corus inženirji d.o.o.
družba za inženiring projektiranje in tehnično svetovanje
mednarodni prehod 6 si-5290 šempeter pri gorici | +386 (0)5 3002020 | info@corusinzenirji.si

1C NASLOVNA STRAN NAČRTA
2 Načrt s področja gradbeništva
2.1 Načrt temeljenja drogov razsvetljave

PODATKI O GRADNJI	
naziv gradnje	**IZVEDBA RAZSVETLJAVE IN VZDRŽEVALNIH DEL NA NOGOMETNEM STADIONU V AJDOVŠČINI**
kratek opis gradnje	**na obodu glavnega nogometnega igrišča se postavi 8 reflektorskih drogov z ustreznimi temelji, 7 drogov je višine 22 m, en reflektorski drog pa višine 19,24 m merjeno od absolutne nadmorske višine 111.12 m.n.m., na katere se montira 80 reflektorjev za razsvetljavo moči 1200W in svetlobnim tokom 216000lum, 5000°K, IP65, IK09.**
VRSTE GRADNJE	**novogradnja-prizidava**
PODATKI O PROJEKTNI DOKUMENTACIJI	
vrsta dokumentacije	**PZI (projektna dokumentacija za izvedbo gradnje**
številka projekta	**2023-1/12**
PODATKI O NAČRTU	
strokovno področje načrta	**2 Načrt s področja gradbeništva**
naziv načrta	**2.1 Načrt temeljenja drogov razsvetljave**
številka načrta	**116/23**
datum izdelave	**05.2024**
datum spremembe	
PODATKI O PROJEKTANTU NAČRTA	
projektant načrta (naziv družbe)	**CORUS INŽENIRJI d.o.o.**
naslov	**C. IV prekomorske 30a, 5270 Ajdovščina**
odgovorna oseba projektanta načrta	**MATEJ KOSOVEL**
podpis odgovorne osebe projektanta načrta	corus inženirji
PODATKI O IZDELOVALCU NAČRTA	
ime in priimek pooblaščenega inženirja	**MATEJ KOSOVEL, univ.dipl.inž.grad.**
identifikacijska številka	**IZS G-2341 PI**
podpis pooblaščenega inženirja	MATEJ KOSOVEL univ.dipl.inž.grad. IZS G-2341

2C IZJAVA PROJEKTANTA NAČRTA IN POOBLAŠČENEGA STROKOVNJAKA, KI JE IZDELAL NAČRT V PZI IN PID

PROJEKTANT NAČRTA	
projektant načrta (naziv družbe)	**CORUS INŽENIRJI d.o.o.**
naslov	**C. IV prekomorske 30a, 5270 Ajdovščina**
odgovorna oseba projektanta načrta	**MATEJ KOSOVEL**

IN POOBLAŠČENI STROKOVNJAK, KI JE IZDELAL NAČRT	
ime in priimek pooblaščenega inženirja	**MATEJ KOSOVEL, univ.dipl.inž.grad.**

IZJAVLJAVA:

DA NAČRT

vrsta dokumentacije	**PZI (projektna dokumentacija za izvedbo gradnje**
strokovno področje načrta	**2 Načrt s področja gradbeništva**
naziv načrta	**2.1 Načrt temeljenja drogov razsvetljave**
številka načrta	**116/23**
datum izdelave	**05.2024**
datum spremembe	

upošteva relevantne predpise in druge normativne dokumente ter da so upoštevane ustrezne bistvene in druge zahteve.

PODATKI O PROJEKTANTU NAČRTA	
projektant načrta (naziv družbe)	**CORUS INŽENIRJI d.o.o.**
naslov	**C. IV prekomorske 30a, 5270 Ajdovščina**
odgovorna oseba projektanta načrta	**MATEJ KOSOVEL**
podpis odgovorne osebe projektanta načrta	corus inženirji

PODATKI O IZDELOVALCU NAČRTA	
ime in priimek pooblaščenega inženirja	**MATEJ KOSOVEL, univ.dipl.inž.grad.**
identifikacijska številka	**IZS G-2341 PI**
podpis pooblaščenega inženirja	MATEJ KOSOVEL univ.dipl.inž.grad. IZS G-2341

PRILOGA 3A

3A KAZALO VSEBINE NAČRTA

1C NASLOVNA STRAN NAČRTA

2C IZJAVA PROJEKTANTA NAČRTA IN POOBLAŠČENEGA STROKOVNJAKA, KI JE IZDELAL NAČRT V PZI IN PID

3A KAZALO VSEBINE NAČRTA

T.1.1 TEHNIČNO POROČILO

- 1 SPLOŠNO
- 2 OSNOVE ZA PROJEKTIRANJE
- 3 ZASNOVA KONSTRUKCIJE
- 4 ZAŠČITA GRADBENE JAME
- 5 ZAKLJUČEK

T.1.2 STATIČNA ANALIZA KONSTRUKCIJ

- 1 DIMENZIONIRANJE TEMELJEV DROGOV ZA RAZSVETLJAVO
- 2 DIMENZIONIRANJE PODKONSTRUKCIJE LED ZASLONA

G RISBE

T.1.1 TEHNIČNO POROČILO

1 SPLOŠNO

Občina Ajdovščina želi izvesti razsvetljavo nogometnega igrišča na mestnem stadionu v Ajdovščini. V ta namen bo potrebno postaviti osem (8) reflektorskih drogov. Na vsakem drogu bo montirano deset (10) reflektorjev. Reflektorski drogovi so različnih višin, ki so navedene v spodnji tabeli:

oznaka reflektorja	nadmorska višina vpetja reflektorskega droga v vrh temelja m.n.m.	maksimalna nadmorska višina reflektorskega droga m.n.m	maksimalna skupna višina reflektorskega droga (m)
1	111,12	133,12	**22,00**
2	111,12	133,12	**22,00**
3	111,12	133,12	**22,00**
4	111,12	133,12	**22,00**
5	111,12	133,12	**22,00**
6	111,12	130,36	**19,20**
7	114,60	133,12	**18,50**
8	114,60	133,12	**18,50**

Drogovi so izdelek zato je dimenzioniranje le teh izvedlo podjetje proizvajalca Abacus Lighting ltd iz Velike Britanije. Vzdolž daljše stranice so na obeh straneh razporejeni po štirje reflektorji. Vogalni drogovi se montirajo na obstoječe temelje, katere je potrebno delno rekonstruirati, vmesni pa na nove temelje. V sklopu projekta je potrebno postaviti LED zaslon, ki bo lociran na platoju za golom na S strani igrišča.

2 OSNOVE ZA PROJEKTIRANJE

Osnove za projektiranje:

- Načrt s področja gradbeništva faze DGD št.: 2023-1/12 (Arti inženiring d.o.o, december 2023)
- GG elaborat št.:006/24 (corus inženirji d.o.o., januar 2024)

2.1 STANDARDI, PRAVILNIKI IN NAVODILA

Upoštevani standardi in pravilniki pri projektiranju objektov:

PODROČJE	STANDARD
osnove projektiranja	SIST EN 1990: 2004
upoštevane obtežbe	SIST EN 1991-1-1:2004, SIST EN 1991-1-1:2004/A101:2005
	SIST EN 1991-1-4:2005, SIST EN 1991-1-4:2005/oA10:2007
betonske konstrukcije	SIST EN 1992-1-1:2005, SIST EN 1992-1-1:2005/A101:2006
jeklene konstrukcije – zaslon	SIST EN 1993-1-1:2005, SIST EN 1993-1-1:2005/A101:2006
temeljenje	SIST EN 1997-1:2005, SIST EN 1997-1:2005/AC:2009
materiali	Beton: SIST EN 206, SIST EN 1026, SIST EN 12620,
	Armatura: SIST EN 10080
	Izvajanje jeklenih konstrukcij: SIST EN 1090

2.2 GEOLOŠKO GEOMEHANSKI ELABORAT – POVZETEK

Na lokaciji objekta so bile izvedene terenske raziskave na podlagi katerih je izdelan GG elaborat (št. 006/24, corus inženirji d.o.o., januar 2024). Objekt bo pretežno temeljen v zaglinjenih do zameljenih prodih in gruščih kjer se mestoma lahko pojavljajo tudi žepi gline ali meljev. V računu so bile privzete karakteristike temeljnih tal iz preglednice 1.

	prostor. teža	enoosna tlačna trdnost	nedrenirana strižna trdnost	kohezija	strižni kot	Modul elastičnosti
Material	γ	q_u	c_u	c	ϕ	E
	[kN/m3]	[kPa]	[kPa]	[kPa]	[°]	[kPa]
GrP – nasip	20,1	-	-	0	31,0	16.000
CIL – aluvialne gline	18,3	350	175	2,0	27,0	6.500
GrP-siGr – zaglinjeni do zameljeni prodi	19,0	-	-	1	33,0	20.000
flišna podlaga	22,0	-	-	30	35	100.000

Preglednica 1: Karakteristične vrednosti geomehanskih parametrov

Na lokaciji objekta se talna voda ne dvigne do nivoja temeljenja.

3 ZASNOVA KONSTRUKCIJE

Drogovi so izdelek zato je dimenzioniranje le teh izvedlo podjetje proizvajalca Abacus Lighting ltd iz Velike Britanije. Za dimenzioniranje plitvih AB točkovnih temeljev drogov so bile privzete reakcije drogov na vpetju katere je določil proizvajalec.

3.1 TEMELJENJE DROGOV ZA RAZSVETLJAVO

Drogovi za razsvetljavo so temeljeni plitvo na točkovnih AB temeljih.

Vogalni točkovni temelji TT1 (so že izvedeni po načrtu (št.: 3947/2010, Primorje d.d., avgust 2010) z dimenzijo temeljne stope 470/470/80cm ter temeljnim nastavkom 150/150/185cm. V načrtu predpisani materiali so beton C30/37 (XC4, Xf3, PV II) ter armatura (B500). Temelji niso pravilno orientirani zato bo potrebno temeljne nastavke rekonstruirati na zarotirano pozicijo. Obstoječe nastavke bo potrebno porušiti nato pa izvesti nove temeljne nastavke skladno z detajli prikazanimi v risbah. Posebno pozornost je potrebno posvetiti izvedbi kemičnih sider na temeljih TT1 ter natančno slediti predpisanemu postopku vgradnje.

Ob glavni tribuni je potrebno zgraditi nova točkovna temelja TT2 katerih dimenzija temeljne stope znaša 450/450/80cm dimenzija temeljnega nastavka pa 150/150/140cm.

Ob pomožni tribuni je potrebno zgraditi nova točkovna temelja TT3 katerih dimenzija temeljne stope znaša 450/255/80cm dimenzija temeljnega nastavka pa 150/150/70cm. Nove temelje je potrebno monolitno povezati z obstoječimi temelji tribunskih nosilcev skladno z detajli prikazanimi v risbah.

V vse temeljne nastavke je potrebno natančno vgraditi sidrni modul za montažo drogov. Sidri modul predstavljajo navojne palice 16xM20 (8.8) dolžine 150cm.

Pod novimi temelji je potrebno izvesti zbitost planuma do nivoja min.100 MPa (Ev2).

3.2 PODKONSTRUKCIJA LED ZASLONA

Na dvignjenem platoju na S strani igrišča bo postavljen led zaslon dimenzije 5760x3840mm.

LED zaslon je postavljen na kovinsko podkonstrukcijo na višini 100cm od tal. Podkonstrukcijo predstavljajo trije kovinski stebri HEA220 na razmaku 250cm na katere je pritrjen kovinski okvir zasnovan iz profilov SHS 100/100/5mm. Skladno s standardi SIST EN ISO 14713:2010 in EN ISO 1461:2009 mora debelina nanosa cinka znašati minimalno 55μm (povprečno 70μm). Temeljenje LED zaslona je zasnovano kot plitvo na treh točkovnih temeljih. Točkovni temelj predstavlja temeljna stopa dimenzije 150/350/80cm ter temeljni nastavek 60/60/120cm. V temeljni nastavek je potrebno vgraditi sidrni modul katerega predstavljajo navojne palice 8xM20 (8.8) dolžine 100cm.

Pod temelji je potrebno izvesti zbitost planuma do nivoja min.80 MPa (Ev2).

3.3 MATERIALI

Vsa betonska dela se izvajajo z betonom C 30/37, XC4, XD3, XF3, PV-II, Dmax 32 ter armirajo z varivim armaturnim jeklom B500A. Konstrukcije se sidra v temelje z vroče cinkanimi navojnimi palicami kvalitete 8.8. Kovinska konstrukcija LED zaslona se izdela iz jekla S355J2 (stebri) ter jekla S235J2 (okvir), izvedbeni razred EXC2.

4 ZAŠČITA GRADBENE JAME

Gradbena jama se varuje s stabilnimi nakloni izkopa 1:1, kjer to ni možno je potrebno gradbeno jamo varovati z geotehničnimi podpornimi konstrukcijami za katere je potrebno pred izvedbo izdelati načrt.

5 ZAKLJUČEK

Izvajalec je pred začetkom izvajanja del dolžan izdelati Tehnološki elaborat za izvedbo konstrukcij. Iz elaborata mora biti razvidna tehnologija izvedbe in faznost del. Navedeni morajo biti proizvajalci ključnih materialov za zagotavljanje trajnosti in stabilnosti konstrukcij, priloženi pa morajo biti ustrezni certifikati. Del elaborata mora biti tudi program notranje kontrole kakovosti.

Za čas gradnje mora biti imenovan nadzornik nad gradnjo.

Izkop gradbene jame mora pregledati strokovnjak geomehanik kateri ugotovi ustreznost izbranih predpostavk. V primeru, da so razmere slabše od predpostavljenih je potrebno obvestiti odgovornega projektanta gradbeništva, ki bo podal ustrezne rešitve

T.1.2 STATIČNA ANALIZA KONSTRUKCIJ

1 DIMENZIONIRANJE TEMELJEV DROGOV ZA RAZSVETLJAVO

1.1 OBTEŽBE

Konstrukcija je bila preverjena na vse predpisane obtežbe standardov

- SIST EN 1991-1-1:2004, SIST EN 1991-1-1:2004/A101:2005– določitev stalne obtežbe
- SIST EN 1991-1-4:2005, SIST EN 1991-1-4:2005/oA10:2007– določitev vetrne obtežbe

a Teže izbranih materialov

prostorninska teža betona	$\gamma_c = 25$ kN/m^3
prostorninska teža jekla	$\gamma_z = 78.5$ kN/m^3

b Varnostni faktorji za dimenzioniranje

MSN:	$\gamma_Q = 1.50$, $\gamma_G = 1.35$
MSU:	$\gamma_Q = 1.00$, $\gamma_G = 1.00$

1.2 HORIZONTALNE OBTEŽBE

1.2.1 VETRNA OBTEŽBA POSREDIVANA IZVAJALCU ZA IZRAČUN DROGA

Obtežba vetra CONA 3:	$q_b = 0{,}56$kN/m^2
- Ref. hitrost vetra:	30 m/s
- Kat terena:	I. kategorija
- Višina objekta	22,00m
Tlak konične hitrosti:	qp(z)=1,98kN/m^2

1.2.2 OBTEŽBA PRIVZETA ZA IZRAČUN TEMELJEV

V spodnji tabeli je prikazana obtežba na temelj privzeta v računu temeljev.

Summary of Mast Calculations

Abacus
Leaders in lighting

Project	4064179	Date	15/04/2024
Client		Engineer	MN
Mast ref.	PNE/22-5.2/A4714	Calc. No.	D6648c1

Design and Loading Parameters

Overall mast height	=	22.000 m

Design code	=	EN40

Wind gust speed @ 10m	=	41.5 m/s
	=	149 kph

Wind load factor	=	1.20
Material factor	=	1.15

Calculation Summary

Point / Element	Height Above Ground	Factored Moment	Ultimate Capacity	Utilisation	Deflection & Rotation		
					Lateral	Rotation	Vertical
	(m)	(KNm)	(KNm)	%	(mm)	(degrees)	(mm)
0	22.000				1429	6.2	0
1	21.918	0.7	116	1%	1420	6.2	0
2	21.405	5.1	116	4%	1365	6.2	0
3	20.893	9.5	116	8%	1309	6.2	0
4	20.380	14.1	116	12%	1254	6.2	0
5	19.380	23.2	154	15%	1146	6.1	0
6	18.380	32.6	154	21%	1041	6.0	0
7	17.380	42.4	154	28%	938	5.9	0
8	16.380	52.5	154	34%	839	5.7	0
9	15.393	62.8	197	32%	744	5.5	0
10	14.405	73.5	197	37%	655	5.2	0
11	13.418	84.4	197	43%	571	4.9	0
12	12.430	95.7	197	49%	491	4.6	0
13	11.480	106.8	250	43%	420	4.3	0
14	10.530	118.2	250	47%	355	3.9	0
15	9.580	129.9	250	52%	296	3.6	0
16	8.630	141.9	250	57%	242	3.3	0
17	7.693	153.9	344	45%	194	2.9	0
18	6.755	166.3	344	48%	153	2.5	0
19	5.818	178.8	344	52%	117	2.2	0
20	4.880	191.7	344	56%	85	1.9	0
21	3.668	208.6	430	49%	51	1.6	0
22	2.455	225.9	430	53%	26	1.2	0
23	1.243	243.6	430	57%	9	0.8	0
24	0.030	261.6	430	61%	0	0.4	0
25	0.000	262.0	897	29%	0	0.0	0

Mast strength	61%	vs. limit of	100%	Therefore OK
Deflection limit	71%	vs. limit of	100%	Therefore OK
Flange plate strength	0%	vs. limit of	100%	Therefore OK
Foundation bolt strength	0%	vs. limit of	100%	Therefore OK

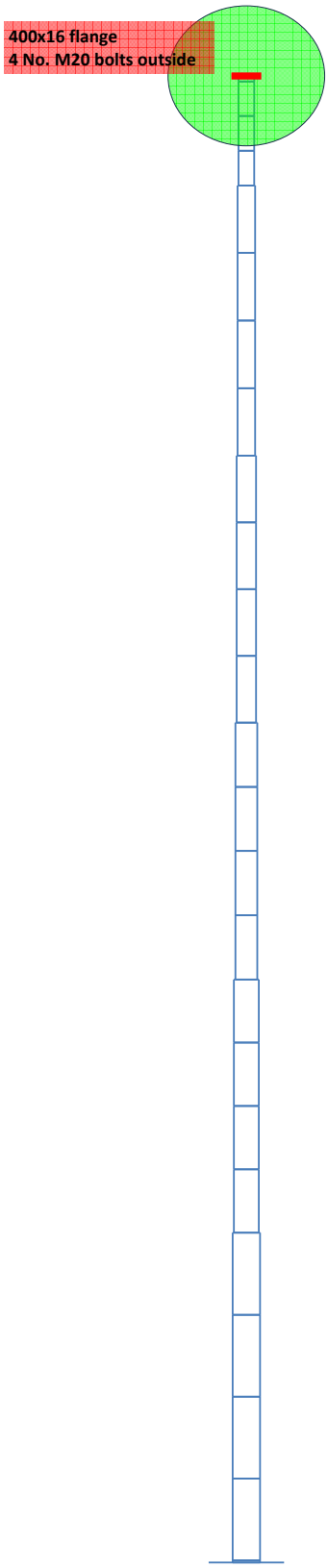
1.3 IZPISKI IZRAČUNOV

- Dimenzioniranje droga Abacus Lighting ltd
- Dimenzioniranje sidrišča droga
- Dimenzioniranje točkovnih temeljev

Summary of Mast Construction

Abacus
Leaders in lighting

Project	4064179	Date	15/04/2024
Client		Engineer	MN
Mast ref.	PNE/22-5.2/A4714	Calc. No.	D6648c1



Unfactored foundation loads:
Overturning moment = 217kNm
Shear = 15kN
Vertical load = 15kN

Shaft summary:

Element	Len.	AF b	AF t	t	Grd.	N	kg
Shaft5	1.62	202	202	25.0	170	0	66
Shaft4	4.00	229	229	25.0	170	0	174
Shaft3	3.95	256	256	25.0	170	0	194
Shaft2	3.80	285	285	25.0	170	0	210
Shaft1	3.75	330	330	25.0	170	0	243
Base	4.88	366	366	25.0	355	0	354

Total shaft weight (including flanges) = 1242

Total mast weight (including ancillaries) = 1548

Headload summary:

Headframe type: SB10

10 No. Customer specified flood lights

25kg / 0.25m2 EA.

