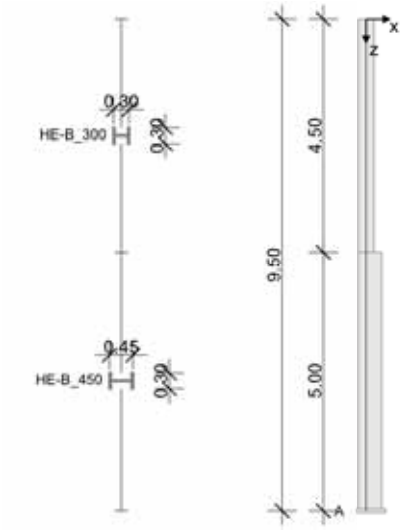
RIB Software SE	BEST V18.0 Build-No. 24072018	Type: Steel column
File: KragstützeQuerschnittssprungXZ.Besx		

Project information

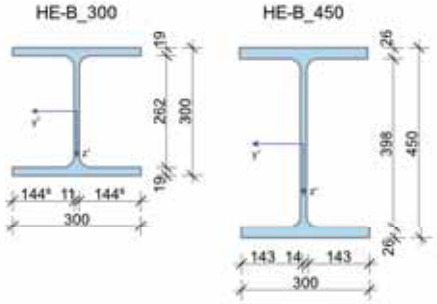
Contract	Stahlbau
Description	Kragstütze mit Querschnittssprung
Position	Beispiel 1
Structural member	Stütze in Achse A/12

System information



Standard:	DIN EN 1993-1-1
Structural behavior:	xz-plane
Carrying resistances:	elastic - elastic / plastic

Column geometry



		Height	Web	Top flange		Bottom flange		Resistance			
Section	Type	h	t_w	$b_{f,o}$	$t_{f,o}$	$b_{f,u}$	$t_{f,u}$	A [cm²]	I_y [cm⁴]	I_z [cm⁴]	I_t [cm⁴]
HE-B_300	WP	300	11	300	19	300	19	149.0	25170	8560	186
HE-B_450	WP	450	14	300	26	300	26	218.0	79890	11720	442

Section	Section	Length [m]	e_x [mm]	e_y [mm]	Rotation [°]
1	HE-B_300	4.50	7.5	0.0	0
2	HE-B_450	5.00	0.0	0.0	0

Material

Structural steel	f_y [N/mm²]		E-Modulus	γ_{M0}	γ_{M1}	Unit weight
	t ≤ 40 mm	40 < t ≤ 80 mm	[N/mm²]	perma. / acciden.	perma. / acciden.	[kN/m³]
S235	235	215	210000	1.0 / 1.0	1.1 / 1.0	78.5

Support and imperfection

Support	Height [m]	c_x [kN/m]	φ_y [kNm]	c_y [kN/m]	φ_x [kNm]	φ_z [kNm]
A	0.00	rigid	rigid	rigid	rigid	rigid

Imperfection

The imperfection is applied per load case combination affine to the particular first eigenmode.
The scaling is made at the height of the maximum deflection to a value of 3.20 cm for all load case combinations likewise.

Loading

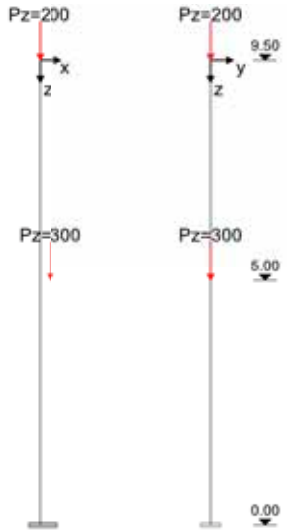
Load cases

LC	Type of action	γ_{sup}	γ_{inf}	ψ_0	ψ_1	ψ_2	Name
1	Permanent load	1.35	1.00	1.00	1.00	1.00	Konstruktion
2	Storage rooms (Live load E)	1.50	0.00	1.00	0.90	0.80	Lager
3	Wind	1.50	0.00	0.60	0.20	0.00	Windlast
4	Snow	1.50	0.00	0.50	0.20	0.00	Schneelast
5	Accidental under structure	1.00	0.00	1.00	1.00	1.00	Anprall

P_z	vertical single load	$e_{x/y}$	Eccentricity of the vertical single load
$P_{x/y}$	Horizontal forces	$p_{x/y/z\ a/e}$	Ordinate at the beginning/end of the line load in x/y/z-direction
$M_{x/y}$	Single moment about the x/y-axis	h_a	Height of the lower application point of the line load
h	Height of the application point of the single load	Length	Length of the line load
T	Load transfer from different calculation		

