

# NASLOVNA STRAN NAČRTA

## 2 Načrt s področja gradbeništva

### 2.1. Načrt gradbeništva

#### OSNOVNI PODATKI O GRADNJI

naziv gradnje	KOTLOVNICA Z ZALOGOVNIKOM
kratak opis gradnje	Investitor Dom starejših občanov Ilirska Bistrica, Kidričeva 15, 6250 Ilirska Bistrica, želi na parcelah 959/1, 959/2, 1095/71, 1095/32 in 987/3 k.o. 2525 Ilirska Bistrica zgraditi toplovodno omrežje s kotlovnico za potrebe ogrevanja doma starejših občanov in parkirišče ob kotlovnici. Iz nove kotlovnice se proti obstoječim objektom Doma starejših občanov IB, natančneje proti Centralni kotlarni in Kotlarni prizidka 2 izvede nov interni toplovodni razvod iz togih predizoliranih cevi. Potek cevovodov je v terenu, večinoma pod povoznimi površinami. Odsek med obstoječo Centralno kotlarno in novo kotlovnico dimenzije DN100 (oz. PRE114/225). Iz tega odseka se proti obstoječi Kotlarni prizidka 2 izvede nov odcep dimenzije DN65 (oz. CFL 75/162) iz poltogih cevi. Nov toplovni razvod bo predstavljal interno inštalacijo kompleksa Doma starejših občanov IB in bo v lasti ter upravljanju investitorja lastnika.
VRSTE GRADNJE	NOVOGRADNJA - NOVOZGRAJEN OBJEKT

#### DOKUMENTACIJA

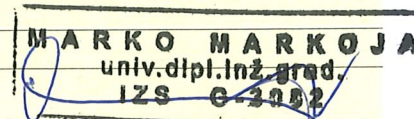
vrsta dokumentacije	PZI (projektna dokumentacija za izvedbo gradnje)
	<input type="checkbox"/> sprememba dokumentacije
številka projekta	6710

#### PODATKI O NAČRTU

strokovno področje načrta	2 Načrt s področja gradbeništva
številka in naziv načrta	2.1. Načrt gradbeništva
številka načrta	6710
datum izdelave	Maj 2023

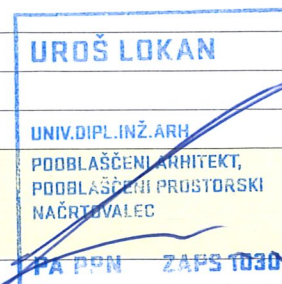
#### PODATKI O IZDELOVALCU NAČRTA

ime in priimek pooblaščenega arhitekta, pooblaščenega inženirja ali druge osebe	Marko Markoja, univ. dipl. inž. gr.
identifikacijska številka	IZS G-3082
podpis pooblaščenega arhitekta, pooblaščenega inženirja ali druge osebe	



#### PODATKI O PROJEKTANTU

projektant (naziv družbe)	PROJEKTIVNI BIRO VELENJE d.d.
sedež družbe	Prešernova cesta 8, 3320 Velenje
vodja projekta	Uroš Lokan, univ. dipl. inž. arh.
identifikacijska številka	ZAPS PA PPN 1030
odgovorna oseba projektanta	Direktor Andrej Božič
podpis odgovorne osebe projektanta	



Projektivni biro d.d.  
VELENJE

# TEHNIČNO POROČILO

## 1.0 SPLOŠNO

Investitor želi zgraditi kotlovnico z zalogovnikom in pripadajočimi opornimi zidovi.

## 2.0 KONSTRUKCIJA

Objekt je etažnosti K+P in je pravokotne tlorisne oblike. Konstrukcija je klasične AB izvedbe.

Konstrukcija je sestavljena iz AB sten, ki so debeline 30 cm in AB plošč. Plošča nad kletjo je debeline 30 cm in 15 cm (v predelu, kjer je hkrati strešna konstrukcija). Plošča nad 1.N. je debeline 25cm.

AB temeljna plošča je debeline 35 cm in je izvedena po sistemu XYPEX. Po sistemu XYPEX so izvedene tudi AB stene kleti.

Oporni zidovi so tudi armirano betonske izvedbe. AB stene so debeline 20 cm, AB pete so različnih dimenzij odvisno od velikosti zemeljskih pritiskov. Za zidovi mora biti izvedena ustrezna drenaža po pravilih stroke.

## 3.0 TEMELJENJE

Temeljenje objekta je izvedeno na armiranobetonski temeljni plošči debeline 35 cm. AB pete opornih zidov so različnih dimenzij.

Za projektno nosilnost in tudi za vse ostale pogoje pri temeljenju objekta je upoštevano »GEOLOŠKO GEOMEHANSKO IN HIDROGEOLOŠKO POROČILO Z OCENO EROZISJKE OGROŽENOSTI – OBJEKT: KOTLOVNICA Z ZALOGOVNIKOM«, ki ga je pod št. poročila: 5283-014/2023-01 izdelalo podjetje GEOLOGIJA d.o.o. iz Idrije.

Pred in med izvedbo temeljnih konstrukcij je obvezen pregled in spremljanje geotehničnih del s strani geomehanika.

## 4.0 OBTEŽBA

Objekt je kontroliran na vertikalno in horizontalno obtežbo po veljavnih predpisih in standardih – EC0, EC1 in EC8.

Horizontalna obtežba je potres  $a/ag = 0.175$  ( tip tal »A« ), prav tako pa je objekt kontroliran na horizontalno obtežbo z vetrom hitrosti 25 m/s.

## **5.0 MATERIALI**

Vsi vgrajeni materiali morajo ustrezati veljavnim standardom in predpisom, ter pogojem iz tega projekta, za kar je odgovoren izvajalec konstrukcije. Betoni so kvalitete C 25/30, C 30/37 in C35/45, jeklo za armiranje je S 500B.

Projekt betona bo izdelal izbran izvajalec glede na uporabljen material in na svojo tehnologijo, pri čemer mora upoštevati zahteve za odpornost proti soli in mrazu, obrabi in kemijsko agresivnemu okolju ter vodo neprepustnosti (sistem XYPEX). Armaturno jeklo mora biti vgrajeno po armaturnih načrtih z zahtevano zaščitno plastjo, ter pred vgradnjo ustrezno očiščeno.

Pri izdelavi projekta betona je potrebno posvetiti posebno pozornost na eventualne dodatke betonom (OMO, OSMO), na eventualne zahteve po vidnem betonu ter vodotesnem betonu, načinu vgradnje in transporta glede na velikost armiranobetonskih konstrukcij, ki delujejo kot celota.

Prav tako je potrebna pozornost pri kvalitetni izdelavi opaža, predvsem pri eventualnih zahtevah po nadvišanih nosilnih armiranobetonskih konstrukcijah.

Morebitne delavniške in PZI načrte jeklene konstrukcije naredi izbrani izvajalec.

## **6.0 IZRAČUN**

Celotna konstrukcija je izračunana kot prostorska konstrukcija s pomočjo programa »Tower 8«. Del izpisa je sestavni del te statične presoje faze PZI projekta, celoten izpis je v arhivu izdelovalca te statične presoje (zaradi obsežnosti).

Vsi konstruktivni elementi so dimenzionirani skladno z EC2, EC3, EC5, EC6, EC7 in EC8.

## **7.0 ZAKLJUČEK**

Kot je omenjeno že v točki 5.0 morajo vsi vgrajeni materiali ustrezati veljavnim standardom in predpisom, za kar je odgovoren izvajalec konstrukcije.

Ni dovoljeno naknadno prebijanje nosilnih elementov brez soglasja projektanta konstrukcije.

Velenje, maj 2023

M. Markoja u.d.i.g.

<b>Objekt:</b> KOTLOVNICA Z ZALOGOVNIKOM	Str.:1/51
<b>POZ.: GLAVNI OBJEKT - MODEL</b>	Štev. načrta: 6710
<b>Vsebina</b>	
Osnovni podatki o modelu	2
Vhodni podatki	
Vhodni podatki - Konstrukcija	3
Vhodni podatki - Obtežba	12
Rezultati	
Modalna analiza	23
Seizmični preračun	24
Statični preračun	25
Dimenzioniranje (beton)	30



Datoteka: model pzi.twp  
Datum preračuna: 17.5.2023

Način preračuna: 3D model

- ☒ Teorija I-ga reda
- ☒ Modalna analiza
- ☐ Stabilnost
- ☐ Teorija II-ga reda
- ☒ Seizmični preračun
- ☐ Faze gradnje
- ☐ Nelinearen preračun

**Velikost modela**

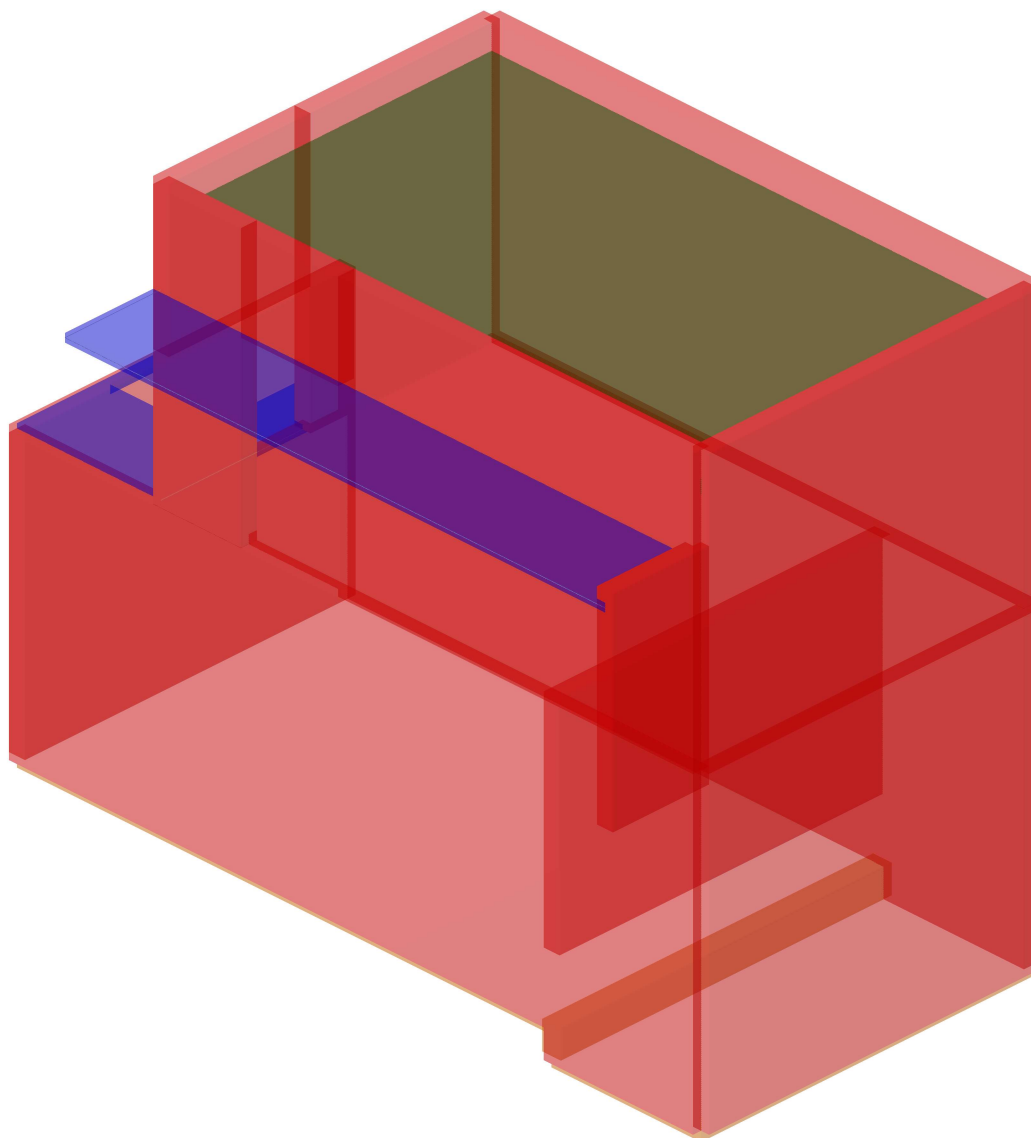
Število vozlišč:	6902
Število ploskovnih elementov:	6923
Število grednih elementov	49
Število robnih elementov	10446
Število osnovnih obtežnih primerov:	9
Število kombinacij obtežb:	122

**Enote mer**

Dolžina:	m [cm,mm]
Sila:	kN
Temperatura:	Celsius

**Vhodni podatki - Konstrukcija**

Plošča / Zid
1. d = 0.35 m
2. d = 0.15 m
3. d = 0.30 m
4. d = 0.25 m



## Vhodni podatki - Konstrukcija

Shema nivojev			
Naziv	z [m]	h [m]	
	4.34	1.12	
	3.22	3.22	

Naziv	z [m]	h [m]
	0.00	5.02
	-5.02	0.50

Naziv	z [m]	h [m]
	-5.52	

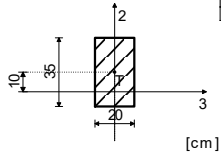
Tabele materialov						
No	Naziv materiala	E[kN/m <sup>2</sup> ]	$\mu$	$\gamma$ [kN/m <sup>3</sup> ]	$\alpha$ [1/C]	Em[kN/m <sup>2</sup> ]
1	C 25/30	3.100e+7	0.20	25.00	1.000e-5	3.100e+7

No	d[m]	e[m]	Material	Tip preračuna	Ortotropija	E2[kN/m <sup>2</sup> ]	G[kN/m <sup>2</sup> ]	$\alpha$
<1>	0.350	0.175	1	Tanka plošča	Izotropna			
<2>	0.150	0.075	1	Tanka plošča	Izotropna			
<3>	0.300	0.150	1	Tanka plošča	Izotropna			
<4>	0.250	0.125	1	Tanka plošča	Izotropna			

## Seli gred

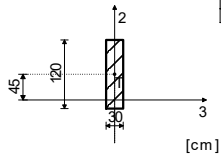
Set: 1 Prerez: b/d=20/35, Fiktivna ekscentričnost

Mat.	A1	A2	A3	I1	I2	I3
1 - C 25/30	7.000e-2	5.833e-2	5.833e-2	6.003e-4	2.333e-4	7.146e-4

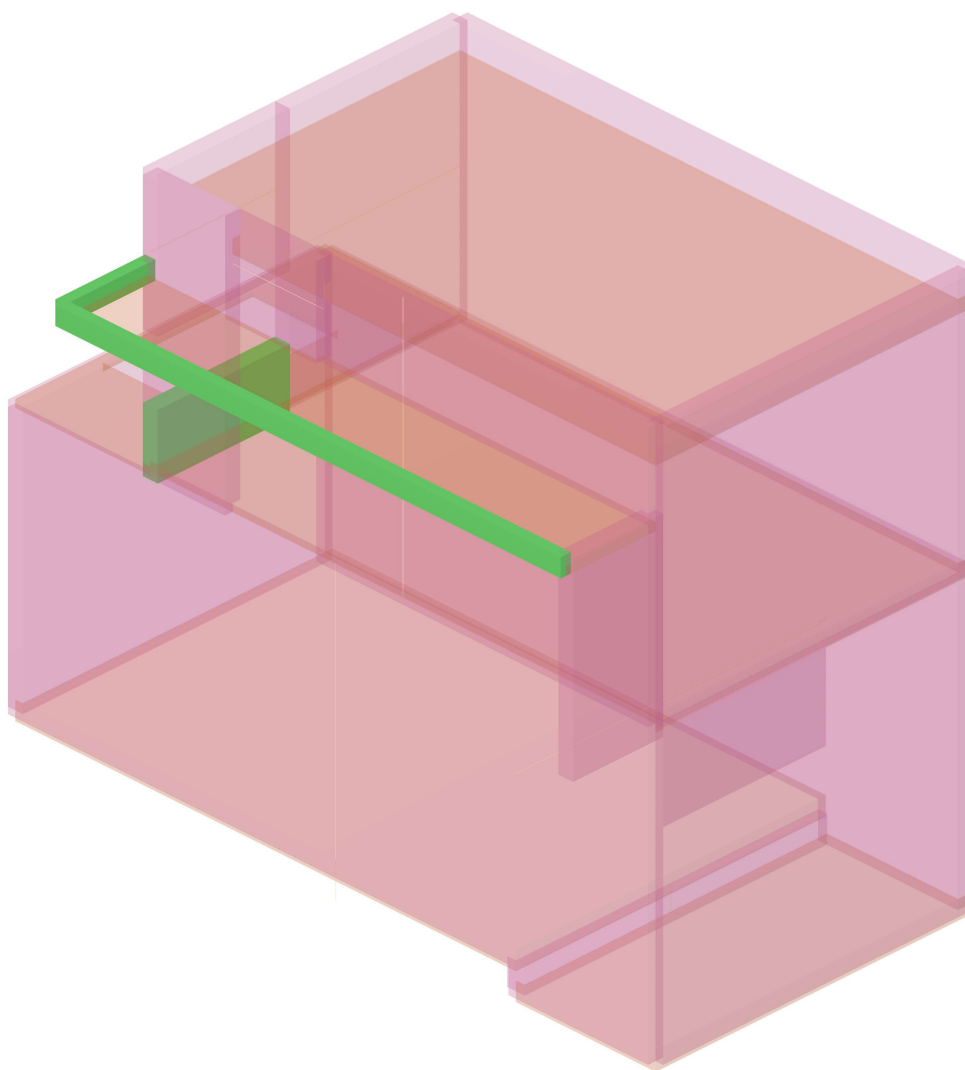


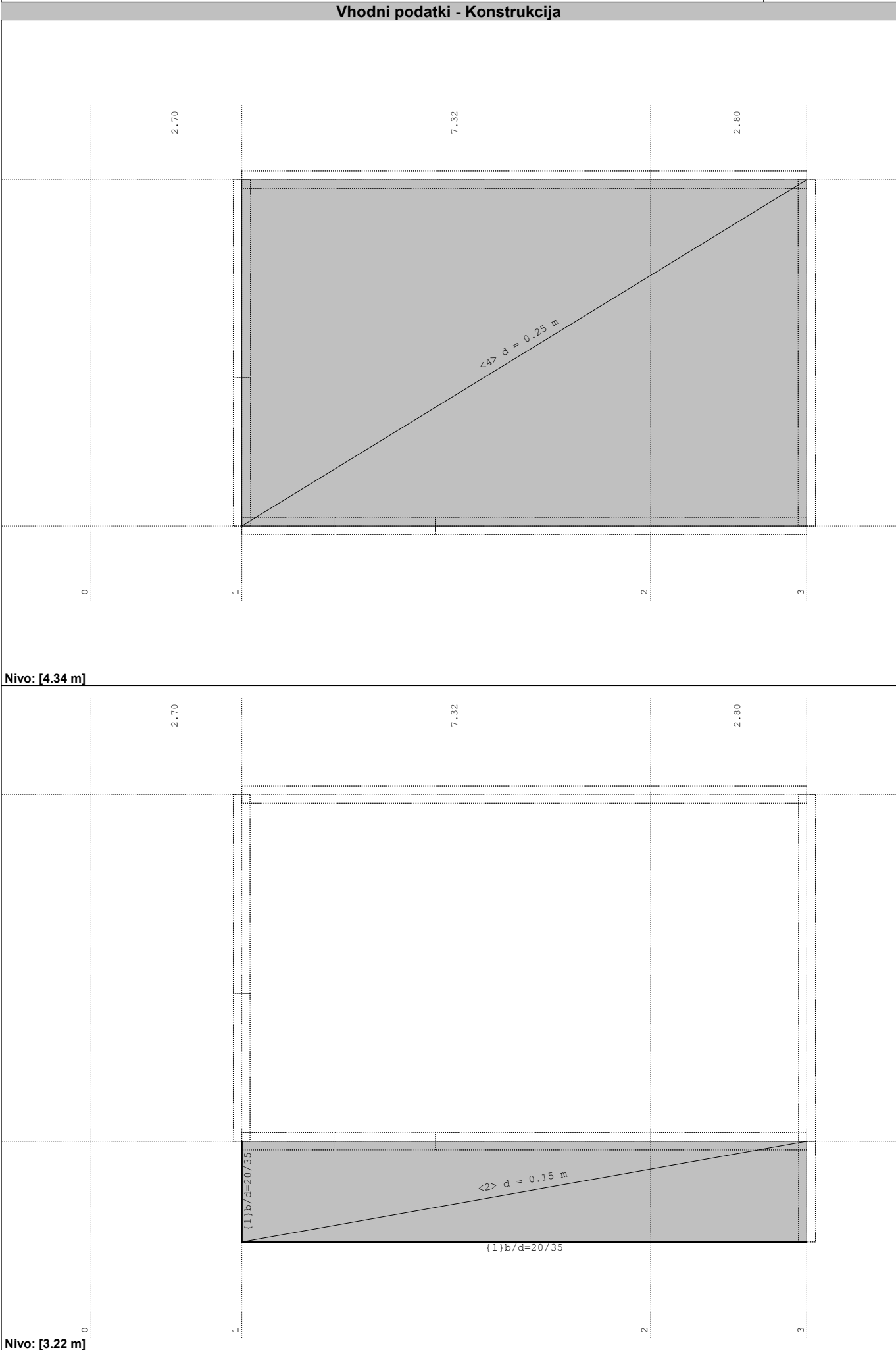
Set: 2 Prerez: b/d=30/120, Fiktivna ekscentričnost

Mat.	A1	A2	A3	I1	I2	I3
1 - C 25/30	3.600e-1	3.000e-1	3.000e-1	9.100e-3	2.700e-3	4.320e-2

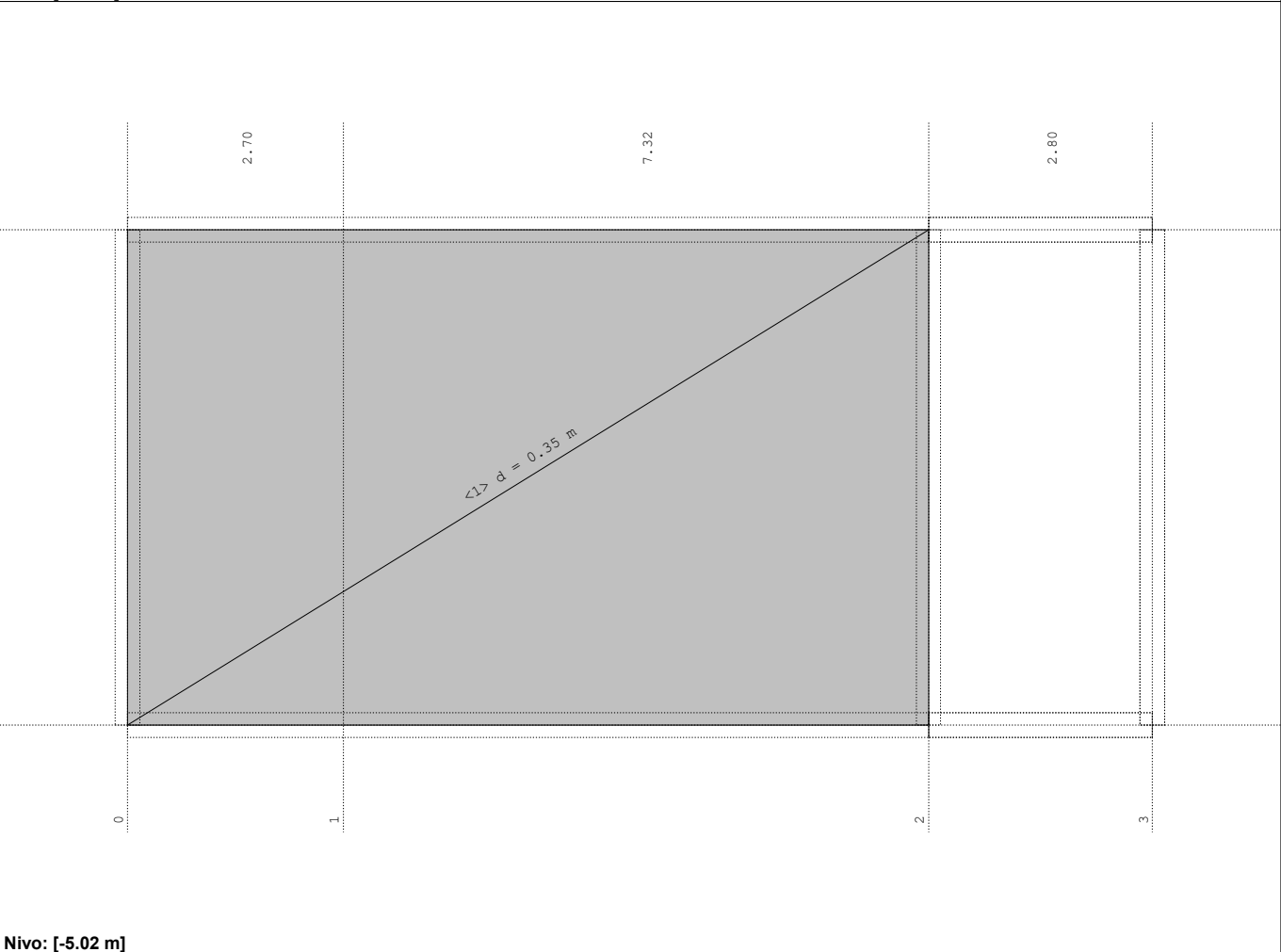
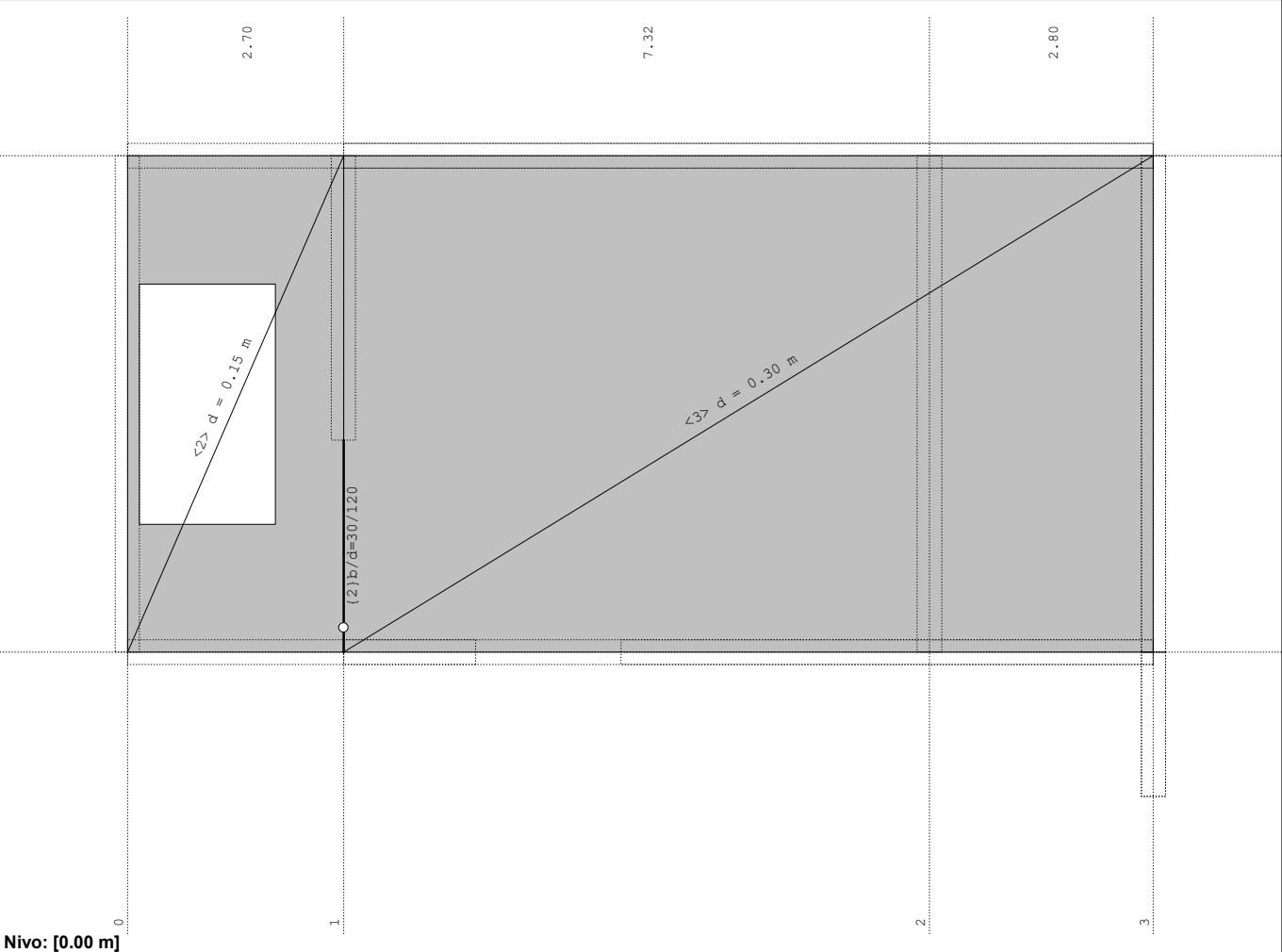