Summary of Mast Calculations

Abacus
Leaders in lighting

Project	4064179	Date	15/04/2024
Client		Engineer	MN
Mast ref.	PNE/22-5.2/A4714	Calc. No.	D6648c1

Design and Loading Parameters

Overall mast height	=	22.000 m

Design code	=	EN40

Wind gust speed @ 10m	=	41.5 m/s
	=	149 kph

Wind load factor	=	1.20
Material factor	=	1.15

Calculation Summary

Point / Element	Height Above Ground (m)	Factored Moment (KNm)	Ultimate Capacity (KNm)	Utilisation %	Deflection & Rotation: Lateral (mm)	Rotation (degrees)	Vertical (mm)
0	22.000				1429	6.2	0
1	21.918	0.7	116	1%	1420	6.2	0
2	21.405	5.1	116	4%	1365	6.2	0
3	20.893	9.5	116	8%	1309	6.2	0
4	20.380	14.1	116	12%	1254	6.2	0
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17	7.693	153.9	344	45%	194	2.9	0
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19	5.818	178.8	344	52%	117	2.2	0
20	4.880	191.7	344	56%	85	1.9	0
21	3.668	208.6	430	49%	51	1.6	0
22	2.455	225.9	430	53%	26	1.2	0
23	1.243	243.6	430	57%	9	0.8	0
24	0.030	261.6	430	61%	0	0.4	0
25	0.000	262.0	897	29%	0	0.0	0

Mast strength	61%	vs. limit of	100%	Therefore OK
Deflection limit	71%	vs. limit of	100%	Therefore OK
Flange plate strength	0%	vs. limit of	100%	Therefore OK
Foundation bolt strength	0%	vs. limit of	100%	Therefore OK

Abacus
Leaders in lighting

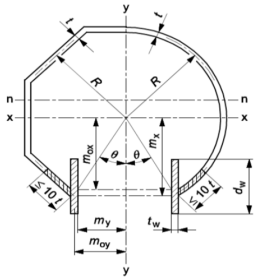
Table i1

ver: 5.7

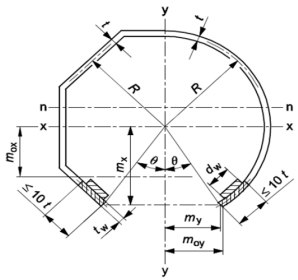
Date	15/04/2024	Design to	EN40
Client			
Project	4064179		
Mast ref.	PNE/22-5.2/A4714		
Calc. No.	D6648c1		
Engineer	MN	Checked by	
Elements	25 (maximum 25)	Material Young's modulus	70000 MPa
		Material modulus of rigidity	26600 MPa
Top D	mm A/F	Material density	2710 kg/m3
Base D	mm A/F		
Height	22.000 m		
Weight	1237 kg		

Basic Geometry																	True	Element
Point	Element	Note	Length	From top	From base	Dtaper	Dactual	Duse,b	Duse,t	N	t	t	Material	Taper	Incline	Offset	Length	Mass
			(m)	(m)	(m)	(mm)	(mm)	(mm)	(mm)		(mm)	(mm)		(y/n/dim)	(degs)	(mm)	(m)	(kg)
0				0.000	22.000	0	202	202		0	25.0	25.0	170			0		
1	1		0.083	0.083	21.918	0	202	202	202	0	25.0	25.0	170	N		0	0.083	3.1
2	2		0.513	0.595	21.405	0	202	202	202	0	25.0	25.0	170	N		0	0.513	19.3
3	3		0.513	1.108	20.893	0	202	202	202	0	25.0	25.0	170	N		0	0.513	19.3
4	4	#Shaft5	0.513	1.620	20.380	0	202	202	202	0	25.0	25.0	170	N		0	0.513	19.3
5	5		1.000	2.620	19.380	0	229	229	229	0	25.0	25.0	170	N		0	1.000	43.4
6	6		1.000	3.620	18.380	0	229	229	229	0	25.0	25.0	170	N		0	1.000	43.4
7	7		1.000	4.620	17.380	0	229	229	229	0	25.0	25.0	170	N		0	1.000	43.4
8	8	#Shaft4	1.000	5.620	16.380	0	229	229	229	0	25.0	25.0	170	N		0	1.000	43.4
9	9		0.988	6.608	15.393	0	256	256	256	0	25.0	25.0	170	N		0	0.988	48.6
10	10		0.988	7.595	14.405	0	256	256	256	0	25.0	25.0	170	N		0	0.988	48.6
11	11		0.988	8.583	13.418	0	256	256	256	0	25.0	25.0	170	N		0	0.988	48.6
12	12	#Shaft3	0.988	9.570	12.430	0	256	256	256	0	25.0	25.0	170	N		0	0.988	48.6
13	13		0.950	10.520	11.480	0	285	285	285	0	25.0	25.0	170	N		0	0.950	52.6
14	14		0.950	11.470	10.530	0	285	285	285	0	25.0	25.0	170	N		0	0.950	52.6
15	15		0.950	12.420	9.580	0	285	285	285	0	25.0	25.0	170	N		0	0.950	52.6
16	16	#Shaft2	0.950	13.370	8.630	0	285	285	285	0	25.0	25.0	170	N		0	0.950	52.6
17	17		0.938	14.308	7.693	0	330	330	330	0	25.0	25.0	170	N		0	0.938	60.9
18	18		0.938	15.245	6.755	0	330	330	330	0	25.0	25.0	170	N		0	0.938	60.9
19	19		0.938	16.183	5.818	0	330	330	330	0	25.0	25.0	170	N		0	0.938	60.9
20	20	#Shaft1	0.938	17.120	4.880	0	330	330	330	0	25.0	25.0	170	N		0	0.938	60.9
21	21		1.213	18.333	3.668	0	366	366	366	0	25.0	25.0	170	N		0	1.213	88.0
22	22		1.213	19.545	2.455	0	366	366	366	0	25.0	25.0	170	N		0	1.213	88.0
23	23		1.213	20.758	1.243	0	366	366	366	0	25.0	25.0	170	N		0	1.213	88.0
24	24		1.213	21.970	0.030	0	366	366	366	0	25.0	25.0	170	N		0	1.213	88.0
25	25	#Base	0.030	22.000	0.000	0	366	366	366	0	25.0	25.0	355	N		0	0.030	2.2

Table i2



Type 1 reinforcement



Type 4 reinforcement

Table i3

Dynamic factor;
γf dyn = 1.05

Hinge height;
0.000 m

Ram top;
0.000 m

Ram base;
0.000 m

Openings and Reinforcement

Element	Type	Width (mm)	r (N) (mm)	R-Type (0, 1 or 4)	dw (mm)	tw (mm)	x (mm)	Overlap factor	Moment factor
1									1.000
2									1.000
3									1.000
4									1.000
5									1.000
6									1.000
7									1.000
8									1.000
9									1.000
10									1.000
11									1.000
12									1.000
13									1.000
14									1.000
15									1.000
16									1.000
17									1.000
18									1.000
19									1.000
20									1.000
21									1.000
22									1.000
23									1.000
24									1.000
25									1.000

Hinge

Point	Hinge (Rt,H,Rb)
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	

Table i4

Note: Alpha angle is clockwise from x-axis

Utilisation summary;

Mast	60.9%
Flange	0.0%
Counterbalance	0.0%

Max deflection @ max wind speed = Height x 65

Linear ancillaries:

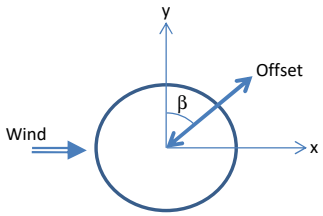
Internal cable weight = 0.0 kg/m
Ladder weight = kg/m
Ladder effective wind area = m2/m

Ancillaries

Point	Height	Label	Area (x)	Area (y)	Cf	Mass	Total	Alpha	Offset A	Offset M	Deflection Limits	
	(m)		(m2	(m2)		(kg)	(kg)	(deg)	(m)	(m)	(degs)	(mm)
0	22.000		3.373		1.000	300	310.7	0	0.000	0.000		2000
1	21.918						0.0					
2	21.405						0.0					
3	20.893						0.0					
4	20.380						0.0					
5	19.380						0.0					
6	18.380						0.0					
7	17.380						0.0					
8	16.380						0.0					
9	15.393						0.0					
10	14.405						0.0					
11	13.418						0.0					
12	12.430						0.0					
13	11.480						0.0					
14	10.530						0.0					
15	9.580						0.0					
16	8.630						0.0					
17	7.693						0.0					
18	6.755						0.0					
19	5.818						0.0					
20	4.880						0.0					
21	3.668						0.0					
22	2.455						0.0					
23	1.243						0.0					
24	0.030						0.0					
25	0.000						0.0					

Table i5

Note: Direct loading NOT included in natural frequncy calculation.
Enter loading with 90 degree beta angle to be additive to wind loads.



Direct Loading (N or Nm, unfactored)						
Point	Label	Shear (Y)	Offset	Vertical (Z)	Beta	γf
		(N)	(m)	(N)	(deg)	
0						
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

Table i6

Ice:

Radial ice thickness = mm

Ice density = kg/m3

Ice Loading				
Point	Element	Diameter	Area	Mass
		(m)	(m2)	(kg)
0	0	0.202	0.000	
1	1	0.202	0.000	0.0
2	2	0.202	0.000	0.0
3	3	0.202	0.000	0.0
4	4	0.202	0.000	0.0
5	5	0.229	0.000	0.0
6	6	0.229	0.000	0.0
7	7	0.229	0.000	0.0
8	8	0.229	0.000	0.0
9	9	0.256	0.000	0.0
10	10	0.256	0.000	0.0
11	11	0.256	0.000	0.0
12	12	0.256	0.000	0.0
13	13	0.285	0.000	0.0
14	14	0.285	0.000	0.0
15	15	0.285	0.000	0.0
16	16	0.285	0.000	0.0
17	17	0.330	0.000	0.0
18	18	0.330	0.000	0.0
19	19	0.330	0.000	0.0
20	20	0.330	0.000	0.0
21	21	0.366	0.000	0.0
22	22	0.366	0.000	0.0
23	23	0.366	0.000	0.0
24	24	0.366	0.000	0.0
25	25	0.366	0.000	0.0

Table i7

Effective stiffness	=	6652 N/m
Total equivilent mass	=	556 kg
Frequency	=	0.550 Hz
Period	=	1.817 seconds

Natural Frequency Calculation					
Element	L	Iav E^5	L^3/I	Mass	Eqiv. M
	(m)			(kg)	(kg)
0				312.2	312.2
1	0.083	8.1	0.0	11.2	11.1
2	0.513	8.1	0.0	19.3	17.8
3	0.513	8.1	0.1	19.3	16.5
4	0.513	8.1	0.4	31.4	24.9
5	1.000	11.8	1.2	43.4	29.7
6	1.000	11.8	2.5	43.4	25.3
7	1.000	11.8	4.3	43.4	21.4
8	1.000	11.8	6.7	46.0	19.0
9	0.988	16.5	6.7	48.6	16.6
10	0.988	16.5	9.1	48.6	13.6
11	0.988	16.5	11.8	48.6	11.0
12	0.988	16.5	14.8	50.6	9.1
13	0.950	22.7	12.7	52.6	7.5
14	0.950	22.7	15.2	52.6	5.8
15	0.950	22.7	17.9	52.6	4.3
16	0.950	22.7	20.9	56.7	3.4
17	0.938	35.3	15.3	60.9	2.6
18	0.938	35.3	17.4	60.9	1.8
19	0.938	35.3	19.7	60.9	1.1
20	0.938	35.3	22.1	74.4	0.8
21	1.213	48.1	23.8	88.0	0.4
22	1.213	48.1	27.1	88.0	0.1
23	1.213	48.1	30.7	88.0	0.0
24	1.213	48.1	34.5	45.1	0.0
25	0.030	48.1	0.9	1.1	0.0

Table i8

Harmonic ocillation can occur in conditions only when the following parameters are co-existent;

- Strouhal number is equal to 0.2
- Reynolds number is greater than 40 and less than 200000
- Cross wind energy input is sufficient to give negative net damping
- Vcrit is above 10m/s and below maximum design wind speed

Risk summary: Unlikely to be at risk

Vortex Induced Vibration Assessment					
Point	Diameter	Vmax	1st mode		
	(m)	(m/s)	Vcrit	Re	Risk
0	0.202	50.9	0.56	7691	No
1	0.202	50.8	0.56	7691	No
2	0.202	50.7	0.56	7691	No
3	0.202	50.6	0.56	7691	No
4	0.202	50.4	0.56	7691	No
5	0.229	50.1	0.63	9885	No
6	0.229	49.8	0.63	9885	No
7	0.229	49.4	0.63	9885	No
8	0.229	49.1	0.63	9885	No
9	0.256	48.7	0.70	12353	No
10	0.256	48.3	0.70	12353	No
11	0.256	47.8	0.70	12353	No
12	0.256	47.4	0.70	12353	No
13	0.285	46.9	0.78	15310	No
14	0.285	46.3	0.78	15310	No
15	0.285	45.7	0.78	15310	No
16	0.285	45.1	0.78	15310	No
17	0.330	44.4	0.91	20526	No
18	0.330	43.6	0.91	20526	No
19	0.330	42.6	0.91	20526	No
20	0.330	41.5	0.91	20526	No
21	0.366	40.3	1.01	25249	No
22	0.366	40.3	1.01	25249	No
23	0.366	40.3	1.01	25249	No
24	0.366	40.3	1.01	25249	No
25	0.366	40.3	1.01	25249	No

Abacus
Leaders in lighting

Table e1

From BE EN 1991-1-4 NA, 10 minute mean wind speed,	vref0 =	30.0	m/s
	(equivalent 3-second gust speed) =	41.5	m/s
Air density,	ρ =	1.23	kg/m3
Kinematic viscosity of air,	ν =	1.51E-05	m2/s
Site altitude (to base of topographic feature if f<>1.0),	a =		m
Topography and direction factor product (required for Rwf run also),	f =	1.00	
Terrain category (0 to 4) (required for Rwf run also) (leave blank to use PD6547 defaults),	=	2	
Base elevation (if installed on building or bridge etc.),	=		m
Altitude factor (= 1 + a / 1000),	Calt =	1.000	
Basic reference wind velocity (= vref0 x Calt),	vref =	30.0	m/s
Wind return period	1 / p =	25	years
Annual probability factor,	Cs =	0.960	
Rationalised wind loading factor (overrules specific wind speed if present),	Rwf =		Pa
Reference wind pressure,	q(10) =	510	Pa
	BS 5649-6 K-Factor =	3.23	

δ = 0.780 β = 1.729

z0 = 0.05 zmin = 4 kr = 0.19

Table e2

Material partial safety factor,	γm =	1.15	
Partial load factor,	γf wind =	1.20	
	γf dead =	1.20	
	γf ice =	1.20	
	γf hinge =	1.60	

EN40:

Class	γf wind	γf dead
A	1.4	1.2
B	1.2	1.2

Wind Loading on Elements (unfactored, omni-directional)

Element	z	Cr(z)	Ce(z)	q(z)	V	D	Re	r	r/D	c	Ac	Fc
1	21.959	1.156	2.874	1975	50.9	0.202	6.80E+05	0.075	0.371	0.547	0.017	18
2	21.661	1.154	2.865	1969	50.8	0.202	6.79E+05	0.075	0.371	0.547	0.104	111
3	21.149	1.149	2.848	1958	50.6	0.202	6.77E+05	0.075	0.371	0.546	0.104	111
4	20.636	1.144	2.831	1946	50.5	0.202	6.75E+05	0.075	0.371	0.546	0.104	110
5	19.880	1.137	2.806	1928	50.3	0.229	7.62E+05	0.075	0.328	0.560	0.229	247
6	18.880	1.127	2.771	1904	49.9	0.229	7.57E+05	0.075	0.328	0.560	0.229	244
7	17.880	1.117	2.734	1879	49.6	0.229	7.52E+05	0.075	0.328	0.559	0.229	240
8	16.880	1.106	2.695	1852	49.2	0.229	7.47E+05	0.075	0.328	0.558	0.229	237
9	15.886	1.095	2.654	1824	48.9	0.256	8.29E+05	0.075	0.293	0.571	0.253	264
10	14.899	1.082	2.611	1795	48.5	0.256	8.22E+05	0.075	0.293	0.570	0.253	259
11	13.911	1.069	2.566	1764	48.1	0.256	8.15E+05	0.075	0.293	0.569	0.253	254
12	12.924	1.055	2.518	1730	47.6	0.256	8.07E+05	0.075	0.293	0.568	0.253	248
13	11.955	1.041	2.467	1695	47.1	0.285	8.89E+05	0.075	0.263	0.582	0.271	267
14	11.005	1.025	2.413	1659	46.6	0.285	8.80E+05	0.075	0.263	0.580	0.271	260
15	10.055	1.008	2.356	1619	46.0	0.285	8.69E+05	0.075	0.263	0.578	0.271	253
16	9.105	0.989	2.293	1576	45.4	0.285	8.57E+05	0.075	0.263	0.576	0.271	246
17	8.161	0.968	2.225	1529	44.7	0.330	9.78E+05	0.075	0.227	0.596	0.309	282
18	7.224	0.945	2.150	1477	44.0	0.330	9.61E+05	0.075	0.227	0.594	0.309	271
19	6.286	0.918	2.065	1419	43.1	0.330	9.42E+05	0.075	0.227	0.590	0.309	259
20	5.349	0.888	1.969	1353	42.1	0.330	9.20E+05	0.075	0.227	0.587	0.309	246
21	4.274	0.845	1.838	1263	40.7	0.366	9.86E+05	0.075	0.205	0.598	0.444	335
22	3.061	0.833	1.801	1237	40.3	0.366	9.76E+05	0.075	0.205	0.596	0.444	327
23	1.849	0.833	1.801	1237	40.3	0.366	9.76E+05	0.075	0.205	0.596	0.444	327
24	0.636	0.833	1.801	1237	40.3	0.366	9.76E+05	0.075	0.205	0.596	0.444	327
25	0.015	0.833	1.801	1237	40.3	0.366	9.76E+05	0.075	0.205	0.596	0.011	8

Wind Loading on Ancillaries (unfactored, omni-directional)

Point	z	Cr(z)	Ce(z)	q(z)	V	Fl
0	22.000	1.156	2.876	1976	50.9	6666
1	21.918	1.156	2.873	1975	50.8	0
2	21.405	1.151	2.857	1963	50.7	0
3	20.893	1.147	2.840	1952	50.6	0
4	20.380	1.142	2.823	1940	50.4	0
5	19.380	1.132	2.788	1916	50.1	0
6	18.380	1.122	2.752	1892	49.8	0
7	17.380	1.112	2.714	1866	49.4	0
8	16.380	1.100	2.675	1838	49.1	0
9	15.393	1.089	2.633	1810	48.7	0
10	14.405	1.076	2.589	1779	48.3	0
11	13.418	1.063	2.542	1747	47.8	0
12	12.430	1.048	2.492	1713	47.4	0
13	11.480	1.033	2.441	1677	46.9	0
14	10.530	1.016	2.385	1639	46.3	0
15	9.580	0.999	2.325	1598	45.7	0
16	8.630	0.979	2.259	1553	45.1	0
17	7.693	0.957	2.188	1504	44.4	0
18	6.755	0.932	2.109	1449	43.6	0
19	5.818	0.904	2.019	1387	42.6	0
20	4.880	0.870	1.915	1316	41.5	0
21	3.668	0.833	1.801	1237	40.3	0
22	2.455	0.833	1.801	1237	40.3	0
23	1.243	0.833	1.801	1237	40.3	0
24	0.030	0.833	1.801	1237	40.3	0
25	0.000	0.833	1.801	1237	40.3	0

Table e3

Unfactored forces for foundation design:

		Wind	Hinge	Max
Total moment at ground level	=	216.612	0.000	216.612 kNm
Total shear at ground level	=	12.419	-	12.419 kN
Total vertical load at ground level	=	15.181	-	15.181 kN

Factored forces for baseplate design:

		Wind	Hinge	Max
Total moment at ground level	=	262.008	0.000	262.008 kNm
Total shear at ground level	=	14.903	-	14.903 kN
Total vertical load at ground level	=	18.217	-	18.217 kN

Serviceability summary:

SLS deflection at masthead	=	1429 mm
SLS rotation at mast head	=	6.21 degrees
ULS deflection as masthead	=	1715 mm
Fundemental frequency	=	0.550 Hz

SLS Mast Analysis

Point	h	Fwind	Fx	Fy	Fz	Mwind	Mx	My	Mz
	(m)	(N)	(N)	(N)	(N)	(Nm)	(Nm)	(Nm)	(Nm)
0	22.000	6666	0	0	3048	0	0	0	0
1	21.918	6684	0	0	3078	551	0	0	0
2	21.405	6796	0	0	3268	4005	0	0	0
3	20.893	6906	0	0	3457	7516	0	0	0
4	20.380	7016	0	0	3647	11084	0	0	0
5	19.380	7264	0	0	4073	18224	0	0	0
6	18.380	7508	0	0	4498	25609	0	0	0
7	17.380	7748	0	0	4924	33237	0	0	0
8	16.380	7985	0	0	5350	41104	0	0	0
9	15.393	8248	0	0	5827	49119	0	0	0
10	14.405	8507	0	0	6303	57391	0	0	0
11	13.418	8761	0	0	6779	65917	0	0	0
12	12.430	9009	0	0	7256	74691	0	0	0
13	11.480	9276	0	0	7771	83376	0	0	0
14	10.530	9536	0	0	8287	92312	0	0	0
15	9.580	9790	0	0	8803	101492	0	0	0
16	8.630	10036	0	0	9319	110910	0	0	0
17	7.693	10318	0	0	9916	120450	0	0	0
18	6.755	10589	0	0	10513	130250	0	0	0
19	5.818	10848	0	0	11110	140299	0	0	0
20	4.880	11094	0	0	11707	150585	0	0	0
21	3.668	11429	0	0	12570	164239	0	0	0
22	2.455	11756	0	0	13433	178295	0	0	0
23	1.243	12084	0	0	14297	192748	0	0	0
24	0.030	12411	0	0	15160	207598	0	0	0
25	0.000	12419	0	0	15181	207971	0	0	0

Table e4

ULS Mast Analysis

Point	h	Fwind	Fx	Fy	Fz	Mwind	Mx	My	Mz
	(m)	(N)	(N)	(N)	(N)	(Nm)	(Nm)	(Nm)	(Nm)
0	22.000	7999	0	0	3657	0	0	0	0
1	21.918	8021	0	0	3694	661	0	0	0
2	21.405	8155	0	0	3921	4806	0	0	0
3	20.893	8288	0	0	4149	9019	0	0	0
4	20.380	8420	0	0	4376	13300	0	0	0
5	19.380	8716	0	0	4887	21868	0	0	0
6	18.380	9009	0	0	5398	30731	0	0	0
7	17.380	9298	0	0	5909	39885	0	0	0
8	16.380	9582	0	0	6420	49324	0	0	0
9	15.393	9898	0	0	6992	58942	0	0	0
10	14.405	10208	0	0	7564	68870	0	0	0
11	13.418	10513	0	0	8135	79101	0	0	0
12	12.430	10811	0	0	8707	89629	0	0	0
13	11.480	11131	0	0	9326	100052	0	0	0
14	10.530	11444	0	0	9944	110775	0	0	0
15	9.580	11748	0	0	10563	121791	0	0	0
16	8.630	12043	0	0	11182	133091	0	0	0
17	7.693	12381	0	0	11899	144540	0	0	0
18	6.755	12707	0	0	12615	156300	0	0	0
19	5.818	13018	0	0	13332	168359	0	0	0
20	4.880	13313	0	0	14048	180702	0	0	0
21	3.668	13715	0	0	15084	197087	0	0	0
22	2.455	14108	0	0	16120	213954	0	0	0
23	1.243	14500	0	0	17156	231298	0	0	0
24	0.030	14893	0	0	18192	249118	0	0	0
25	0.000	14903	0	0	18217	249565	0	0	0