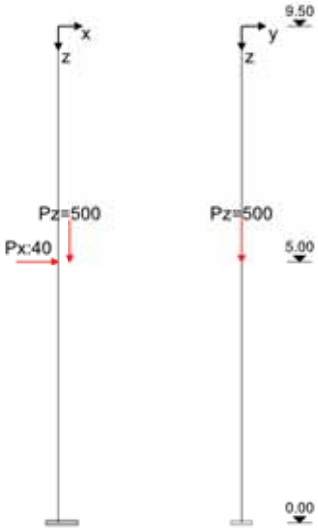
Dead load: p_z [kN/m] = 78.5 * A_{brutto} for all LCC

Lastfall 1



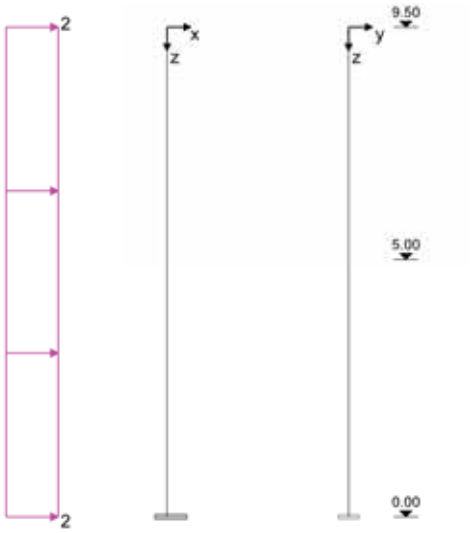
T	Single loads	h [m]	P_z [kN]	e_x [m]	e_y [m]	M_x [kNm]	M_y [kNm]	P_x [kN]	P_y [kN]
		9.50	200.00						
		5.00	300.00	0.150					

Lastfall 2



T	Single loads	h [m]	P_z [kN]	e_x [m]	e_y [m]	M_x [kNm]	M_y [kNm]	P_x [kN]	P_y [kN]
		5.00	500.00	0.150				40.00	

Lastfall 3

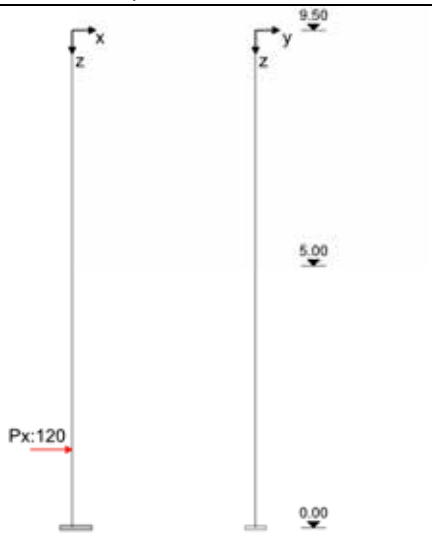


T	Line loads	h_a [m]	Length [m]	p_{xa} [kN/m]	p_{xe} [kN/m]	p_{ya} [kN/m]	p_{ye} [kN/m]	p_{za} [kN/m]	p_{ze} [kN/m]
		0.00	9.50	2.00	2.00				

Lastfall 4

T	Single loads	h [m]	P_z [kN]	e_x [m]	e_y [m]	M_x [kNm]	M_y [kNm]	P_x [kN]	P_y [kN]
		9.50	80.00						

Lastfall 5



T	Single loads	h [m]	P_z [kN]	e_x [m]	e_y [m]	M_x [kNm]	M_y [kNm]	P_x [kN]	P_y [kN]
		1.50						120.00	