## Vhodni podatki - Konstrukcija

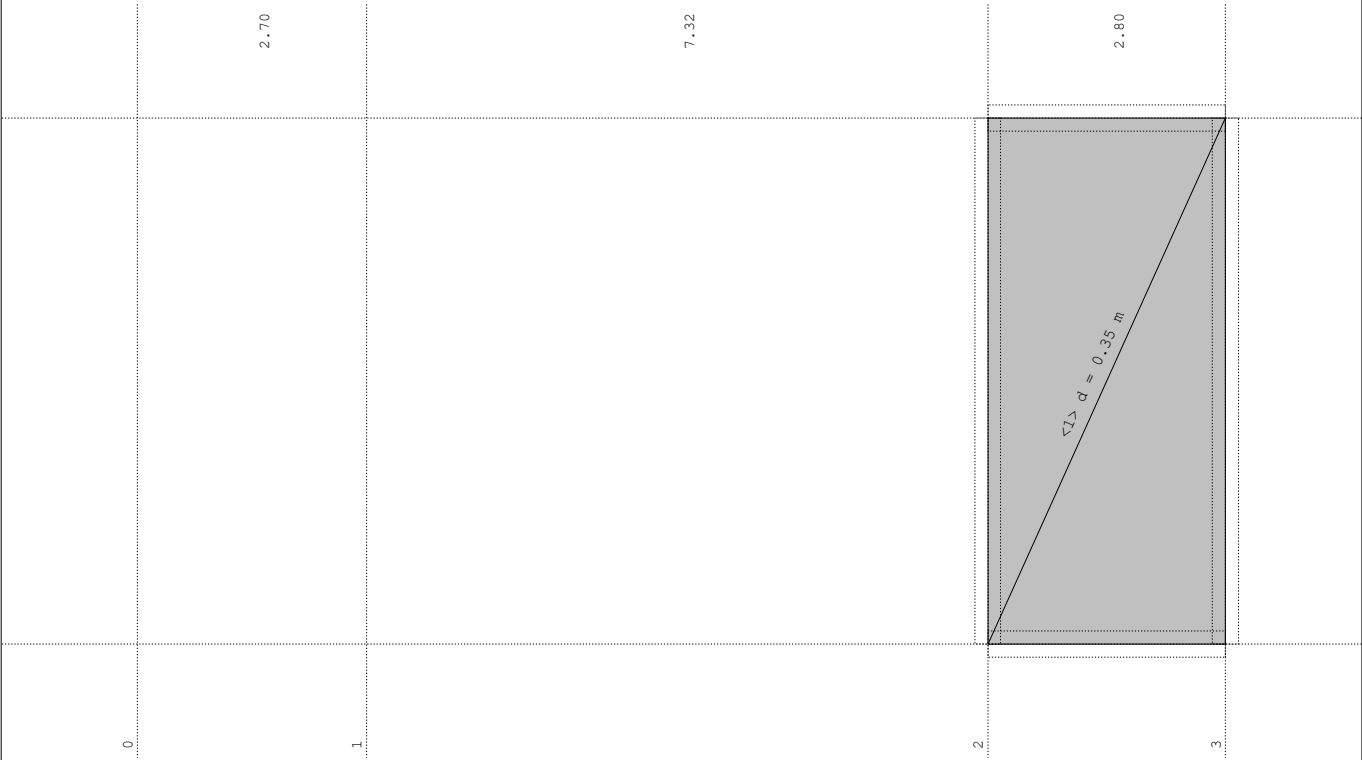




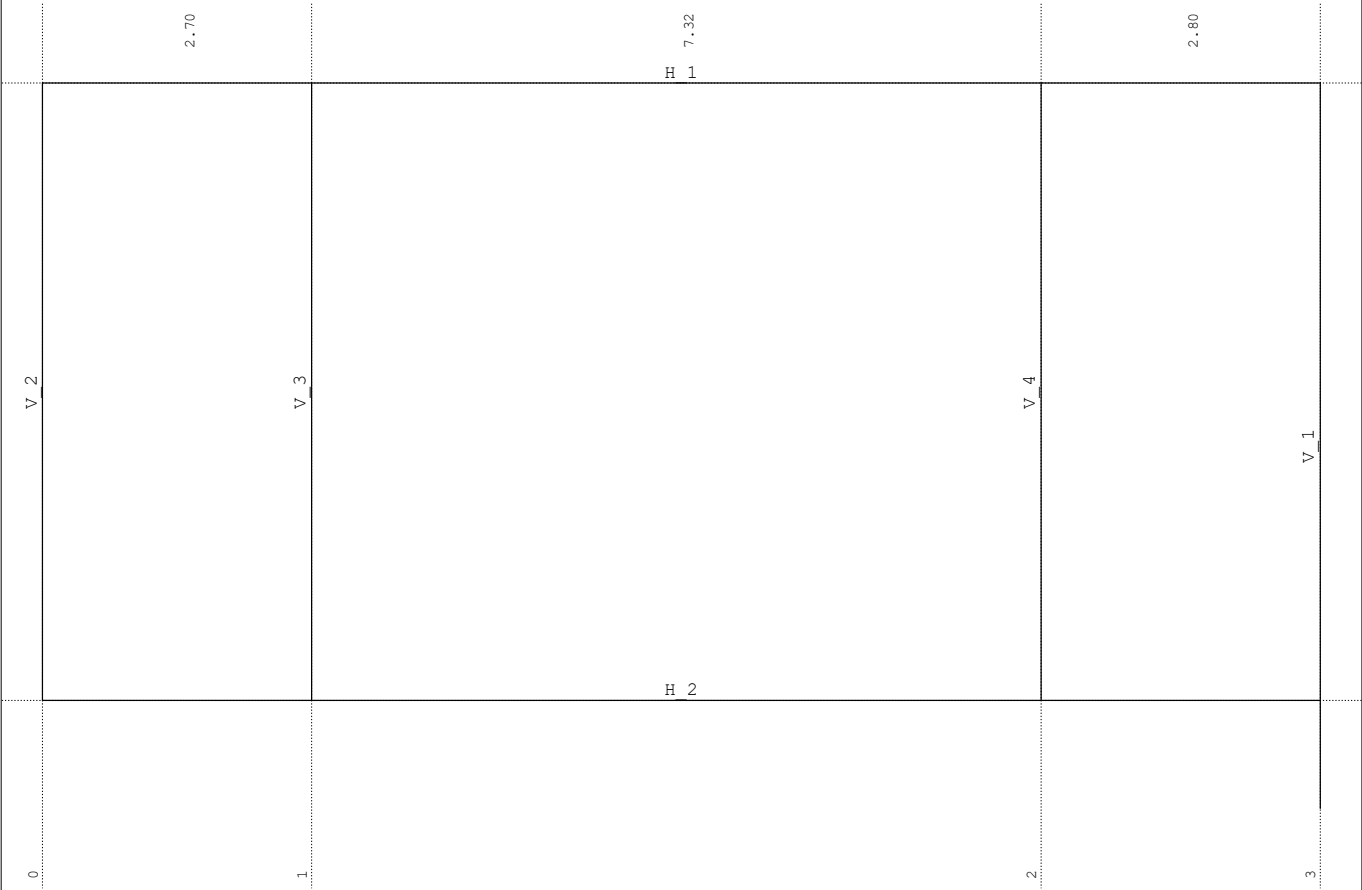
Vhodni podatki - Konstrukcija



Vhodni podatki - Konstrukcija



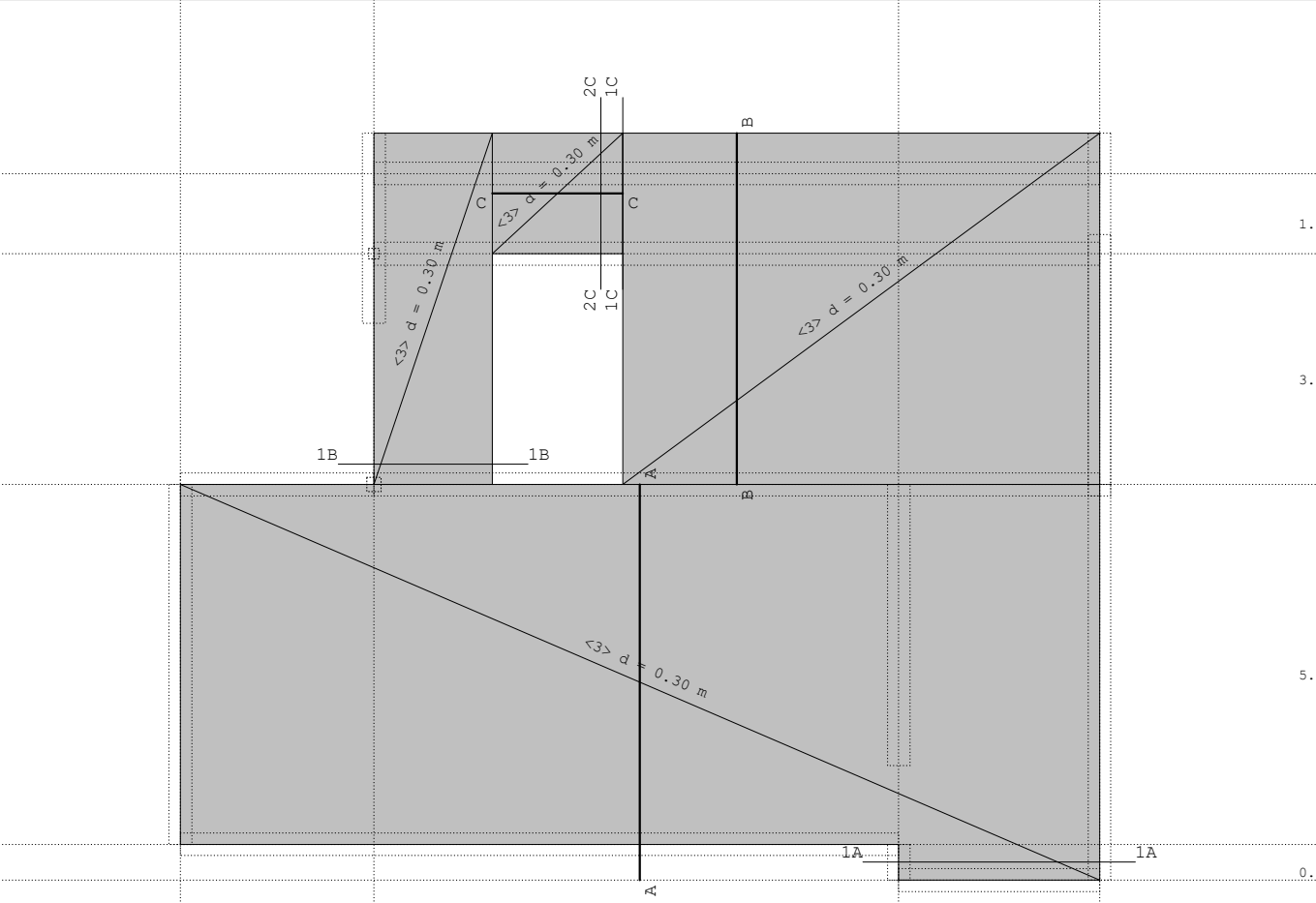
Nivo: [-5.52 m]