Table e5

SLS Deflection Calculation (principal moment)															
Point	Element	Length	I	J	EI	Mp1 SLS	M/EI	θ	Σθ	K	α	Σα	δ	Σδ	Σδinc
		(mm)	(mm4)	(mm4)	(Nmm2)	(Nm)		(rads)	(rads)	(mm4)	(rads)	(rads)	(mm)	(mm)	(mm)
0			80919651.33	108880395	5.66E+12	0	0.00E+00	0.000	0.103			0.0000		1359	1359
1	1	82.5	80919651.33	108880395	5.66E+12	551	9.72E-08	0.000	0.103	111052489	0.00E+00	0.0000	8	1350	1350
2	2	512.5	80919651.33	108880395	5.66E+12	4005	7.07E-07	0.000	0.103	111052489	0.00E+00	0.0000	53	1297	1297
3	3	512.5	80919651.33	108880395	5.66E+12	7516	1.33E-06	0.000	0.103	111052489	0.00E+00	0.0000	53	1245	1245
4	4	512.5	80919651.33	108880395	5.66E+12	11084	1.96E-06	0.001	0.103	111052489	0.00E+00	0.0000	53	1192	1192
5	5	1000	117897973.8	166694163	8.25E+12	18224	2.21E-06	0.002	0.102	169197584	0.00E+00	0.0000	102	1090	1090
6	6	1000	117897973.8	166694163	8.25E+12	25609	3.10E-06	0.002	0.100	169197584	0.00E+00	0.0000	100	990	990
7	7	1000	117897973.8	166694163	8.25E+12	33237	4.03E-06	0.003	0.098	169197584	0.00E+00	0.0000	98	893	893
8	8	1000	117897973.8	166694163	8.25E+12	41104	4.98E-06	0.004	0.095	169197584	0.00E+00	0.0000	95	798	798
9	9	987.5	164709932.9	242028121	1.15E+13	49119	4.26E-06	0.005	0.091	244862867	0.00E+00	0.0000	89	708	708
10	10	987.5	164709932.9	242028121	1.15E+13	57391	4.98E-06	0.004	0.086	244862867	0.00E+00	0.0000	85	624	624
11	11	987.5	164709932.9	242028121	1.15E+13	65917	5.72E-06	0.005	0.081	244862867	0.00E+00	0.0000	80	543	543
12	12	987.5	164709932.9	242028121	1.15E+13	74691	6.48E-06	0.006	0.077	244862867	0.00E+00	0.0000	76	468	468
13	13	950	227266003.3	345103953	1.59E+13	83376	5.24E-06	0.006	0.071	348294561	0.00E+00	0.0000	67	400	400
14	14	950	227266003.3	345103953	1.59E+13	92312	5.80E-06	0.005	0.065	348294561	0.00E+00	0.0000	62	339	339
15	15	950	227266003.3	345103953	1.59E+13	101492	6.38E-06	0.006	0.060	348294561	0.00E+00	0.0000	57	282	282
16	16	950	227266003.3	345103953	1.59E+13	110910	6.97E-06	0.006	0.054	348294561	0.00E+00	0.0000	52	230	230
17	17	937.5	352810672.5	557095189	2.47E+13	120450	4.88E-06	0.007	0.048	560837986	0.00E+00	0.0000	45	185	185
18	18	937.5	352810672.5	557095189	2.47E+13	130250	5.27E-06	0.005	0.042	560837986	0.00E+00	0.0000	39	146	146
19	19	937.5	352810672.5	557095189	2.47E+13	140299	5.68E-06	0.005	0.037	560837986	0.00E+00	0.0000	35	111	111
20	20	937.5	352810672.5	557095189	2.47E+13	150585	6.10E-06	0.005	0.032	560837986	0.00E+00	0.0000	30	81	81
21	21	1212.5	481330243.5	778561685	3.37E+13	164239	4.87E-06	0.007	0.027	782746221	0.00E+00	0.0000	33	49	49
22	22	1212.5	481330243.5	778561685	3.37E+13	178295	5.29E-06	0.006	0.019	782746221	0.00E+00	0.0000	24	25	25
23	23	1212.5	481330243.5	778561685	3.37E+13	192748	5.72E-06	0.006	0.014	782746221	0.00E+00	0.0000	16	9	9
24	24	1212.5	481330243.5	778561685	3.37E+13	207598	6.16E-06	0.007	0.007	782746221	0.00E+00	0.0000	9	0	0
25	25	30	481330243.5	778561685	3.37E+13	207971	6.17E-06	0.000	0.000	782746221	0.00E+00	0.0000	0	0	0

Table e6

ULS Deflection Calculation (principal moment)								
Point	Element	Mp1 ULS	M/EI	θ	Σθ	δ	Σδ	Σδinc
		(Nm)		(rads)	(rads)	(mm)	(mm)	(mm)
0		0	0.00E+00	0.000	0.124		1630	1630
1	1	661	1.17E-07	0.000	0.124	10	1620	1620
2	2	4806	8.48E-07	0.000	0.124	63	1557	1557
3	3	9019	1.59E-06	0.000	0.124	63	1494	1494
4	4	13300	2.35E-06	0.001	0.123	63	1431	1431
5	5	21868	2.65E-06	0.002	0.122	122	1308	1308
6	6	30731	3.72E-06	0.003	0.120	120	1188	1188
7	7	39885	4.83E-06	0.004	0.117	117	1071	1071
8	8	49324	5.98E-06	0.005	0.114	114	957	957
9	9	58942	5.11E-06	0.006	0.109	107	850	850
10	10	68870	5.97E-06	0.005	0.103	102	749	749
11	11	79101	6.86E-06	0.006	0.098	97	652	652
12	12	89629	7.77E-06	0.007	0.092	91	561	561
13	13	100052	6.29E-06	0.007	0.085	81	480	480
14	14	110775	6.96E-06	0.006	0.078	74	407	407
15	15	121791	7.66E-06	0.007	0.072	68	338	338
16	16	133091	8.37E-06	0.007	0.065	62	276	276
17	17	144540	5.85E-06	0.008	0.058	54	222	222
18	18	156300	6.33E-06	0.005	0.050	47	175	175
19	19	168359	6.82E-06	0.006	0.045	42	134	134
20	20	180702	7.32E-06	0.006	0.039	36	97	97
21	21	197087	5.85E-06	0.009	0.032	39	58	58
22	22	213954	6.35E-06	0.007	0.023	28	30	30
23	23	231298	6.86E-06	0.008	0.016	20	10	10
24	24	249118	7.39E-06	0.008	0.009	10	0	0
25	25	249565	7.41E-06	0.000	0.000	0	0	0

Table e7

Secondary Moments			
SLS PΔ	ULS PΔ	Mp SLS	Mp ULS
(Nm)	(Nm)	(Nm)	(Nm)
0	0	0	0
26	37	577	698
188	271	4193	5077
361	520	7877	9539
543	781	11626	14082
914	1316	19138	23185
1321	1903	26931	32634
1761	2536	34998	42420
2227	3207	43331	52531
2706	3896	51824	62839
3199	4606	60590	73476
3706	5337	69623	84437
4219	6075	78910	95704
4707	6779	88084	106831
5186	7467	97498	118242
5656	8145	107149	129936
6110	8799	117020	141890
6532	9405	126982	153946
6919	9963	137169	166264
7285	10490	147584	178849
7620	10973	158205	191674
8001	11521	172240	208608
8297	11948	186593	225903
8518	12266	201266	243564
8641	12443	216239	261561
8641	12443	216612	262008

Table e8

Maximum deflection ratios against input limits;

Deflection = 71%
Rotation = 0%

SLS Deflection Calculation (secondary moment)										
Point	Element	SLS Fp	SLS Mp	M/EI	θ	Σθ	δ	Σδ	Height/	Over limit
		(N)	(Nm)		(rads)	(rads)	(mm)	(mm)		Mins / yr
0		0	0	0.00E+00	0.000	0.108		1429	15.4	0
1	1	6684	577	1.02E-07	0.000	0.108	9	1420	15.4	0
2	2	6796	4193	7.40E-07	0.000	0.108	56	1365	15.7	0
3	3	6906	7877	1.39E-06	0.000	0.108	56	1309	16.0	0
4	4	7016	11626	2.05E-06	0.001	0.108	55	1254	16.3	0
5	5	7264	19138	2.32E-06	0.002	0.107	107	1146	16.9	0
6	6	7508	26931	3.26E-06	0.002	0.105	105	1041	17.7	0
7	7	7748	34998	4.24E-06	0.003	0.103	103	938	18.5	0
8	8	7985	43331	5.25E-06	0.004	0.100	100	839	19.5	0
9	9	8248	51824	4.49E-06	0.005	0.095	94	744	20.7	0
10	10	8507	60590	5.26E-06	0.004	0.090	89	655	22.0	0
11	11	8761	69623	6.04E-06	0.005	0.086	85	571	23.5	0
12	12	9009	78910	6.84E-06	0.006	0.081	80	491	25.3	0
13	13	9276	88084	5.54E-06	0.007	0.075	71	420	27.3	0
14	14	9536	97498	6.13E-06	0.005	0.068	65	355	29.6	0
15	15	9790	107149	6.74E-06	0.006	0.063	60	296	32.4	0
16	16	10036	117020	7.36E-06	0.006	0.057	54	242	35.7	0
17	17	10318	126982	5.14E-06	0.007	0.051	47	194	39.6	0
18	18	10589	137169	5.55E-06	0.005	0.044	41	153	44.1	0
19	19	10848	147584	5.98E-06	0.005	0.039	36	117	49.9	0
20	20	11094	158205	6.41E-06	0.006	0.034	32	85	57.5	0
21	21	11429	172240	5.11E-06	0.008	0.028	34	51	72.1	0
22	22	11756	186593	5.54E-06	0.006	0.020	25	26	93.8	0
23	23	12084	201266	5.97E-06	0.007	0.014	17	9	137.7	0
24	24	12411	216239	6.42E-06	0.007	0.007	9	0	5193.8	0
25	25	12419	216612	6.43E-06	0.000	0.000	0	0	0	0

Table e9

Column Design Check (non-directional, openings not considered)											
Point	Mp	t	fy	R	ε	ϕ1	ϕ2	Zp	Mup	Tu	F of S
	(Nm)	(mm)	(Mpa)	(mm)				(mm3)	(Nm)	(Nm)	
0	0	25.0	170	89	0.174	1.000	1.000	783225	115781	90934	0.000
1	698	25.0	170	89	0.174	1.000	1.000	783225	115781	90934	0.006
2	5077	25.0	170	89	0.174	1.000	1.000	783225	115781	90934	0.044
3	9539	25.0	170	89	0.174	1.000	1.000	783225	115781	90934	0.082
4	14082	25.0	170	89	0.174	1.000	1.000	783225	115781	90934	0.122
5	23185	25.0	170	102	0.201	1.000	1.000	1040400	153798	120793	0.151
6	32634	25.0	170	102	0.201	1.000	1.000	1040400	153798	120793	0.212
7	42420	25.0	170	102	0.201	1.000	1.000	1040400	153798	120793	0.276
8	52531	25.0	170	102	0.201	1.000	1.000	1040400	153798	120793	0.342
9	62839	25.0	170	116	0.228	1.000	1.000	1334025	197204	154883	0.319
10	73476	25.0	170	116	0.228	1.000	1.000	1334025	197204	154883	0.373
11	84437	25.0	170	116	0.228	1.000	1.000	1334025	197204	154883	0.428
12	95704	25.0	170	116	0.228	1.000	1.000	1334025	197204	154883	0.485
13	106831	25.0	170	130	0.256	1.000	1.000	1690000	249826	196213	0.428
14	118242	25.0	170	130	0.256	1.000	1.000	1690000	249826	196213	0.473
15	129936	25.0	170	130	0.256	1.000	1.000	1690000	249826	196213	0.520
16	141890	25.0	170	130	0.256	1.000	1.000	1690000	249826	196213	0.568
17	153946	25.0	170	153	0.301	1.000	1.000	2325625	343788	270010	0.448
18	166264	25.0	170	153	0.301	1.000	1.000	2325625	343788	270010	0.484
19	178849	25.0	170	153	0.301	1.000	1.000	2325625	343788	270010	0.520
20	191674	25.0	170	153	0.301	1.000	1.000	2325625	343788	270010	0.558
21	208608	25.0	170	171	0.336	1.000	1.000	2907025	429734	337512	0.485
22	225903	25.0	170	171	0.336	1.000	1.000	2907025	429734	337512	0.526
23	243564	25.0	170	171	0.336	1.000	1.000	2907025	429734	337512	0.567
24	261561	25.0	170	171	0.336	1.000	1.000	2907025	429734	337512	0.609
25	262008	25.0	355	171	0.486	1.000	1.000	2907025	897386	704805	0.292

Table e10

Opening Check (directional)						
Element	Mp	Mux	Muy	Tu	F of S x	F of S y
	(Nm)	(Nm)	(Nm)	(Nm)		
1	698	N/A	N/A	N/A	0.000	0.000
2	5077	N/A	N/A	N/A	0.000	0.000
3	9539	N/A	N/A	N/A	0.000	0.000
4	14082	N/A	N/A	N/A	0.000	0.000
5	23185	N/A	N/A	N/A	0.000	0.000
6	32634	N/A	N/A	N/A	0.000	0.000
7	42420	N/A	N/A	N/A	0.000	0.000
8	52531	N/A	N/A	N/A	0.000	0.000
9	62839	N/A	N/A	N/A	0.000	0.000
10	73476	N/A	N/A	N/A	0.000	0.000
11	84437	N/A	N/A	N/A	0.000	0.000
12	95704	N/A	N/A	N/A	0.000	0.000
13	106831	N/A	N/A	N/A	0.000	0.000
14	118242	N/A	N/A	N/A	0.000	0.000
15	129936	N/A	N/A	N/A	0.000	0.000
16	141890	N/A	N/A	N/A	0.000	0.000
17	153946	N/A	N/A	N/A	0.000	0.000
18	166264	N/A	N/A	N/A	0.000	0.000
19	178849	N/A	N/A	N/A	0.000	0.000
20	191674	N/A	N/A	N/A	0.000	0.000
21	208608	N/A	N/A	N/A	0.000	0.000
22	225903	N/A	N/A	N/A	0.000	0.000
23	243564	N/A	N/A	N/A	0.000	0.000
24	261561	N/A	N/A	N/A	0.000	0.000
25	262008	N/A	N/A	N/A	0.000	0.000

Abacus
Leaders in lighting

Table e11

Hinge Point Analysis

Point	Element	L	Wp	We	Mh	M*	F of S
		(m)	(N)	(N)	(Nm)	(Nm)	
0			5120		0		
1	1	0.083	0	51	0	115781	0.000
2	2	0.513	0	318	0	115781	0.000
3	3	0.513	0	318	0	115781	0.000
4	4	0.513	0	318	0	115781	0.000
5	5	1.000	0	716	0	153798	0.000
6	6	1.000	0	716	0	153798	0.000
7	7	1.000	0	716	0	153798	0.000
8	8	1.000	0	716	0	153798	0.000
9	9	0.988	0	800	0	197204	0.000
10	10	0.988	0	800	0	197204	0.000
11	11	0.988	0	800	0	197204	0.000
12	12	0.988	0	800	0	197204	0.000
13	13	0.950	0	866	0	249826	0.000
14	14	0.950	0	866	0	249826	0.000
15	15	0.950	0	866	0	249826	0.000
16	16	0.950	0	866	0	249826	0.000
17	17	0.938	0	1003	0	343788	0.000
18	18	0.938	0	1003	0	343788	0.000
19	19	0.938	0	1003	0	343788	0.000
20	20	0.938	0	1003	0	343788	0.000
21	21	1.213	0	1450	0	429734	0.000
22	22	1.213	0	1450	0	429734	0.000
23	23	1.213	0	1450	0	429734	0.000
24	24	1.213	0	1450	0	429734	0.000
25	25	0.030	0	36	0	897386	0.000

Table e12

Maximum utilisation = 0.609

Maximum deflection utilisation = 0.715

Mast Utilisation Summary

Point	Shaft	Opening	Hinged	Max
Max	0.609	0.000	0.000	0.609
0	0.000	0.000	0.000	0.000
1	0.006	0.000	0.000	0.006
2	0.044	0.000	0.000	0.044
3	0.082	0.000	0.000	0.082
4	0.122	0.000	0.000	0.122
5	0.151	0.000	0.000	0.151
6	0.212	0.000	0.000	0.212
7	0.276	0.000	0.000	0.276
8	0.342	0.000	0.000	0.342
9	0.319	0.000	0.000	0.319
10	0.373	0.000	0.000	0.373
11	0.428	0.000	0.000	0.428
12	0.485	0.000	0.000	0.485
13	0.428	0.000	0.000	0.428
14	0.473	0.000	0.000	0.473
15	0.520	0.000	0.000	0.520
16	0.568	0.000	0.000	0.568
17	0.448	0.000	0.000	0.448
18	0.484	0.000	0.000	0.484
19	0.520	0.000	0.000	0.520
20	0.558	0.000	0.000	0.558
21	0.485	0.000	0.000	0.485
22	0.526	0.000	0.000	0.526
23	0.567	0.000	0.000	0.567
24	0.609	0.000	0.000	0.609
25	0.292	0.000	0.000	0.292

Table e13

Design life, L = years
Frequency of vibration, Nf = 0.550 Hz
Effective frequency, Nfe = 0.000 Hz
Number of cycles, n1 = 0.00E+00
Dynamic resposnse factor, β = 1.729
Cstat = 0.560

Fatigue - BD94/17

Point	Detail	σs	Cvs	σr	σrlim	F of S
		(MPa)		(MPa)	(MPa)	
		0.0	1.20	0.0	0.0	0.000
1		0.7	1.20	0.2	0.0	0.000
2		5.4	1.20	1.2	0.0	0.000
3		10.1	1.20	2.3	0.0	0.000
4		14.8	1.20	3.4	0.0	0.000
5		18.4	1.20	4.2	0.0	0.000
6		25.9	1.20	5.8	0.0	0.000
7		33.6	1.20	7.6	0.0	0.000
8		41.6	1.20	9.4	0.0	0.000
9		38.8	1.20	8.8	0.0	0.000
10		45.4	1.20	10.3	0.0	0.000
11		52.2	1.20	11.8	0.0	0.000
12		59.2	1.20	13.4	0.0	0.000
13		52.1	1.20	11.8	0.0	0.000
14		57.7	1.20	13.0	0.0	0.000
15		63.4	1.20	14.3	0.0	0.000
16		69.2	1.20	15.6	0.0	0.000
17		54.6	1.20	12.3	0.0	0.000
18		59.0	1.20	13.3	0.0	0.000
19		63.5	1.20	14.3	0.0	0.000
20		68.0	1.20	15.4	0.0	0.000
21		59.2	1.20	13.4	0.0	0.000
22		64.2	1.20	14.5	0.0	0.000
23		69.2	1.20	15.6	0.0	0.000
24		74.4	1.20	16.8	0.0	0.000
25		74.5	1.20	16.8	0.0	0.000

Project data

Project name	stadion Ajdovščina
Project number	116/23
Author	corus inženirji d.o.o.
Description	
Date	6/20/2024
Code	EN

Material

Steel	S 355
Concrete	C30/37

Project item STEBER REFLEKTORJA

Design

Name	STEBER REFLEKTORJA
Description	sidranje stebra
Analysis	Stress, strain/ loads in equilibrium

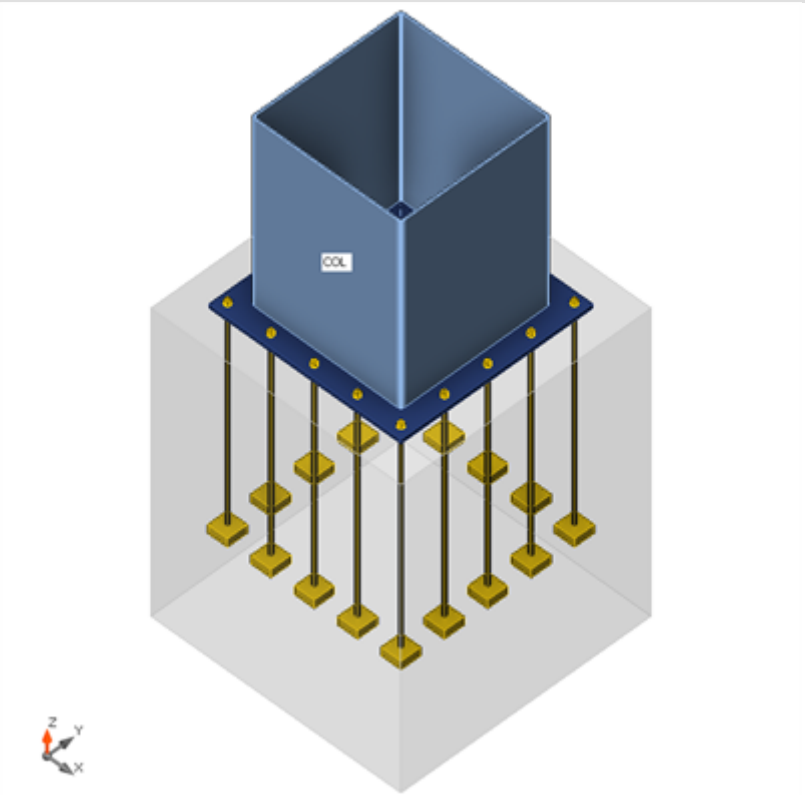
Members

Geometry

Name	Cross-section	β – Direction [°]	γ - Pitch [°]	α - Rotation [°]	Offset ex [mm]	Offset ey [mm]	Offset ez [mm]
COL	2 - RHS900x900	0.0	90.0	0.0	0	0	0