Load case combinations

LCC	relev.	Type	Combination
1	V	V	1.00*LC1+0.80*LC2+0.20*LC3+0.00*LC4+1.00*LC5
2		GK	1.35*LC1
3		GK	1.35*LC1+1.50*LC2+0.75*LC4
4		GK	1.35*LC1+1.50*LC2+0.90*LC3+0.75*LC4
5		GK	1.35*LC1+1.50*LC2+0.90*LC3
6	1	GK	1.35*LC1+1.50*LC2+1.50*LC4
7	2	GK	1.35*LC1+1.50*LC2+0.90*LC3+1.50*LC4
8	1	GK	1.35*LC1+0.90*LC3+1.50*LC4
9		GK	1.35*LC1+1.50*LC2+1.50*LC3
10	1,2,S	GK	1.35*LC1+1.50*LC2+1.50*LC3+0.75*LC4
11	1	GK	1.35*LC1+1.50*LC3+0.75*LC4
12		AK	1.00*LC1+0.90*LC2+1.00*LC5
13		AK	1.00*LC1+0.80*LC2+0.20*LC4+1.00*LC5
14		AK	1.00*LC1+0.20*LC4+1.00*LC5
15		AK	1.00*LC1+0.80*LC2+0.20*LC3+1.00*LC5
16		AK	1.00*LC1+0.20*LC3+1.00*LC5
17		AK	1.00*LC1+0.80*LC2+1.00*LC5
18		AK	1.00*LC1+1.00*LC5

Results

Ultimate limit state

Stress analysis EE with internal forces according to 1st order theory

Results of the linear internal force calculation (wihtout imperfection).

Only the results for the decisive design combinations are being issued.

Summary of the analyses EE (1st order theory)

LCC	Height [m]	Q_{kl}	N_{Ed} [kN]	$V_{z',Ed}$ $V_{y',Ed}$ [kN]	$M_{y',Ed}$ $M_{z',Ed}$ [kNm]	$\sigma_{x',Ed,max}$ $\sigma_{x',Ed,min}$ [N/mm²]	$\tau_{Ed,max}$ $\tau_{Ed,min}$ [N/mm²]	$\sigma_{v,Ed,max}$ $\sigma_{v,Ed,min}$ [N/mm²]	IAB
6	9.50	1	-390.0	0.0 0.0	0.0 0.0	-26.2 -26.2	0.0 0.0	26.2 26.2	0.11
8	9.05	1	-390.7	0.8 0.0	-0.2 0.0	-26.1 -26.3	0.3 0.0	26.3 26.1	0.11
8	8.60	1	-391.4	1.6 0.0	-0.7 0.0	-25.8 -26.7	0.5 0.0	26.7 25.8	0.11
8	8.15	1	-392.1	2.4 0.0	-1.6 0.0	-25.3 -27.3	0.8 0.0	27.3 25.3	0.12
8	7.70	1	-392.8	3.2 0.0	-2.9 0.0	-24.6 -28.1	1.0 0.0	28.1 24.6	0.12
8	7.25	1	-393.6	4.1 0.0	-4.6 0.0	-23.7 -29.1	1.3 0.0	29.1 23.7	0.12
8	6.80	1	-394.3	4.9 0.0	-6.6 0.0	-22.6 -30.4	1.6 0.0	30.4 22.6	0.13
8	6.35	1	-395.0	5.7 0.0	-8.9 0.0	-21.2 -31.8	1.8 0.0	31.8 21.2	0.14

11	5.90	1	-335.7	10.8 0.0	-19.4 0.0	-10.9 -34.1	3.5 0.0	34.2 10.9	0.15
11	5.45	1	-336.4	12.1 0.0	-24.6 0.0	-7.9 -37.2	3.9 0.0	37.3 7.9	0.16
11	5.00	1	-337.1	13.5 0.0	-30.4 0.0	-4.5 -40.7	4.4 0.0	40.8 4.5	0.17
10	5.00	1	-1492.1	73.5 0.0	-91.7 0.0	-42.6 -94.3	12.7 0.0	94.4 42.6	0.40
10	4.50	1	-1493.3	75.0 0.0	-128.8 0.0	-32.2 -104.8	12.9 0.0	104.9 32.2	0.45
10	4.00	1	-1494.4	76.5 0.0	-166.7 0.0	-21.6 -115.5	13.2 0.0	115.6 21.6	0.49
10	3.50	1	-1495.6	78.0 0.0	-205.3 0.0	-10.8 -126.4	13.5 0.0	126.6 10.8	0.54
10	3.00	1	-1496.7	79.5 0.0	-244.7 0.0	0.3 -137.6	13.7 0.0	137.7 0.3	0.59
10	2.50	1	-1497.9	81.0 0.0	-284.8 0.0	11.5 -148.9	14.0 0.0	149.0 2.2	0.63
10	2.00	1	-1499.0	82.5 0.0	-325.7 0.0	23.0 -160.5	14.2 0.0	160.6 12.4	0.68
10	1.50	1	-1500.2	84.0 0.0	-367.3 0.0	34.6 -172.3	14.5 0.0	172.4 22.7	0.73
10	1.00	1	-1501.3	85.5 0.0	-409.7 0.0	46.5 -184.3	14.8 0.0	184.4 33.2	0.78
10	0.50	1	-1502.5	87.0 0.0	-452.8 0.0	58.6 -196.5	15.0 0.0	196.6 43.9	0.84
10	0.00	1	-1503.7	88.5 0.0	-496.7 0.0	70.9 -208.9	15.3 0.0	209.0 54.8	0.89

Analysis fulfilled. Maximum utilization: 0.89 at 0.00 m height.