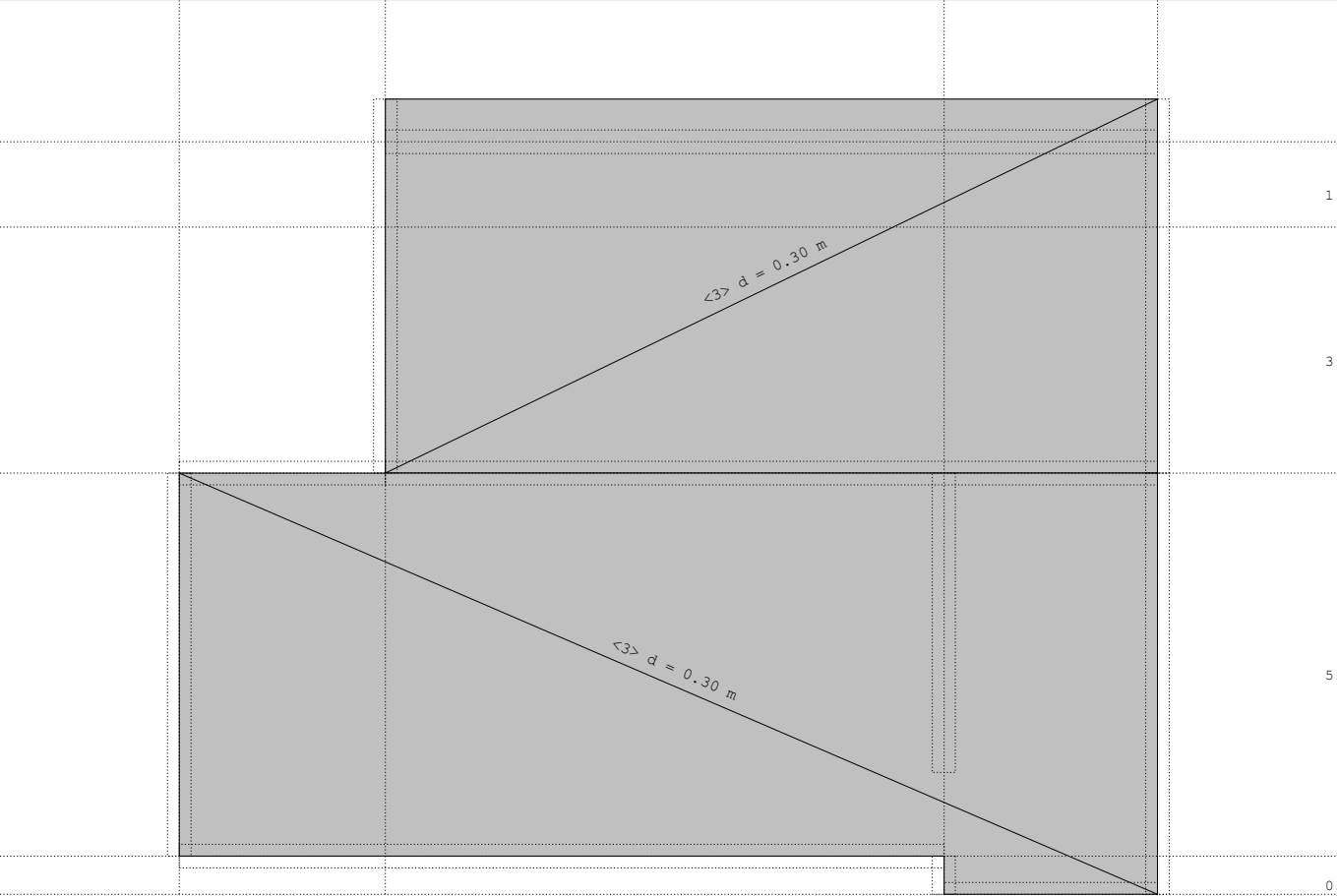
Dispozicija okvirjev



Vhodni podatki - Konstrukcija

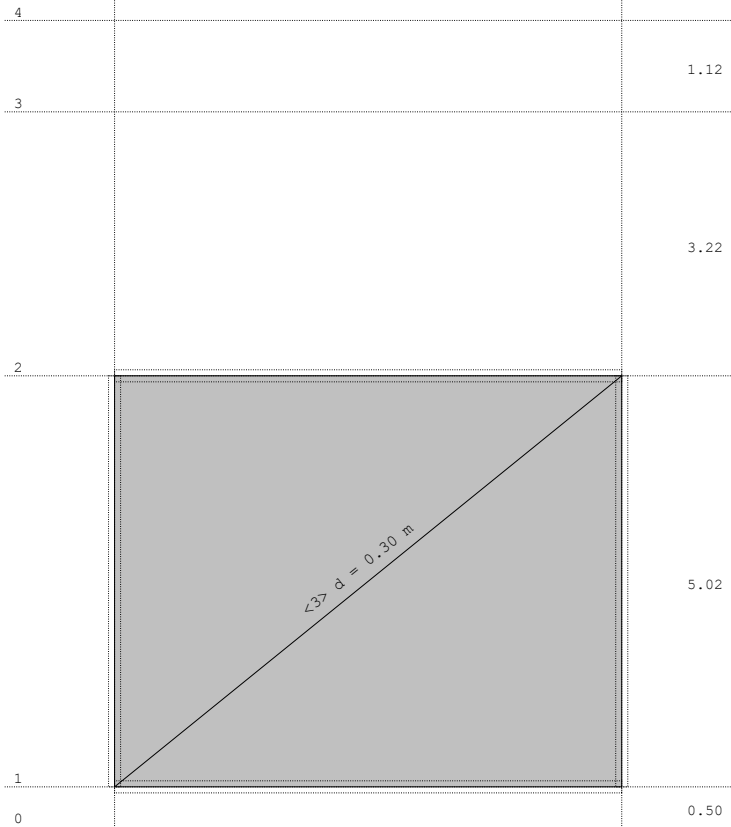


Okvir: H\_2

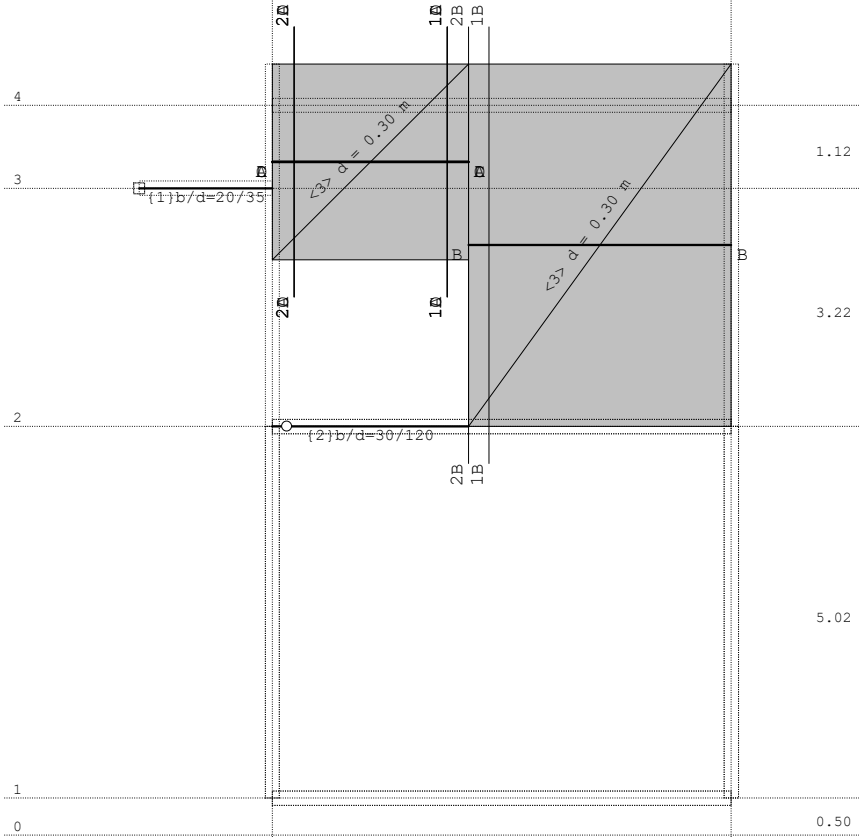


Okvir: H\_1

Vhodni podatki - Konstrukcija

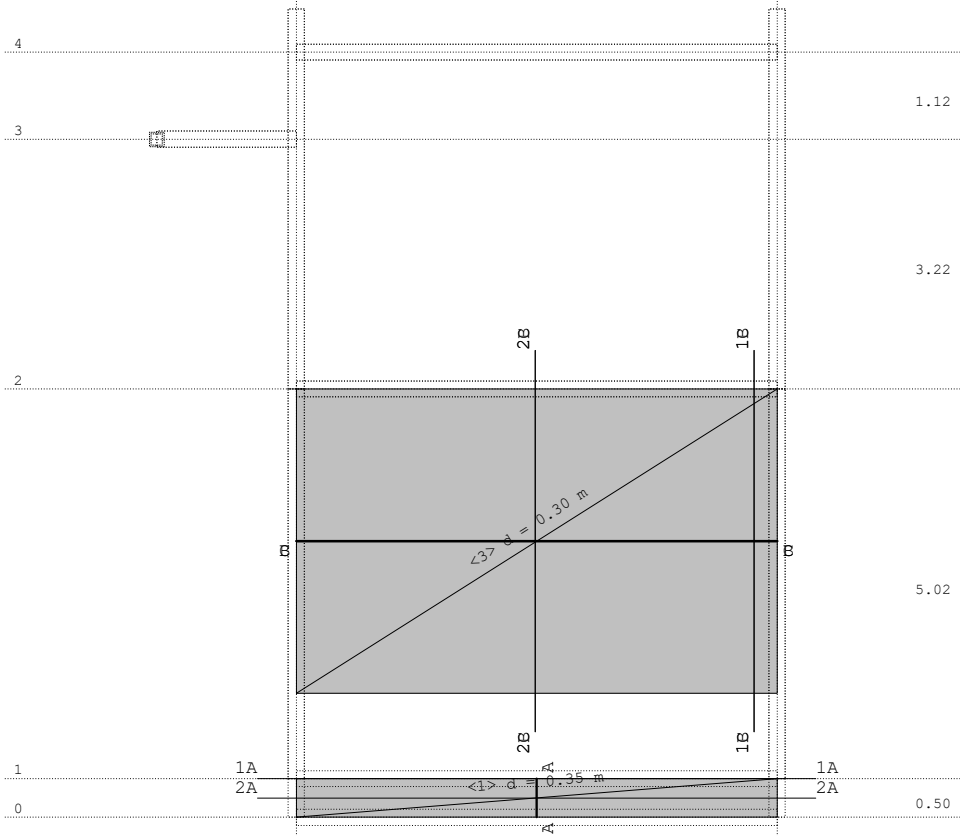


Okvir: V\_2

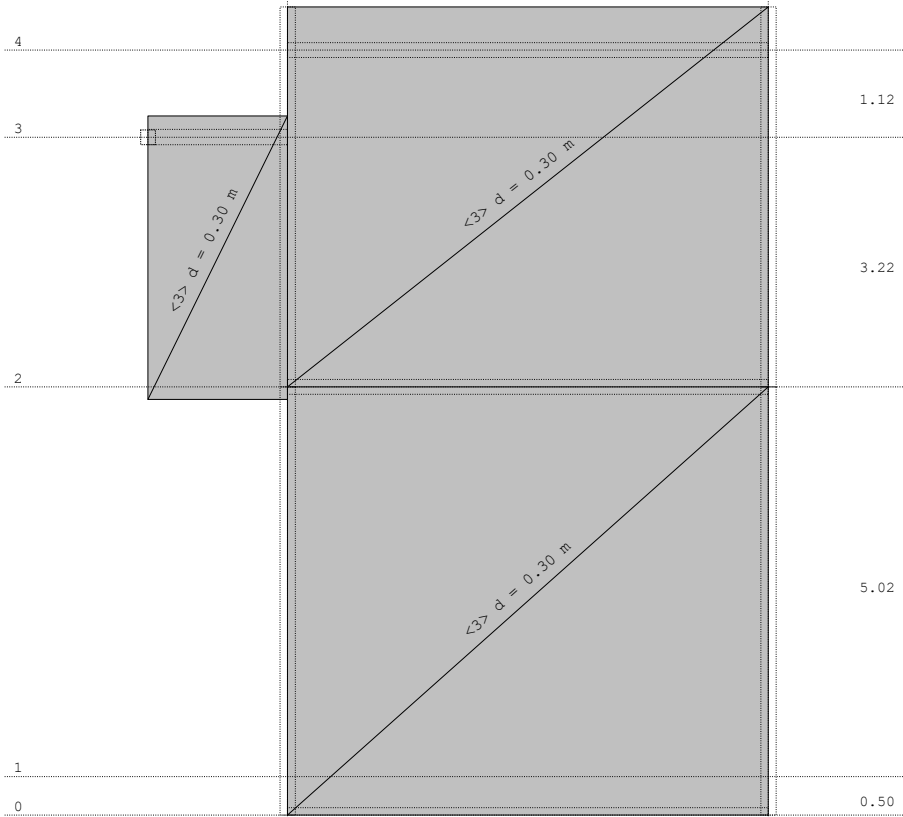


Okvir: V\_3

Vhodni podatki - Konstrukcija



Okvir: V\_4



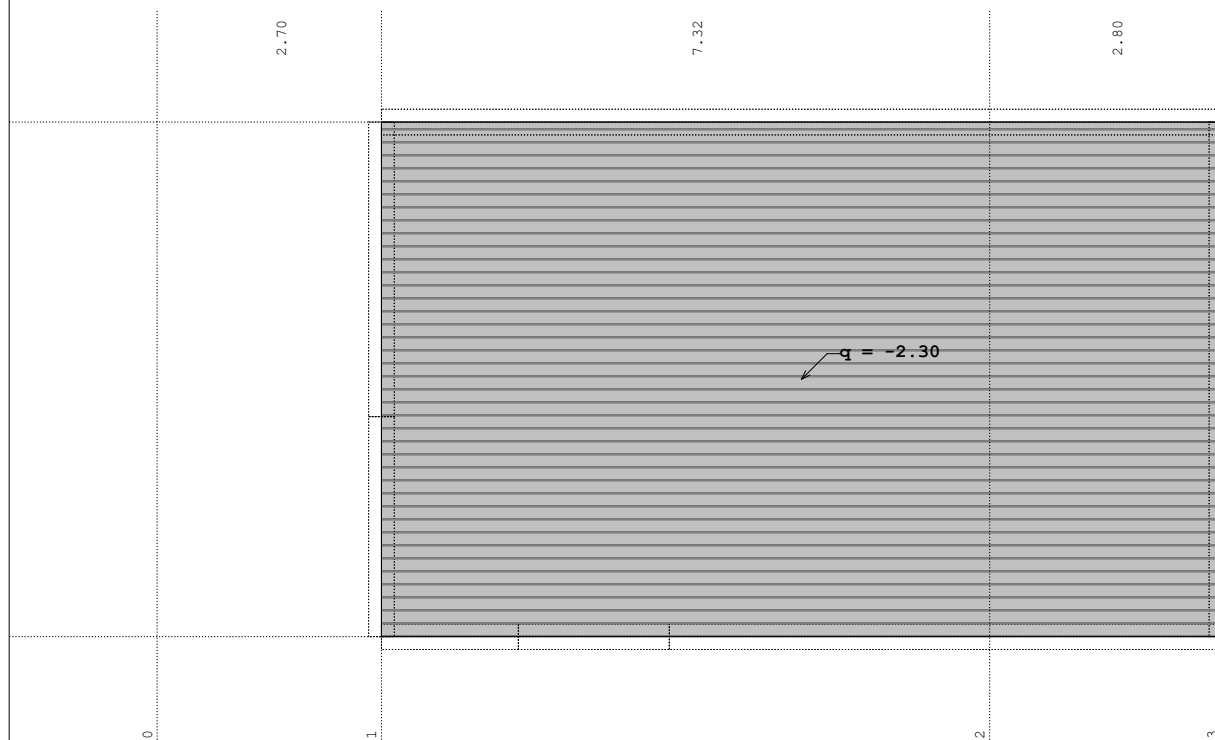
Okvir: V\_1

## Vhodni podatki - Obtežba

Lista obtežnih primerov				
LC	Naziv	pX [kN]	pY [kN]	pZ [kN]
1	stalna (g)	0.00	0.00	-5345.70
2	stalna + zem.pr. (g)	350.70	-28.25	-5345.70
3	koristna	0.00	0.00	-795.04
4	sneg	0.00	0.00	-99.18
5	veter	0.00	0.00	-40.48
6	Sx (+e)			
7	Sx (-e)			
8	Sy (+e)			
9	Sy (-e)			
10	Komb.: 1.35xII+1.5xIII+1.5xIV+0.9xV	473.45	-38.13	-8594.45
11	Komb.: 1.35xII+1.5xIII+1.5xIV+0.9xV	0.00	0.00	-8594.45
12	Komb.: 1.35xII+1.5xIII+0.75xIV+1.5xV	473.45	-38.13	-8544.36
13	Komb.: 1.35xII+1.5xIII+0.75xIV+1.5xV	0.00	0.00	-8544.36
14	Komb.: II+1.5xIII+1.5xIV+0.9xV	350.70	-28.25	-6723.46
15	Komb.: I+1.5xIII+1.5xIV+0.9xV	0.00	0.00	-6723.46
16	Komb.: II+1.5xIII+0.75xIV+1.5xV	350.70	-28.25	-6673.36
17	Komb.: I+1.5xIII+0.75xIV+1.5xV	0.00	0.00	-6673.36
18	Komb.: 1.35xII+1.5xIII+0.75xIV+0.9xV	473.45	-38.13	-8520.07
19	Komb.: 1.35xII+1.5xIII+0.75xIV+0.9xV	0.00	0.00	-8520.07
20	Komb.: 1.35xII+1.5xIII+1.5xV	473.45	-38.13	-8469.98
21	Komb.: 1.35xII+1.5xIII+1.5xV	473.45	-38.13	-8558.02
22	Komb.: 1.35xII+1.5xIII+1.5xV	0.00	0.00	-8469.98
23	Komb.: 1.35xII+1.5xIII+1.5xV	0.00	0.00	-8558.02
24	Komb.: II+1.5xIII+0.75xIV+0.9xV	350.70	-28.25	-6649.08
25	Komb.: I+1.5xIII+0.75xIV+0.9xV	0.00	0.00	-6649.08
26	Komb.: II+1.5xIII+1.5xV	350.70	-28.25	-6598.98
27	Komb.: I+1.5xIII+1.5xV	350.70	-28.25	-6687.03
28	Komb.: I+1.5xIII+1.5xV	0.00	0.00	-6598.98
29	Komb.: I+1.5xIII+1.5xV	0.00	0.00	-6687.03
30	Komb.: 1.35xII+1.5xIV+0.9xV	473.45	-38.13	-7401.89
31	Komb.: 1.35xII+1.5xIV+0.9xV	473.45	-38.13	-8445.69
32	Komb.: 1.35xII+1.5xIV+0.9xV	0.00	0.00	-7401.89
33	Komb.: 1.35xII+1.5xIV+0.9xV	0.00	0.00	-8445.69
34	Komb.: 1.35xII+0.75xIV+1.5xV	473.45	-38.13	-7351.79
35	Komb.: 1.35xII+1.5xIII+0.75xIV	473.45	-38.13	-8483.64
36	Komb.: 1.35xII+0.75xIV+1.5xV	0.00	0.00	-7351.79
37	Komb.: 1.35xII+1.5xIII+0.75xIV	0.00	0.00	-8483.64
38	Komb.: II+1.5xIV+0.9xV	350.70	-28.25	-5530.89
39	Komb.: II+1.5xIII+0.9xV	350.70	-28.25	-6574.69
40	Komb.: I+1.5xIV+0.9xV	0.00	0.00	-5530.89
41	Komb.: I+1.5xIII+0.9xV	0.00	0.00	-6574.69
42	Komb.: II+0.75xIV+1.5xV	350.70	-28.25	-5480.80
43	Komb.: II+1.5xIII+0.75xIV	350.70	-28.25	-6612.64
44	Komb.: I+0.75xIV+1.5xV	0.00	0.00	-5480.80
45	Komb.: I+1.5xIII+0.75xIV	0.00	0.00	-6612.64
46	Komb.: 1.35xII+1.5xV	473.45	-38.13	-7277.41
47	Komb.: 1.35xII+1.5xV	473.45	-38.13	-7365.45

LC	Naziv	pX [kN]	pY [kN]	pZ [kN]
48	Komb.: 1.35xII+1.5xIII	473.45	-38.13	-8409.26
49	Komb.: 1.35xII+1.5xV	0.00	0.00	-7277.41
50	Komb.: 1.35xII+1.5xIV	0.00	0.00	-7365.45
51	Komb.: 1.35xII+1.5xIII	0.00	0.00	-8409.26
52	Komb.: II+0.8xIII-1xVI			
53	Komb.: II+0.8xIII-1xVII			
54	Komb.: II+0.8xIII-1xVIII			
55	Komb.: II+0.8xIII-1xIX			
56	Komb.: II+0.8xIII+IX			
57	Komb.: II+0.8xIII+VIII			
58	Komb.: II+0.8xIII+VII			
59	Komb.: II+0.8xIII+VI			
60	Komb.: II+0.8xIII-1xVI			
61	Komb.: II+0.8xIII-1xVII			
62	Komb.: II+0.8xIII-1xVIII			
63	Komb.: II+0.8xIII-1xIX			
64	Komb.: II+0.8xIII+IX			
65	Komb.: II+0.8xIII+VIII			
66	Komb.: II+0.8xIII+VII			
67	Komb.: II+0.8xIII+VI			
68	Komb.: II+1.5xV	350.70	-28.25	-5406.42
69	Komb.: II+1.5xIV	350.70	-28.25	-5494.46
70	Komb.: II+1.5xIII	350.70	-28.25	-6538.26
71	Komb.: II+1.5xV	0.00	0.00	-5406.42
72	Komb.: II+1.5xIV	0.00	0.00	-5494.46
73	Komb.: II+1.5xIII	0.00	0.00	-6538.26
74	Komb.: II-1xVI			
75	Komb.: II-1xVII			
76	Komb.: II-1xVIII			
77	Komb.: II-1xIX			
78	Komb.: II+IX			
79	Komb.: II+VIII			
80	Komb.: II+VII			
81	Komb.: II+VI			
82	Komb.: I-1xVI			
83	Komb.: I-1xVII			
84	Komb.: I-1xVIII			
85	Komb.: I-1xIX			
86	Komb.: I+IX			
87	Komb.: I+VIII			
88	Komb.: I+VII			
89	Komb.: I+VI			
90	Komb.: 1.35xII	473.45	-38.13	-7216.69
91	Komb.: 1.35xI	0.00	0.00	-7216.69
92	Komb.: II	350.70	-28.25	-5345.70
93	Komb.: I	0.00	0.00	-5345.70

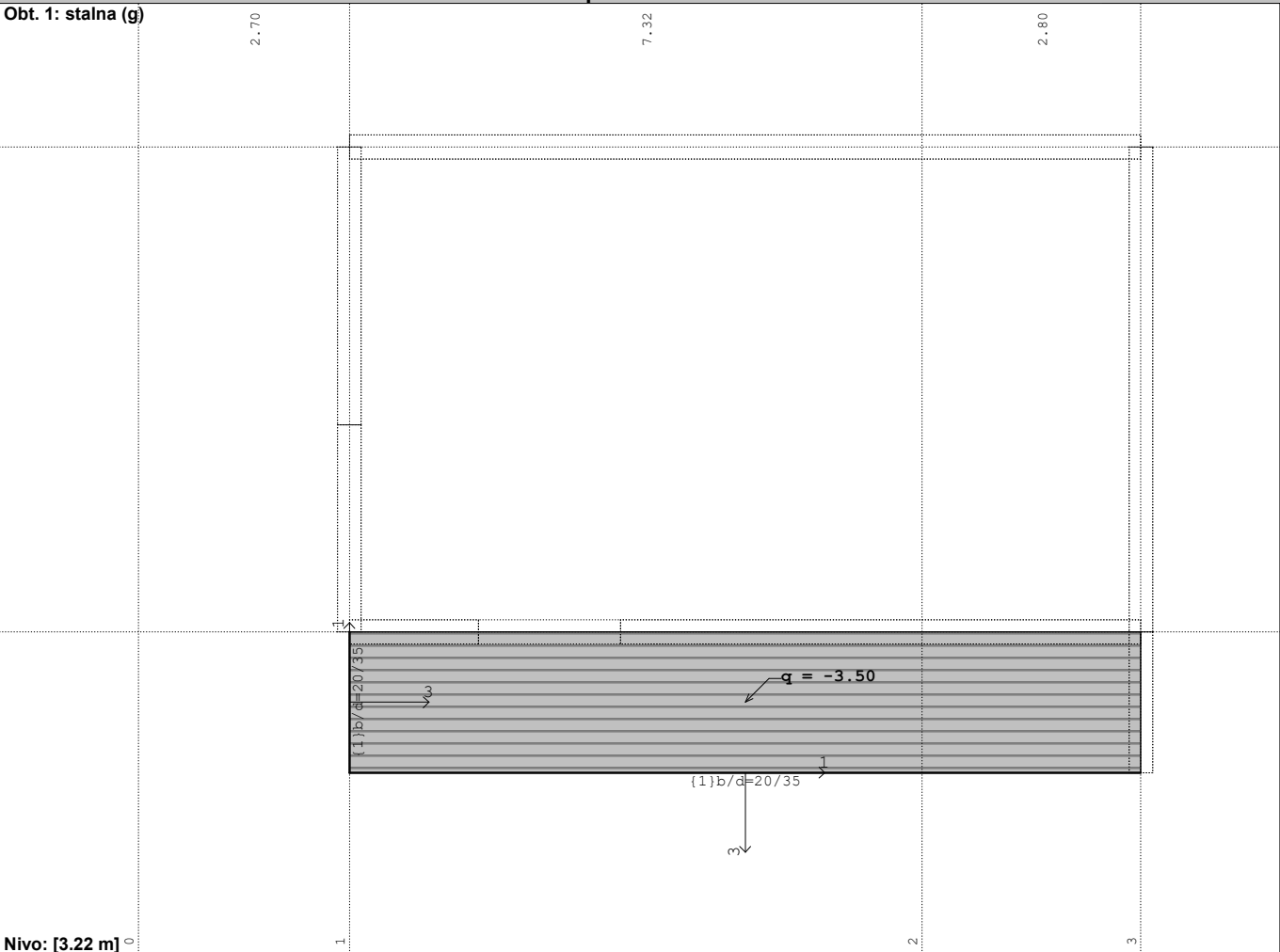
Obt. 1: stalna (g)



Nivo: [4.34 m]

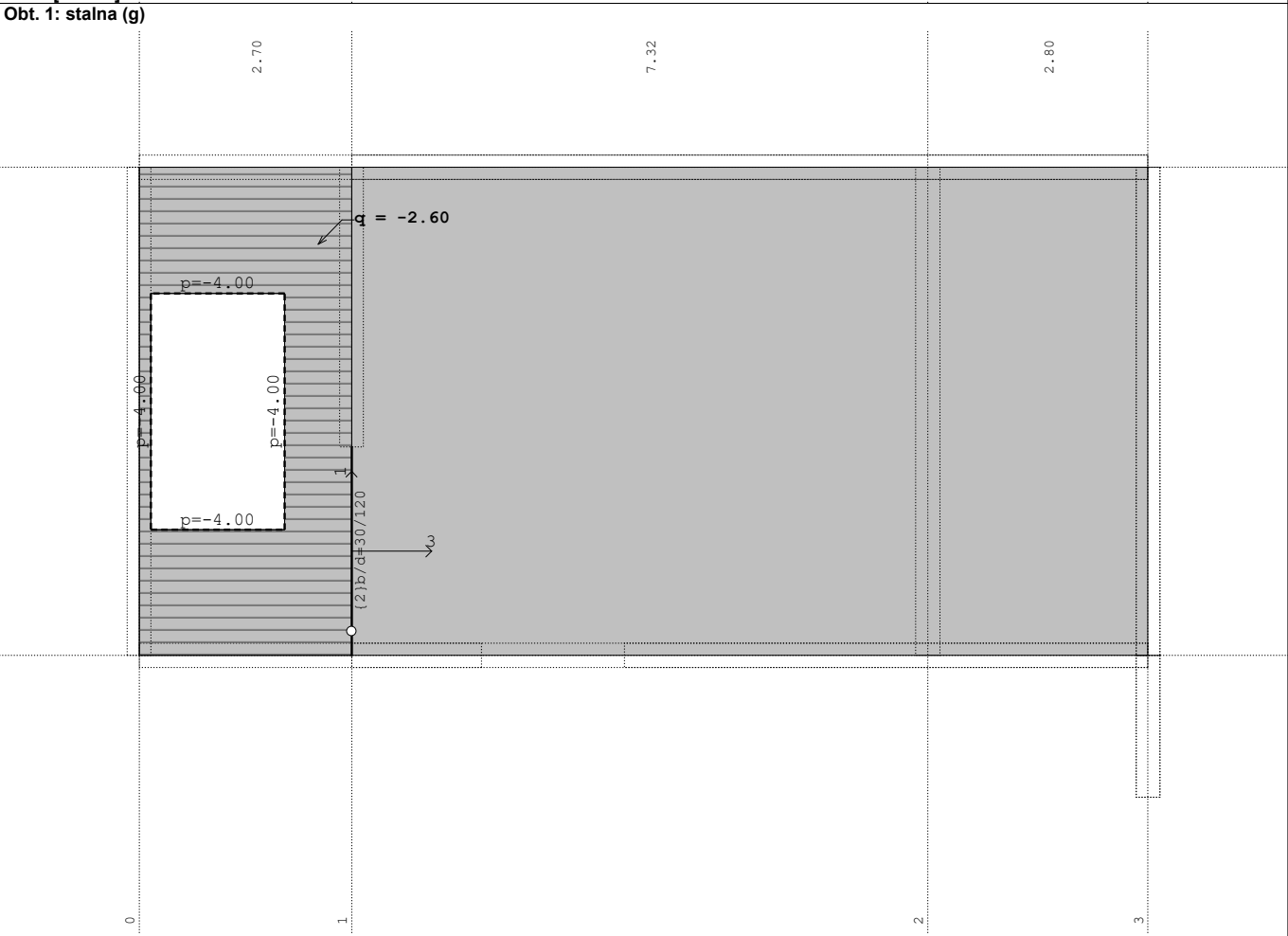
Vhodni podatki - Obtežba

Obt. 1: stalna (g)



Nivo: [3.22 m]

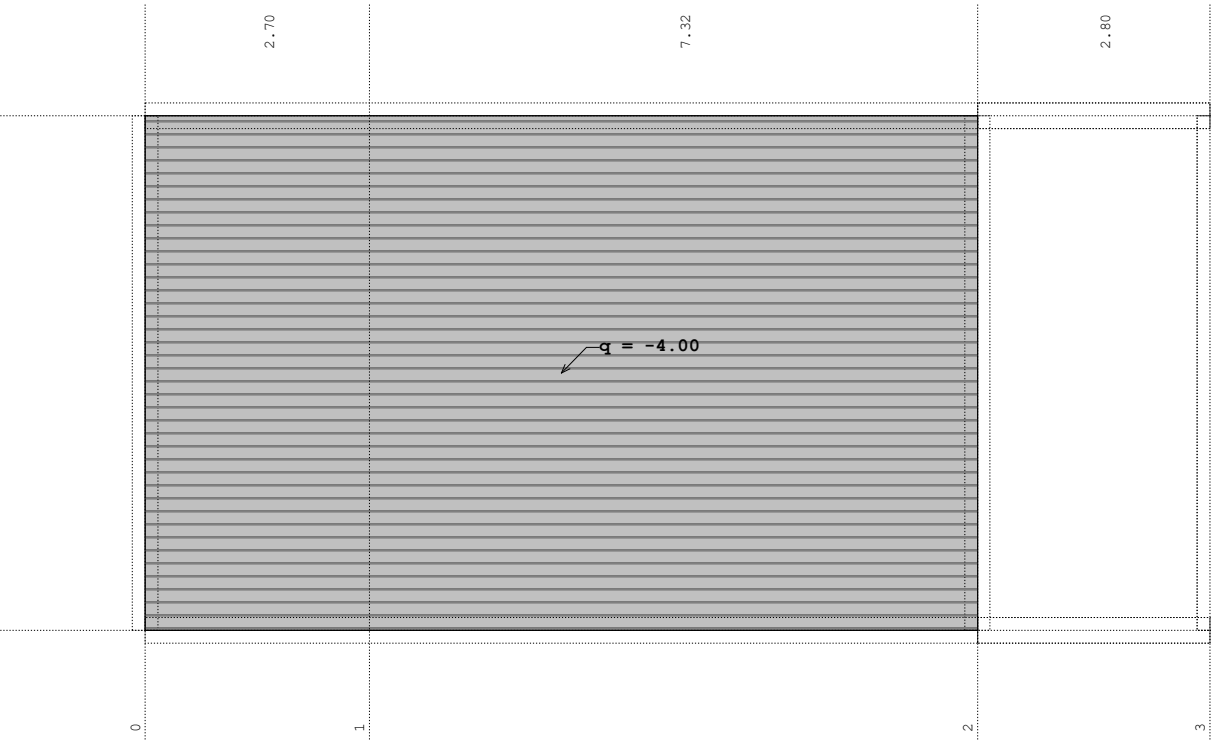
Obt. 1: stalna (g)



Nivo: [0.00 m]

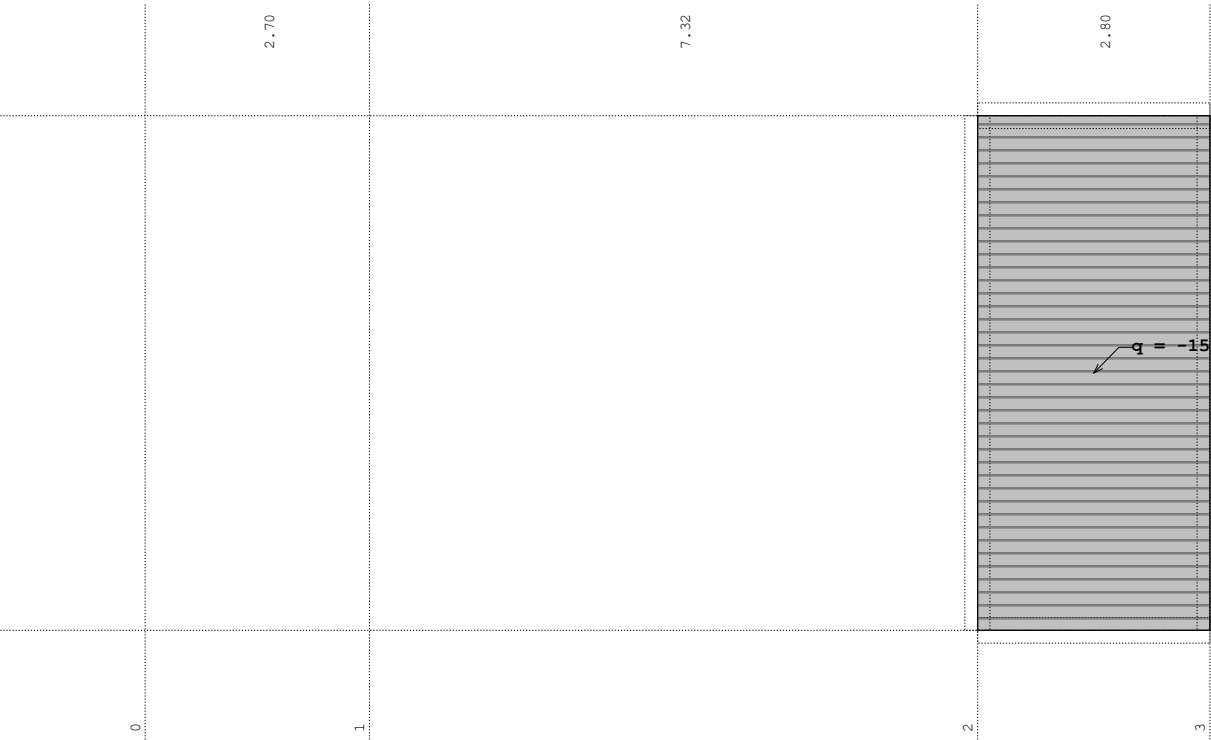
Vhodni podatki - Obtežba

Obt. 1: stalna (g)