Supports and forces

Name	Support	Forces in	X [mm]
COL / end		Node	0



Cross-sections

Name	Material
2 - RHS900x900	S 355

Anchors

Name	Diameter [mm]	f_y [MPa]	f_u [MPa]	Gross area [mm^2]
M20 8.8	20	640.0	800.0	314

Load effects (forces in equilibrium)

Name	Member	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
LE1	COL / End	-15.0	0.0	-12.0	0.0	262.0	0.0

Unbalanced forces

Name	X [kN]	Y [kN]	Z [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
LE1	12.0	0.0	-15.0	0.0	262.0	0.0

Foundation block

Item	Value	Unit
CB 1		
Dimensions	1500 x 1500	mm
Depth	1850	mm
Anchor	M20 8.8	
Anchoring length	1300	mm
Shear force transfer	Friction	

Check

Summary

Name	Value	Check status
Analysis	100.0%	OK
Plates	0.0 < 5.0%	OK
Loc. deformation	0.0 < 3%	OK
Anchors	53.4 < 100%	OK
Welds	0.0 < 100%	OK
Concrete block	9.7 < 100%	OK
Shear	12.0 < 100%	OK
Buckling	6.64	

Plates

Name	t_p [mm]	Loads	σ_{Ed} [MPa]	ε_{Pl} [%]	$\sigma_{c,Ed}$ [MPa]	Status
COL	10.0	LE1	195.8	0.0	0.0	OK
BP1	25.0	LE1	162.2	0.0	0.0	OK

Design data

Material	f_y [MPa]	ε_{lim} [%]
S 355	355.0	5.0

Symbol explanation

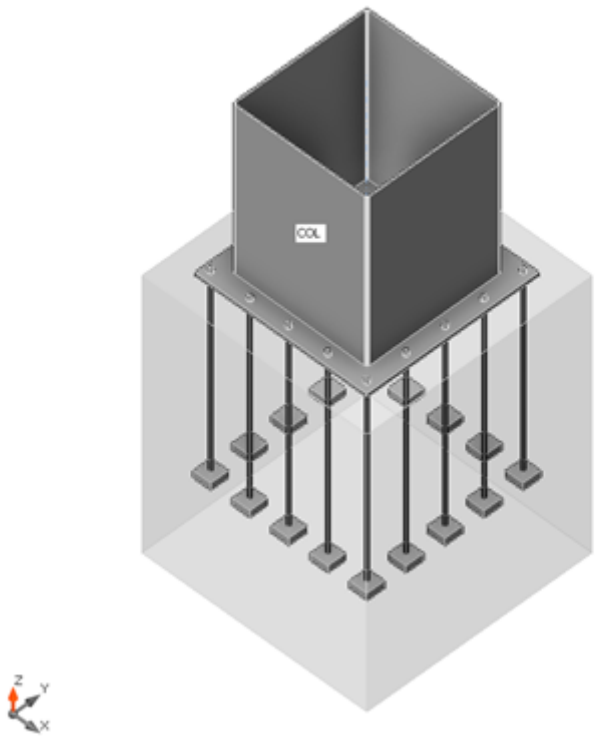
t_p	Plate thickness
σ_{Ed}	Equivalent stress
ε_{Pl}	Plastic strain
$\sigma_{c,Ed}$	Contact stress
f_y	Yield strength
ε_{lim}	Limit of plastic strain

Loc. deformation

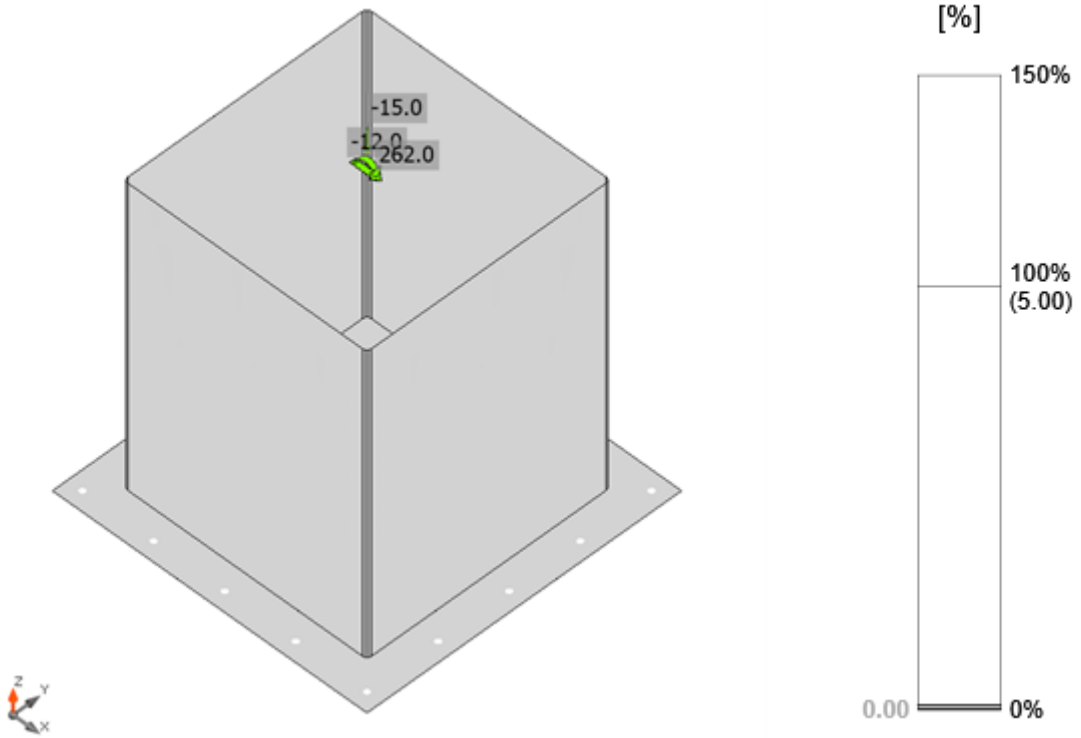
Name	d_0 [mm]	Loads	δ [mm]	δ_{lim} [mm]	δ/d_0 [%]	Check status
COL	900	LE1	0	27	0.0	OK

Symbol explanation

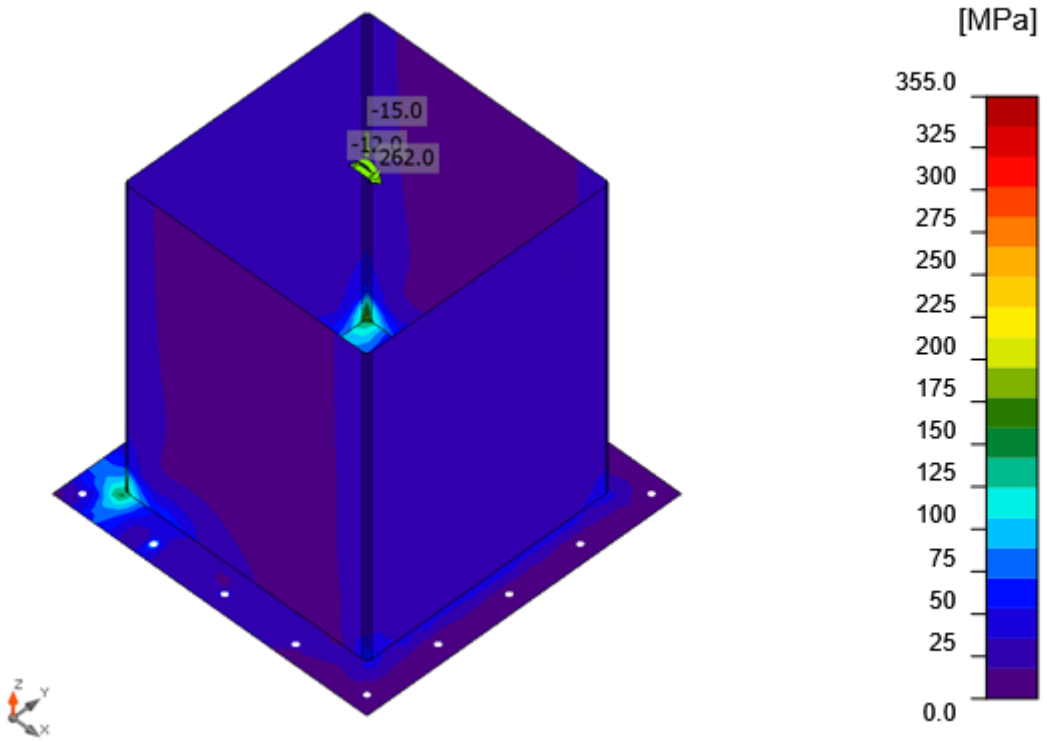
d_0	Cross-section size
δ	Local cross-section deformation
δ_{lim}	Allowed deformation



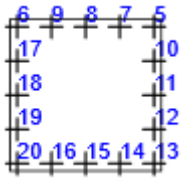
Overall check, LE1



Strain check, LE1



Equivalent stress, LE1

Shape	Item	Loads	N_{Ed} [kN]	V_{Ed} [kN]	$N_{Rd,p}$ [kN]	$N_{Rd,cb}$ [kN]	Ut_t [%]	Ut_s [%]	Ut_{ts} [%]	Detailing	Status
	A5	LE1	32.4	0.0	2465.0	2650.4	29.2	0.0	8.5	OK	OK
	A6	LE1	32.5	0.0	2465.0	2650.4	29.3	0.0	8.6	OK	OK
	A7	LE1	59.3	0.0	2465.0	2650.4	53.4	0.0	28.5	OK	OK
	A8	LE1	49.7	0.0	2465.0	2650.4	44.8	0.0	20.1	OK	OK
	A9	LE1	59.3	0.0	2465.0	2650.4	53.4	0.0	28.5	OK	OK
	A10	LE1	41.7	0.0	2465.0	1743.9	37.6	0.0	14.1	OK	OK
	A11	LE1	16.8	0.0	2465.0	1743.9	15.1	0.0	2.3	OK	OK
	A12	LE1	1.8	0.0	2465.0	1743.9	5.3	0.0	1.2	OK	OK
	A13	LE1	0.0	0.0	2465.0	-	0.0	0.0	0.0	OK	OK
	A14	LE1	0.0	0.0	2465.0	-	0.0	0.0	0.0	OK	OK
	A15	LE1	0.0	0.0	2465.0	-	0.0	0.0	0.0	OK	OK
	A16	LE1	0.0	0.0	2465.0	-	0.0	0.0	0.0	OK	OK
	A17	LE1	41.9	0.0	2465.0	1741.7	37.7	0.0	14.2	OK	OK
	A18	LE1	16.8	0.0	2465.0	1741.7	15.1	0.0	2.3	OK	OK
	A19	LE1	1.8	0.0	2465.0	1741.7	5.3	0.0	1.2	OK	OK
	A20	LE1	0.0	0.0	2465.0	-	0.0	0.0	0.0	OK	OK

Design data

Grade	$N_{Rd,s}$ [kN]	$V_{Rd,s}$ [kN]
M20 8.8 - 1	111.1	78.4

Symbol explanation

N_{Ed}	Tension force
V_{Ed}	Resultant of bolt shear forces Vy and Vz in shear planes
$N_{Rd,p}$	Design resistance in case of pull-out failure - EN 1992-4 – 7.2.1.5
$N_{Rd,cb}$	Design resistance in case of concrete blow-out failure - EN 1992-4 – 7.2.1.8
Ut_t	Utilization in tension
Ut_s	Utilization in shear
Ut_{ts}	Utilization in tension and shear
$N_{Rd,s}$	Design tensile resistance of a fastener in case of steel failure - EN 1992-4 – 7.2.1.3
$V_{Rd,s}$	Design shear resistance of a fastener in case of steel failure - EN 1992-4 – 7.2.2.3.1

Welds

Item	Edge	T_w [mm]	L [mm]	Loads	$\sigma_{w,Ed}$ [MPa]	ε_{Pl} [%]	$\sigma_{\perp}$ [MPa]	$\tau_{\perp}$ [MPa]	$\tau_{\parallel}$ [MPa]	Ut [%]	Ut_c [%]	Detailing	Status
BP1	COL-w 1	-	4393	-	-	-	-	-	-	-	-	OK	OK

Design data

Material	f_u [MPa]	β_w [-]	$\sigma_{w,Rd}$ [MPa]	0.9 σ [MPa]
S 355	0.0	-	-	-

Symbol explanation

T_w	Throat thickness a
L	Length
$\sigma_{w,Ed}$	Equivalent stress
ε_{Pl}	Strain
$\sigma_{\perp}$	Perpendicular stress
$\tau_{\perp}$	Shear stress perpendicular to weld axis
$\tau_{\parallel}$	Shear stress parallel to weld axis
Ut	Utilization
Ut_c	Weld capacity estimation
f_u	Ultimate strength of weld
β_w	Correlation factor EN 1993-1-8 – Tab. 4.1
$\sigma_{w,Rd}$	Equivalent stress resistance
0.9 σ	Perpendicular stress resistance: 0.9*fu/γM2

Item	Loads	c [mm]	A_{eff} [mm^2]	σ [MPa]	k_j [-]	f_{jd} [MPa]	Ut [%]	Status
CB 1	LE1	43	104872	3.8	2.92	39.1	9.7	OK

Symbol explanation

c	Bearing width
A_{eff}	Effective area
σ	Average stress in concrete
k_j	Concentration factor
f_{jd}	The ultimate bearing strength of the concrete block
Ut	Utilization

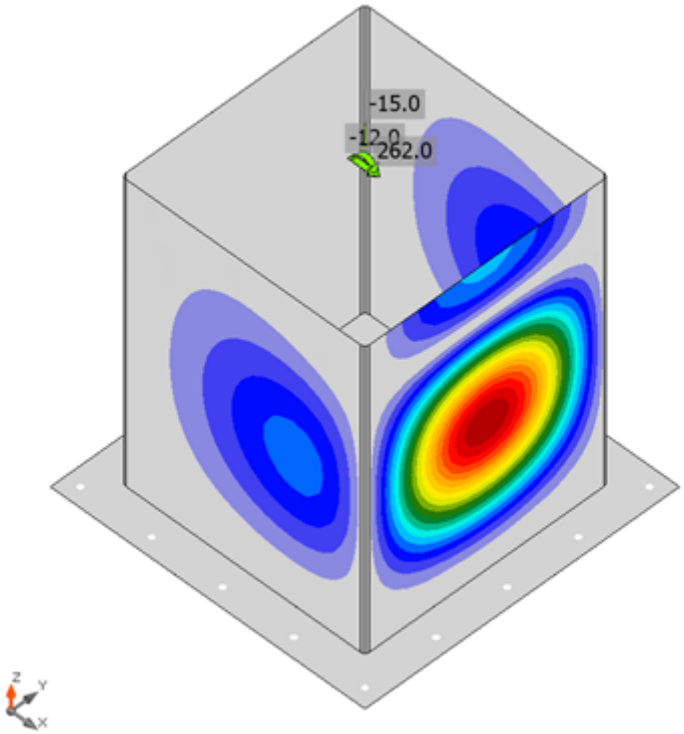
Name	Loads	V_y [kN]	V_z [kN]	$V_{Rd,y}$ [kN]	$V_{Rd,z}$ [kN]	U_t [%]	Status
BP1	LE1	0.0	-12.0	99.8	99.8	12.0	OK

Symbol explanation

V_y	Shear force in base plate Vy
V_z	Shear force in base plate Vz
$V_{Rd,y}$	Shear resistance
$V_{Rd,z}$	Shear resistance
U_t	Utilization

Buckling

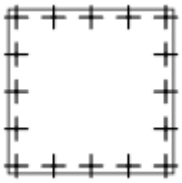
Loads	Shape	Factor [-]
LE1	1	6.64
	2	7.17
	3	11.49
	4	14.98
	5	18.98
	6	19.57



First buckling mode shape, LE1

Bill of material

Manufacturing operations

Name	Plates [mm]	Shape	Nr.	Welds Throat thickness [mm]	Length [mm]	Bolts	Nr.
BP1	P25.0x1150.0-1150.0 (S 355)		1	Butt: 10.0	3533.2	M20 8.8	16

Welds

Type	Material	Throat thickness [mm]	Leg size [mm]	Length [mm]
Butt	S 355	-	-	3533.2

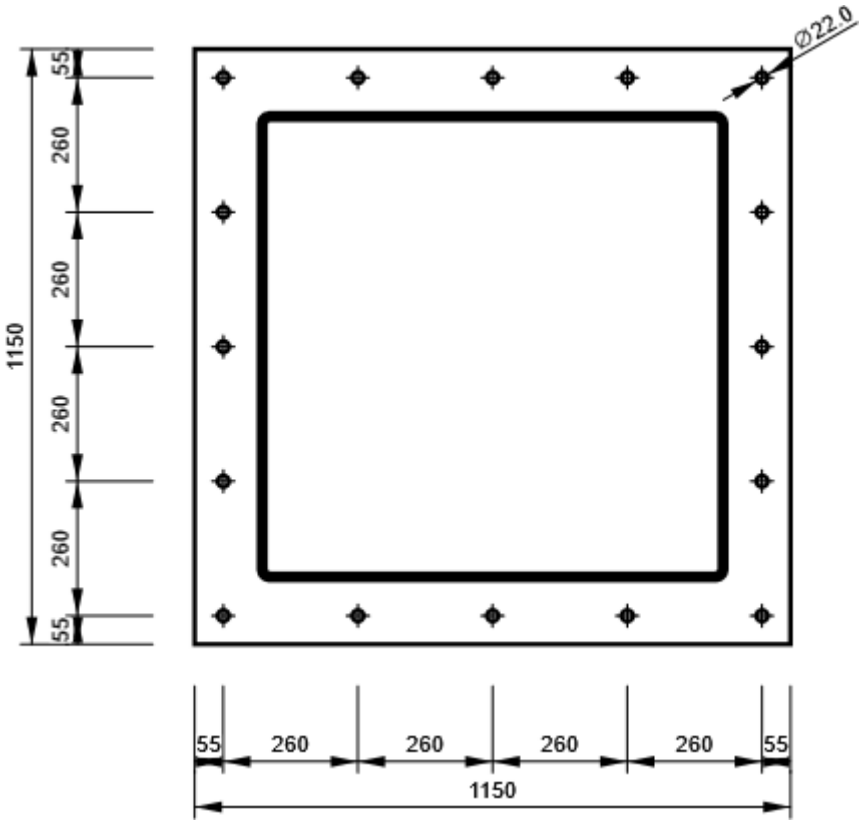
Anchors

Name	Length [mm]	Drill length [mm]	Count
M20 8.8	1325	1300	16

Drawing

BP1

P25.0x1150-1150 (S 355)



Code settings

Item	Value	Unit	Reference
Safety factor γ_{M0}	1.00	-	EN 1993-1-1: 6.1
Safety factor γ_{M1}	1.00	-	EN 1993-1-1: 6.1
Safety factor γ_{M2}	1.25	-	EN 1993-1-1: 6.1
Safety factor γ_{M3}	1.25	-	EN 1993-1-8: 2.2
Safety factor γ_{C}	1.50	-	EN 1992-1-1: 2.4.2.4
Safety factor γ_{Inst}	1.20	-	EN 1992-4: Table 4.1
Joint coefficient βj	0.67	-	EN 1993-1-8: 6.2.5
Effective area - influence of mesh size	0.10	-	
Friction coefficient - concrete	0.25	-	EN 1993-1-8
Friction coefficient in slip-resistance	0.30	-	EN 1993-1-8 tab 3.7
Limit plastic strain	0.05	-	EN 1993-1-5
Detailing	Yes		
Distance between bolts [d]	2.20	-	EN 1993-1-8: tab 3.3
Distance between bolts and edge [d]	1.20	-	EN 1993-1-8: tab 3.3
Concrete breakout resistance check	None		EN 1992-4: 7.2.1.4 and 7.2.2.5
Use calculated αb in bearing check.	Yes		EN 1993-1-8: tab 3.4
Cracked concrete	No		EN 1992-4
Local deformation check	Yes		CIDECT DG 1, 3 - 1.1
Local deformation limit	0.03	-	CIDECT DG 1, 3 - 1.1
Geometrical nonlinearity (GMNA)	Yes		Analysis with large deformations for hollow section joints
Braced system	No		EN 1993-1-8: 5.2.2.5

(temelj je dimenzioniran na nosilnost stebra Mu=897kNm, delovanje obtežbe 45°)

NOSILNOST TEMELJNIH TAL

Vhodni podatki

Materialne karakteristike

IG 2b

c' =	0	kPa
φ' =	33	°
γ' =	19	kN/m³

Dimenzije temelja

D =	2,60	m pod koto izkopa
B =	4,70	m - v smeri x
L =	4,70	m - v smeri y
T=	0,75	m