Analysis in LCC 6 fulfilled. Maximum utilization: 0.73 at 0.00 m height.

Analysis in LCC 8 fulfilled. Maximum utilization: 0.26 at 0.00 m height.

Analysis in LCC 10 fulfilled. Maximum utilization: 0.89 at 0.00 m height.

Analysis in LCC 11 fulfilled. Maximum utilization: 0.32 at 0.00 m height.

Stress analysis EE with internal forces according to 2nd order theory

Geometrical and physical non-linear analysis in the ultimate limit state.

Only the results for the decisive design combinations are being issued.

Summary of the analyses EE (2nd order theory)

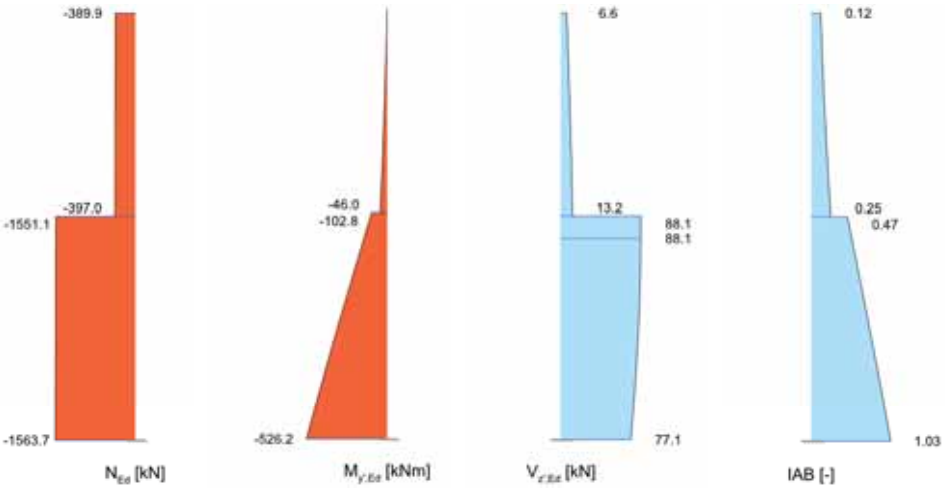
LCC	Height [m]	Q_{kl}	N_{Ed} [kN]	$V_{z',Ed}$ $V_{y',Ed}$ [kN]	$M_{y',Ed}$ $M_{z',Ed}$ [kNm]	$\sigma_{x',Ed,max}$ $\sigma_{x',Ed,min}$ [N/mm²]	$\tau_{Ed,max}$ $\tau_{Ed,min}$ [N/mm²]	$\sigma_{v,Ed,max}$ $\sigma_{v,Ed,min}$ [N/mm²]	IAB
7	9.50	1	-389.9	6.6 0.0	0.0 0.0	-26.2 -26.2	2.2 0.0	26.4 26.2	0.12
7	9.05	1	-390.6	7.5 0.0	-3.2 0.0	-24.3 -28.1	2.4 0.0	28.1 24.3	0.13
7	8.60	1	-391.3	8.2 0.0	-6.7 0.0	-22.3 -30.3	2.7 0.0	30.3 22.3	0.14
7	8.15	1	-392.0	9.0 0.0	-10.6 0.0	-20.0 -32.6	2.9 0.0	32.7 20.0	0.15
7	7.70	1	-392.7	9.7 0.0	-14.8 0.0	-17.5 -35.2	3.1 0.0	35.2 17.5	0.16
7	7.25	1	-393.4	10.4 0.0	-19.3 0.0	-14.9 -37.9	3.3 0.0	38.0 14.9	0.18
7	6.80	1	-394.1	11.0 0.0	-24.1 0.0	-12.1 -40.8	3.6 0.0	40.9 12.1	0.19
7	6.35	1	-394.8	11.6 0.0	-29.2 0.0	-9.1 -43.9	3.8 0.0	44.0 9.1	0.21
7	5.90	1	-395.6	12.2 0.0	-34.6 0.0	-5.9 -47.2	3.9 0.0	47.2 5.9	0.22
10	5.45	1	-336.2	17.1 0.0	-47.7 0.0	5.9 -51.0	5.5 0.0	51.0 2.3	0.24
10	5.00	1	-336.9	18.2 0.0	-55.7 0.0	10.6 -55.8	5.9 0.0	55.8 6.4	0.26
10	5.00	1	-1490.9	94.3 0.0	-116.9 0.0	-35.5 -101.3	16.3 0.0	101.5 35.5	0.48
10	4.50	1	-1492.1	94.9 0.0	-164.3 0.0	-22.2 -114.7	16.4 0.0	114.9 22.2	0.54
10	4.00	1	-1493.3	95.3 0.0	-211.9 0.0	-8.8 -128.2	16.4 0.0	128.4 8.8	0.60
10	3.50	1	-1494.6	95.3 0.0	-259.6 0.0	4.6 -141.7	16.5 0.0	141.8 0.3	0.66
10	3.00	1	-1495.8	95.1 0.0	-307.3 0.0	17.9 -155.2	16.4 0.0	155.3 7.9	0.73
10	2.50	1	-1497.1	94.6 0.0	-354.8 0.0	31.2 -168.6	16.3 0.0	168.7 19.7	0.79
10	2.00	1	-1498.4	93.9 0.0	-401.9 0.0	44.5 -181.9	16.2 0.0	182.1 31.4	0.85
10	1.50	1	-1499.7	92.9 0.0	-448.7 0.0	57.6 -195.2	16.0 0.0	195.3 43.0	0.91
10	1.00	1	-1501.0	91.7 0.0	-494.9 0.0	70.5 -208.2	15.8 0.0	208.3 54.4	0.98
10	0.50	1	-1502.3	90.2 0.0	-540.4 0.0	83.3 -221.1	15.6 0.0	221.2 65.7	1.04