Nivo: [-5.02 m]

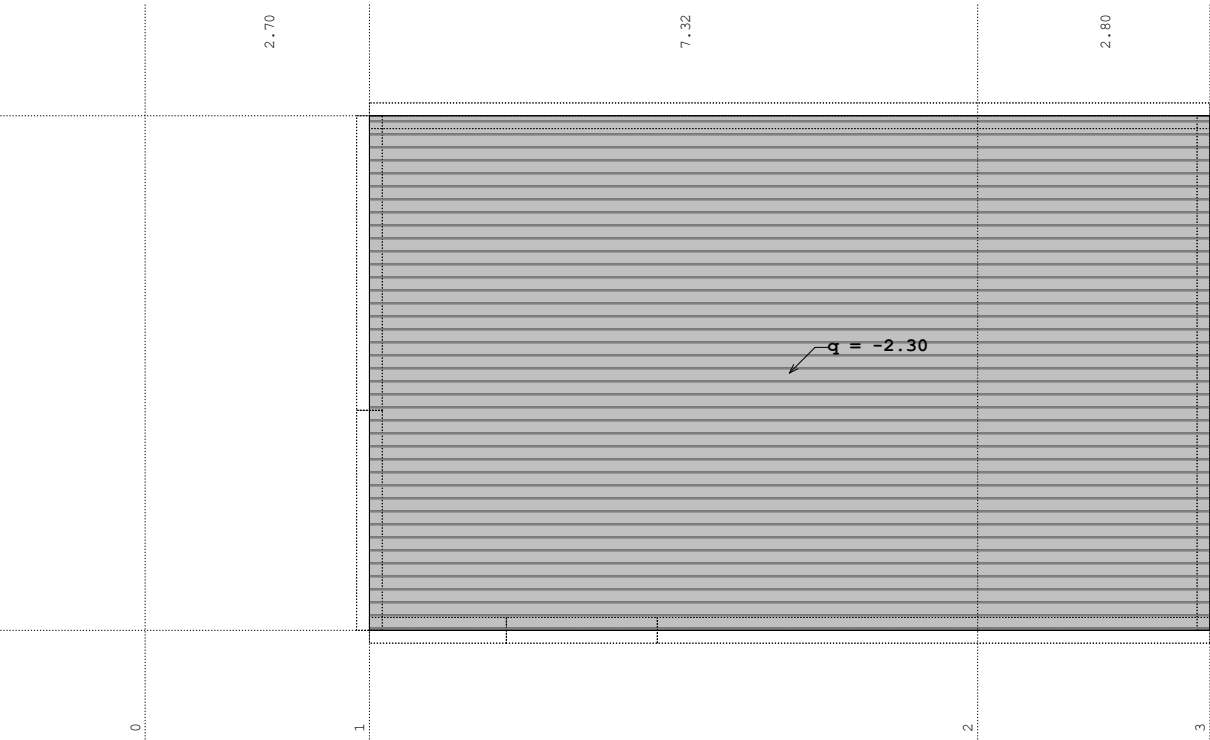
Obt. 1: stalna (g)



Nivo: [-5.52 m]

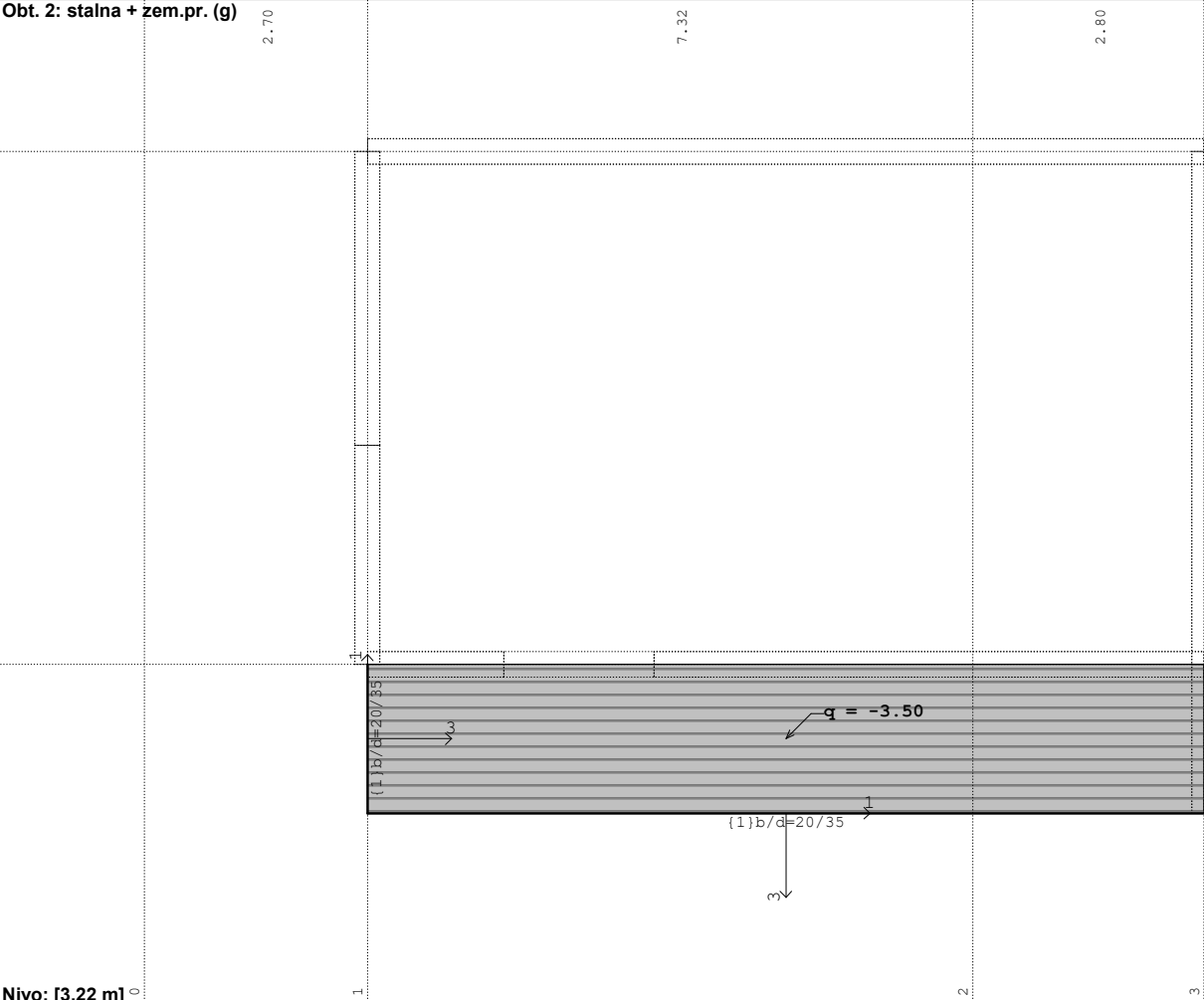
Vhodni podatki - Obtežba

Obt. 2: stalna + zem.pr. (g)



Nivo: [4.34 m]

Obt. 2: stalna + zem.pr. (g)

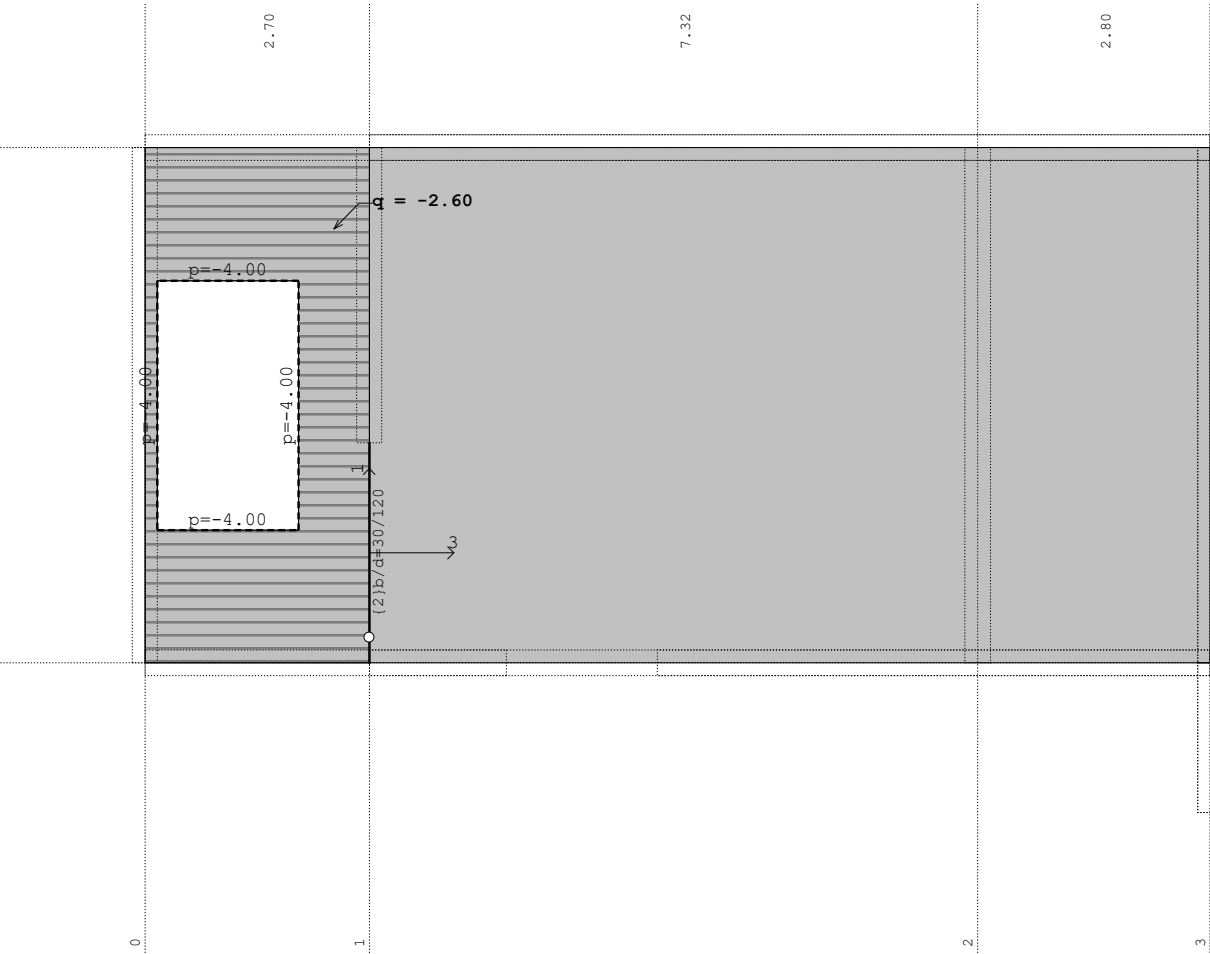


Nivo: [3.22 m]

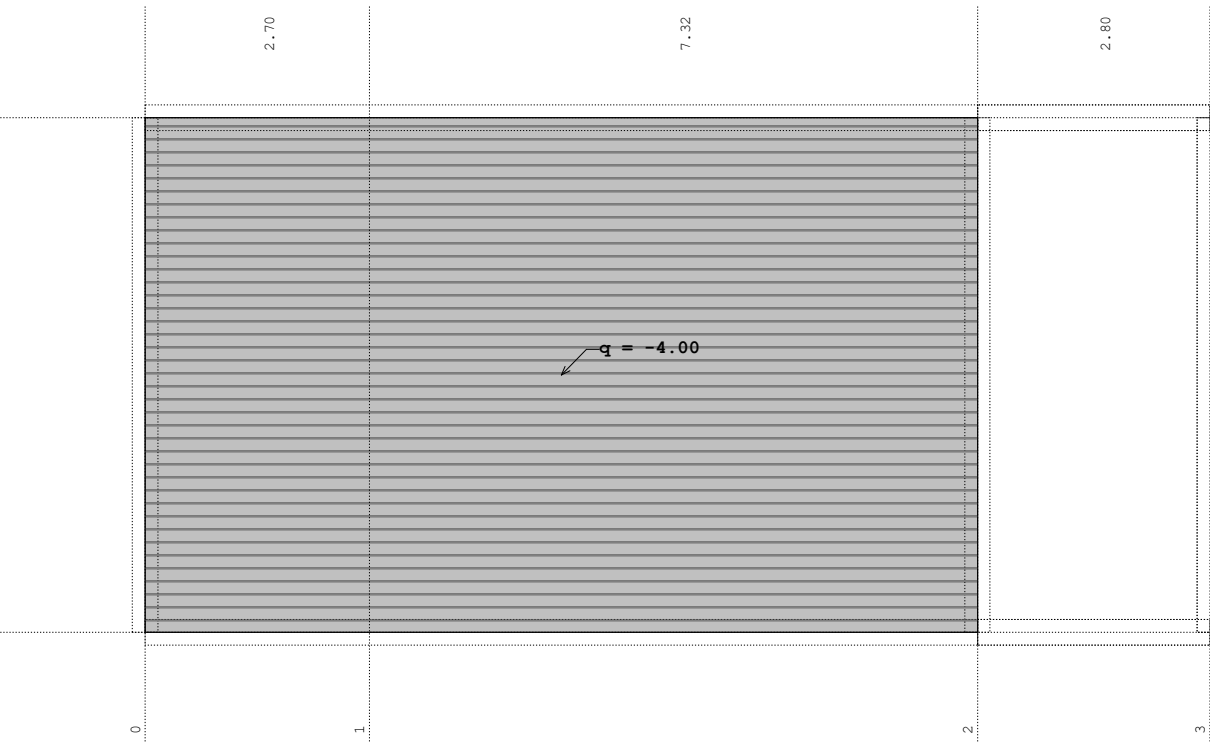


Vhodni podatki - Obtežba

Obt. 2: stalna + zem.pr. (g)



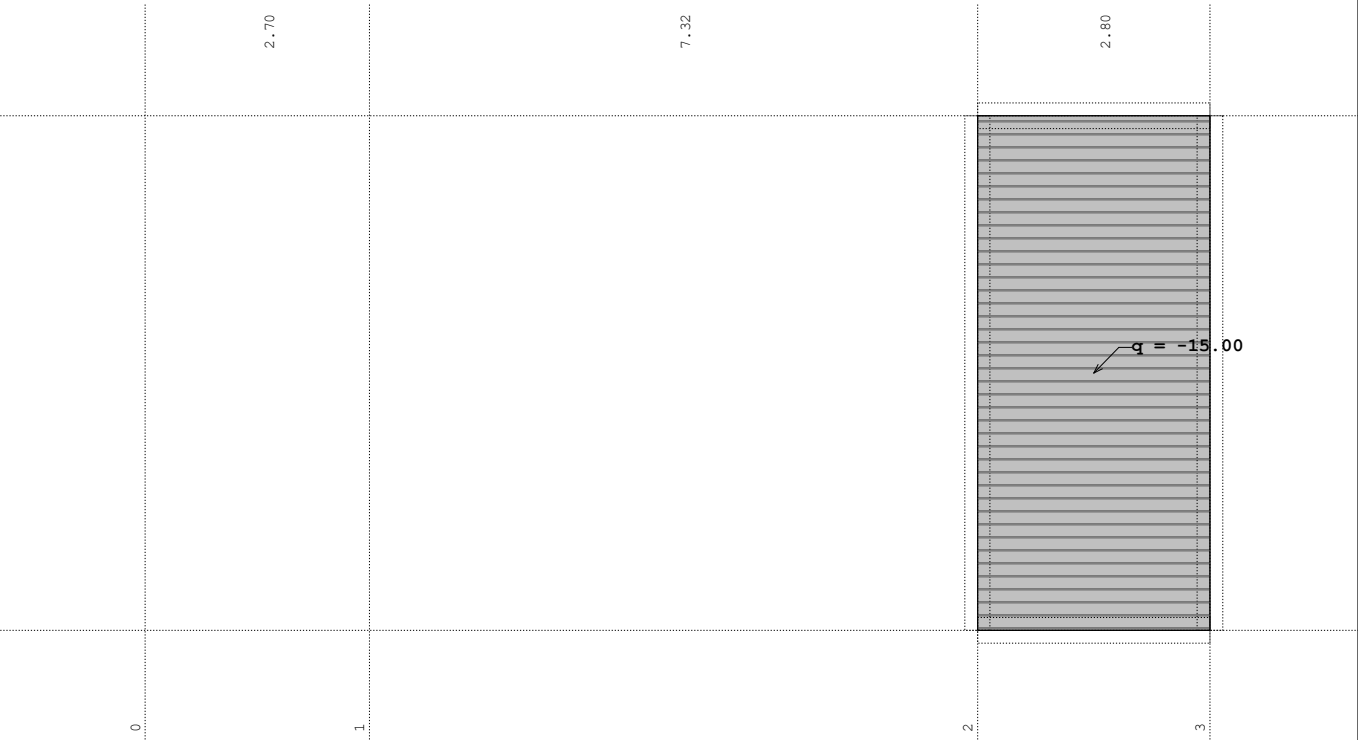
Nivo: [0.00 m]  
Obt. 2: stalna + zem.pr. (g)



Nivo: [-5.02 m]

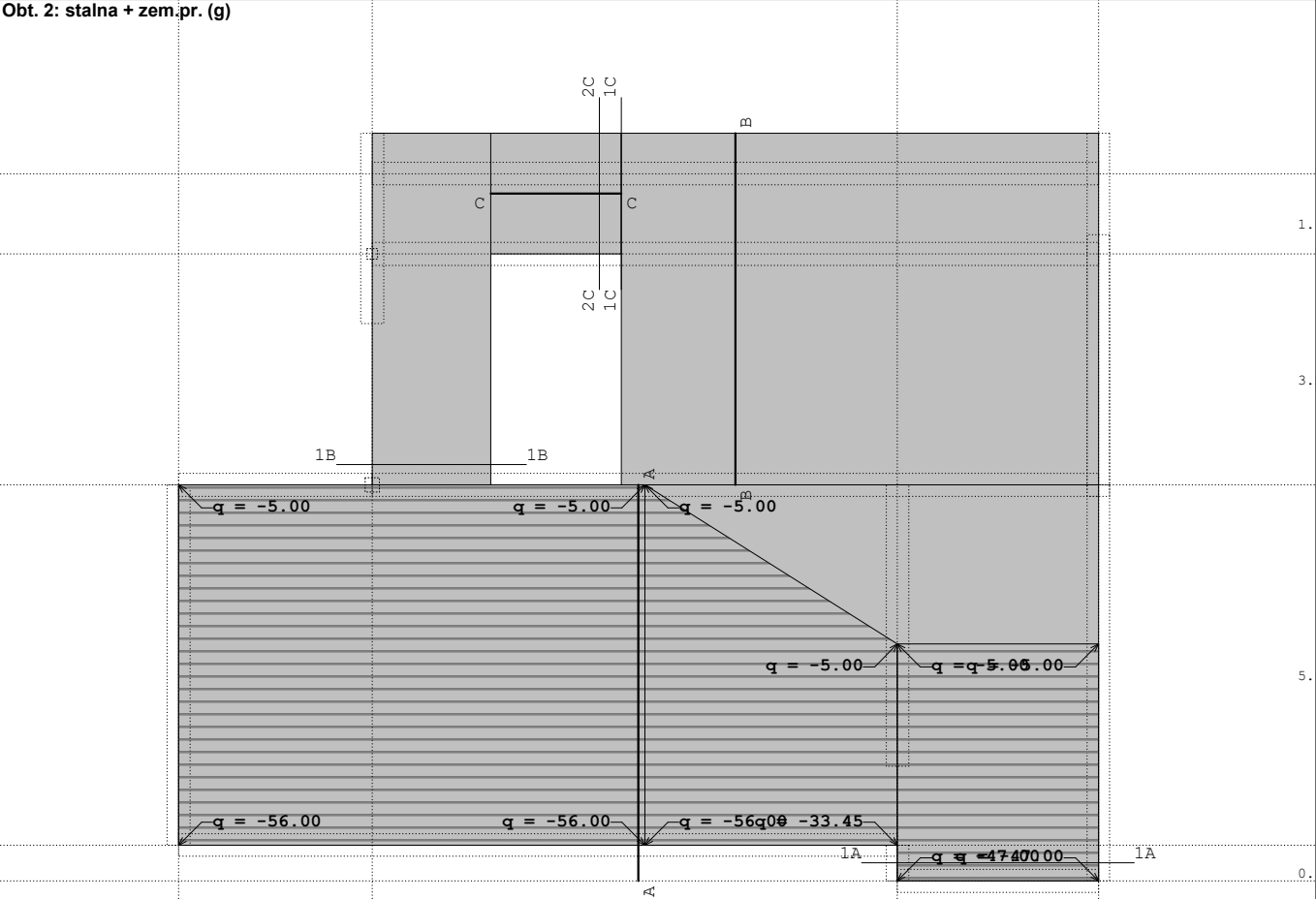
Vhodni podatki - Obtežba

Obt. 2: stalna + zem.pr. (g)



Nivo: [-5.52 m]

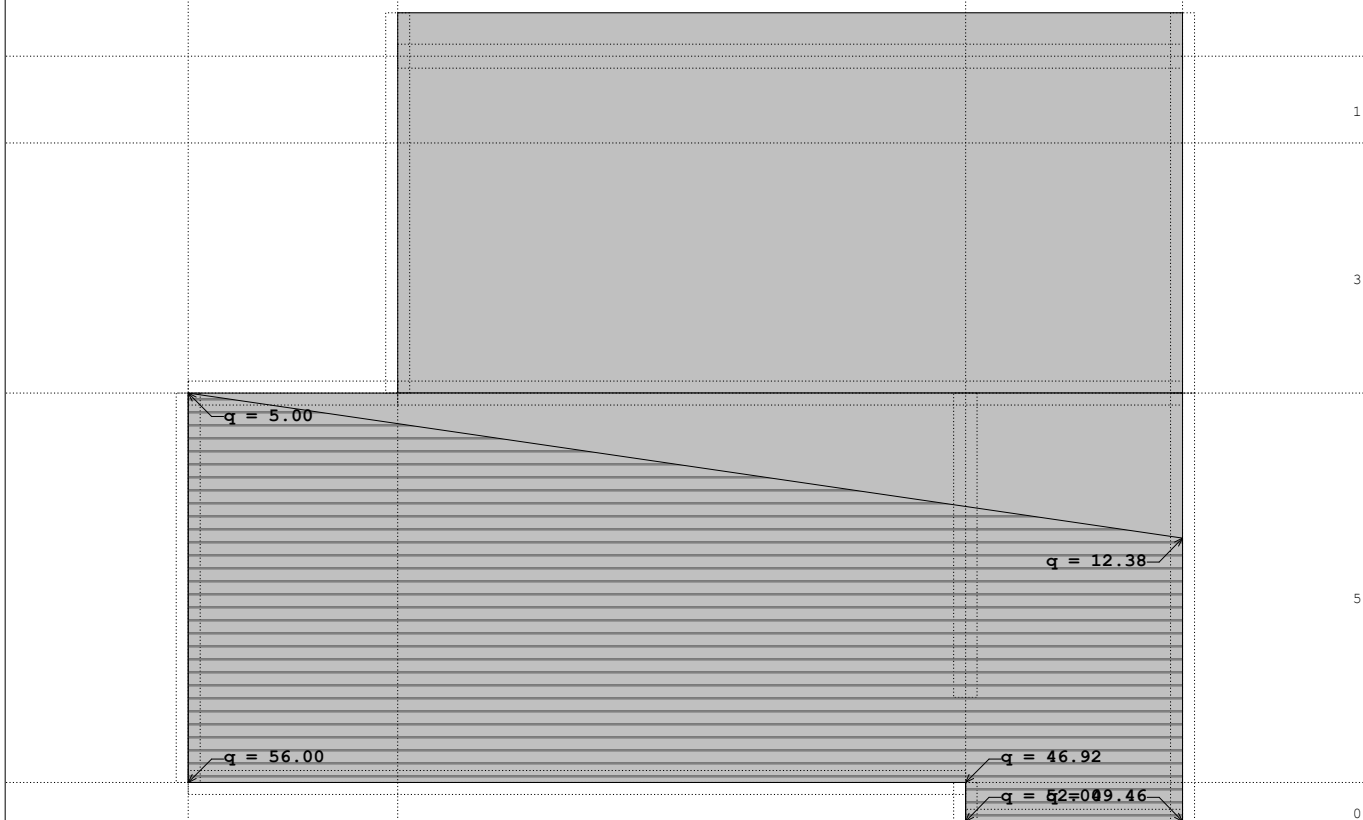
Obt. 2: stalna + zem.pr. (g)