Tampon pod temeljem (v m)

d_t =	0,00	m

Obremenitev

P_{Ed} =	833,0	kN, kN/m
$H_{x,Ed}$ =	28,8	kN, kN/m
$H_{y,Ed}$ =	28,8	kN, kN/m
$M_{yy,Ed}$ =	709,0	kNm, kNm/m
$M_{xx,Ed}$ =	709,0	kNm, kNm/m
Q_k =		kN, kN/m

dopustna napetost pod temeljem

q_{dop} =	1.728,4	kPa
(q_{dop} =	703,2	kPa)

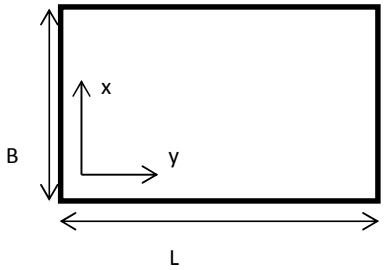
računska napetost pod temeljem

q_d =	92,69	kPa

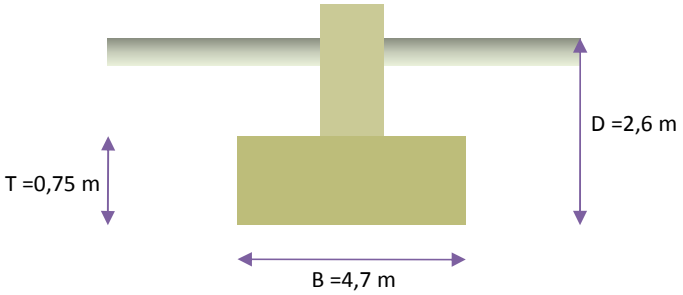
temelj	*414,1875*	m³
zemljina	*776,4635*	m³

Izračun (EC7)

q' =	49,40	kPa
N_q =	26,09	
N_c =	38,64	
N_γ =	32,59	
e_x =	0,85	m
e_y =	0,85	m
B' =	3,00	m
L' =	3,00	m
s_q =	1,545	
s_c =	1,566	
s_γ =	0,700	
i_q =	0,928	
i_c =	0,931	
i_γ =	0,882	



računska odpornost temelja: R_d = 15.533.3 kN	>	**računska obremenitev temelja:** V_d = 833.0 kN



moment odpora točka A (EQU) M_{odpor} = 2.041.7 kN	>	**moment prevrnitve točka A** M_{prev} = 897.0 kN

NOSILNOST TEMELJNIH TAL

Vhodni podatki

Materialne karakteristike

IG 2b

c' =	0	kPa
φ' =	33	°
γ' =	19	kN/m^3

Dimenzije temelja

D =	2,20	m pod koto izkopa
B =	4,50	m - v smeri x
L =	4,50	m - v smeri y
T=	0,80	m

Tampon pod temeljem (v m)

d_t =	0,00	m

Obremenitev

P_{Ed} =	586,8	kN, kN/m
$H_{x,Ed}$ =	0,0	kN, kN/m
$H_{y,Ed}$ =	40,8	kN, kN/m
$M_{yy,Ed}$ =	0,0	kNm, kNm/m
$M_{xx,Ed}$ =	986,7	kNm, kNm/m
Q_k =		kN, kN/m

dopustna napetost pod temeljem

q_{dop} =	2.007,4	kPa
(q_{dop} =	507,1	kPa)

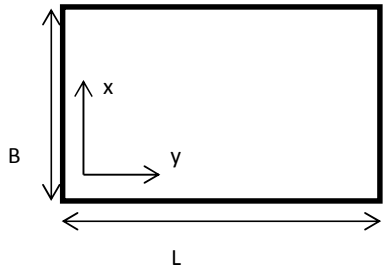
računska napetost pod temeljem

q_d =	114,71	kPa

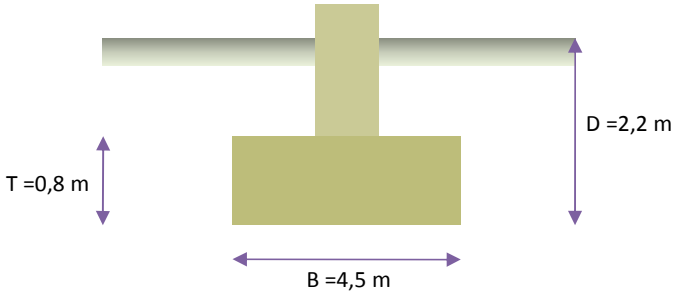
temelj	*405*	m^3
zemljina	*538,65*	m^3

Izračun (EC7)

q' =	41,80	kPa
N_q =	26,09	
N_c =	38,64	
N_γ =	32,59	
e_x =	0,00	m
e_y =	1,68	m
B' =	4,50	m
L' =	1,14	m
s_q =	3,156	
s_c =	3,242	
s_γ =	-0,188	
i_q =	0,879	
i_c =	0,885	
i_γ =	0,817	



računska odpornost temelja: R_d = 10.268.3 kN	>	**računska obremenitev temelja:** V_d = 586.8 kN



moment odpora točka A (EQU) M_{odpor} = 1.188.2 kN	>	**moment prevrnitve točka A** M_{prev} = 986.7 kN

2 DIMENZIONIRANJE PODKONSTRUKCIJE LED ZASLONA

2.1 OBTEŽBE

Konstrukcija je bila preverjena na vse predpisane obtežbe standardov

- SIST EN 1991-1-1:2004, SIST EN 1991-1-1:2004/A101:2005– določitev stalne obtežbe
- SIST EN 1991-1-4:2005, SIST EN 1991-1-4:2005/oA10:2007– določitev vetrne obtežbe

a Teže izbranih materialov

prostorninska teža betona	$\gamma_c = 25$ kN/m^3
prostorninska teža jekla	$\gamma_z = 78.5$ kN/m^3
teža zaslona	$g = 0.40$ kN/m^2

b Varnostni faktorji za dimenzioniranje

MSN:	$\gamma_Q = 1.50$, $\gamma_G = 1.35$
MSU:	$\gamma_Q = 1.00$, $\gamma_G = 1.00$

2.2 HORIZONTALNE OBTEŽBE

2.2.1 VETRNA OBTEŽBA

Obtežba vetra CONA 3:	$q_b = 0{,}56$kN/m^2
- Ref. hitrost vetra:	30 m/s
- Kat terena:	I. kategorija
- Višina objekta	5,00m
- Faktor oblike	$c_f = 1.8$
Tlak konične hitrosti:	$qp(z) = 1{,}43$kN/m^2

2.3 IZPISKI IZRAČUNOV

- Dimenzioniranje kovinske podkonstrukcije
- Dimenzioniranje sidrišča stebra
- Dimenzioniranje točkovnega temelja

Vhodni podatki - Konstrukcija

Shema nivojev

Naziv	z [m]	h [m]
vrh panoja	5.00	5.00

Naziv	z [m]	h [m]
temelj	0.00	

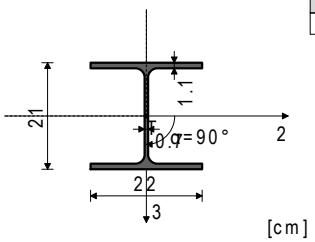
Tabele materialov

No	Naziv materiala	E[kN/m2]	μ	γ[kN/m3]	αt[1/C]	Em[kN/m2]	μm
1	Jeklo	2.100e+8	0.30	78.50	1.200e-5	2.100e+8	0.30

Seti gred

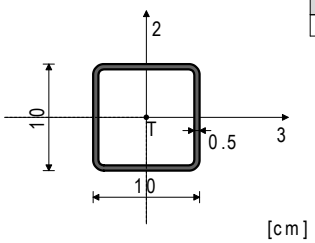
Set: 1 Prerez: IPBl 220, Fiktivna ekscentričnost

Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	6.430e-3	4.367e-3	2.063e-3	2.860e-7	5.410e-5	1.950e-5



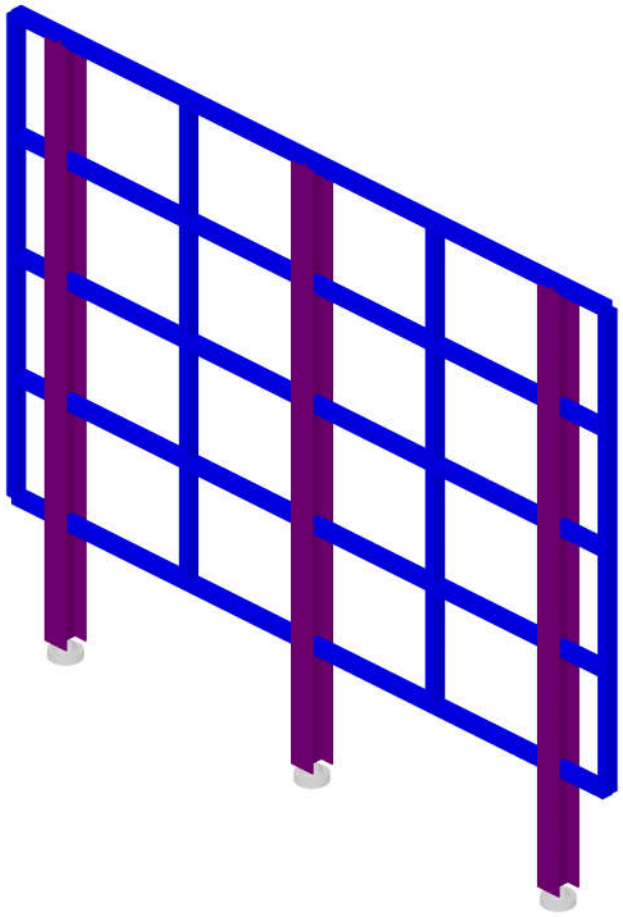
Set: 2 Prerez: HOP [] 100x100x5, Fiktivna ekscentričnost

Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	1.836e-3	1.000e-3	1.000e-3	4.390e-6	2.618e-6	2.618e-6



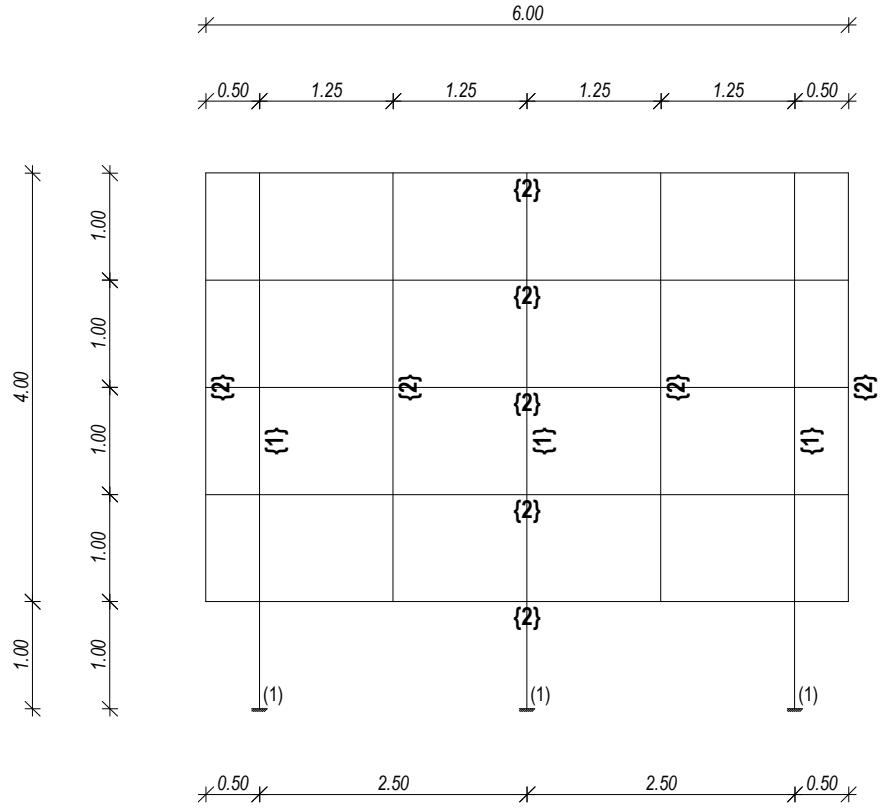
Seti točkovnih podpor

Set	K,R1	K,R2	K,R3	K,M1	K,M2	K,M3
1	1.000e+10	1.000e+10	1.000e+10	1.000e+10	1.000e+10	1.000e+10



Seti numeričnih podatkov
Greda (1,2)

Vhodni podatki - Konstrukcija, Vhodni podatki - Obtežba

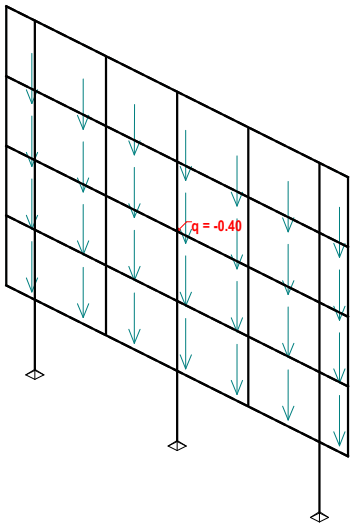


Okvir: H_1

Lista obtežnih primerov

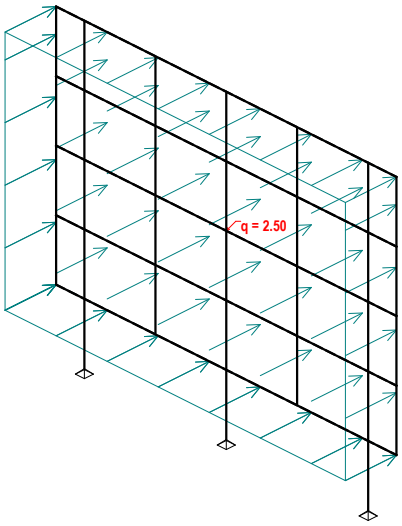
LC	Naziv	pX [kN]	pY [kN]	pZ [kN]
1	lastna (g)	0.00	0.00	-23.80
2	veter CONA 3	0.00	60.00	0.00
3	Komb.: 1.35xI+1.5xII	0.00	90.00	-32.13
4	Komb.: I+II	0.00	60.00	-23.80

Obt. 1: lastna (g)



Izometrija

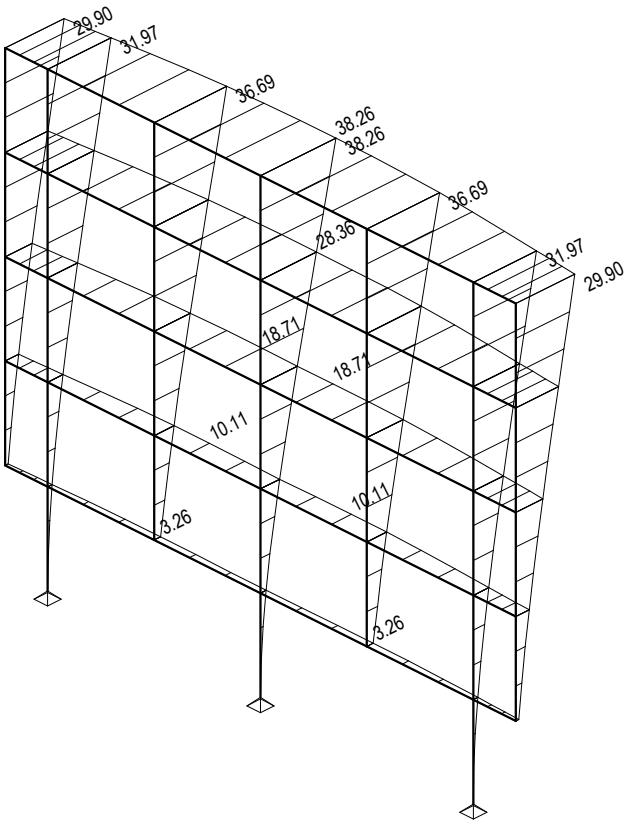
Obt. 2: veter CONA 3



Izometrija

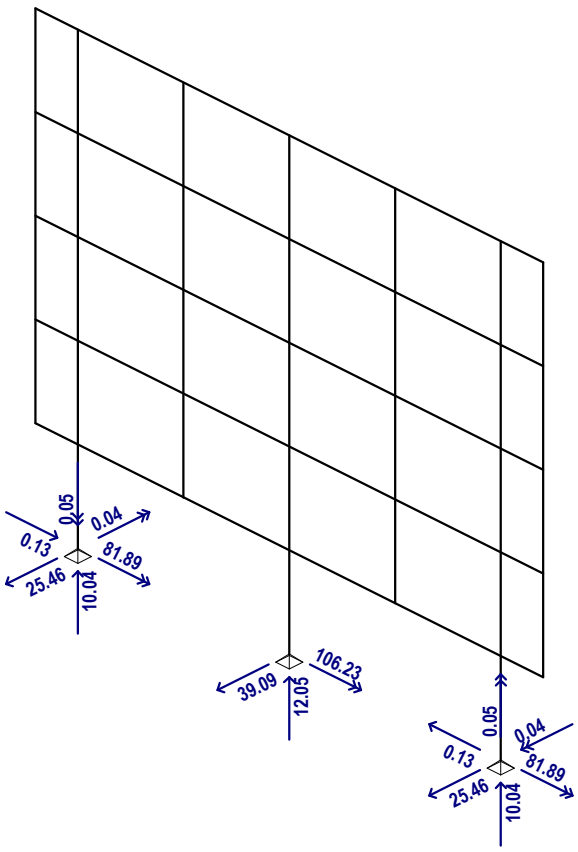
Statični preračun

Obt. 4: I+II



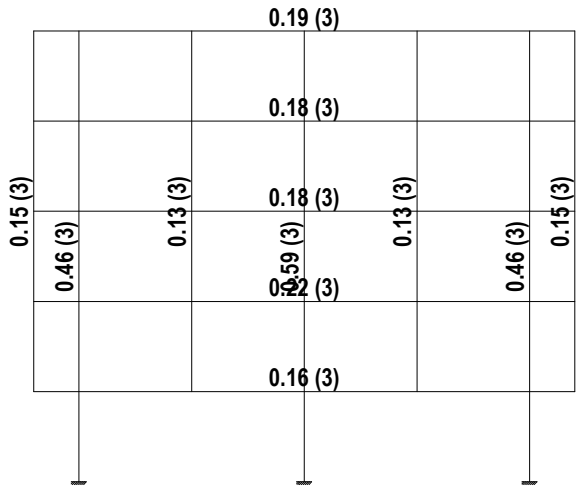
Izometrija
Vplivi v gredi: max Yp= 38.26 / min Yp= 0.00 m / 1000

Obt. 3: 1.35xI+1.5xII

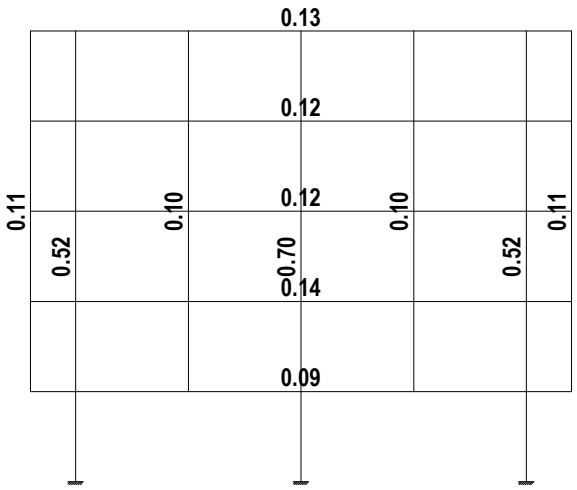


Izometrija
Reakcije podpor

Dimenzioniranje (jeklo)



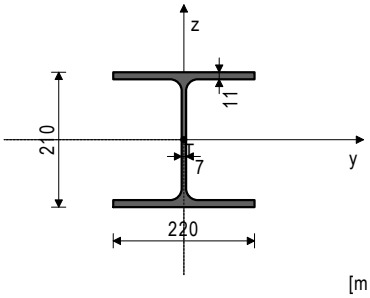
Okvir: H_1
Kontrola napetosti



Okvir: H_1
Kontrola stabilnosti

PALICA 8-29
PREČNI PREREZ: IPBI 220 [S 355] [Set: 1]
EUROCODE 3 (EN 1993-1-1:2005)

GEOMETRIJSKE KARAKTERISTIKE prereza



[mm]

Ax =	64.300	cm2
Ay =	43.670	cm2
Az =	20.630	cm2
Ix =	28.600	cm4
Iy =	5410.0	cm4
Iz =	1950.0	cm4
Wy =	515.24	cm3
Wz =	177.27	cm3
Wy,pl =	561.84	cm3
Wz,pl =	266.20	cm3
γM0 =	1.000	
γM1 =	1.000	
γM2 =	1.250	
Anet/A =	0.900	

(fy = 35.5 kN/cm2, fu = 51.0 kN/cm2)

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB
3. γ=0.70 4. γ=0.47

PALICA IZPOSTAVLJENA PRITISKU IN UPOGIBU
(obtežni primer 3, konec palice)

Računska osna sila	N_{Ed} =	-12.047 kN
Prečna sila v z smeri	$V_{Ed,z}$ =	-39.088 kN
Upogibni moment okoli y osi	$M_{Ed,y}$ =	106.23 kNm
Sistemska dolžina palice	L =	500.00 cm

5.5 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 2

6.2 NOSILNOST PREČNIH PREREZOV
6.2.4 Tlak
Računska nosilnost na tlak $N_{c,Rd}$ = 2282.7 kN
Pogoj 6.9: N_{Ed} <= $N_{c,Rd}$ (12.05 <= 2282.65)

6.2.5 Upogib y-y
Upoštevajo se tudi luknje za vezna sredstva.
Efektivni odpornostni moment $W_{y,eff}$ = 440.65 cm3
Računska nosilnost na upogib $M_{c,Rd}$ = 156.43 kNm
Pogoj 6.12: $M_{Ed,y}$ <= $M_{c,Rd,y}$ (106.23 <= 156.43)

