^{1.66} = 0.16 < 1.00 \quad (6.2.9.1.(6))$$

$$V_{y,Ed}/V_{y,T,Rd} = 0.01 < 1.00 \quad (6.2.6-7)$$

$$V_{z,Ed}/V_{z,T,Rd} = 0.05 < 1.00 \quad (6.2.6-7)$$

$$\tau_{ty,Ed}/(f_y/(\sqrt{3})gM0) = 0.13 < 1.00 \quad (6.2.6)$$

$$\tau_{tz,Ed}/(f_y/(\sqrt{3})gM0) = 0.13 < 1.00 \quad (6.2.6)$$

Global stability check of member:

$$\lambda_{m,y} = 73.74 < \lambda_{m,max} = 210.00 \quad \lambda_{m,z} = 36.87 < \lambda_{m,max} = 210.00 \text{ STABLE}$$

$$N_{Ed}/(X_y*N_{Rk}/gM1) + k_{yy}*M_{y,Ed,max}/(XLT*M_{y,Rk}/gM1) + k_{yz}*M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.37 < 1.00 \quad (6.3.3.(4))$$

$$N_{Ed}/(X_z*N_{Rk}/gM1) + k_{zy}*M_{y,Ed,max}/(XLT*M_{y,Rk}/gM1) + k_{zz}*M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.25 < 1.00 \quad (6.3.3.(4))$$

LIMIT DISPLACEMENTS



Deflections (LOCAL SYSTEM):

$u_y = 0.1 \text{ cm} < u_{y \text{ max}} = L/200.00 = 1.9 \text{ cm}$

Verified

Governing Load Case: 12 Seismic EC 8 Direction_Y

$u_z = 0.5 \text{ cm} < u_{z \text{ max}} = L/200.00 = 1.9 \text{ cm}$

Verified

Governing Load Case: 76 SLS 11 $(1+2+3)*1.00+59*0.60+4*0.50$

$u_{\text{inst},z} = 0.3 \text{ cm} < u_{\text{inst,max},z} = L/200.00 = 1.9 \text{ cm}$

Verified

Governing Load Case: $1.9*3 + 0.5*4 + 0.45*9$



Displacements (GLOBAL SYSTEM): Not analyzed

Section OK !!!

STEEL DESIGN

CODE: EN 1993-1:2005/A1:2014, Eurocode 3: Design of steel structures.

ANALYSIS TYPE: Member Verification

CODE GROUP:

MEMBER: 15

POINT: 3

COORDINATE: $x = 0.50 L = 1.94 \text{ m}$

LOADS:

Governing Load Case: 66 ULS 31 (1+2)*1.35+3*0.90+59*1.50

MATERIAL:

S275 (S275) $f_y = 275.00 \text{ MPa}$



SECTION PARAMETERS: TCAR 135x5

$h=13.5 \text{ cm}$	$gM0=1.00$	$gM1=1.00$	
$b=13.5 \text{ cm}$	$A_y=12.55 \text{ cm}^2$	$A_z=12.55 \text{ cm}^2$	$A_x=25.10 \text{ cm}^2$
$tw=0.5 \text{ cm}$	$I_y=695.00 \text{ cm}^4$	$I_z=695.00 \text{ cm}^4$	$I_x=1127.00 \text{ cm}^4$
$tf=0.5 \text{ cm}$	$W_{ply}=126.81 \text{ cm}^3$	$W_{plz}=126.81 \text{ cm}^3$	

INTERNAL FORCES AND CAPACITIES:

$N_{Ed} = 8.49 \text{ kN}$	$M_{y,Ed} = 10.94 \text{ kN*m}$	$M_{z,Ed} = 1.34 \text{ kN*m}$	$V_{y,Ed} = -1.25 \text{ kN}$
$N_{c,Rd} = 690.25 \text{ kN}$	$M_{y,Ed,max} = 10.94 \text{ kN*m}$	$M_{z,Ed,max} = 1.34 \text{ kN*m}$	$V_{y,T,Rd} = 173.76 \text{ kN}$
$N_{b,Rd} = 528.95 \text{ kN}$	$M_{y,c,Rd} = 34.87 \text{ kN*m}$	$M_{z,c,Rd} = 34.87 \text{ kN*m}$	$V_{z,Ed} = 7.47 \text{ kN}$
	$MN_{y,Rd} = 34.87 \text{ kN*m}$	$MN_{z,Rd} = 34.87 \text{ kN*m}$	$V_{z,T,Rd} = 173.76 \text{ kN}$
			$T_{t,Ed} = 3.43 \text{ kN*m}$
			Class of section = 1