Okvir: H\_2

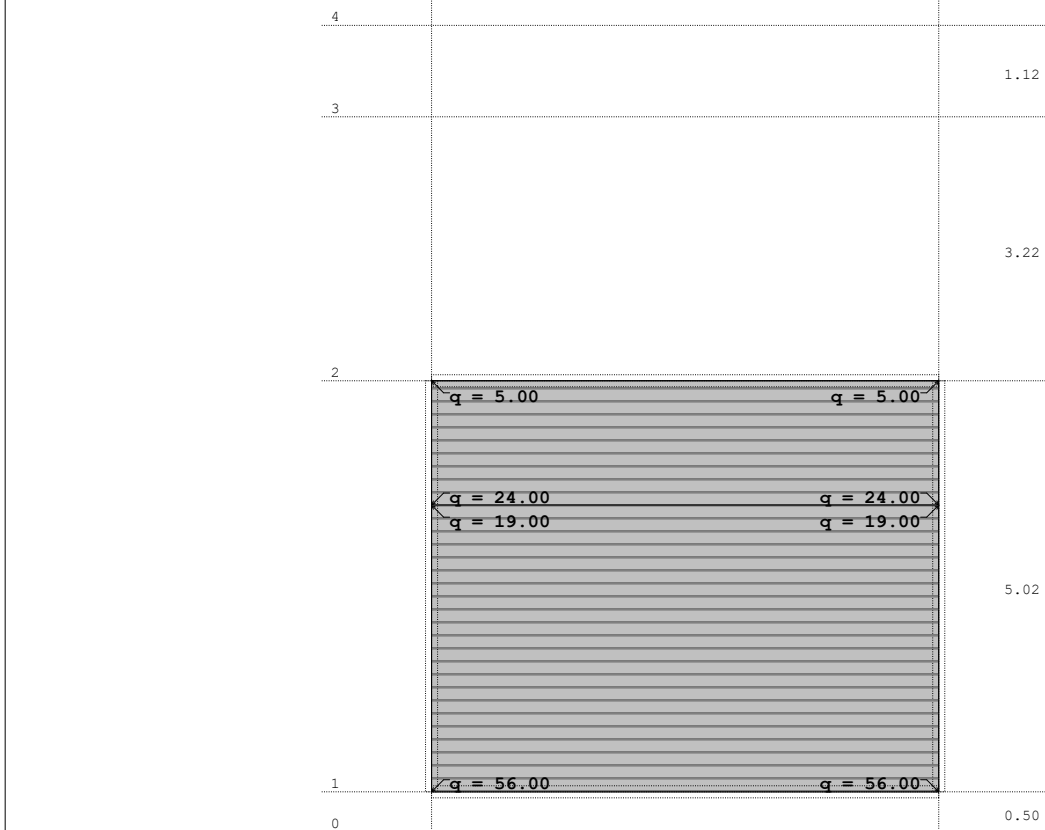
## Vhodni podatki - Obtežba

Obt. 2: stalna + zem.pr. (g)



Okvir: H\_1

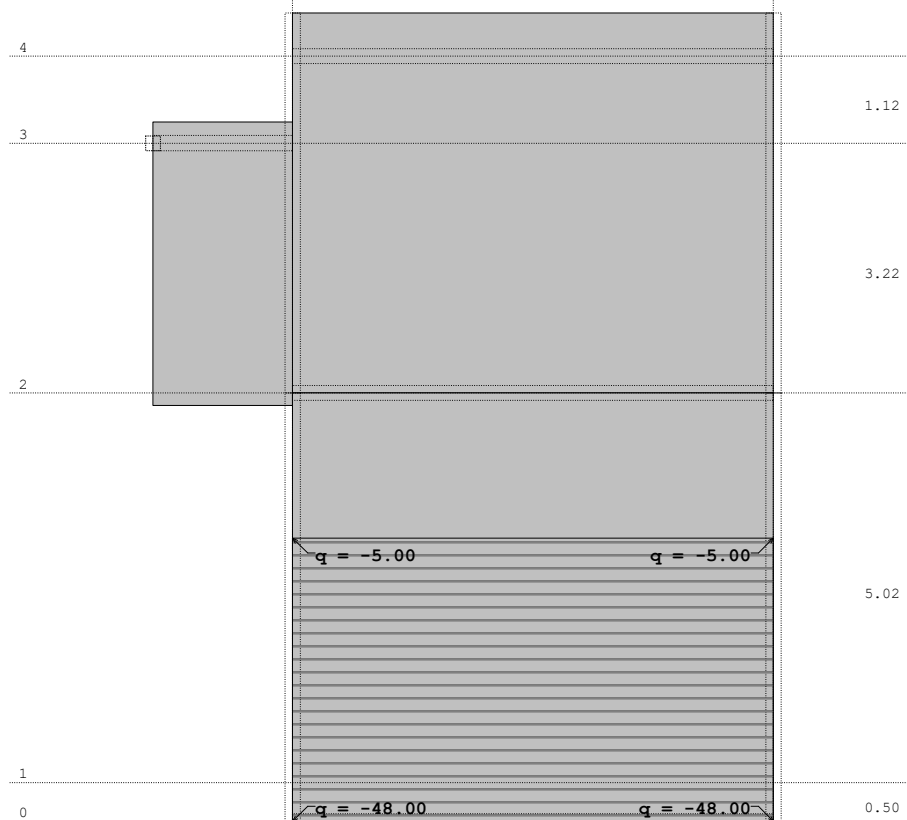
Obt. 2: stalna + zem.pr. (g)



Okvir: V\_2

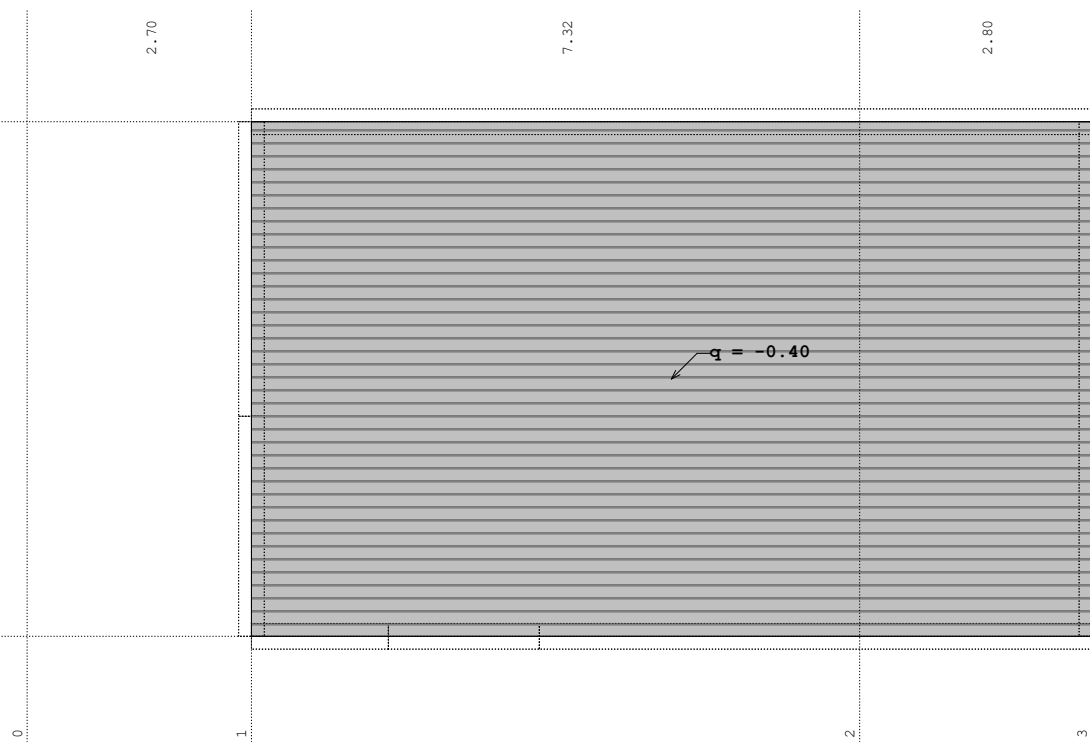
### Vhodni podatki - Obtežba

Obt. 2: stalna + zem.pr. (g)



**Okvir: V\_1**

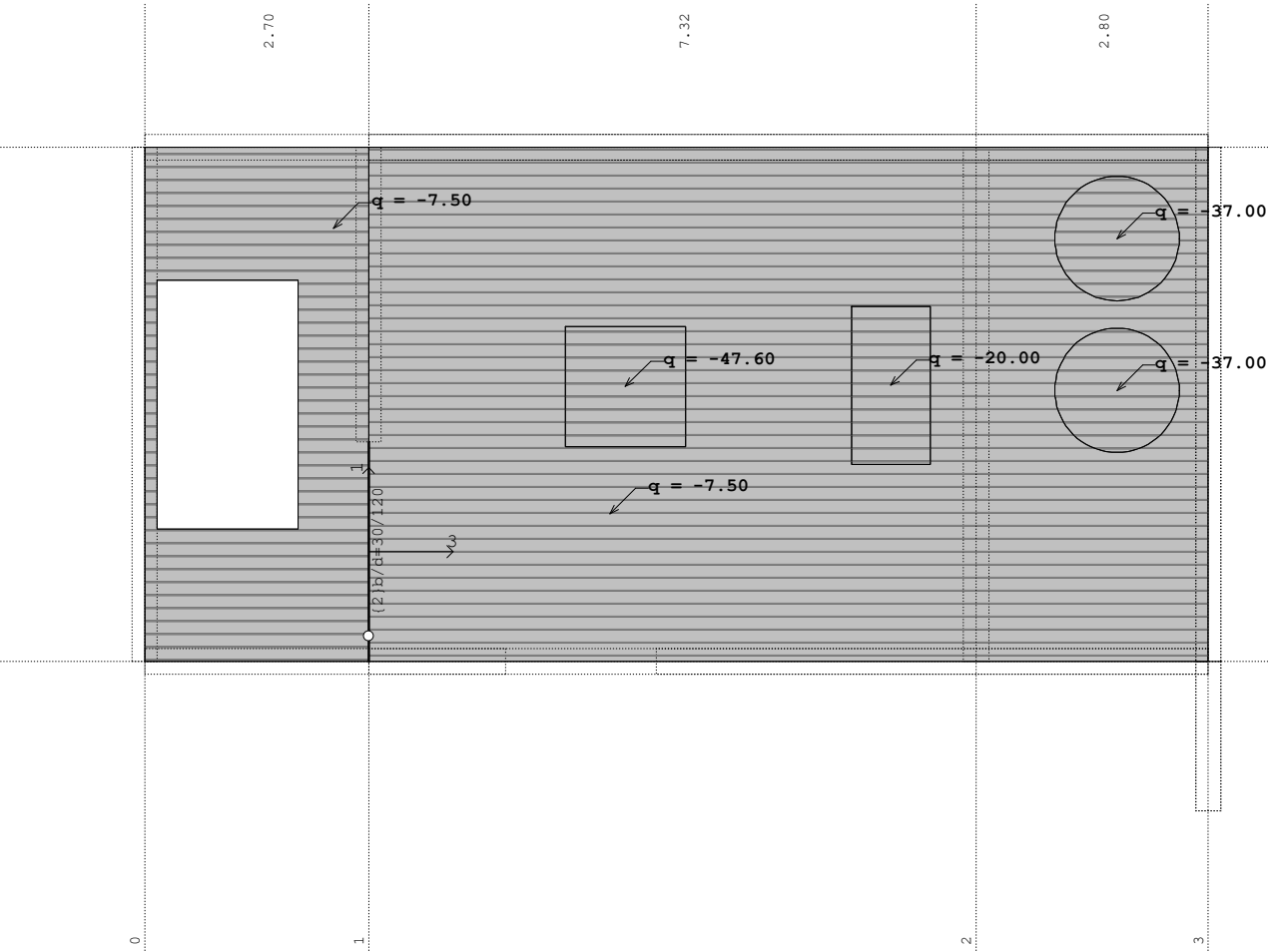
Obt. 3: koristna
------------------



**Nivo: [4.34 m]**

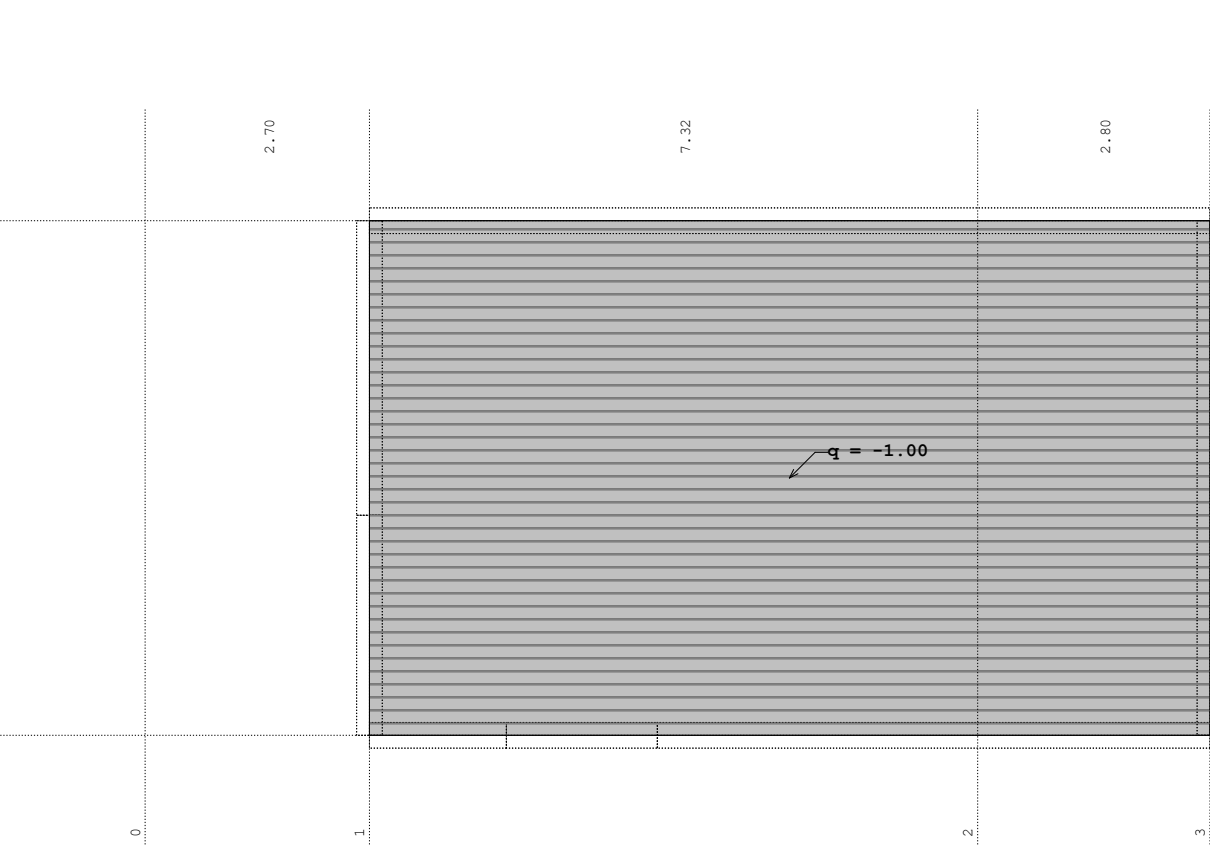
Vhodni podatki - Obtežba

Obt. 3: koristna



Nivo: [0.00 m]

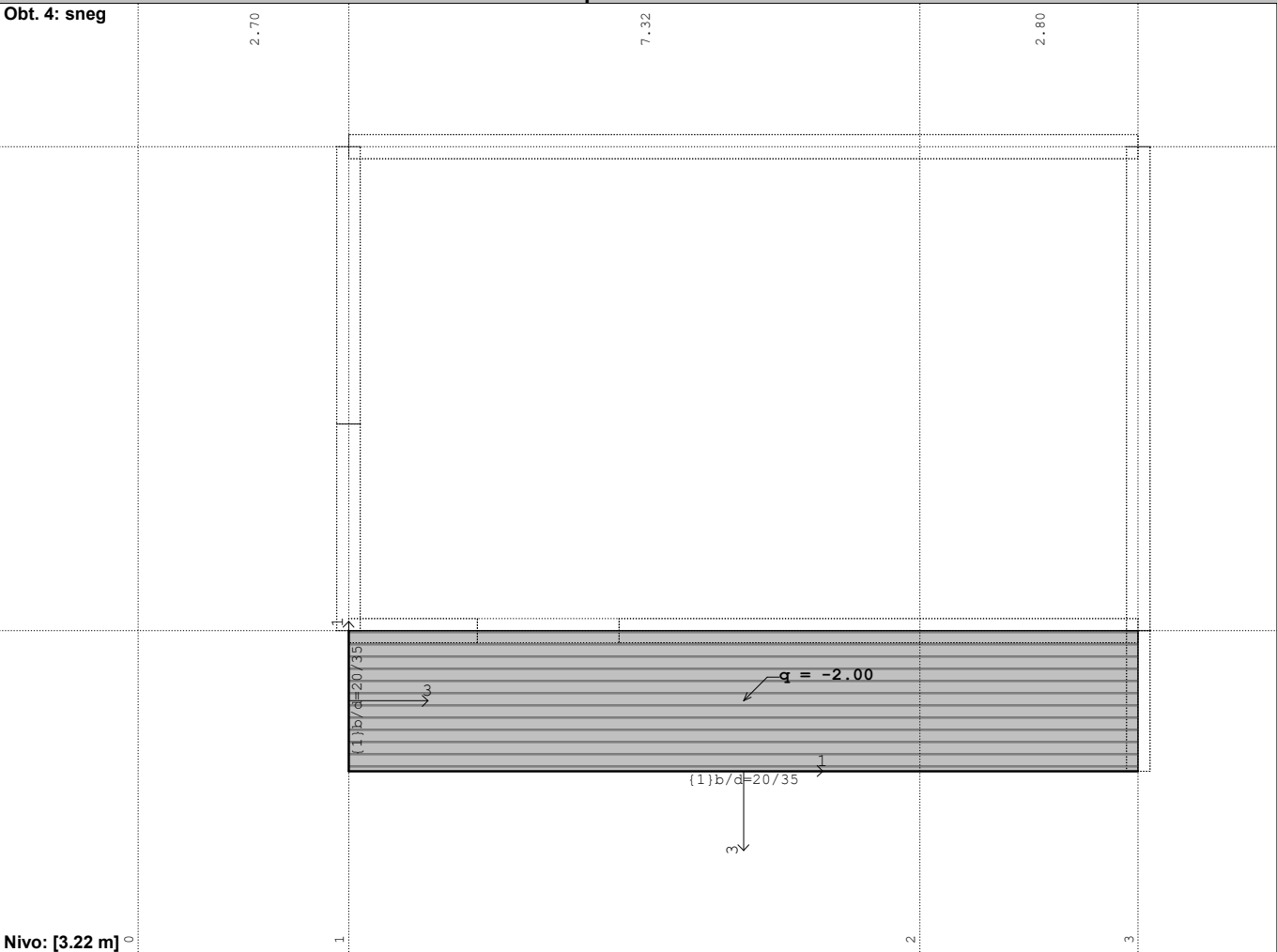
Obt. 4: sneg



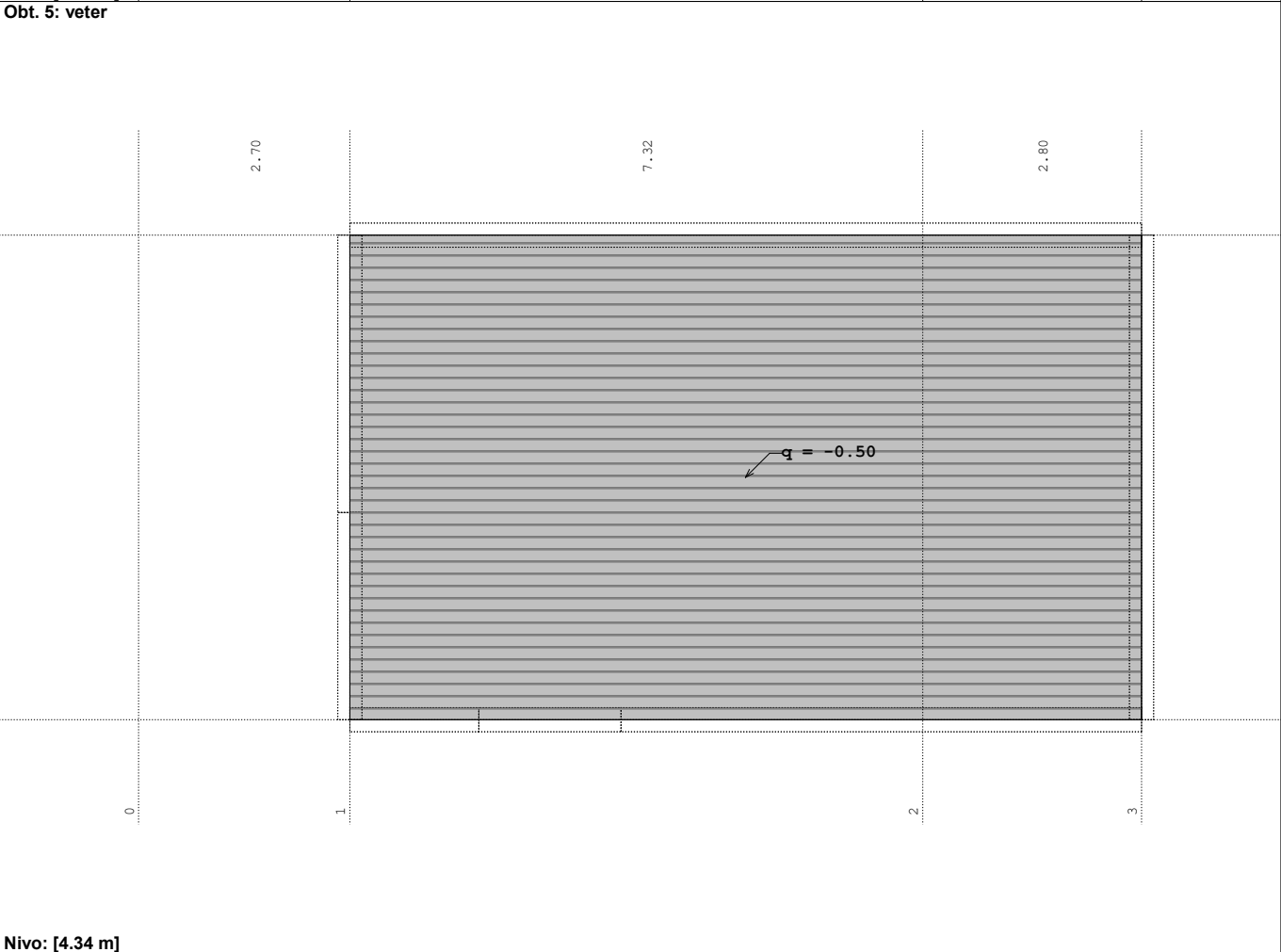
Nivo: [4.34 m]

Vhodni podatki - Obtežba

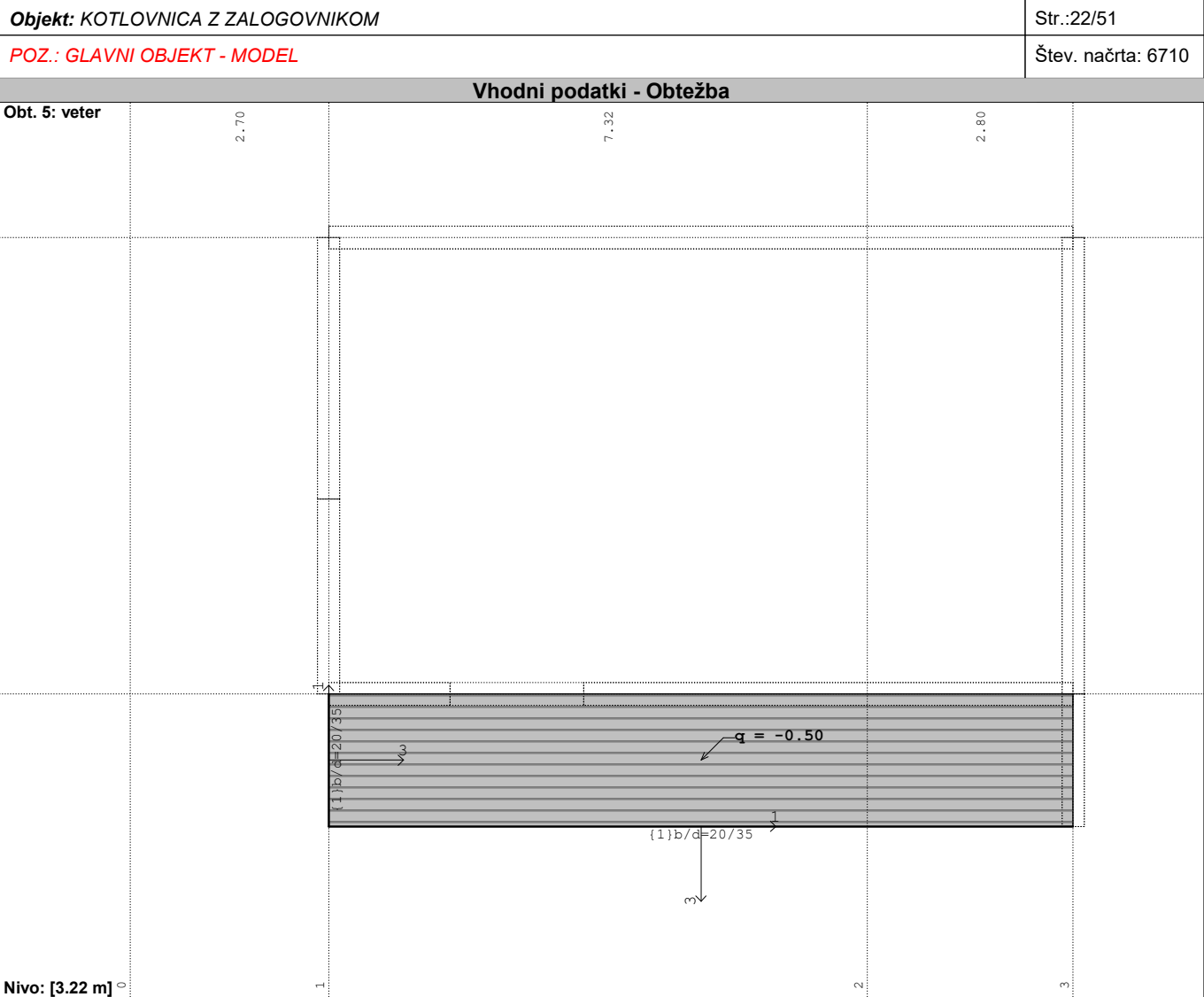
Obt. 4: sneg



Nivo: [3.22 m]  
Obt. 5: veter



Nivo: [4.34 m]