10	0.00	1	-1503.7	88.5 0.0	-585.1 0.0	95.8 -233.8	15.3 0.0	233.8 73.9	1.09

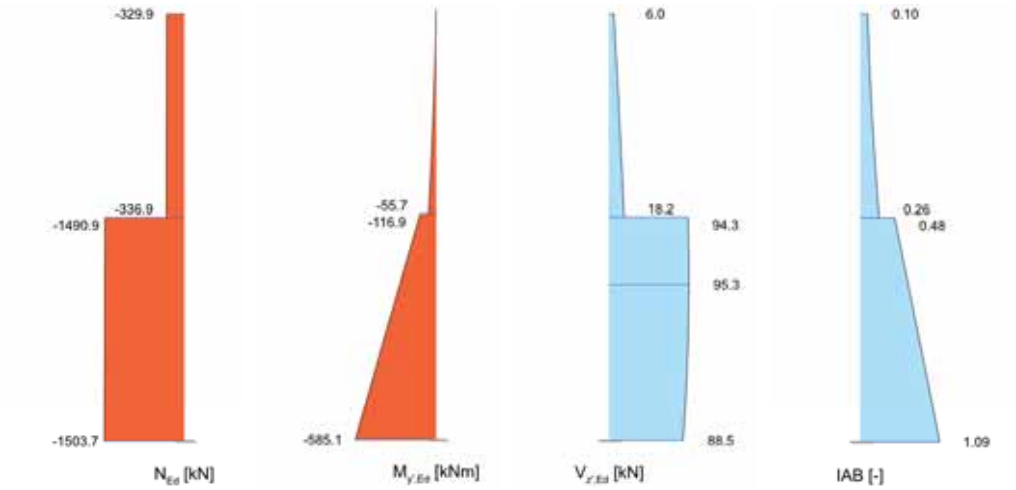
LCC 7: Analyses EE (2nd order theory)