6.2.6 Strig
Računska strižna nosilnost $V_{pl,Rd,z}$ = 422.83 kN
Računska strižna nosilnost $V_{c,Rd,z}$ = 422.83 kN
Pogoj 6.17: $V_{Ed,z}$ <= $V_{c,Rd,z}$ (39.09 <= 422.83)

6.2.10 Upogib z osno in prečno silo
Ni potrebno zmanjšanje upogibne nosilnosti
Pogoj: $V_{Ed,z}$ <= 50%$V_{pl,Rd,z}$

6.2.9 Upogib in osna sila
Razmerje N_{Ed} / $N_{pl,Rd}$ 0.005
Zmanjšana plast.upogibna nosilnost $M_{N,y,Rd}$ = 199.45 kNm
Koeficient α = 1.000
Razmerje ($M_{y,Ed}$ / $M_{N,y,Rd}$)^α 0.533
Pogoj 6.41: (0.53 <= 1)

6.3 NOSILNOST ELEMENTA NA UKLON
6.3.1.1 Nosilnost na uklon

Uklonska dolžina y-y	l,y =	500.00 cm
Relativna vitkost y-y	λ_y =	0.713
Uklonska krivulja za os y-y: B	α =	0.340
Elastična kritična sila	N_{cr},y =	4485.1 kN
Koeficient nepopolnosti	χ,y =	0.776
Računska uklonska nosilnost	$N_{b,Rd,y}$ =	1771.5 kN

Pogoj 6.46: N_{Ed} <= $N_{b,Rd,y}$ (12.05 <= 1771.54)

Uklonska dolžina z-z	l,z =	500.00 cm
Relativna vitkost z-z	λ_z =	1.188
Uklonska krivulja za os z-z: C	α =	0.490
Koeficient nepopolnosti	χ,z =	0.439
Računska uklonska nosilnost	$N_{b,Rd,z}$ =	1003.0 kN

Pogoj 6.46: N_{Ed} <= $N_{b,Rd,z}$ (12.05 <= 1003.01)

6.3.2.1 Nosilnost na bočno-torzijski uklon

Koeficient	C1 =	1.132
Koeficient	C2 =	0.459
Koeficient	C3 =	0.525
Koef.ukl.dolžine za uklon	k =	1.000
Koef.ukl.dolžine za vbočenje	kw =	1.000
Koordinata	zg =	0.000 cm
Koordinata	zj =	0.000 cm
Razmak med bočnimi podporami	L =	500.00 cm
Sektorski vztrajnostni moment	Iw =	1.93e+5 cm6
Krit.moment bočne zvrnitve	Mcr =	284.69 kNm
Ustrezni odpornostni moment	W_y =	561.84 cm3
Koeficient imperf.	αLT =	0.210
Brezdimenz.vitkost	λLT_ =	0.837
Koeficient zmanjšanja (6.3.2.2.)	χLT =	0.774
Računska uklonska nosilnost	$M_{b,Rd}$ =	154.35 kNm

Pogoj 6.54: $M_{Ed,y}$ <= $M_{b,Rd}$ (106.23 <= 154.35)

6.3.3. Elementi konstantnega prečnega prereza obremenjeni z upogibom in osnim tlakom
Preračun koeficienta interakcije je izvršen z alternativno metodo št.2 (Aneks B)

Koeficient oblike momenta	C_{my} =	0.552
Koeficient oblike momenta	C_{mz} =	1.000
Koeficient oblike momenta	C_{mLT} =	0.552
Koeficient interakcije	k_{yy} =	0.554
Koeficient interakcije	k_{yz} =	0.610
Koeficient interakcije	k_{zy} =	0.996
Koeficient interakcije	k_{zz} =	1.017

Koeficient nepopolnosti χ_y = 0.776
N_{Ed} / (χ_y N_{Rk} / γM1) 0.007
kyy * (M_{yEd} + ΔM_{yEd}) / ... 0.381
Pogoj 6.61: (0.39 <= 1)

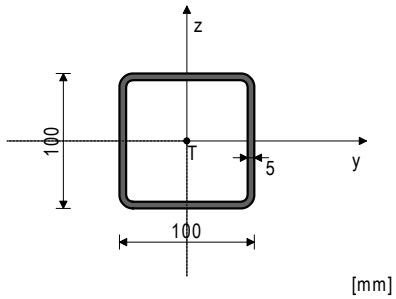
Koeficient nepopolnosti χ_z = 0.439
N_{Ed} / (χ_z N_{Rk} / γM1) 0.012
kzy * (M_{yEd} + ΔM_{yEd}) / ... 0.685
Pogoj 6.62: (0.70 <= 1)

Dimenzioniranje (jeklo)

PALICA 30-4

PREČNI PREREZ: HOP [] 100x100x5 [S 235] [Set: 2]
EUROCODE 3 (EN 1993-1-1:2005)

GEOMETRIJSKE KARAKTERISTIKE prereza



Ax =	18.360	cm2
Ay =	9.180	cm2
Az =	9.180	cm2
Ix =	438.99	cm4
Iy =	261.77	cm4
Iz =	261.77	cm4
Wy =	52.354	cm3
Wz =	52.354	cm3
Wy,pl =	67.750	cm3
Wz,pl =	67.750	cm3
γM0 =	1.000	
γM1 =	1.000	
γM2 =	1.250	
Anet/A =	0.900	

(fy = 23.5 kN/cm2, fu = 36.0 kN/cm2)

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB
3. γ=0.14 4. γ=0.09

PALICA IZPOSTAVLJENA NATEGU IN UPOGIBU
(obtežni primer 3, na 300.0 cm od začetka palice)

Računska osna sila	N_{Ed} =	0.063	kN
Prečna sila v y smeri	$V_{Ed,y}$ =	5.746	kN
Prečna sila v z smeri	$V_{Ed,z}$ =	0.942	kN
Upogibni moment okoli y osi	$M_{Ed,y}$ =	-0.397	kNm
Upogibni moment okoli z osi	$M_{Ed,z}$ =	-2.193	kNm
Moment torzije	M_t =	-0.195	kNm
Sistemska dolžina palice	L =	600.00	cm

5.5 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

6.2 NOSILNOST PREČNIH PREREZOV
6.2.3 Nateg

Plast.rač.nosilnost bruto prereza	$N_{pl,Rd}$ =	431.46	kN
Mejna rač.nosilnost neto prereza	$N_{u,Rd}$ =	428.30	kN
Računska nos. na nateg	$N_{t,Rd}$ =	428.30	kN

Pogoj 6.5: N_{Ed} <= $N_{t,Rd}$ (0.06 <= 428.30)

6.2.5 Upogib y-y

Plastični odpornostni moment	Wy,pl =	67.750	cm3
Računska nosilnost na upogib	$M_{c,Rd}$ =	15.921	kNm

Pogoj 6.12: $M_{Ed,y}$ <= $M_{c,Rd,y}$ (0.40 <= 15.92)

6.2.5 Upogib z-z

Plastični odpornostni moment	Wz,pl =	67.750	cm3
Računska nosilnost na upogib	$M_{c,Rd}$ =	15.921	kNm

Pogoj 6.12: $M_{Ed,z}$ <= $M_{c,Rd,z}$ (2.19 <= 15.92)

6.2.6 Strig

Računska strižna nosilnost	$V_{pl,Rd,z}$ =	124.55	kN
Računska strižna nosilnost	$V_{c,Rd,z}$ =	124.55	kN

Pogoj 6.17: $V_{Ed,z}$ <= $V_{c,Rd,z}$ (0.94 <= 124.55)

Računska strižna nosilnost	$V_{pl,Rd,y}$ =	124.55	kN
Računska strižna nosilnost	$V_{c,Rd,y}$ =	124.55	kN

Pogoj 6.17: $V_{Ed,y}$ <= $V_{c,Rd,y}$ (5.75 <= 124.55)

6.2.10 Upogib z osno in prečno silo
Ni potrebno zmanjšanje upogibne nosilnosti
Pogoj: $V_{Ed,z}$ <= 50%$V_{pl,Rd,z}$; $V_{Ed,y}$ <= 50%$V_{pl,Rd,y}$

6.2.9 Upogib in osna sila

Razmerje N_{Ed} / $N_{pl,Rd}$		0.000	
Zmanjšana plast.upogibna nosilnost	$M_{N,z,Rd}$ =	15.921	kNm
Koeficient	β =	1.660	
Razmerje ($M_{z,Ed}$ / $M_{N,z,Rd}$)^β		0.037	

Pogoj 6.41: (0.04 <= 1)

Project data

Project name	stadion Ajdovščina
Project number	116/23
Author	corus inženirji d.o.o.
Description	
Date	6/20/2024
Code	EN

Material

Steel	S 355
Concrete	C30/37

Project item STEBER LCD

Design

Name	STEBER LCD
Description	sidranje stebra
Analysis	Stress, strain/ loads in equilibrium

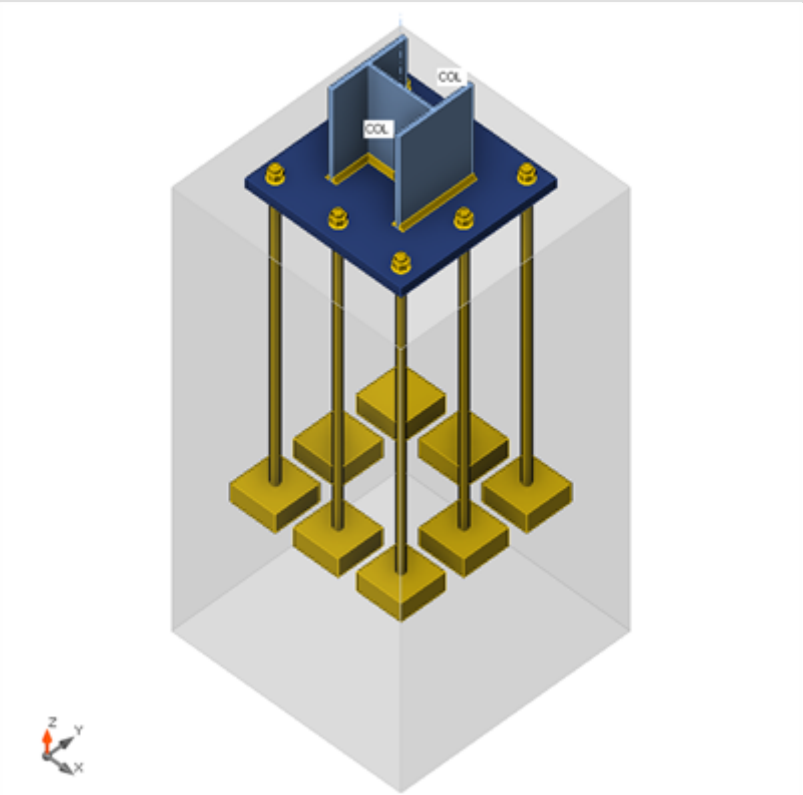
Members

Geometry

Name	Cross-section	β – Direction [°]	γ - Pitch [°]	α - Rotation [°]	Offset ex [mm]	Offset ey [mm]	Offset ez [mm]
COL	1 - CON1(HEA200)	0.0	90.0	0.0	0	0	0

Supports and forces

Name	Support	Forces in	X [mm]
COL / end		Node	0



Cross-sections

Name	Material
1 - CON1(HEA200)	S 355

Anchors

Name	Diameter [mm]	f_y [MPa]	f_u [MPa]	Gross area [mm^2]
M20 8.8	20	640.0	800.0	314

Load effects (forces in equilibrium)

Name	Member	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
LE1	COL / End	-12.0	0.0	-40.0	0.0	106.0	0.0

Unbalanced forces

Name	X [kN]	Y [kN]	Z [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
LE1	40.0	0.0	-12.0	0.0	106.0	0.0

Foundation block

Item	Value	Unit
CB 1		
Dimensions	620 x 620	mm
Depth	1200	mm
Anchor	M20 8.8	
Anchoring length	800	mm
Shear force transfer	Friction	

Check

Summary

Name	Value	Check status
Analysis	100.0%	OK
Plates	2.3 < 5.0%	OK
Anchors	98.6 < 100%	OK
Welds	98.5 < 100%	OK
Concrete block	57.9 < 100%	OK
Shear	35.0 < 100%	OK
Buckling	Not calculated	

Plates

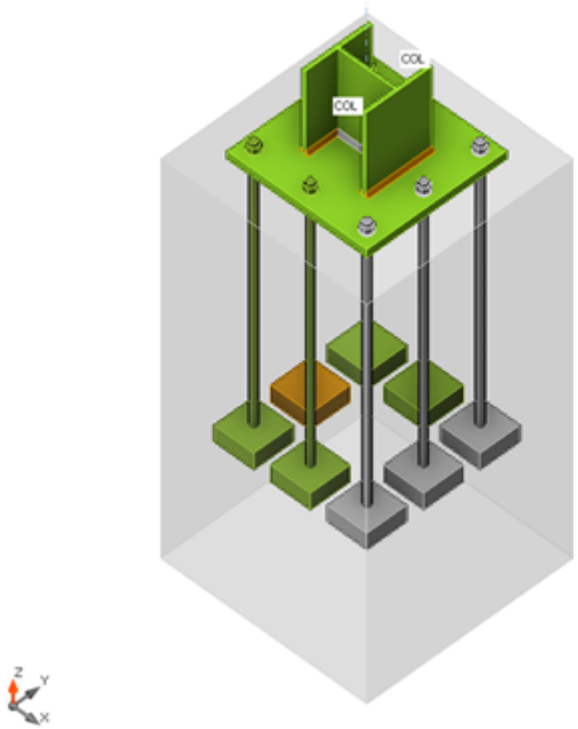
Name	t_p [mm]	Loads	σ_{Ed} [MPa]	ε_{Pl} [%]	$\sigma_{c,Ed}$ [MPa]	Status
COL-bfl 1	10.0	LE1	355.9	0.4	0.0	OK
COL-tfl 1	10.0	LE1	359.8	2.3	0.0	OK
COL-w 1	6.5	LE1	355.5	0.3	0.0	OK
BP1	25.0	LE1	355.9	0.4	0.0	OK

Design data

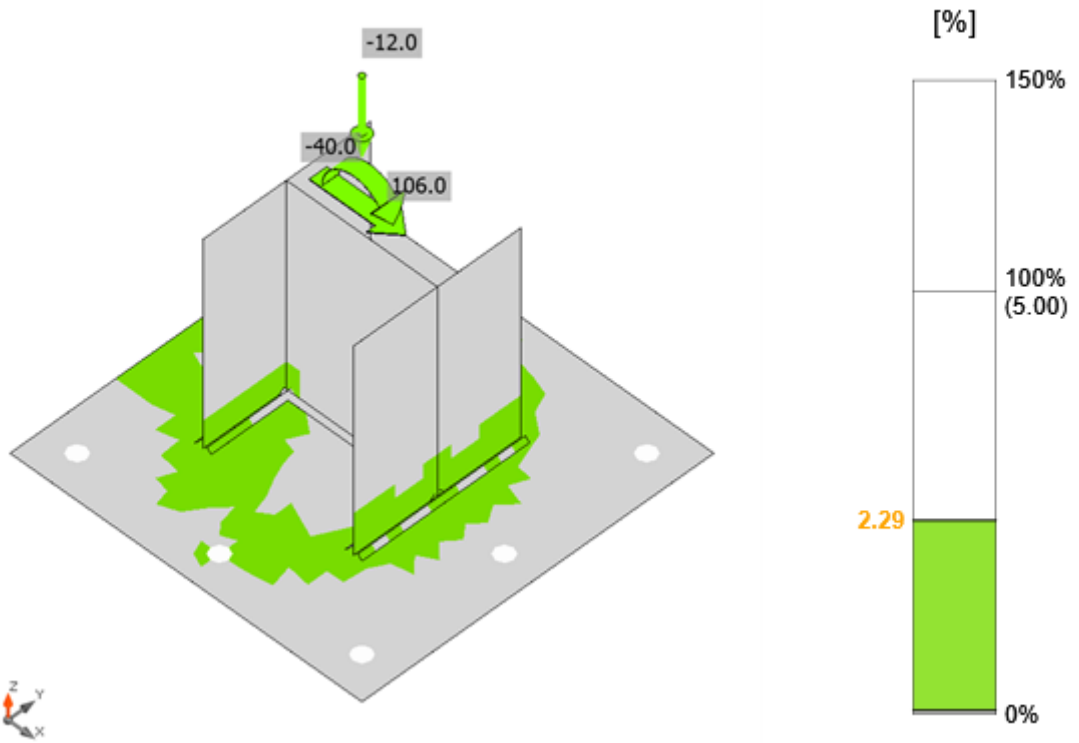
Material	f_y [MPa]	ε_{lim} [%]
S 355	355.0	5.0

Symbol explanation

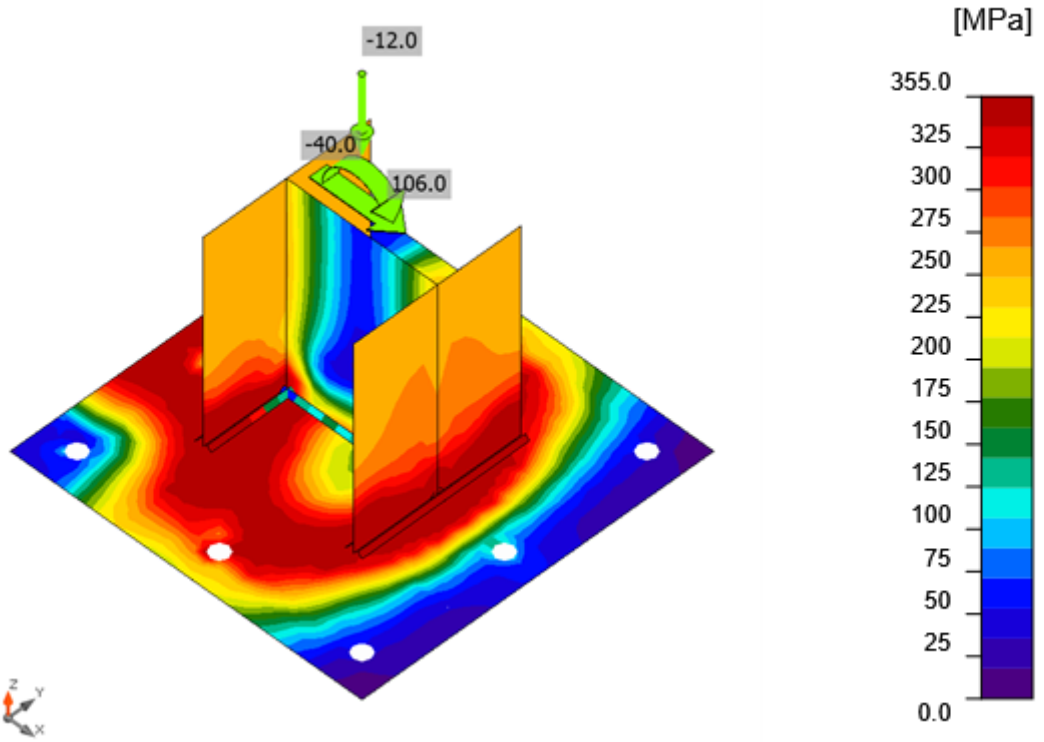
t_p	Plate thickness
σ_{Ed}	Equivalent stress
ε_{Pl}	Plastic strain
$\sigma_{c,Ed}$	Contact stress
f_y	Yield strength
ε_{lim}	Limit of plastic strain



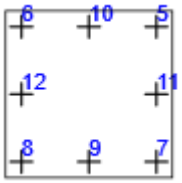
Overall check, LE1



Strain check, LE1



Equivalent stress, LE1

Shape	Item	Loads	N_{Ed} [kN]	V_{Ed} [kN]	$N_{Rd,p}$ [kN]	$N_{Rd,cb}$ [kN]	Ut_t [%]	Ut_s [%]	Ut_{ts} [%]	Detailing	Status
	A5	LE1	91.8	0.0	2465.0	876.3	82.6	0.0	68.3	OK	OK
	A6	LE1	91.7	0.0	2465.0	876.3	82.6	0.0	68.2	OK	OK
	A7	LE1	0.0	0.0	2465.0	-	0.0	0.0	0.0	OK	OK
	A8	LE1	0.0	0.0	2465.0	-	0.0	0.0	0.0	OK	OK
	A9	LE1	0.0	0.0	2465.0	-	0.0	0.0	0.0	OK	OK
	A10	LE1	109.5	0.0	2465.0	876.3	98.6	0.0	97.2	OK	OK
	A11	LE1	67.6	0.0	2465.0	560.9	60.9	0.0	37.0	OK	OK
	A12	LE1	67.6	0.0	2465.0	560.9	60.8	0.0	37.0	OK	OK

Design data

Grade	$N_{Rd,s}$ [kN]	$V_{Rd,s}$ [kN]
M20 8.8 - 1	111.1	78.4

Symbol explanation

N_{Ed}	Tension force
V_{Ed}	Resultant of bolt shear forces Vy and Vz in shear planes
$N_{Rd,p}$	Design resistance in case of pull-out failure - EN 1992-4 – 7.2.1.5
$N_{Rd,cb}$	Design resistance in case of concrete blow-out failure - EN 1992-4 – 7.2.1.8
Ut_t	Utilization in tension
Ut_s	Utilization in shear
Ut_{ts}	Utilization in tension and shear
$N_{Rd,s}$	Design tensile resistance of a fastener in case of steel failure - EN 1992-4 – 7.2.1.3
$V_{Rd,s}$	Design shear resistance of a fastener in case of steel failure - EN 1992-4 – 7.2.2.3.1

Welds

Item	Edge	T_w [mm]	L [mm]	Loads	$\sigma_{w,Ed}$ [MPa]	ε_{Pl} [%]	$\sigma_{\perp}$ [MPa]	$\tau_{\perp}$ [MPa]	$\tau_{\parallel}$ [MPa]	Ut [%]	Ut_c [%]	Detailing	Status
BP1	COL-bfl 1	◢ 7.0 ◣	199	LE1	398.8	0.0	-141.3	-202.6	-72.8	91.6	82.9	OK	OK
		◢ 7.0 ◣	199	LE1	427.0	0.1	-273.5	178.2	64.1	98.0	90.5	OK	OK
BP1	COL-tfl 1	◢ 7.0 ◣	199	LE1	429.0	1.2	182.9	171.9	143.6	98.5	96.9	OK	OK
		◢ 7.0 ◣	199	LE1	428.9	1.2	177.0	-188.2	-124.4	98.5	98.5	OK	OK
BP1	COL-w 1	◢ 7.0 ◣	179	LE1	158.9	0.0	60.2	60.9	59.2	36.5	17.8	OK	OK
		◢ 7.0 ◣	179	LE1	159.4	0.0	61.1	-60.3	-59.9	36.6	18.1	OK	OK

Design data

Material	f_u [MPa]	β_w [-]	$\sigma_{w,Rd}$ [MPa]	0.9 σ [MPa]
S 355	490.0	0.90	435.6	352.8

Symbol explanation

T_w	Throat thickness a
L	Length
$\sigma_{w,Ed}$	Equivalent stress
ε_{Pl}	Strain
$\sigma_{\perp}$	Perpendicular stress
$\tau_{\perp}$	Shear stress perpendicular to weld axis
$\tau_{\parallel}$	Shear stress parallel to weld axis
Ut	Utilization
Ut_c	Weld capacity estimation
◢	Fillet weld
f_u	Ultimate strength of weld
β_w	Correlation factor EN 1993-1-8 – Tab. 4.1
$\sigma_{w,Rd}$	Equivalent stress resistance
0.9 σ	Perpendicular stress resistance: 0.9*fu/γM2

Item	Loads	c [mm]	A_{eff} [mm^2]	σ [MPa]	k_j [-]	f_{jd} [MPa]	Ut [%]	Status
CB 1	LE1	43	19610	23.3	3.00	40.2	57.9	OK

Symbol explanation

c	Bearing width
A_{eff}	Effective area
σ	Average stress in concrete
k_j	Concentration factor
f_{jd}	The ultimate bearing strength of the concrete block
Ut	Utilization

Name	Loads	V_y [kN]	V_z [kN]	$V_{Rd,y}$ [kN]	$V_{Rd,z}$ [kN]	U_t [%]	Status
BP1	LE1	0.0	-40.0	114.2	114.2	35.0	OK

Symbol explanation

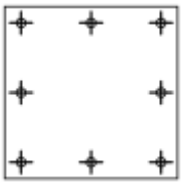
V_y	Shear force in base plate Vy
V_z	Shear force in base plate Vz
$V_{Rd,y}$	Shear resistance
$V_{Rd,z}$	Shear resistance
U_t	Utilization

Buckling

Buckling analysis was not calculated.