LATERAL BUCKLING PARAMETERS:

BUCKLING PARAMETERS:



About y axis:

$L_y = 3.88 \text{ m}$	$\lambda_{m,y} = 0.85$
$L_{cr,y} = 3.88 \text{ m}$	$X_y = 0.77$
$\lambda_{m,y} = 73.74$	$k_{yy} = 1.01$



About z axis:

$L_z = 3.88 \text{ m}$	$\lambda_{m,z} = 0.42$
$L_{cr,z} = 1.94 \text{ m}$	$X_z = 0.95$
$\lambda_{m,z} = 36.87$	$k_{yz} = 0.60$

VERIFICATION FORMULAS:

Section strength check:

$$N_{Ed}/N_{c,Rd} = 0.01 < 1.00 \quad (6.2.4.(1))$$

$$M_{y,Ed}/M_{N,y,Rd} = 0.31 < 1.00 \quad (6.2.9.1.(2))$$

$$M_{z,Ed}/M_{N,z,Rd} = 0.04 < 1.00 \quad (6.2.9.1.(2))$$

$$(M_{y,Ed}/M_{N,y,Rd})^{1.66} + (M_{z,Ed}/M_{N,z,Rd})^{1.66} = 0.15 < 1.00 \quad (6.2.9.1.(6))$$

$$V_{y,Ed}/V_{y,T,Rd} = 0.01 < 1.00 \quad (6.2.6-7)$$

$$V_{z,Ed}/V_{z,T,Rd} = 0.04 < 1.00 \quad (6.2.6-7)$$

$$\tau_{ty,Ed}/(f_y/(\sqrt{3})gM0) = 0.13 < 1.00 \quad (6.2.6)$$

$$\tau_{tz,Ed}/(f_y/(\sqrt{3})gM0) = 0.13 < 1.00 \quad (6.2.6)$$

Global stability check of member:

$$\lambda_{m,y} = 73.74 < \lambda_{m,max} = 210.00 \quad \lambda_{m,z} = 36.87 < \lambda_{m,max} = 210.00 \quad \text{STABLE}$$

$$N_{Ed}/(X_y * N_{Rk}/gM1) + k_{yy} * M_{y,Ed,max}/(XLT * M_{y,Rk}/gM1) + k_{yz} * M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.36 < 1.00 \quad (6.3.3.(4))$$

$$N_{Ed}/(X_z * N_{Rk}/gM1) + k_{zy} * M_{y,Ed,max}/(XLT * M_{y,Rk}/gM1) + k_{zz} * M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.24 < 1.00 \quad (6.3.3.(4))$$

LIMIT DISPLACEMENTS



Deflections (LOCAL SYSTEM):

$$u_y = 0.1 \text{ cm} < u_{y \text{ max}} = L/200.00 = 1.9 \text{ cm}$$

Governing Load Case: 12 Seismic EC 8 Direction_Y

$$u_z = 0.5 \text{ cm} < u_{z \text{ max}} = L/200.00 = 1.9 \text{ cm}$$

Governing Load Case: 76 SLS 11 (1+2+3)*1.00+59*0.60+4*0.50

$$u_{\text{inst},z} = 0.3 \text{ cm} < u_{\text{inst,max},z} = L/200.00 = 1.9 \text{ cm}$$

Governing Load Case: 1.9*3 + 0.5*4 + 0.45*9

Verified

Verified

Verified



Displacements (GLOBAL SYSTEM): Not analyzed

Section OK !!!



Ελέγχθηκε – Θεωρήθηκε

Η Προϊσταμένη Δ/σης
Τεχνικών Υπηρεσιών & Περι/τος



ΚΑΤΣΙΟΥΡΑ ΑΠΟΣΤΟΛΙΑ
ΠΟΛ/ΚΟΣ. ΜΗΧ/ΚΟΣ Π.Ε.