LCC	Height [m]	Q_{kl}	N_{Ed} [kN]	$V_{z',Ed}$ $V_{y',Ed}$ [kN]	$M_{y',Ed}$ $M_{z',Ed}$ [kNm]	$\sigma_{x',Ed,max}$ $\sigma_{x',Ed,min}$ [N/mm²]	$\tau_{Ed,max}$ $\tau_{Ed,min}$ [N/mm²]	$\sigma_{v,Ed,max}$ $\sigma_{v,Ed,min}$ [N/mm²]	IAB
7	9.50	1	-389.9	6.6 0.0	0.0 0.0	-26.2 -26.2	2.2 0.0	26.4 26.2	0.12
7	9.05	1	-390.6	7.5 0.0	-3.2 0.0	-24.3 -28.1	2.4 0.0	28.1 24.3	0.13
7	8.60	1	-391.3	8.2 0.0	-6.7 0.0	-22.3 -30.3	2.7 0.0	30.3 22.3	0.14
7	8.15	1	-392.0	9.0 0.0	-10.6 0.0	-20.0 -32.6	2.9 0.0	32.7 20.0	0.15
7	7.70	1	-392.7	9.7 0.0	-14.8 0.0	-17.5 -35.2	3.1 0.0	35.2 17.5	0.16
7	7.25	1	-393.4	10.4 0.0	-19.3 0.0	-14.9 -37.9	3.3 0.0	38.0 14.9	0.18
7	6.80	1	-394.1	11.0 0.0	-24.1 0.0	-12.1 -40.8	3.6 0.0	40.9 12.1	0.19
7	6.35	1	-394.8	11.6 0.0	-29.2 0.0	-9.1 -43.9	3.8 0.0	44.0 9.1	0.21
7	5.90	1	-395.6	12.2 0.0	-34.6 0.0	-5.9 -47.2	3.9 0.0	47.2 5.9	0.22
7	5.45	1	-396.3	12.7 0.0	-40.2 0.0	-2.6 -50.5	4.1 0.0	50.6 2.6	0.24
7	5.00	1	-397.0	13.2 0.0	-46.0 0.0	0.8 -54.1	4.3 0.0	54.1 0.8	0.25
7	5.00	1	-1551.1	88.1 0.0	-102.8 0.0	-42.2 -100.1	15.2 0.0	100.3 42.2	0.47
7	4.50	1	-1552.3	88.1 0.0	-146.9 0.0	-29.8 -112.6	15.2 0.0	112.7 29.8	0.53
7	4.00	1	-1553.5	87.9 0.0	-191.0 0.0	-17.5 -125.0	15.2 0.0	125.2 17.5	0.59
7	3.50	1	-1554.7	87.4 0.0	-234.8 0.0	-5.2 -137.5	15.1 0.0	137.6 5.2	0.64
7	3.00	1	-1556.0	86.6 0.0	-278.4 0.0	7.0 -149.8	15.0 0.0	149.9 2.0	0.70
7	2.50	1	-1557.2	85.6 0.0	-321.5 0.0	19.1 -162.0	14.8 0.0	162.1 8.6	0.76
7	2.00	1	-1558.5	84.4 0.0	-364.0 0.0	31.0 -174.0	14.6 0.0	174.1 19.2	0.82
7	1.50	1	-1559.8	82.9 0.0	-405.9 0.0	42.8 -185.9	14.3 0.0	186.0 29.6	0.87
7	1.00	1	-1561.1	81.2 0.0	-446.9 0.0	54.3 -197.5	14.0 0.0	197.6 39.7	0.92
7	0.50	1	-1562.4	79.2 0.0	-487.1 0.0	65.5 -208.8	13.7 0.0	208.9 49.7	0.98
7	0.00	1	-1563.7	77.1 0.0	-526.2 0.0	76.5 -219.9	13.3 0.0	220.0 59.3	1.03

Stress resultants and stresses (EE) for LCC 7 (2nd order theory)



Stress resultants and stresses (EE) for LCC 10 (2nd order theory)



Stability analysis

The stability analysis is performed with a geometrically non-linear limit load calculation under application of pre-deformations with the elastic constitutive law under consideration of the compliance with≤ 1 the maximum utilization in the cross-section design.This corresponds with the analysis method acc. to EN 1993-1-1, chapter 5.2.2 (7a). The calculation algorithms consider the stability failure due to flexural buckling as well as lateral torsional buckling.