<b>Objekt:</b> KOTLOVNICA Z ZALOGOVNIKOM	Str.:23/51
<b>POZ.: GLAVNI OBJEKT - MODEL</b>	Štev. načrta: 6710
<b>Modalna analiza</b>	

#### Napredne opcije seizmičnega preračuna:

Mase grupirane v nivojih izbranih etaž  
Plošče - redukcija togosti na upogib: 0.500  
Grede - redukcija togosti na upogib: 0.500  
Zidovi - redukcija togosti na upogib: 0.500  
Stebri - redukcija upogibne togosti: 0.500  
Multiplikator togosti podpor: 2.500  
Preprečeno nihanje v Z smeri

Faktorji obtežb za preračun mas		
No	Naziv	Koeficient
1	stalna (g)	1.00
2	stalna + zem.pr. (g)	0.00
3	koristna	0.80
4	sneg	0.00
5	veter	0.00

Razporeditev mas po višini objekta					
Nivo	Z [m]	X [m]	Y [m]	Masa [T]	T/m²
	4.34	7.69	3.06	82.66	1.32
	3.22	8.59	1.18	69.62	3.82
	0.00	7.20	3.14	249.69	3.36

Nivo	Z [m]	X [m]	Y [m]	Masa [T]	T/m²
	-5.02	5.99	3.10	164.12	2.64
	-5.52	11.42	3.10	43.88	2.53
Skupno:	-0.79	7.40	2.69	608.97	

Položaj centra togosti po višini objekta (približna metoda)			
Nivo	Z [m]	X [m]	Y [m]
	4.34	10.68	4.79
	3.22	10.72	4.80
	0.00	8.68	3.51
	-5.02	8.95	3.10
	-5.52	11.31	3.10

Ekscentriciteta po višini objekta (približna metoda)			
Nivo	Z [m]	eox [m]	eoy [m]
	4.34	2.98	1.73
	3.22	2.13	3.62
	0.00	1.48	0.37
	-5.02	2.96	0.00
	-5.52	0.11	0.00

Nihajne dobe konstrukcije		
No	T [s]	f [Hz]
1	0.2331	4.2899
2	0.1301	7.6892

## Seizmični preračun

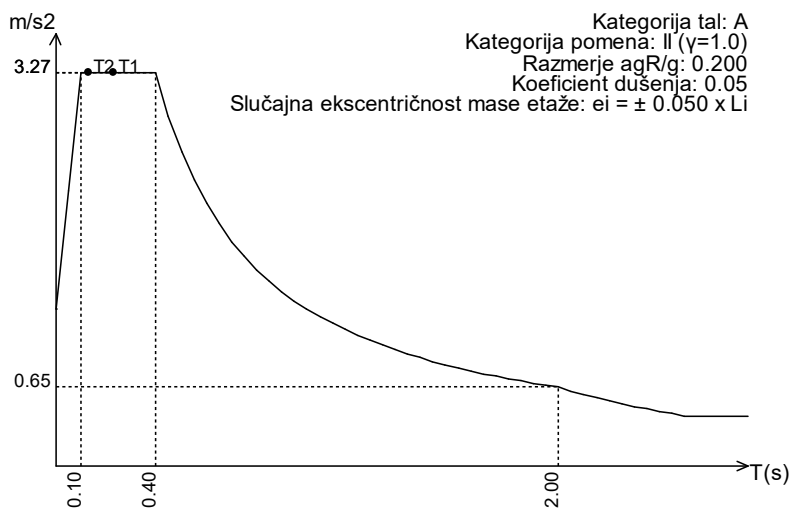
Seizmični preračun: EC8 (EN 1998) SLO

Kategorija tal: A  
 Kategorija pomena: II ( $\gamma=1.0$ )  
 Razmerje  $a_g R/g$ : 0.200  
 Koeficient dušenja: 0.05  
 Slučajna ekscentričnost mase etaže:  $e_i = \pm 0.050 \times L_i$

Faktorji smeri potresa:	Obtežni primer	Kot $\alpha$ [°]	$k_{\alpha}$	$k_{\alpha+90^\circ}$	$k_z$	Faktor $O_i$
Sx		0	1.000	0.300	0.000	1.500
Sy		90	1.000	0.300	0.000	1.500

Tip spektra	Obtežni primer	S	T <sub>b</sub>	T <sub>c</sub>	T <sub>d</sub>	avg/ag
Sx		1.000	0.100	0.400	2.000	1.000
Sy		1.000	0.100	0.400	2.000	1.000

## Projektni spekter

S=1.00, T<sub>b</sub>=0.10, T<sub>c</sub>=0.40, T<sub>d</sub>=2.00

## Razporeditev potresnih sil po višini objekta - Sx (+e)

Nivo	Z [m]	Ton 1			Ton 2		
		Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]
	4.34	-0.29	97.39	0.95	296.72	-0.22	-23.19
	3.22	-0.16	74.25	13.17	231.86	1.12	-36.66
	0.00	-0.21	173.29	-0.11	543.83	-0.61	-32.08
	-5.02	-0.02	10.14	0.02	92.98	-1.08	21.05
	-5.52	0.01	2.69	0.02	18.45	-4.54	-43.36
	$\Sigma$	-0.68	357.77	14.06	1183.8	3.74	-114.23

## Razporeditev potresnih sil po višini objekta - Sx (-e)

Nivo	Z [m]	Ton 1			Ton 2		
		Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]
	4.34	-0.29	97.39	0.95	296.72	-0.22	-23.19
	3.22	-0.16	74.25	13.17	231.86	1.12	-36.66
	0.00	-0.21	173.29	-0.11	543.83	-0.61	-32.08
	-5.02	-0.02	10.14	0.02	92.98	-1.08	21.05
	-5.52	0.01	2.69	0.02	18.45	-4.54	-43.36
	$\Sigma$	-0.68	357.77	14.06	1183.8	3.74	-114.23

## Razporeditev potresnih sil po višini objekta - Sy (+e)

Nivo	Z [m]	Ton 1			Ton 2		
		Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]
	4.34	-0.96	326.88	3.20	-88.00	0.07	6.88
	3.22	-0.54	249.23	44.22	-68.76	-0.33	10.87
	0.00	-0.72	581.62	-0.38	-161.28	0.18	9.51
	-5.02	-0.08	34.03	0.07	-27.58	0.32	-6.24
	-5.52	0.03	9.03	0.08	-5.47	-1.35	12.86
	$\Sigma$	-2.27	1200.8	47.18	-351.08	-1.11	33.88

## Razporeditev potresnih sil po višini objekta - Sy (-e)

Nivo	Z [m]	Ton 1			Ton 2		
		Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]
	4.34	-0.96	326.88	3.20	-88.00	0.07	6.88
	3.22	-0.54	249.23	44.22	-68.76	-0.33	10.87
	0.00	-0.72	581.62	-0.38	-161.28	0.18	9.51
	-5.02	-0.08	34.03	0.07	-27.58	0.32	-6.24
	-5.52	0.03	9.03	0.08	-5.47	-1.35	12.86
	$\Sigma$	-2.27	1200.8	47.18	-351.08	-1.11	33.88

## Faktorji participacije - relativno sodelovanje

Ton \ Naziv	1. Sx (+e)	2. Sx (-e)	3. Sy (+e)	4. Sy (-e)
1	0.083	0.083	0.920	0.920
2	0.917	0.917	0.080	0.080

## Faktorji participacije - angažiranje mase

Ton	U [ $\alpha=0^\circ$ ]
Upošteva se samo masa nad koto temelja	
Kota temelja:	-5.02 m
Skupna masa nad temeljem:	402.00 T

Ton	U [ $\alpha=0^\circ$ ]	U [ $\alpha=90^\circ$ ]
Skupna masa celega objekta:	610.01 T	

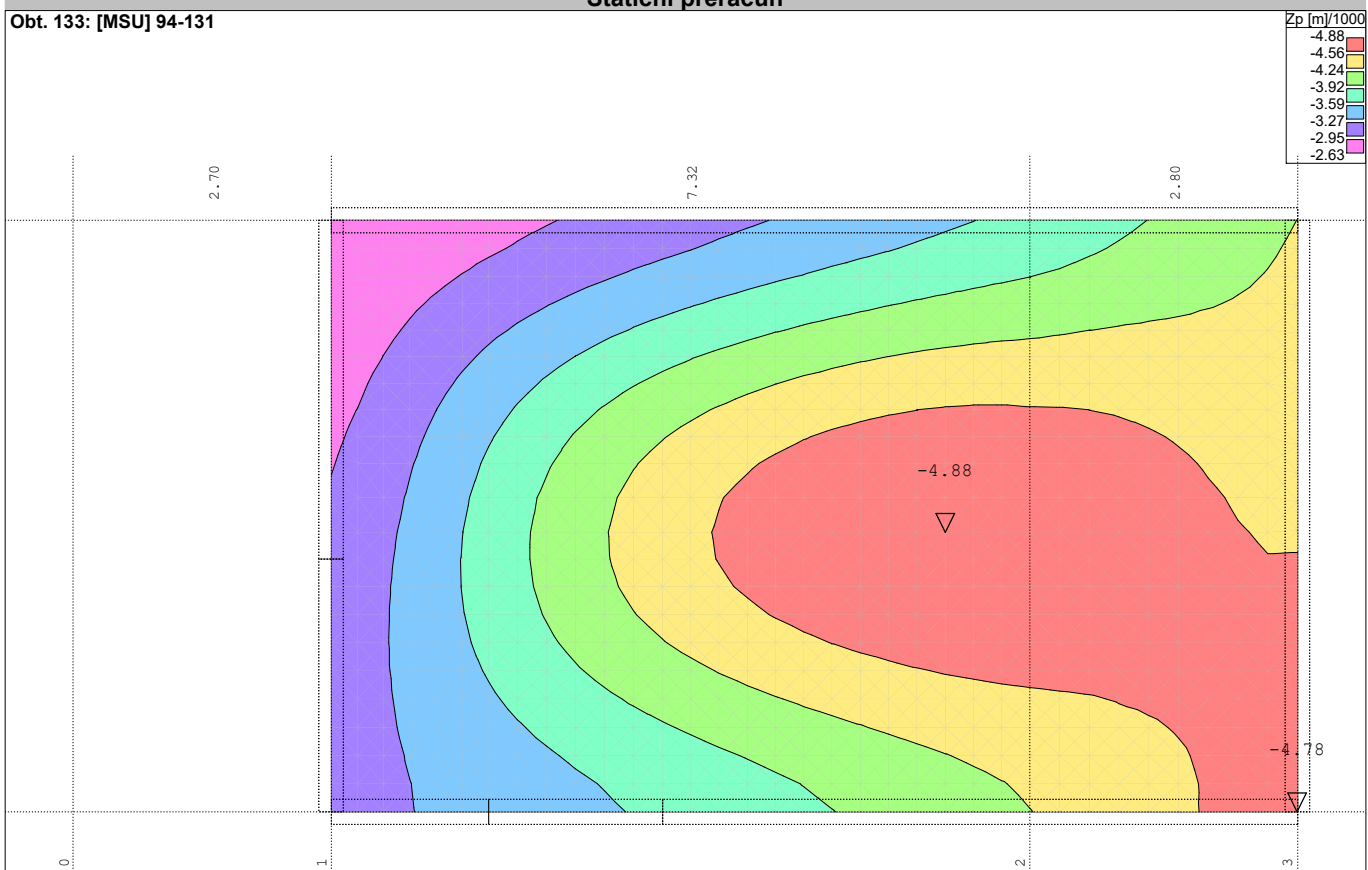
Ton	U [ $\alpha=0^\circ$ ]	U [ $\alpha=90^\circ$ ]
1	0.00	94.09
2	94.40	0.00
$\Sigma U$ (%)	94.40	94.09

## Prečne sile v osnovi [-5.02 m]

Obtežni primer	Kot $\alpha$ [°]	Vib [kN]
Sx	0	1240.57
Sy	90	1236.40

## Statični preračun

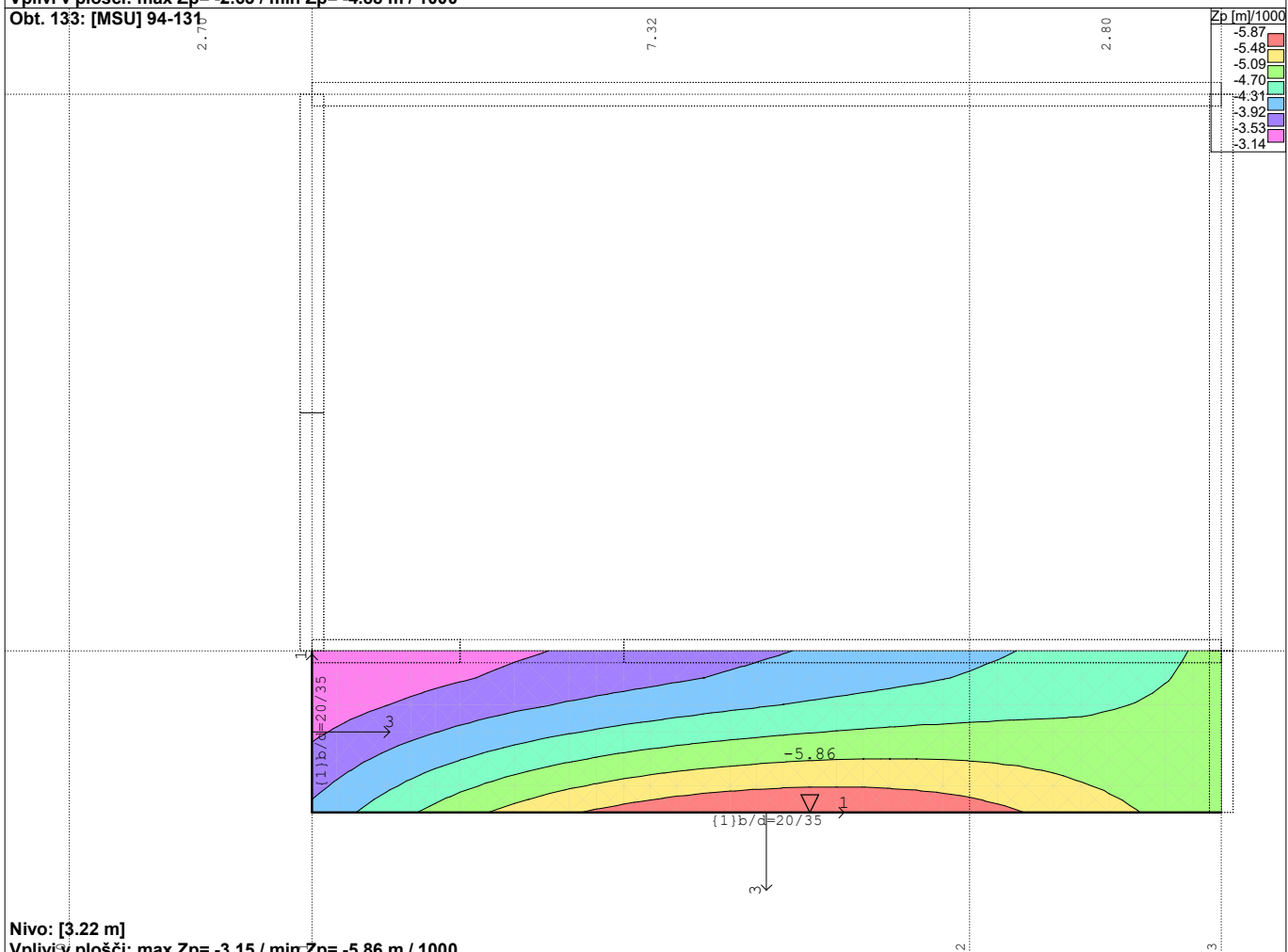
Obt. 133: [MSU] 94-131
------------------------



Nivo: [4.34 m]

**Vplivi v plošči: max Zp= -2.63 / min Zp= -4.88 m / 1000**

Obt. 133: [MSU] 94-131

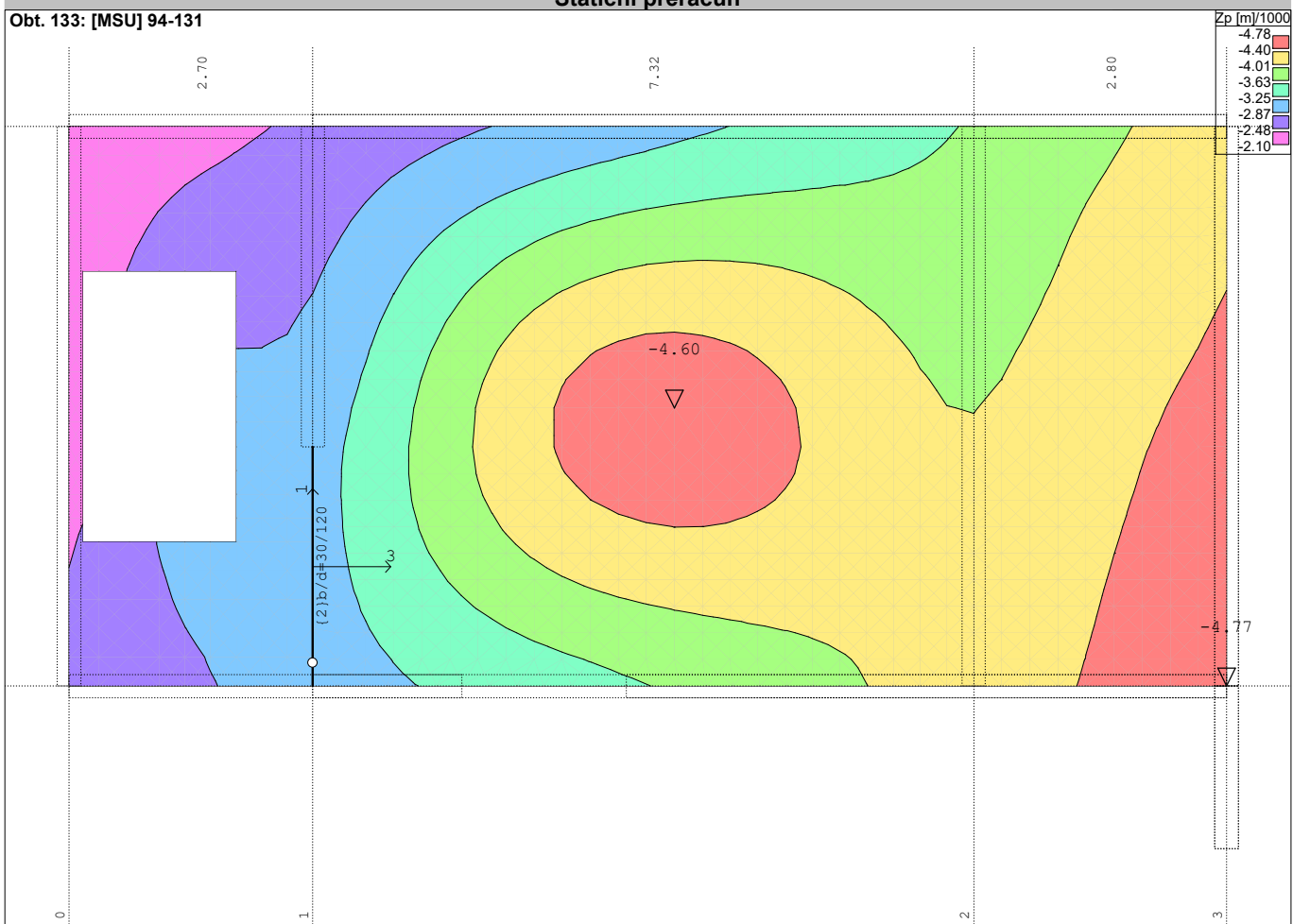


Nivo: [3.22 m]

**Vplivi v plošči: max Zp= -3.15 / min Zp= -5.86 m / 1000**

## Statični preračun

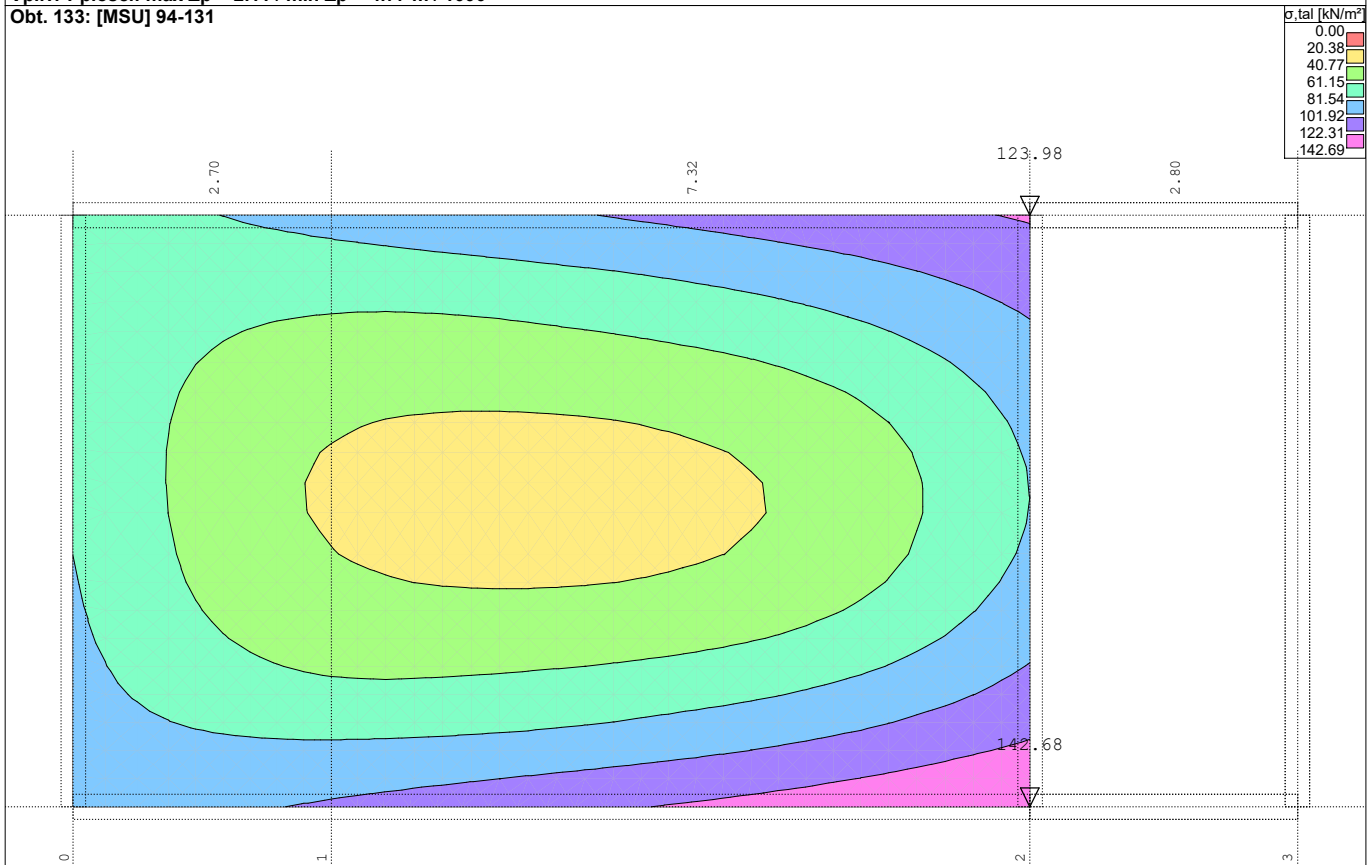
Obt. 133: [MSU] 94-131
------------------------



Nivo: [0.00 m]