Bill of material

Manufacturing operations

Name	Plates [mm]	Shape	Nr.	Welds Throat thickness [mm]	Length [mm]	Bolts	Nr.
BP1	P25.0x420.0-420.0 (S 355)		1	Double fillet: 7.0	580.0	M20 8.8	8

Welds

Type	Material	Throat thickness [mm]	Leg size [mm]	Length [mm]
Double fillet	S 355	7.0	9.9	580.0

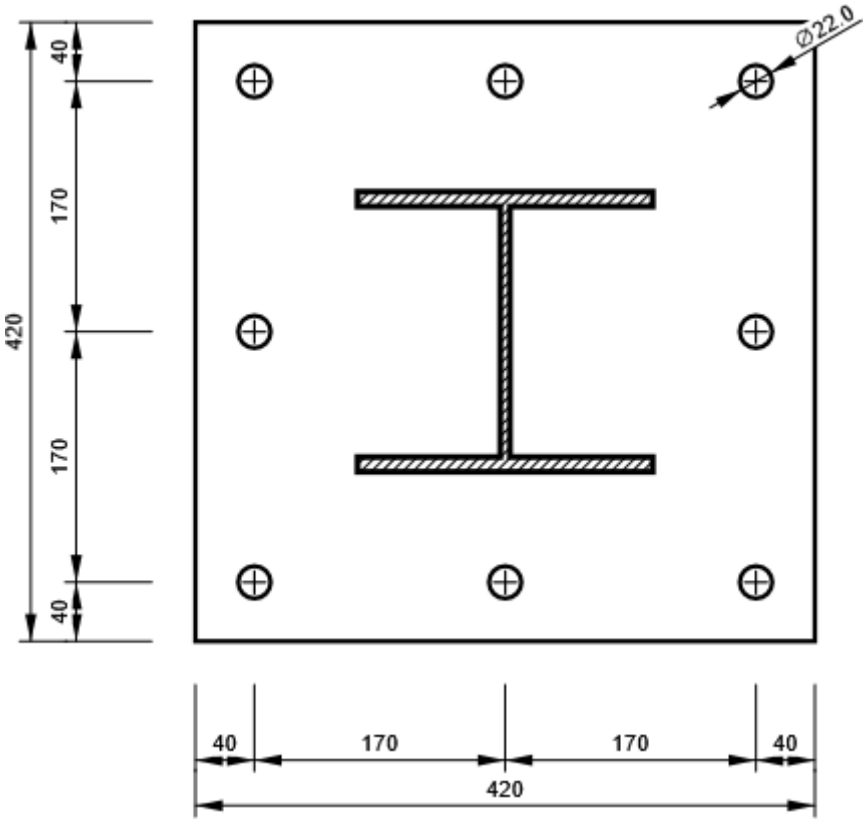
Anchors

Name	Length [mm]	Drill length [mm]	Count
M20 8.8	825	800	8

Drawing

BP1

P25.0x420-420 (S 355)



Code settings

Item	Value	Unit	Reference
Safety factor γ_{M0}	1.00	-	EN 1993-1-1: 6.1
Safety factor γ_{M1}	1.00	-	EN 1993-1-1: 6.1
Safety factor γ_{M2}	1.25	-	EN 1993-1-1: 6.1
Safety factor γ_{M3}	1.25	-	EN 1993-1-8: 2.2
Safety factor γ_{C}	1.50	-	EN 1992-1-1: 2.4.2.4
Safety factor γ_{Inst}	1.20	-	EN 1992-4: Table 4.1
Joint coefficient βj	0.67	-	EN 1993-1-8: 6.2.5
Effective area - influence of mesh size	0.10	-	
Friction coefficient - concrete	0.25	-	EN 1993-1-8
Friction coefficient in slip-resistance	0.30	-	EN 1993-1-8 tab 3.7
Limit plastic strain	0.05	-	EN 1993-1-5
Detailing	Yes		
Distance between bolts [d]	2.20	-	EN 1993-1-8: tab 3.3
Distance between bolts and edge [d]	1.20	-	EN 1993-1-8: tab 3.3
Concrete breakout resistance check	None		EN 1992-4: 7.2.1.4 and 7.2.2.5
Use calculated αb in bearing check.	Yes		EN 1993-1-8: tab 3.4
Cracked concrete	No		EN 1992-4
Local deformation check	Yes		CIDECT DG 1, 3 - 1.1
Local deformation limit	0.03	-	CIDECT DG 1, 3 - 1.1
Geometrical nonlinearity (GMNA)	Yes		Analysis with large deformations for hollow section joints
Braced system	No		EN 1993-1-8: 5.2.2.5

NOSILNOST TEMELJNIH TAL

Vhodni podatki

Materialne karakteristike

IG 2b

c' =	0	kPa
φ' =	33	°
γ' =	19	kN/m^3

Dimenzije temelja

D =	2,00	m pod koto izkopa
B =	1,50	m - v smeri x
L =	3,50	m - v smeri y
T=	0,80	m

Tampon pod temeljem (v m)

d_t =	0,00	m

Obremenitev

P_{Ed} =	138,5	kN, kN/m
$H_{x,Ed}$ =	0,0	kN, kN/m
$H_{y,Ed}$ =	40,0	kN, kN/m
$M_{yy,Ed}$ =	0,0	kNm, kNm/m
$M_{xx,Ed}$ =	190,0	kNm, kNm/m
Q_k =		kN, kN/m

dopustna napetost pod temeljem

q_{dop} =	889,5	kPa
(q_{dop} =	192,2	kPa)

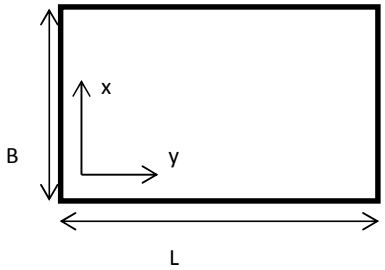
računska napetost pod temeljem

q_d =	122,10	kPa

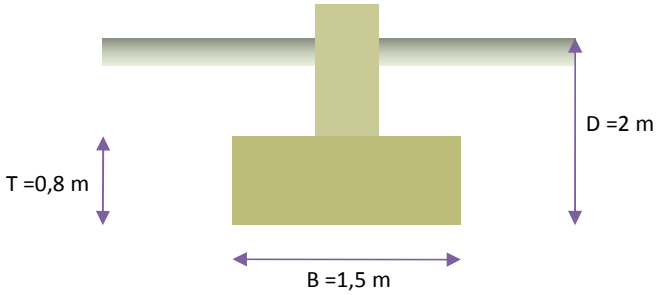
temelj	*105*	m^3
zemljina	*119,7*	m^3

Izračun (EC7)

q' =	38,00	kPa
N_q =	26,09	
N_c =	38,64	
N_γ =	32,59	
e_x =	0,00	m
e_y =	1,37	m
B' =	1,50	m
L' =	0,76	m
s_q =	2,080	
s_c =	2,123	
s_γ =	0,405	
i_q =	0,567	
i_c =	0,589	
i_γ =	0,403	



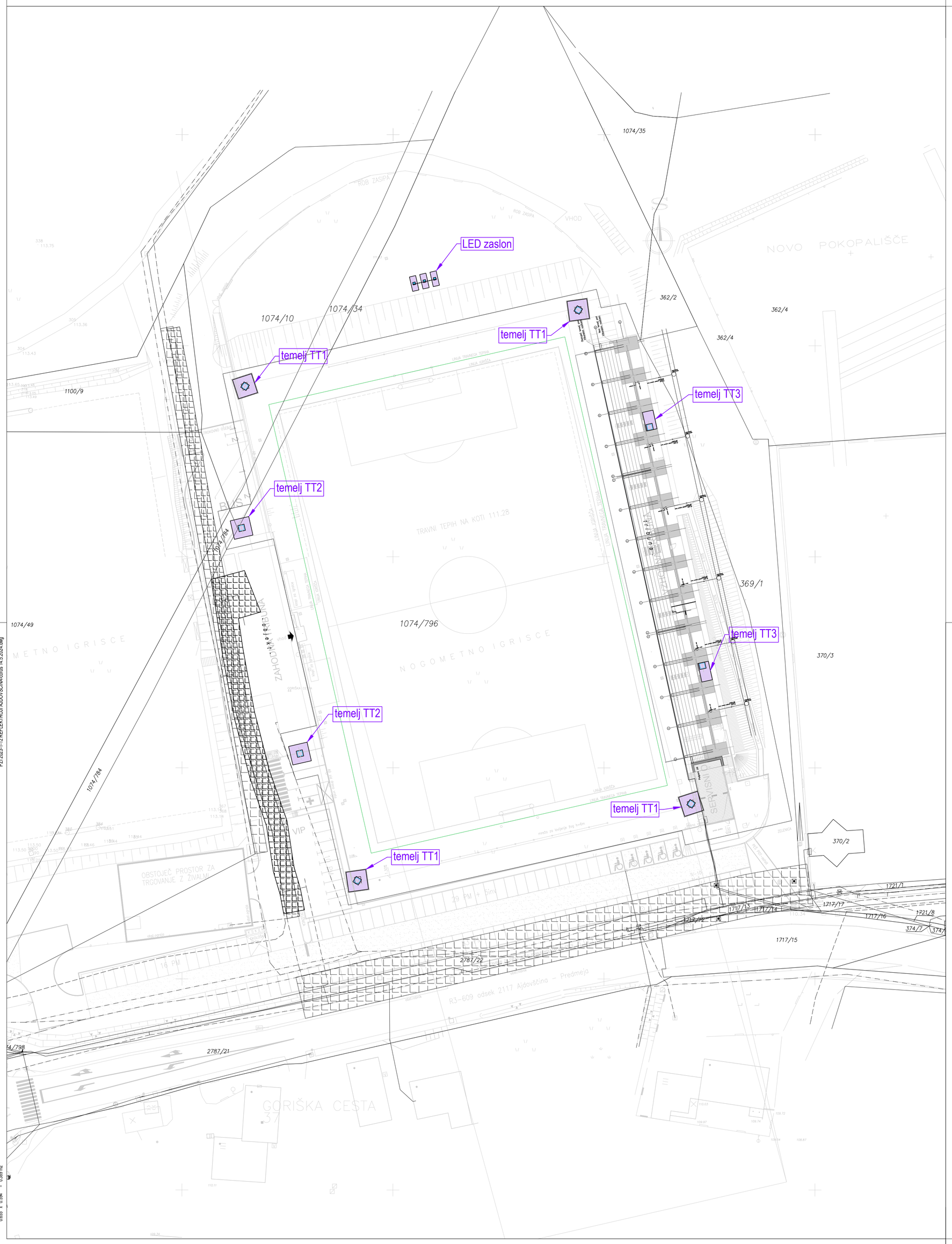
računska odpornost temelja: R_d = 1.008.9 kN	>	**računska obremenitev temelja:** V_d = 138.5 kN



moment odpora točka A (EQU) M_{odpor} = 218.1 kN	>	**moment prevrnitve točka A** M_{prev} = 190.0 kN

G RISBE

OZNAKA	VSEBINA RISBE	MERILO
G1	prikaz pozicij temeljev	1: 500
G2	opažni načrt temeljev	1: 50,25
G3	Armaturni načrt temeljev	1: 50
G4	Pozicijski načrt podkonstrukcije LED zaslona	1: 50
	Izvleček armature	



20.06.2024 08:43
Enertus
PZI 2023-1-12 REFLEKTROJI AJDOVŠČINA-corus 14.5.2024.dwg

0.655 x 0.594 = 0.389 m2

Izvedba razsvetljave in vzdrževalnih del na nogometnem stadionu v Ajdovščini

NAČRT TEMELJEV DROGOV IN KONSTRUKCIJE LCD ZASLONA

PRIKAZ POZICIJ TEMELJEV

MATERIALI			
	ELEMENT	MATERIAL	ZAŠČITNA PLAST
BETON	podložni beton	C 12/15 X0	/
	temelji	C 30/37, XC4 XD3 XF3, PV-II, Cl0,2 Dmax32	50 mm
ARMATURA	palice, mreže	B 500A	
SIDRA	navojne palice	vroče cinkane, kvaliteta 8.8	
KONSTRUKCIJSKO JEKLO	LED zaslon	S235J2 (cevi), S355J2 (profili)	
KOROZIJSKA ZAŠČITA	LED zaslon	SIST EN ISO 1461	min 55µm (povpr. 70µm)
IZVEDBENI RAZRED	LED zaslon	EXC 2	

naziv projekta: Izvedba razsvetljave in vzdrževalnih del na nogometnem stadionu v Ajdovščini

vsebina risbe: 01 PREGLEDNA SITUACIJA
prikaz pozicij temeljev

investitor: Občina Ajdovščina, Cesta 5. maja 6a, 5270 Ajdovščina

projektant: Arti inženiring d.o.o., Ul. Ivana Sulića 6a, 5292 Šempeter pri Gorici

izdelovalec načrta: corus inženirji

vodja projektiranja: ROBERT VRTOVEC, univ.dipl.inž.grad. G-2239 PI

pooblaščeni inženir: MATEJ KOSOVEL, univ.dipl.inž.grad. G-2341 PI

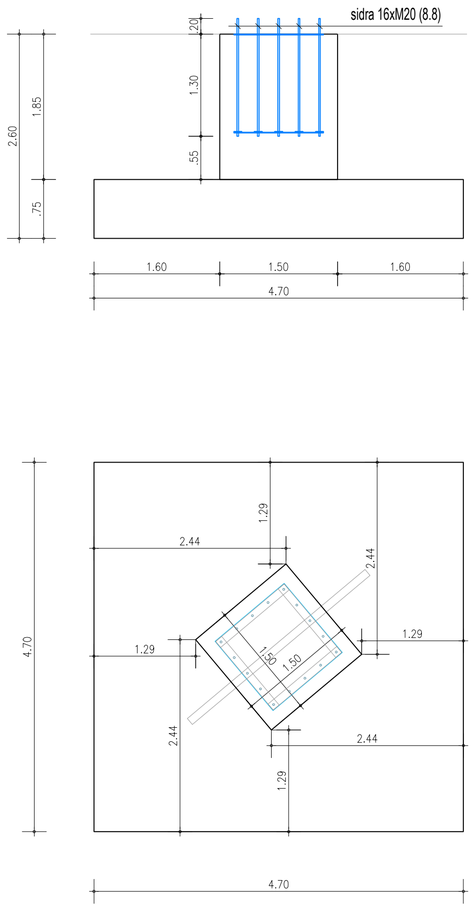
izdelal: MATEJ KOSOVEL, univ.dipl.inž.grad. G-2341 PI

namen dokumentacije: PZI

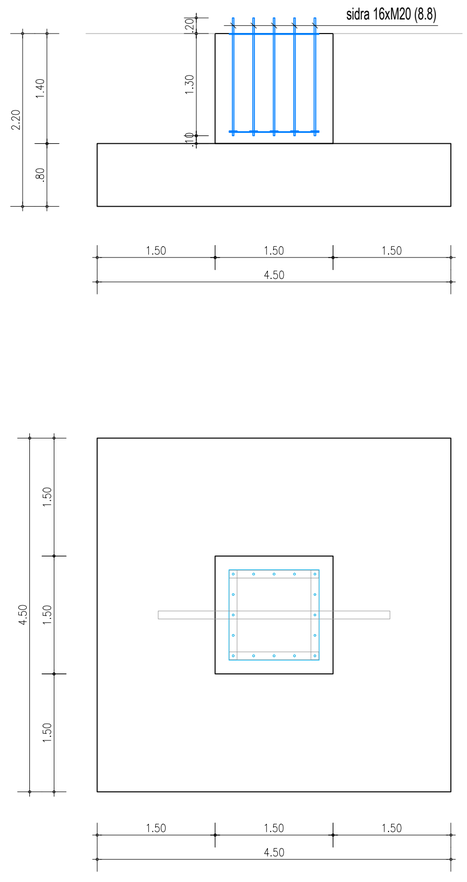
strokovno področje načrta: 2 Načrt gradbeništva
2/1 NAČRT TEMELJEV DROGOV IN KONSTRUKCIJE LCD ZASLONA

datum:	št. projekta:	št. načrta:	merilo:	št. risbe:
05.2024	2023-1/12	116/23	1 : 500	G1

temelj TT1 - rekonstrukcija obstoječega temelja (kom 4)

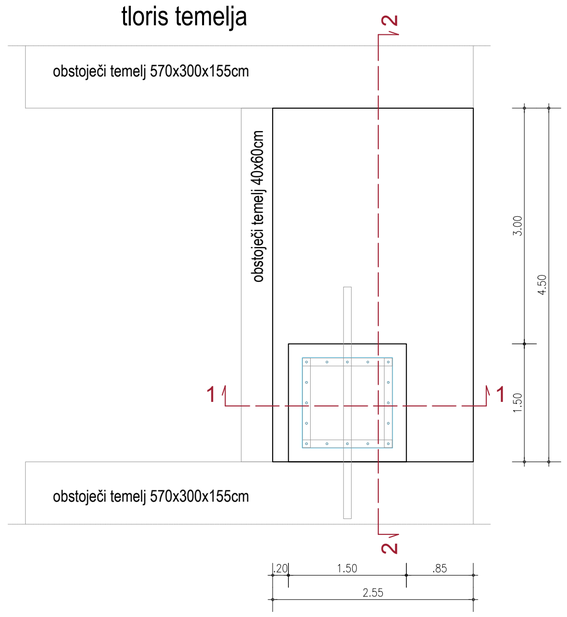


temelj TT2 - novi temelj ob glavni tribuni (kom 2)

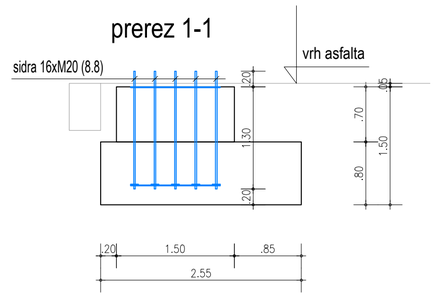


temelj TT3 - novi temelj ob pomožni tribuni (kom 2)