LCC	Safety factor of the ideal buckling load	Limit load factor	Utilization
2	10.32	4.00	0.25
3	6.75	1.11	0.90
4	6.75	0.98	1.02
5	7.58	1.00	1.00
6	6.08	1.09	0.92
7	6.08	0.97	1.03
8	7.54	2.82	0.35
9	7.58	0.93	1.07
10	6.75	0.92	1.09
11	8.72	2.40	0.42
12	10.83	1.26	0.80
13	10.61	1.33	0.75
14	13.07	2.55	0.39
15	11.13	1.29	0.77
16	13.93	2.42	0.41
17	11.13	1.33	0.75
18	13.93	2.55	0.39

Serviceability limit state

Deformations in the ULS

Height [m]	$v_{x,1}$ [mm]	$v_{y,1}$ [mm]	$v_{z,1}$ [mm]	$v_{x,2}$ [mm]	$v_{y,2}$ [mm]	$v_{z,2}$ [mm]
9.50	36.6	0.0	0.94	40.3	0.0	1.00
9.05	34.4	0.0	0.91	37.9	0.0	0.97
8.60	32.3	0.0	0.88	35.5	0.0	0.93
8.15	30.2	0.0	0.85	33.1	0.0	0.90
7.70	28.1	0.0	0.82	30.7	0.0	0.86
7.25	26.0	0.0	0.80	28.3	0.0	0.83
6.80	23.8	0.0	0.77	26.0	0.0	0.79
6.35	21.7	0.0	0.74	23.6	0.0	0.76
5.90	19.6	0.0	0.71	21.3	0.0	0.72
5.45	17.5	0.0	0.68	19.0	0.0	0.69
5.00	15.5	0.0	0.65	16.7	0.0	0.65
5.00	15.5	0.0	0.65	16.7	0.0	0.65
4.50	13.2	0.0	0.56	14.2	0.0	0.56
4.00	11.0	0.0	0.48	11.9	0.0	0.47
3.50	8.9	0.0	0.40	9.6	0.0	0.39
3.00	7.0	0.0	0.32	7.5	0.0	0.31
2.50	5.2	0.0	0.25	5.6	0.0	0.23
2.00	3.6	0.0	0.18	3.9	0.0	0.17
1.50	2.3	0.0	0.11	2.4	0.0	0.10
1.50	2.3	0.0	0.11	2.4	0.0	0.10
1.00	1.1	0.0	0.06	1.2	0.0	0.05

0.50	0.3	0.0	0.02	0.3	0.0	0.02
0.00	0.0	0.0	0.00	0.0	0.0	0.00

Analysis of the horizontal deformations

Section	L [m]	Height [m]	w_x [mm]	L / w_x	Utilization
1 + 2	9.500	9.500	36.6	260	0.38

Support forces

The support reactions result from the calculated load case combinations in the ultimate limit state.

Support forces - 2nd order theory

LCC	Height [m]	Support	A_{Edx} [kN]	A_{Edy} [kN]	A_{Edz} [kN]	M_{Edx} [kNm]	M_{Edy} [kNm]
2	0.00	A	0.0	0.0	693.7	0.0	-76.2
3	0.00	A	60.0	0.0	1503.7	0.0	-545.0
4	0.00	A	77.1	0.0	1503.7	0.0	-636.7
5	0.00	A	77.1	0.0	1443.7	0.0	-630.2
6	0.00	A	60.0	0.0	1563.7	0.0	-550.7
7	0.00	A	77.1	0.0	1563.7	0.0	-643.5
8	0.00	A	17.1	0.0	813.7	0.0	-168.9
9	0.00	A	88.5	0.0	1443.7	0.0	-690.7
10	0.00	A	88.5	0.0	1503.7	0.0	-697.8
11	0.00	A	28.5	0.0	753.7	0.0	-224.4
12	0.00	A	156.0	0.0	963.8	0.0	-509.8
13	0.00	A	152.0	0.0	929.8	0.0	-480.1
14	0.00	A	120.0	0.0	529.8	0.0	-239.4
15	0.00	A	155.8	0.0	913.8	0.0	-498.4
16	0.00	A	123.8	0.0	513.8	0.0	-257.7
17	0.00	A	152.0	0.0	913.8	0.0	-479.0
18	0.00	A	120.0	0.0	513.8	0.0	-238.8

Foundation loads (2nd order theory)

EQU	Limit state of the safety against displacement	BS-P	Permanent situation
STR	Ultimate limit state for the structural member design	BS-A	Accidental situation
GEO-2	Limit state in the subsoil with characteristic CoA (γ = 1.0 and $\psi_{0,i} = \psi_{0,i\,STR}$)	BS-E	Earthquake situation
CHAR	characteristic loads (γ = 1.0 and ψ_i = 1.0)		