**Vplivi v plošči: max Zp= -2.11 / min Zp= -4.77 m / 1000**

Obt. 133: [MSU] 94-131



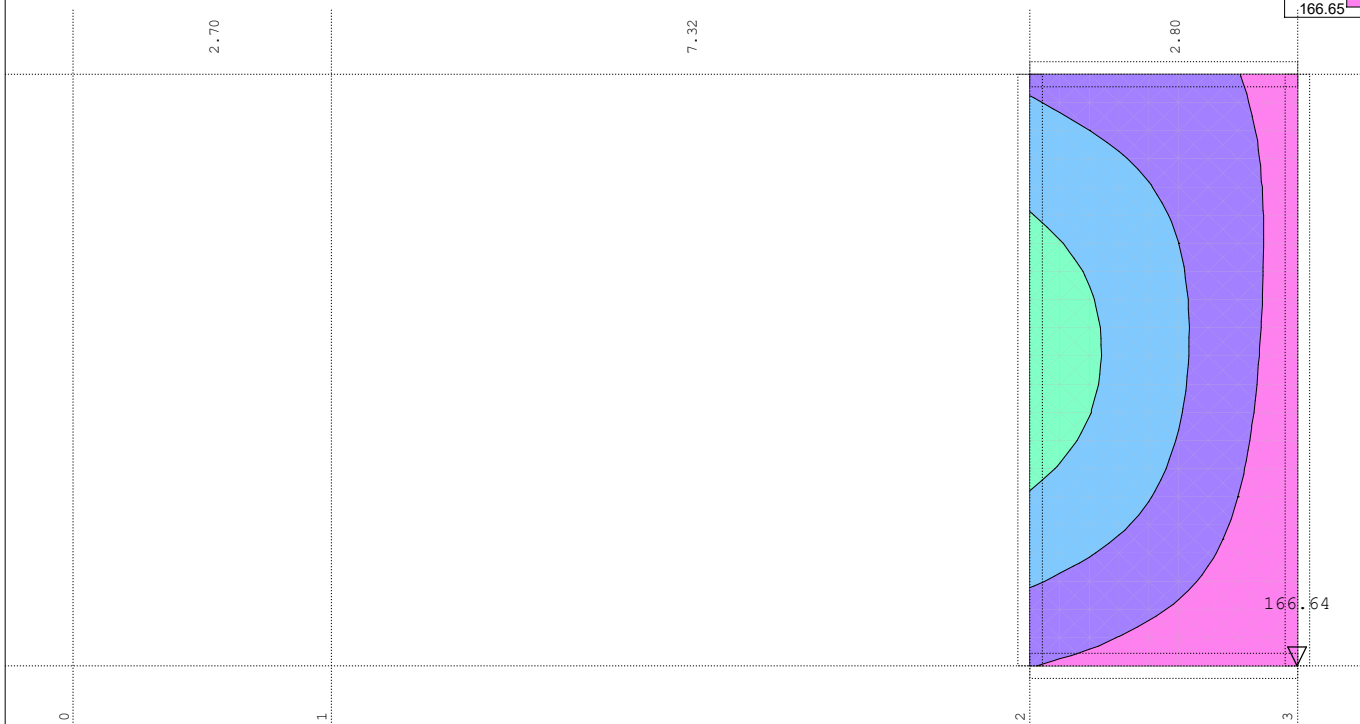
Nivo: [-5.02 m]

Vplivi v pov.podpori: max  $\sigma_{,tal}$  = 142.68 / min  $\sigma_{,tal}$  = 0.00 kN/m<sup>2</sup>

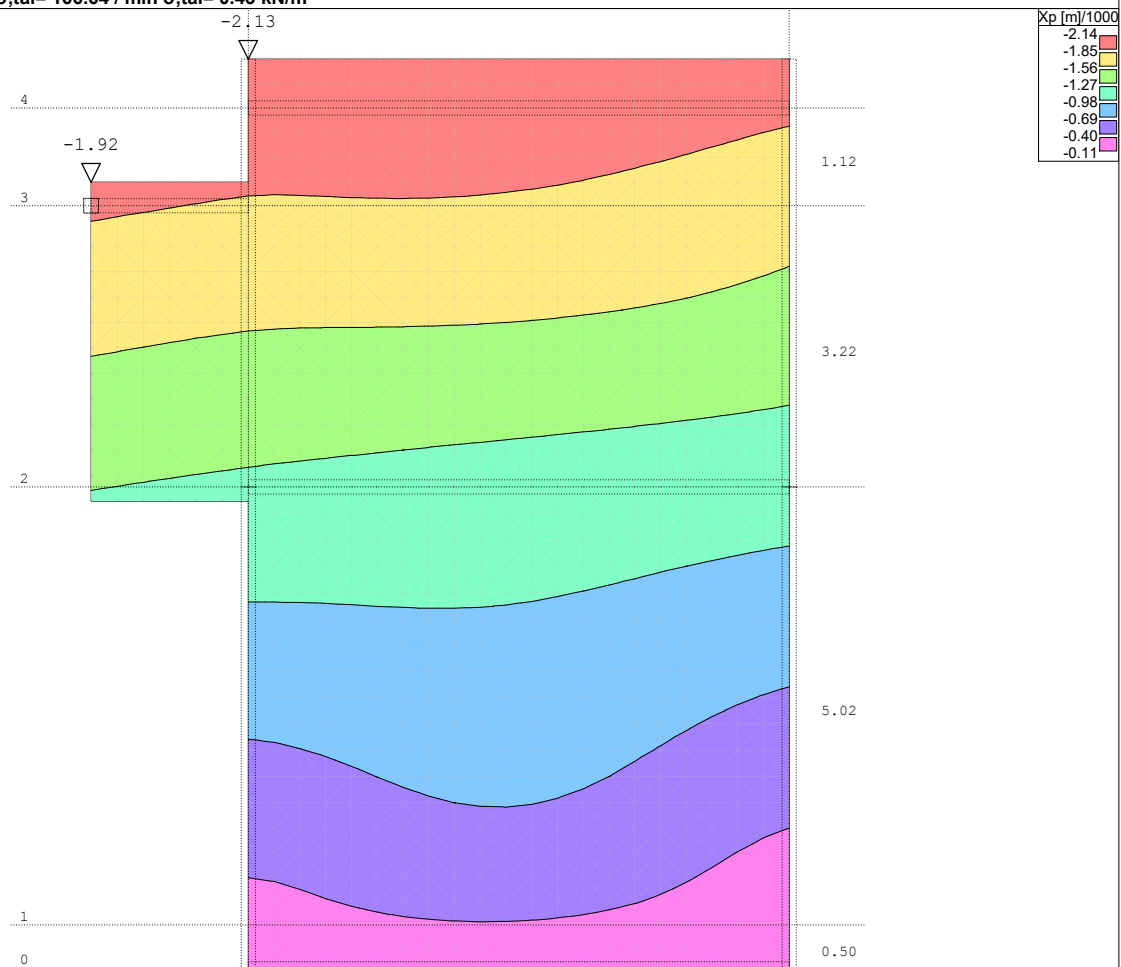
## Statični preračun

Obt. 133: [MSU] 94-131

$\sigma_{tal}$ [kN/m <sup>2</sup> ]
0.42
24.17
47.91
71.66
95.41
119.16
142.90
166.65



Nivo: [-5.52 m]

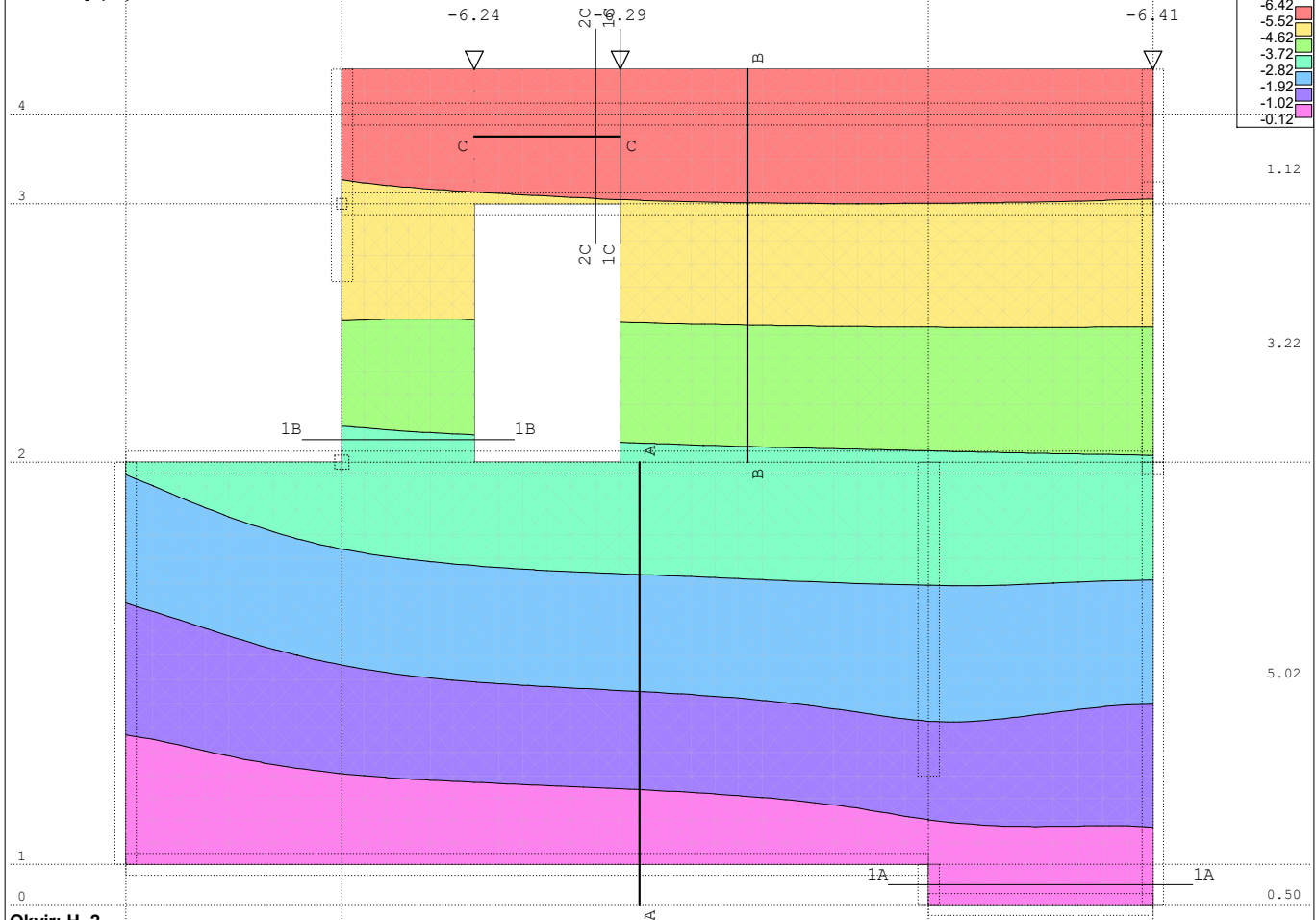
Vplivi v pov.podpori: max σ<sub>tal</sub>= 166.64 / min σ<sub>tal</sub>= 0.43 kN/m<sup>2</sup>Obt. 6: S<sub>x</sub> (+e)

Okvir: V\_1

Vplivi v plošči: max X<sub>p</sub>= -0.12 / min X<sub>p</sub>= -2.13 m / 1000

## Statični preračun

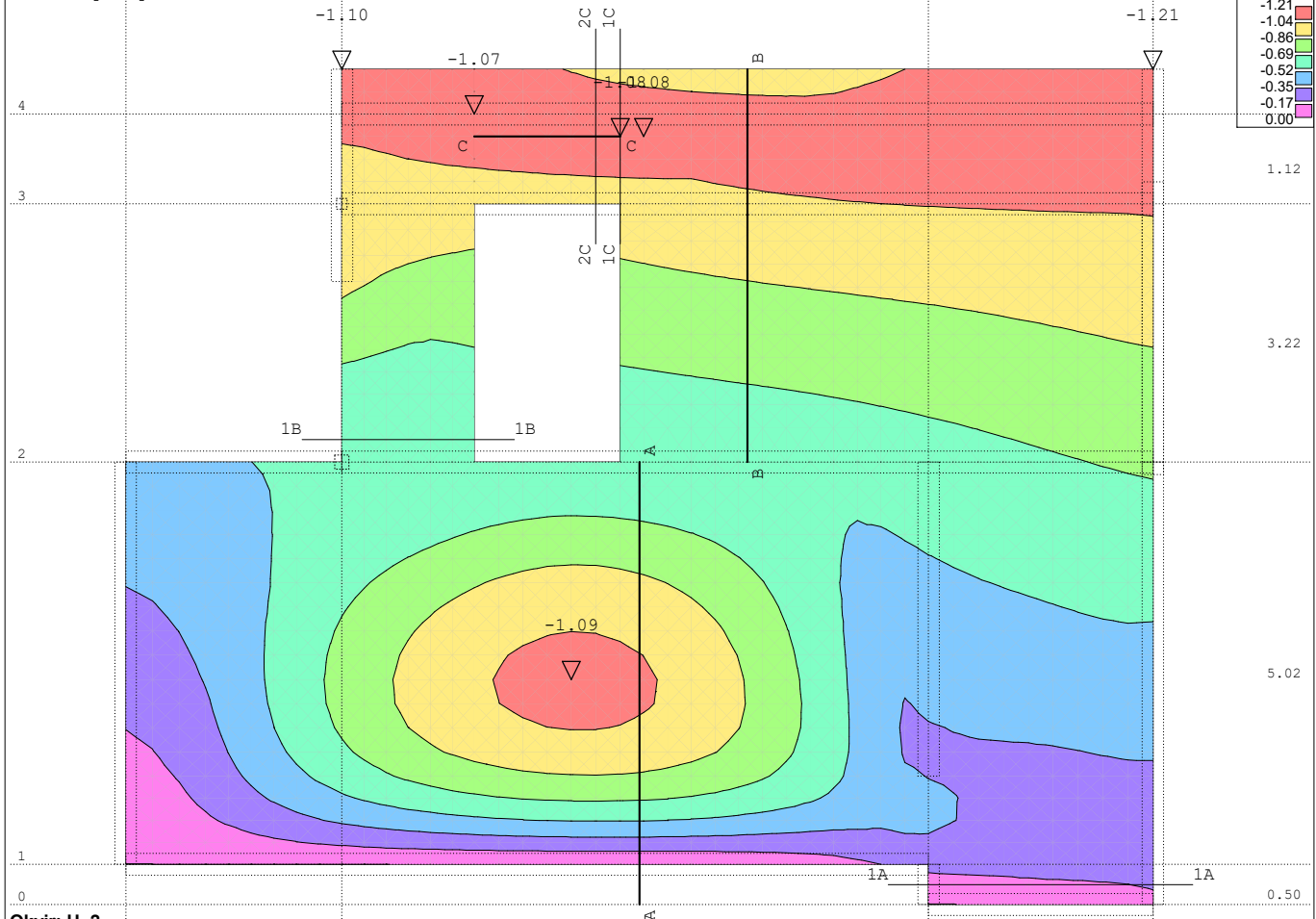
Obt. 8: Sy (+e)



Okvir: H\_2

Vplivi v plošči: max Yp= -0.13 / min Yp= -6.41 m / 1000

Obt. 133: [MSU] 94-131

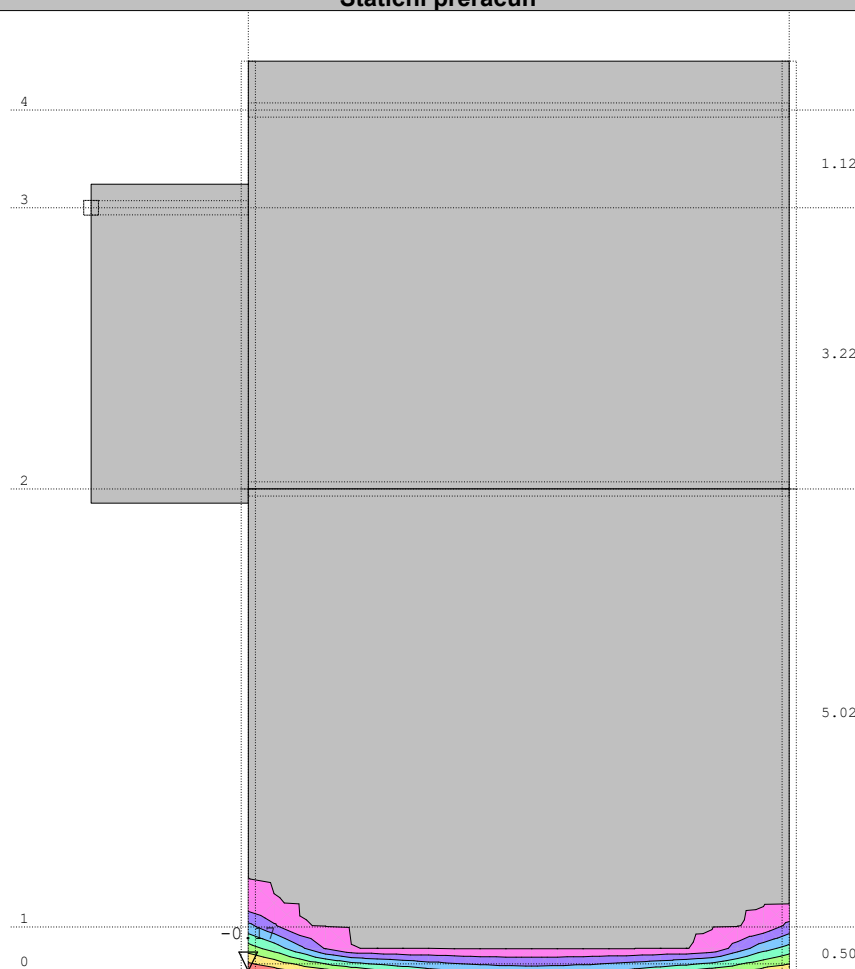


Okvir: H\_2

Vplivi v plošči: max Yp= 0.00 / min Yp= -1.21 m / 1000

## Statični preračun

Obt. 133: [MSU] 94-131



Xp [m]/1000

-0.17
-0.15
-0.12
-0.10
-0.07
-0.05
-0.02
0.00

Okvir: V\_1

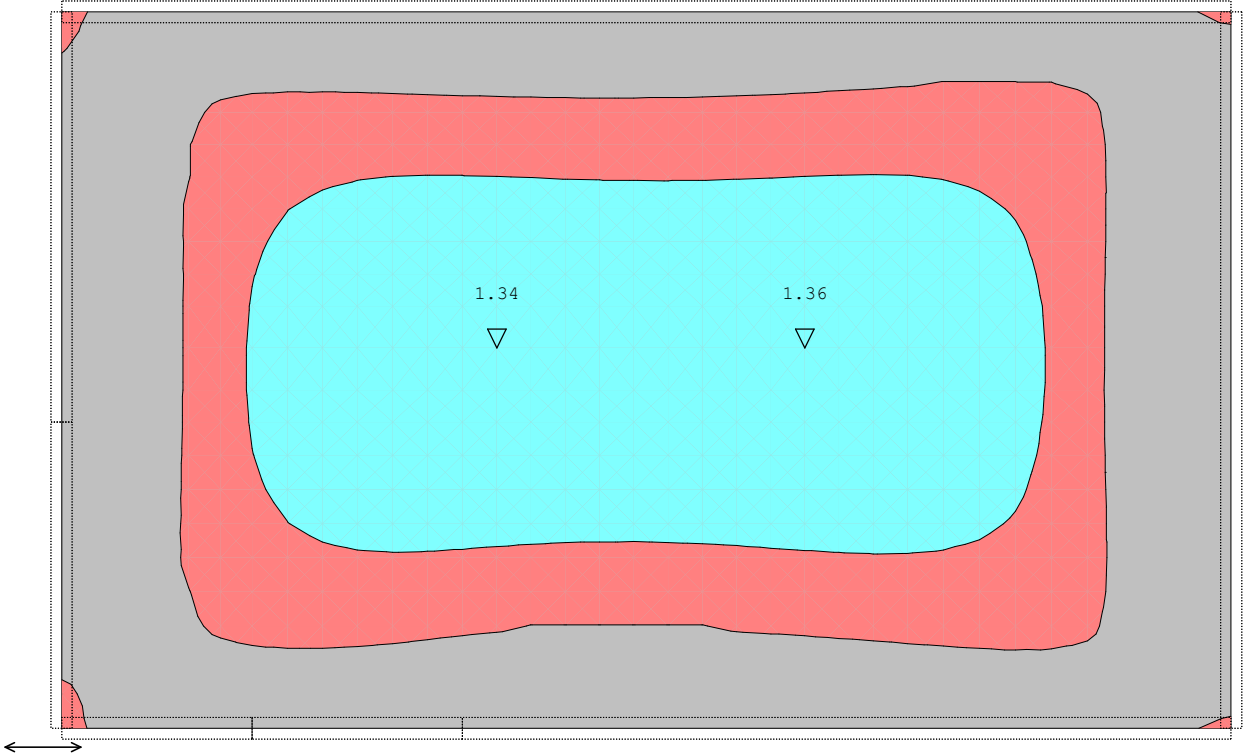
Vplivi v plošči: max Xp= 0.00 / min Xp= -0.17 m / 1000



Dimenzioniranje (beton)

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N 15%, a=4.00 cm

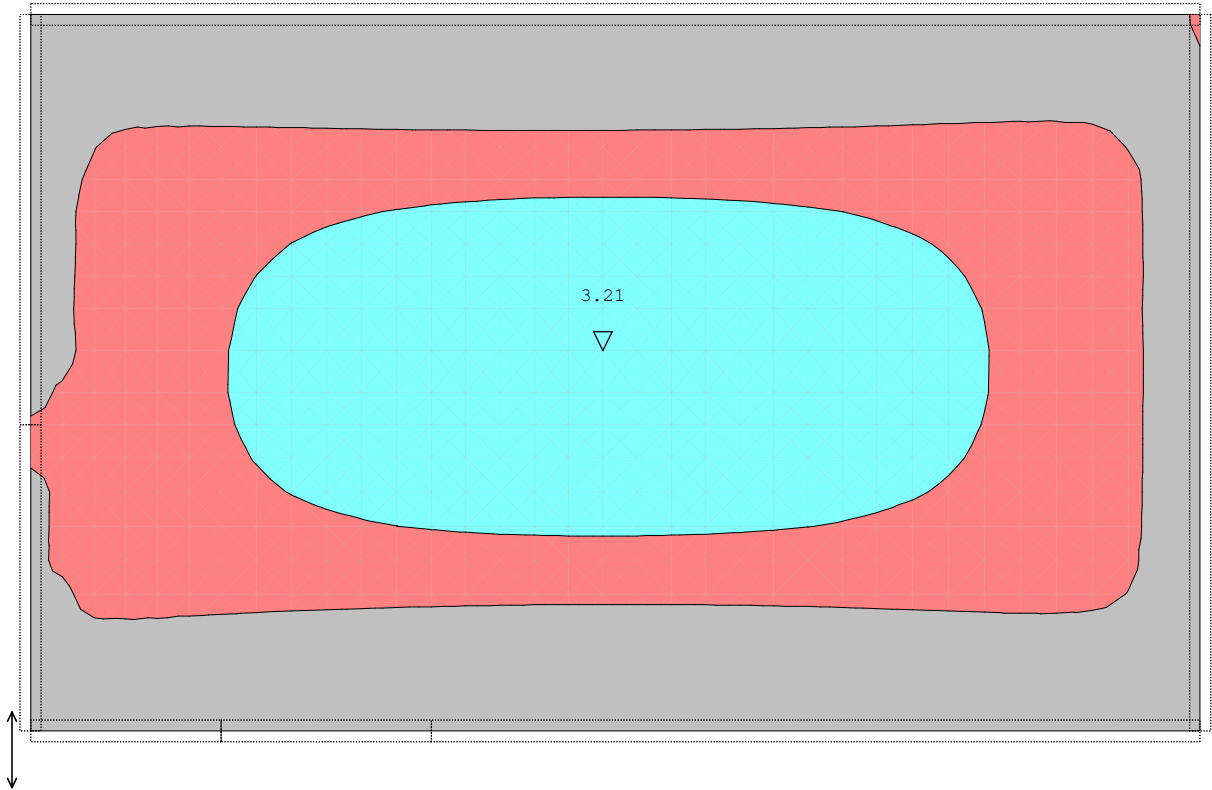
Aa - sp.cona - Smer 1 [cm²/m]
0.00
0.69
1.37



Nivo: [4.34 m]  
Aa - sp.cona - Smer 1 - max Aa1,s= 1.36 cm²/m

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N 15%, a=4.00 cm

Aa - sp.cona - Smer 2 [cm²/m]
0.00
1.61
3.22

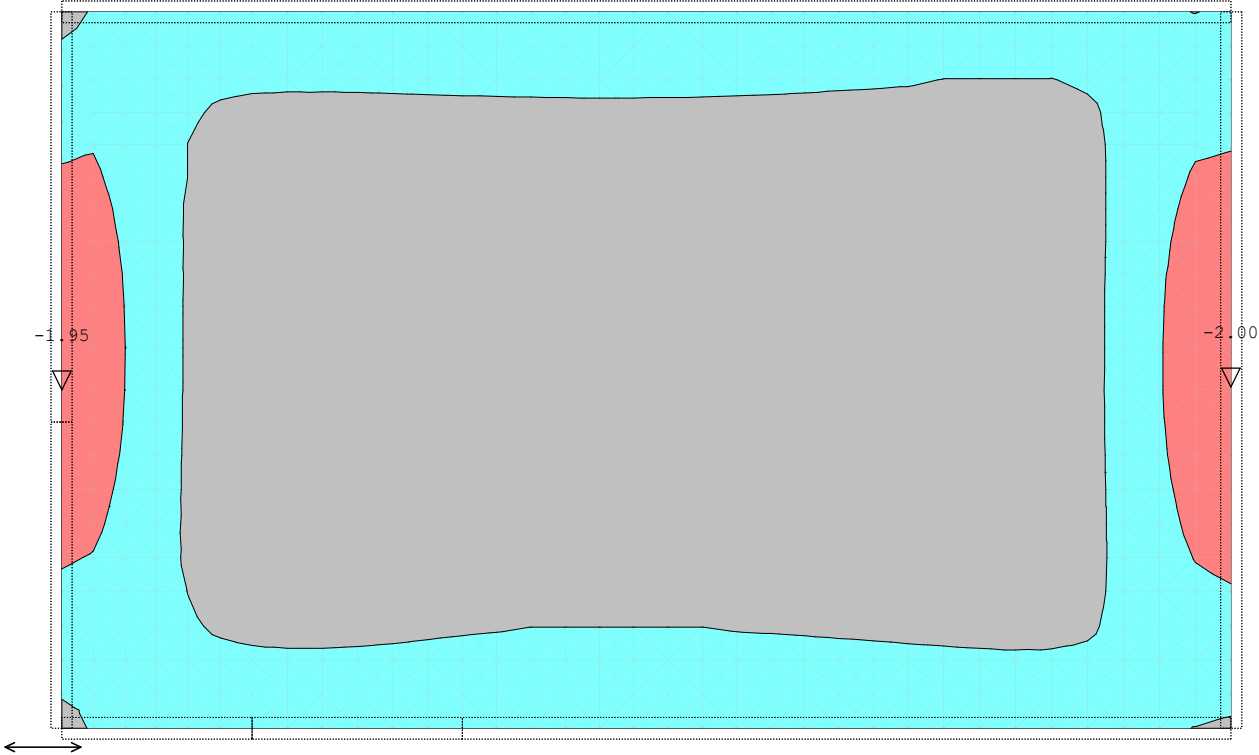


Nivo: [4.34 m]  
Aa - sp.cona - Smer 2 - max Aa2,s= 3.21 cm²/m

Dimenzioniranje (beton)