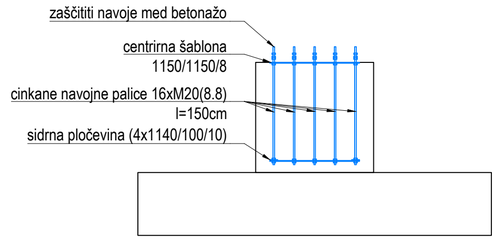
tloris temelja



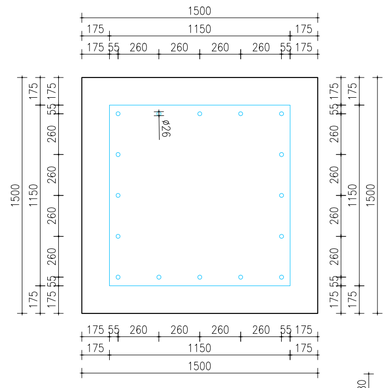
prerez 1-1



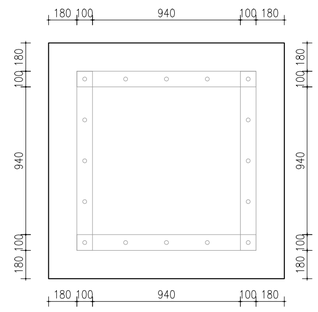
detajl sidranja stebra reflektorja



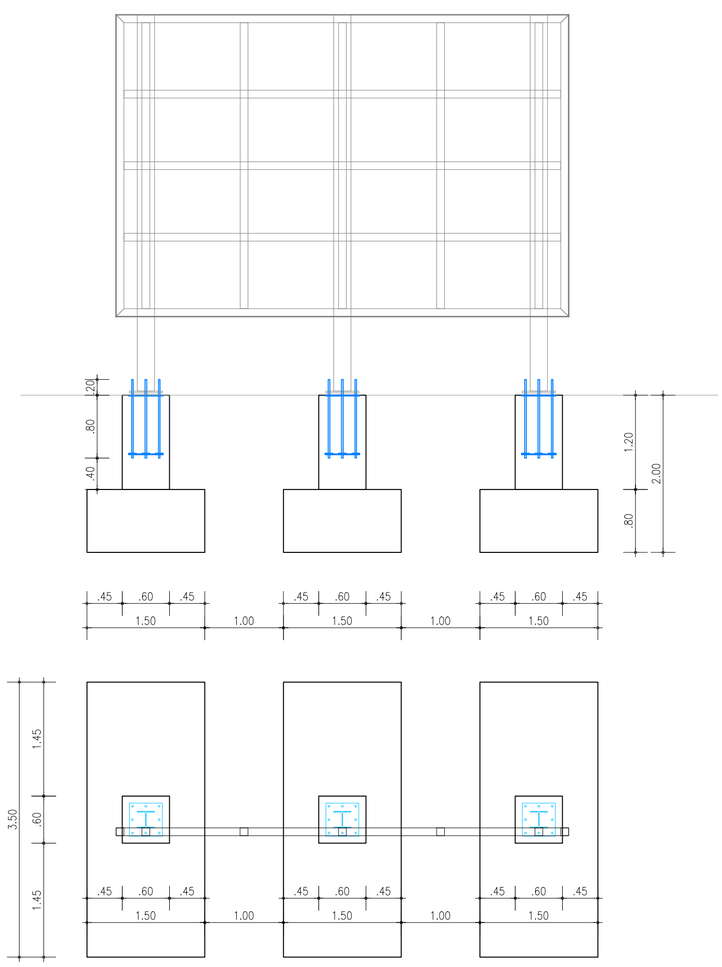
shema sidra centrirna šablona, M 1:25



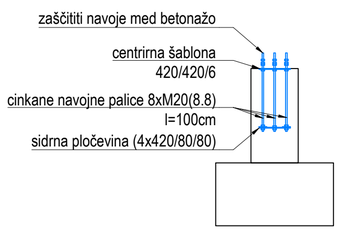
shema sidra sidrna pločevina, M 1:25



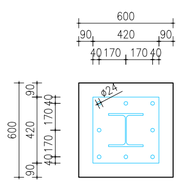
temelji LED zaslona



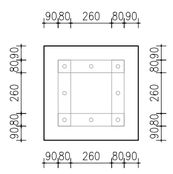
detajl sidranja stebra LCD zaslona



shema sidra centrirna šablona, M 1:25



shema sidra sidrna pločevina, M 1:25



Izvedba razsvetljave in vzdrževalnih del na nogometnem stadionu v Ajdovščini

NAČRT TEMELJEV DROGOV IN KONSTRUKCIJE LCD ZASLONA

OPAŽNI NAČRT TEMELJEV

MATERIALI

	ELEMENT	MATERIAL	ZAŠČITNA PLAST
BETON	podložni beton	C 12/15 X0	/
	temelji	C 30/37, XC4 XD3 XF3, PV-II, Cl0,2 Dmax32	50 mm
ARMATURA	palice, mreže	B 500A	
SIDRA	navojne palice	vroče cinkane, kvaliteta 8.8	
KONSTRUKCIJSKO JEKLO	LED zaslon	S235J2 (cevi), S355J2 (profili)	
KOROZIJSKA ZAŠČITA	LED zaslon	SIST EN ISO 1461	min 55µm (povpr. 70µm)
IZVEDBENI RAZRED	LED zaslon	EXC 2	

naziv projekta: Izvedba razsvetljave in vzdrževalnih del na nogometnem stadionu v Ajdovščini

vsebina risbe: 61 OPAŽNI NAČRT
opažni načrt temeljev

investitor: Občina Ajdovščina, Cesta 5. maja 6a, 5270 Ajdovščina

projektant: Arti inženiring d.o.o., Ul. Ivana Sulčiča 6a, 5292 Šempeter pri Gorici

izdelovalec načrta: corus inženirji

vodja projektiranja: ROBERT VRTOVEC, univ.dipl.inž.grad. G-2239 PI

pooblaščeni inženir: MATEJ KOSOVEL, univ.dipl.inž.grad. G-2341 PI

izdelal: MATEJ KOSOVEL, univ.dipl.inž.grad. G-2341 PI

namen dokumentacije: PZI

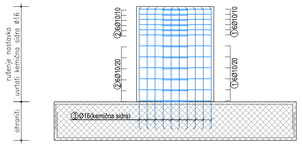
strokovno področje načrta: 2 Načrt gradbeništva
2/1 NAČRT TEMELJEV DROGOV IN KONSTRUKCIJE LCD ZASLONA

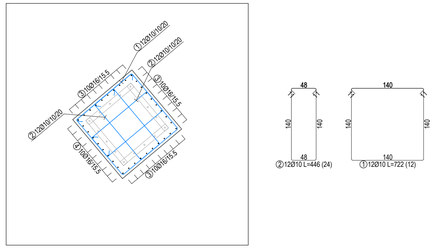
datum:	št. projekta:	št. načrta:	merilo:	št. risbe:
05.2024	2023-1/12	116/23	1 : 50, 25	G2

20.06.2024 08:41
Erlefus
PZI 2023-1-12 REFLEKTROJI AJDOVŠČINA-corus 14.5.2024.dwg
0.635 x 0.594 = 0.389 m2

21.06.2024 09:25 Eventus
PZI 2023-1-12 REFLEKTIRICI LAJDOVŠČINA verzija 14.5.2024 Alej

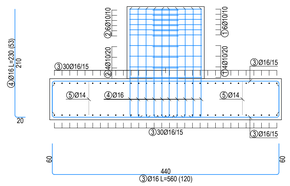
temelj TT1 -
rekonstrukcija obstoječega temelja (kom 4)

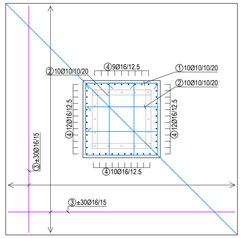


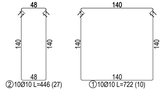


POSTOPEK IZVEDBE:
- odstranitev temeljnega nastavka in krovnega sloja armature pete
- vrtati kemična sidra (hef=50cm), Ø po tehnični specifikaciji lepila
- razprašiti izvrtino ter vstaviti lepilo HILTI HIT-HY-200
- temelj oprati z vodnim curkom 150-200bar
- kontaktno površino premezati s Cementol Elastosil
- izvedba novega nastavka

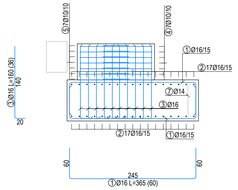
temelj TT2 -
novi temelj ob glavni tribuni (kom 2)

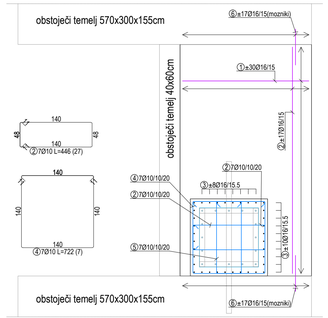


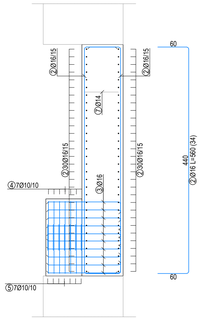




temelj TT3 -
novi temelj ob pomožni tribuni (kom 2)

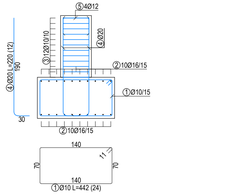


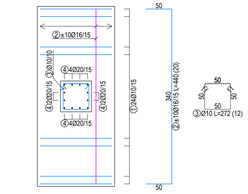




OPOMBA:
- mozniki so kemična sidra katere se vgrajuje z maso HILTI HIT-HY-200

temelj LCD zaslona





MATERIALI			
	ELEMENT	MATERIAL	ZAŠČITNA PLAST
BETON	podložni beton	C 12/15 X0	/
	temelji	C 30/37, XC4 XD3 XF3, PV-II, Cl0.2 Dmax32	50 mm
ARMATURA	palice, mreže	B 500A	
SIDRA	navojne palice	vroče cinkane, kvalitета 8.8	
KONSTRUKCIJSKO JEKLO	LED zaslon	S235J2 (cevi), S355J2 (profili)	
KOROZIJSKA ZAŠČITA	LED zaslon	SIST EN ISO 1461	min 55µm (povpr. 70µm)
IZVEDBENI RAZRED	LED zaslon	EXC 2	

Izvedba razsvetljave in vzdrževalnih del na nogometnem stadionu v Ajdovščini

NAČRT TEMELJEV DROGOV IN KONSTRUKCIJE LCD ZASLONA
ARMATURNI NAČRT TEMELJEV

naziv projekta:
Izvedba razsvetljave in vzdrževalnih del na nogometnem stadionu v Ajdovščini

vsebina risbe:
7.1 ARNATURNI NAČRTI
armaturni načrt temeljev

investitor:
Občina Ajdovščina
Cesta 5. maja 6a,
5270 Ajdovščina

projektant:
Arti inženiring d.o.o.
Ul. Ivana Sušča 6a,
5292 Šempeter pri Gorici

izdelovalec načrta:
corus inženirji

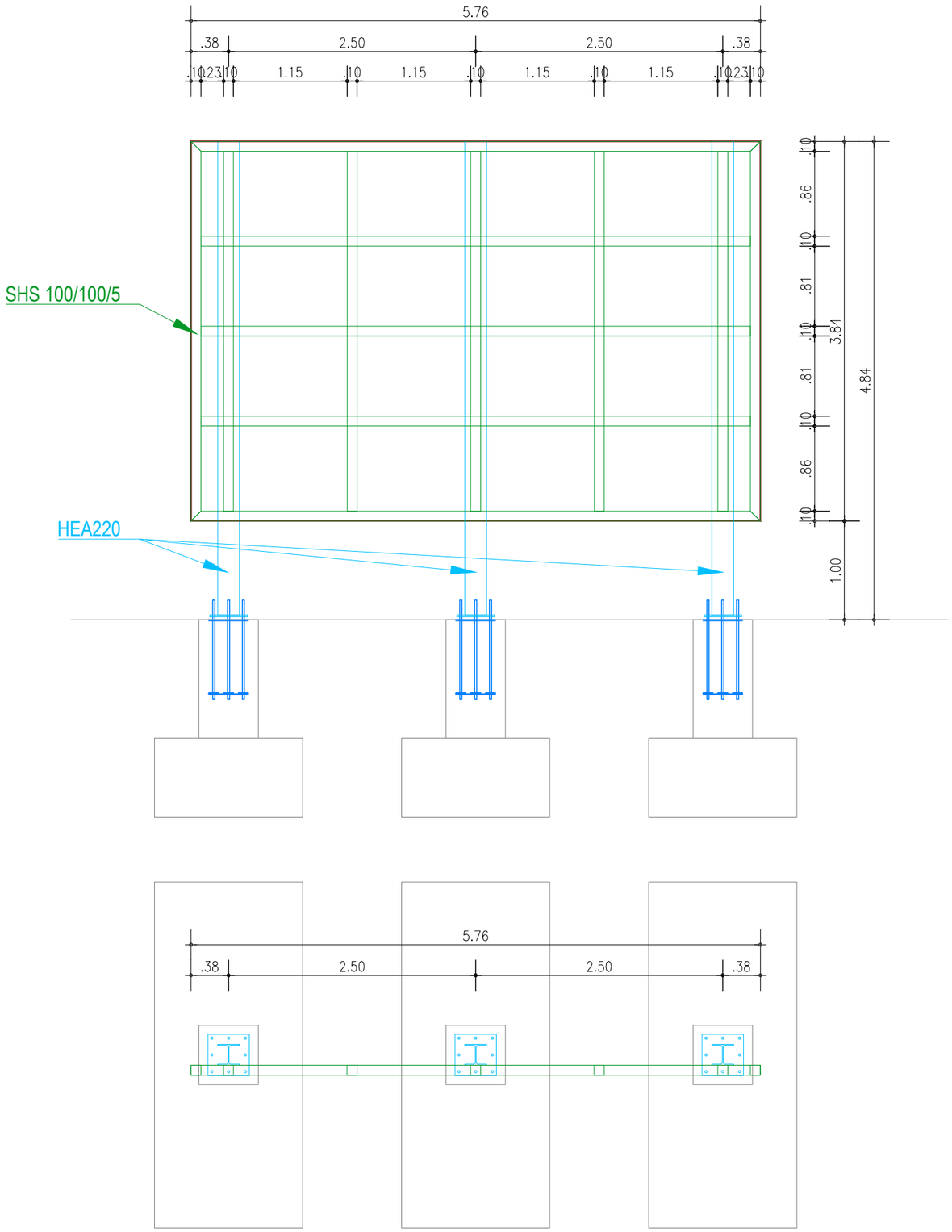
vodja projektiranja:	ROBERT VRTOVEC, univ.dipl.inž.grad. G-2239 PI
pooblaščeni inženir:	MATEJ KOSOVEL, univ.dipl.inž.grad. G-2341 PI
izdelal:	MATEJ KOSOVEL, univ.dipl.inž.grad. G-2341 PI
namen dokumentacije:	PZI
strokovno področje načrta:	2 Načrt gradbeništva 2/1 NAČRT TEMELJEV DROGOV IN KONSTRUKCIJE LCD ZASLONA

datum:	št. projekta:	št. načrta:	merilo:	št. risbe:
05.2024	2023-1/12	116/23	1 : 50	G3

1:100 x 1:20* x 1:20* A2

20.06.2024 08:46
Enertus
PZI 2023-1-12 REFLEKTROJI AJDOVŠČINA-corus 14.5.2024.dwg

podkonstrukcija LED zaslona



OPOMBA:
- izvajalec mora izdelati delavniške načrte katere mora potrditi projektant konstrukcije

Izvedba razsvetljave in vzdrževalnih del na nogometnem stadionu v Ajdovščini

NAČRT TEMELJEV DROGOV IN KONSTRUKCIJE LCD ZASLONA

POZICIJSKI NAČRT PODKONSTRUKCIJE LED ZASLONA

MATERIALI			
	ELEMENT	MATERIAL	ZAŠČITNA PLAST
BETON	podložni beton	C 12/15 X0	/
	temelji	C 30/37, XC4 XD3 XF3, PV-II, Cl0,2 Dmax32	50 mm
ARMATURA	palice, mreže	B 500A	
SIDRA	navojne palice	vroče cinkane, kvaliteta 8.8	
KONSTRUKCIJSKO JEKLO	LED zaslon	S235J2 (cevi), S355J2 (profili)	
KOROZIJSKA ZAŠČITA	LED zaslon	SIST EN ISO 1461	min 55µm (povpr. 70µm)
IZVEDBENI RAZRED	LED zaslon	EXC 2	

naziv projekta: Izvedba razsvetljave in vzdrževalnih del na nogometnem stadionu v Ajdovščini

vsebina risbe: 51 POZICIJSKI NAČRTI
pozicijskii načrt podkonstrukcije LED zaslona

investitor
Občina Ajdovščina
Cesta 5. maja 6a,
5270 Ajdovščina

projektant
Arti inženiring d.o.o.
Ul. Ivana Suliča 6a,
5292 Šempeter pri Gorici

izdelovalec načrta
corus inženirji

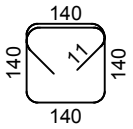
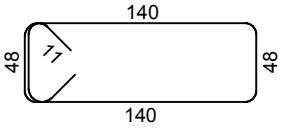
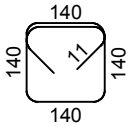
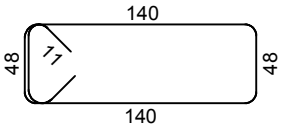
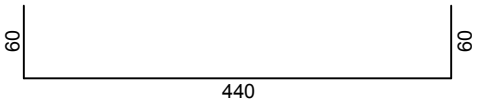
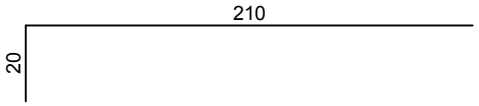
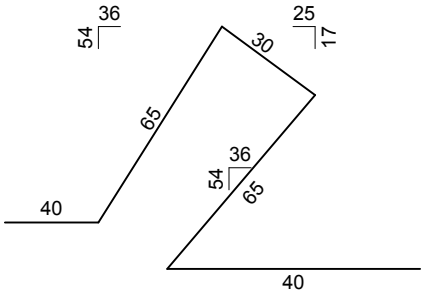
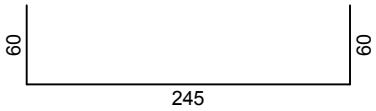
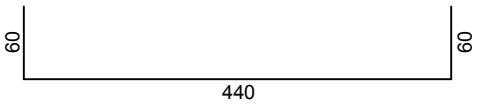
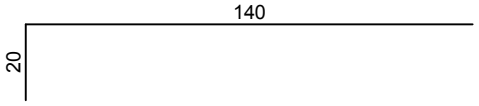
vodja projektiranja:	ROBERT VRTOVEC, univ.dipl.inž.grad. G-2239 PI
pooblaščeni inženir:	MATEJ KOSOVEL, univ.dipl.inž.grad. G-2341 PI
izdelal:	MATEJ KOSOVEL, univ.dipl.inž.grad. G-2341 PI
namen dokumentacije:	PZI
strokovno področje načrta:	2 Načrt gradbeništva 2/1 NAČRT TEMELJEV DROGOV IN KONSTRUKCIJE LCD ZASLONA

datum:	št. projekta:	št. načrta:	merilo:	št. risbe:
05.2024	2023-1/12	116/23	1 : 50	G4

0.420 x 0.297 = 0.125 m2

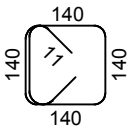
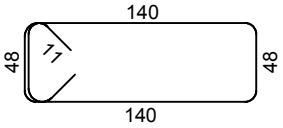
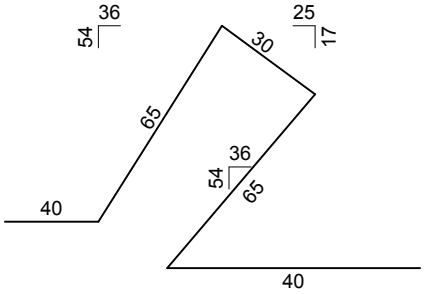
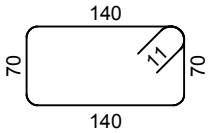
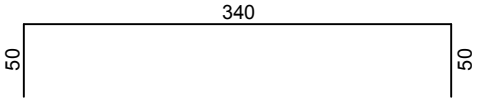
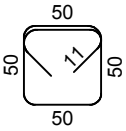
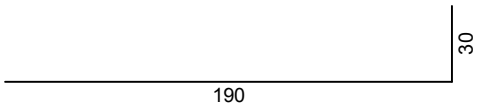
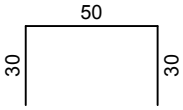
OBJEKT: RAZSVETLJAVA STADION AJDOVŠČINA	1/3
KOSOVNICA - TEMELJI	št:116/23

Palice - specifikacija

ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]	Opomba
TT1 - rekonstrukcija obstoječega (4 kos)						
1		10	7.22	48	346.56	
2		10	4.46	96	428.16	
3		16	2.30	80	184.00	
TT2 - ob glavni tribuni (2 kos)						
1		10	7.22	20	144.40	
2		10	4.46	54	240.84	
3		16	5.60	240	1344.00	
4		16	2.30	106	243.80	
5		14	2.40	120	288.00	
TT3 - ob pomožni tribuni (2 kos)						
1		16	3.65	120	438.00	
2		16	5.60	68	380.80	
3		16	1.60	72	115.20	

OBJEKT: RAZSVETLJAVA STADION AJDOVŠČINA	2/3
KOSOVNICA - TEMELJI	št:116/23

Palice - specifikacija

ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]	Opomba
4		10	7.22	14	101.08	
5		10	4.46	14	62.44	
6		16	0.70	136	95.20	
7		14	2.40	70	168.00	
TT4 - temelj LCD (3 kos)						
1		10	4.42	72	318.24	
2		16	4.40	60	264.00	
3		10	2.72	36	97.92	
4		20	2.20	36	79.20	
5		12	1.10	12	13.20	

KOSOVNICA - TEMELJI

št:116/23

Palice - izvleček

Ø [mm]	lgn [m]	Teža enote [kg/m']	Teža [kg]
B 500, Ø <= 12 mm			
10	1739.64	0.64	1116.67
12	13.20	0.92	12.20
Skupaj (B 500, Ø <= 12 mm)			1128.87
B 500, Ø > 12 mm			
14	456.00	1.26	573.19
16	3065.00	1.64	5032.42
20	79.20	2.57	203.22
Skupaj (B 500, Ø > 12 mm)			5808.83
Skupaj			6937.71