LCC	Type	Situation	P_z [kN]	M_x^I [kNm]	M_y^I [kNm]	H_x^I [kN]	H_y^I [kN]	ΔM_x^{II} [kNm]	ΔM_y^{II} [kNm]	ΔH_x^{II} [kN]	ΔH_y^{II} [kN]
2	STR	BS-P	693.7	0.0	-61.6	0.0	0.0	0.0	-14.6	0.0	0.0
2	GEO-2	BS-P	513.8	0.0	-45.6	0.0	0.0	0.0	-10.3	0.0	0.0
3	STR	BS-P	1503.7	0.0	-474.1	60.0	0.0	0.0	-70.9	0.0	0.0
3	GEO-2	BS-P	1053.8	0.0	-320.6	40.0	0.0	0.0	-37.8	0.0	0.0
4	STR	BS-P	1503.7	0.0	-555.3	77.1	0.0	0.0	-81.4	0.0	0.0
4	GEO-2	BS-P	1053.8	0.0	-374.8	51.4	0.0	0.0	-42.5	0.0	0.0
5	STR	BS-P	1443.7	0.0	-555.3	77.1	0.0	0.0	-74.9	0.0	0.0
5	GEO-2	BS-P	1013.8	0.0	-374.8	51.4	0.0	0.0	-39.5	0.0	0.0
6	STR	BS-P	1563.7	0.0	-474.1	60.0	0.0	0.0	-76.6	0.0	0.0
6	GEO-2	BS-P	1093.8	0.0	-320.6	40.0	0.0	0.0	-40.5	0.0	0.0
7	STR	BS-P	1563.7	0.0	-555.3	77.1	0.0	0.0	-88.1	0.0	0.0
7	GEO-2	BS-P	1093.8	0.0	-374.8	51.4	0.0	0.0	-45.6	0.0	0.0
8	STR	BS-P	813.7	0.0	-142.8	17.1	0.0	0.0	-26.0	0.0	0.0
8	GEO-2	BS-P	593.8	0.0	-99.8	11.4	0.0	0.0	-16.4	0.0	0.0
9	STR	BS-P	1443.7	0.0	-609.5	88.5	0.0	0.0	-81.2	0.0	0.0
9	GEO-2	BS-P	1013.8	0.0	-410.9	59.0	0.0	0.0	-42.4	0.0	0.0
10	STR	BS-P	1503.7	0.0	-609.5	88.5	0.0	0.0	-88.4	0.0	0.0
10	GEO-2	BS-P	1053.8	0.0	-410.9	59.0	0.0	0.0	-45.7	0.0	0.0
11	STR	BS-P	753.7	0.0	-197.0	28.5	0.0	0.0	-27.4	0.0	0.0
11	GEO-2	BS-P	553.8	0.0	-135.9	19.0	0.0	0.0	-16.8	0.0	0.0
12	STR	BS-A	963.8	0.0	-473.1	156.0	0.0	0.0	-36.6	0.0	0.0
12	GEO-2	BS-A	963.8	0.0	-473.1	156.0	0.0	0.0	-36.6	0.0	0.0
13	STR	BS-A	929.8	0.0	-445.6	152.0	0.0	0.0	-34.4	0.0	0.0
13	GEO-2	BS-A	929.8	0.0	-445.6	152.0	0.0	0.0	-34.4	0.0	0.0
14	STR	BS-A	529.8	0.0	-225.6	120.0	0.0	0.0	-13.8	0.0	0.0
14	GEO-2	BS-A	529.8	0.0	-225.6	120.0	0.0	0.0	-13.8	0.0	0.0
15	STR	BS-A	913.8	0.0	-463.7	155.8	0.0	0.0	-34.7	0.0	0.0
15	GEO-2	BS-A	913.8	0.0	-463.7	155.8	0.0	0.0	-34.7	0.0	0.0
16	STR	BS-A	513.8	0.0	-243.7	123.8	0.0	0.0	-14.0	0.0	0.0
16	GEO-2	BS-A	513.8	0.0	-243.7	123.8	0.0	0.0	-14.0	0.0	0.0
17	STR	BS-A	913.8	0.0	-445.6	152.0	0.0	0.0	-33.3	0.0	0.0
17	GEO-2	BS-A	913.8	0.0	-445.6	152.0	0.0	0.0	-33.3	0.0	0.0
18	STR	BS-A	513.8	0.0	-225.6	120.0	0.0	0.0	-13.1	0.0	0.0
18	GEO-2	BS-A	513.8	0.0	-225.6	120.0	0.0	0.0	-13.1	0.0	0.0

Material consumption

Section	Length [m]	Weight [kg]
HE-B_300	4.500	526
HE-B_450	5.000	856

∑ Structural steel S235: 1382 kg