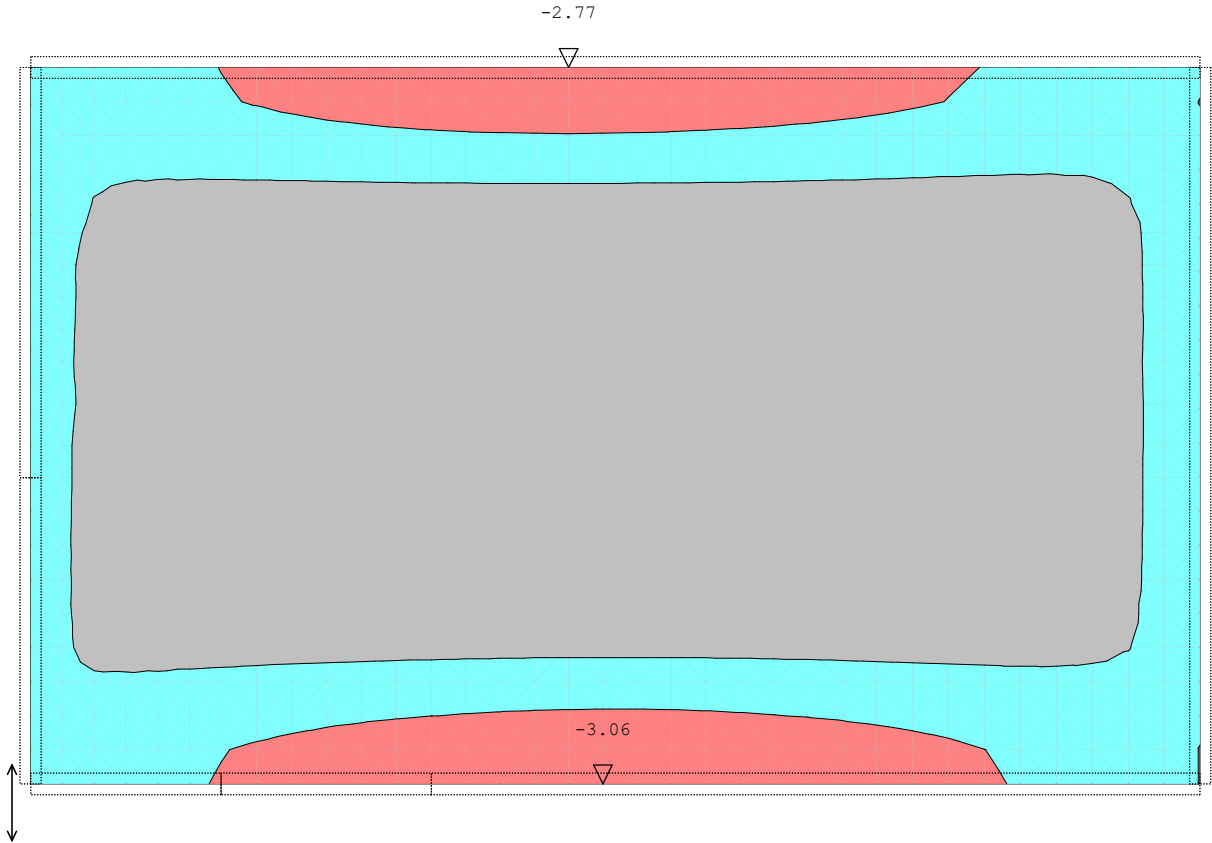
Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=4.00 cm

Aa - zg.cona - Smer 1 [cm²/m]	
-2.01	
-1.01	
0.00	



Nivo: [4.34 m]  
Aa - zg.cona - Smer 1 - max Aa1,z= -2.00 cm²/m  
Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=4.00 cm

Aa - zg.cona - Smer 2 [cm²/m]	
-3.07	
-1.54	
0.00	

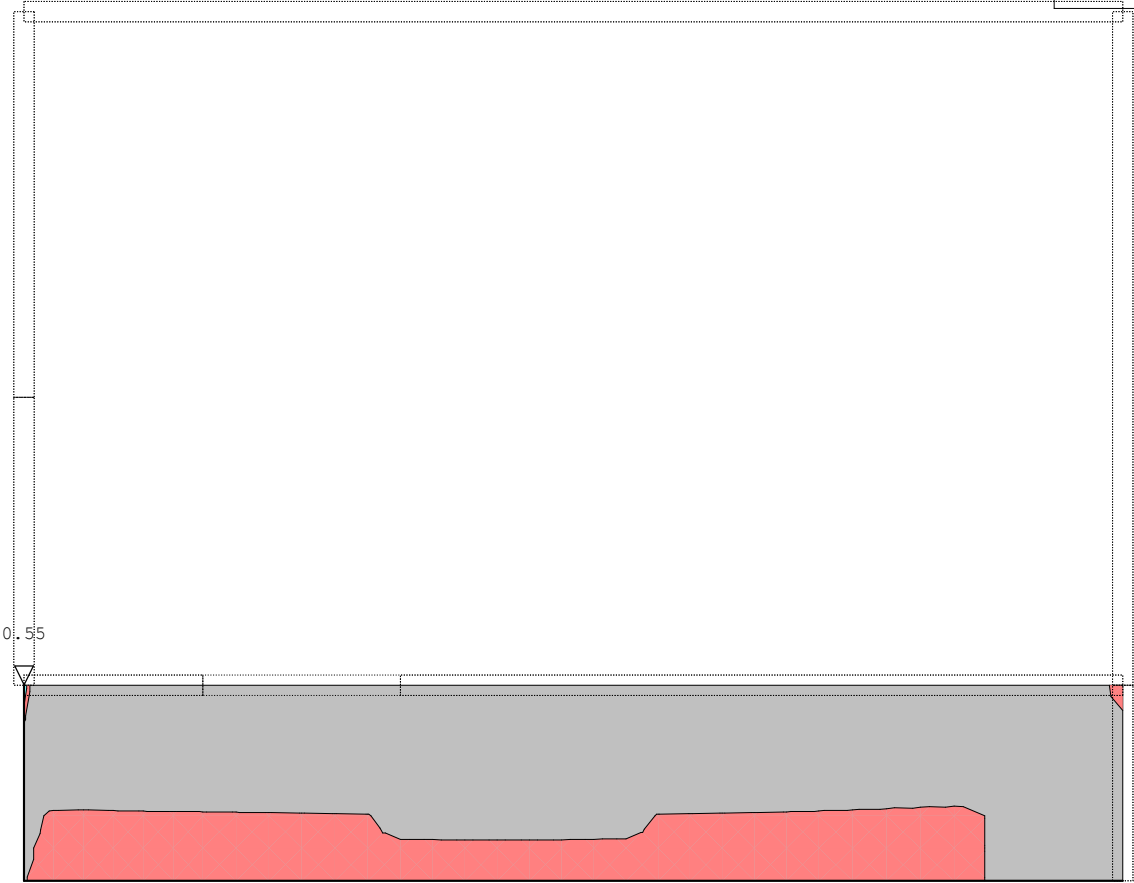


Nivo: [4.34 m]  
Aa - zg.cona - Smer 2 - max Aa2,z= -3.06 cm²/m

Dimenzioniranje (beton)

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N 15%, a=4.00 cm

Aa - sp.cona - Smer 1 [cm²/m]	
0.00	
0.28	
0.56	



Nivo: [3.22 m]  
Aa - sp.cona - Smer 1 - max Aa1,s= 0.55 cm²/m  
Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N 15%, a=4.00 cm

Aa - sp.cona - Smer 2 [cm²/m]	
0.00	
0.16	
0.31	

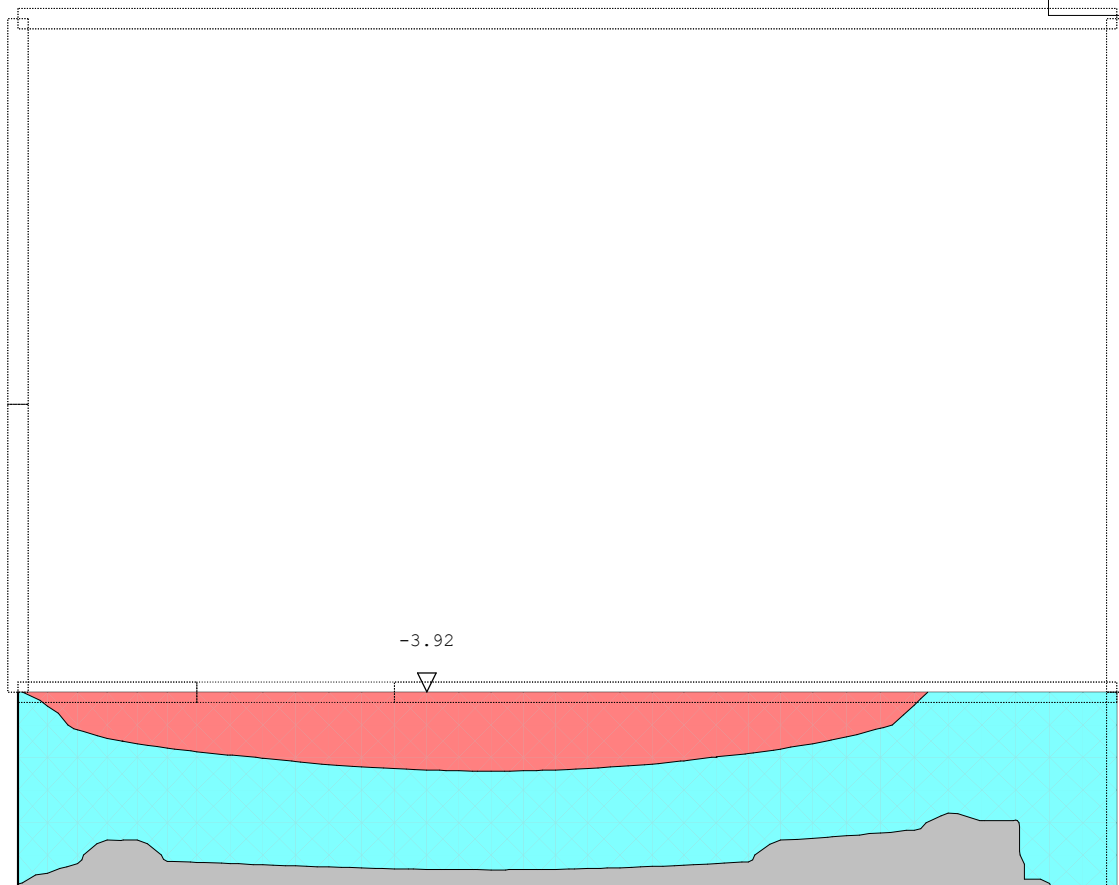


Nivo: [3.22 m]  
Aa - sp.cona - Smer 2 - max Aa2,s= 0.31 cm²/m

## Dimenzioniranje (beton)

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=4.00 cm

Aa - zg.cona - Smer 1 [cm<sup>2</sup>/m]  
-3.93  
-1.97  
0.00

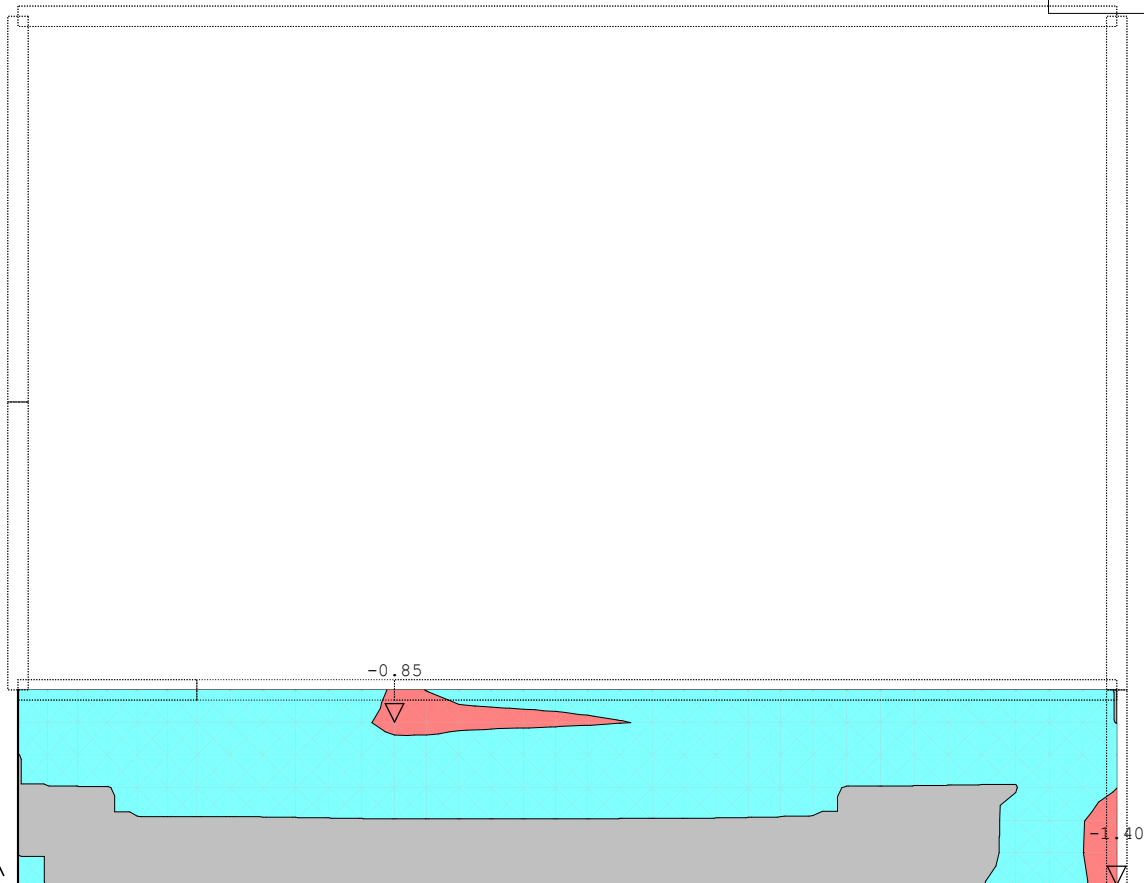


Nivo: [3.22 m]

Aa - zg.cona - Smer 1 - max Aa1,z= -3.92 cm<sup>2</sup>/m

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=4.00 cm

Aa - zg.cona - Smer 2 [cm<sup>2</sup>/m]  
-1.40  
-0.70  
0.00



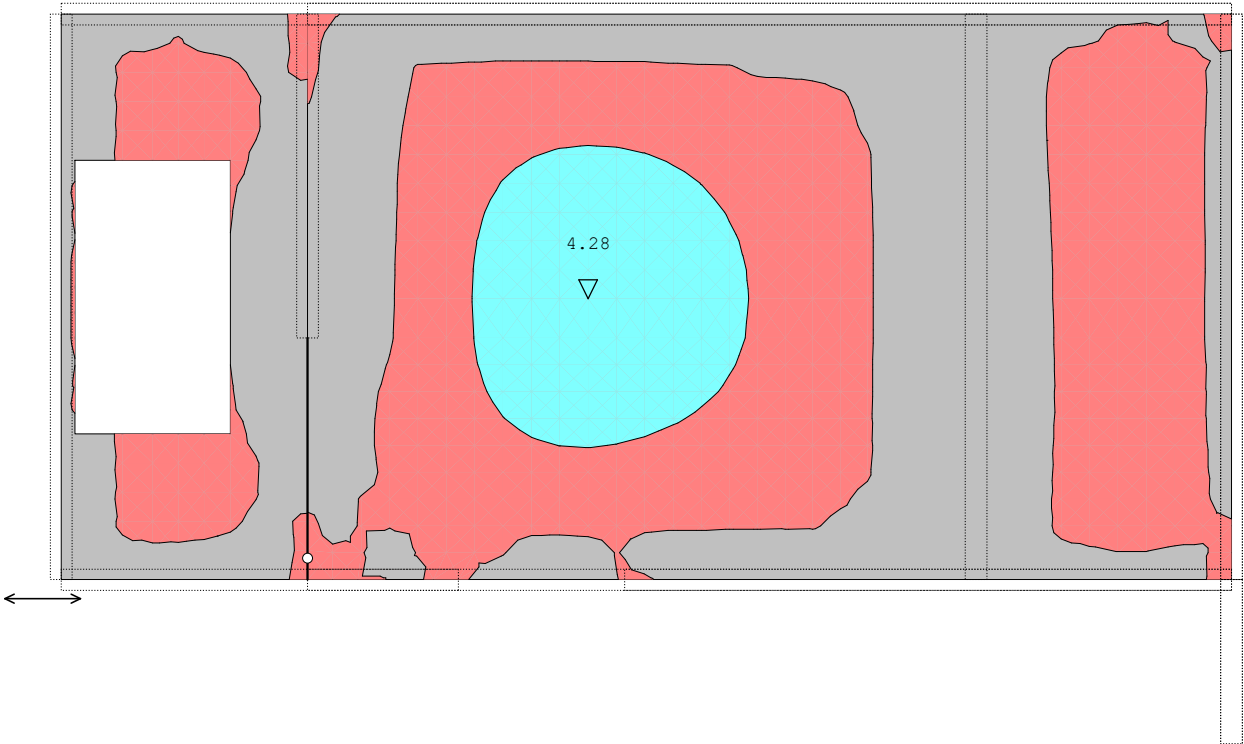
Nivo: [3.22 m]

Aa - zg.cona - Smer 2 - max Aa2,z= -1.40 cm<sup>2</sup>/m

Dimenzioniranje (beton)

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N 15%, a=4.00 cm

Aa - sp.cona - Smer 1 [cm²/m]
0.00
2.14
4.28



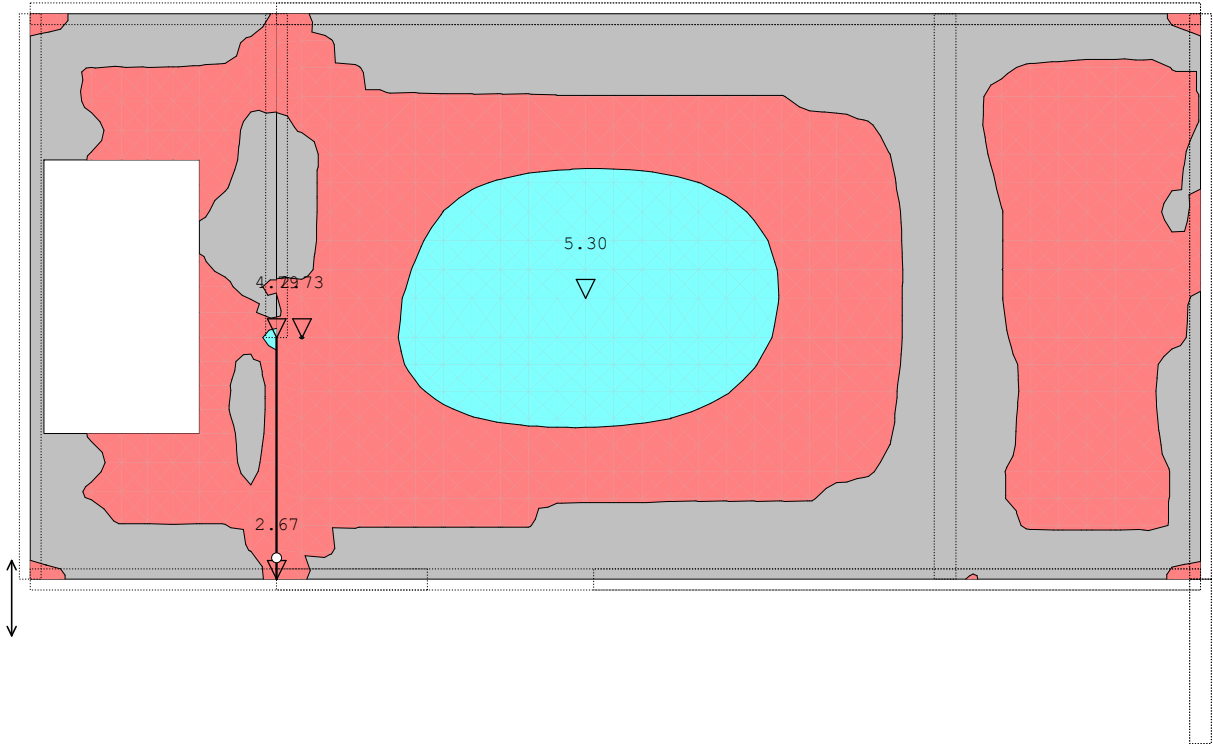
Nivo: [0.00 m]

Aa - sp.cona - Smer 1 - max Aa1,s= 4.28 cm²/m

Merodajna obtežba: Kompletna shema

EC 2 (EN 1992-1-1:2004), C 25, S500N 15%, a=4.00 cm

Aa - sp.cona - Smer 2 [cm²/m]
0.00
2.65
5.30



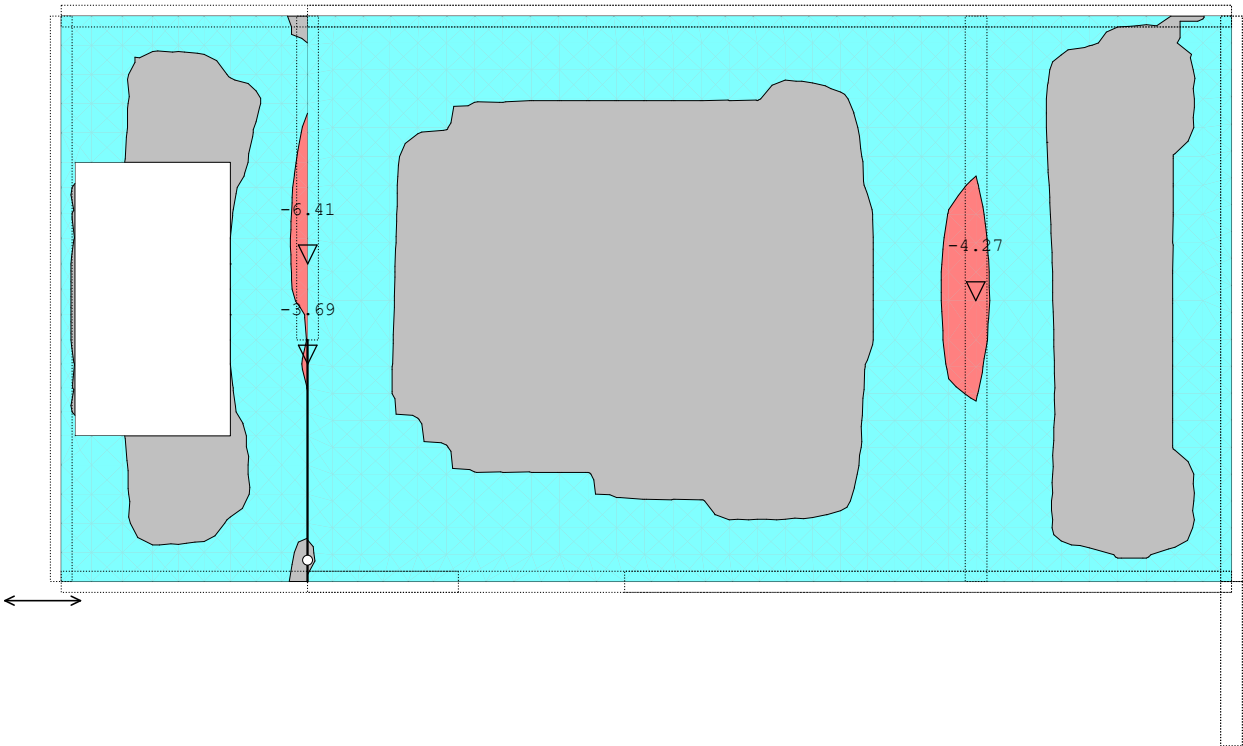
Nivo: [0.00 m]

Aa - sp.cona - Smer 2 - max Aa2,s= 5.30 cm²/m

Dimenzioniranje (beton)

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=4.00 cm

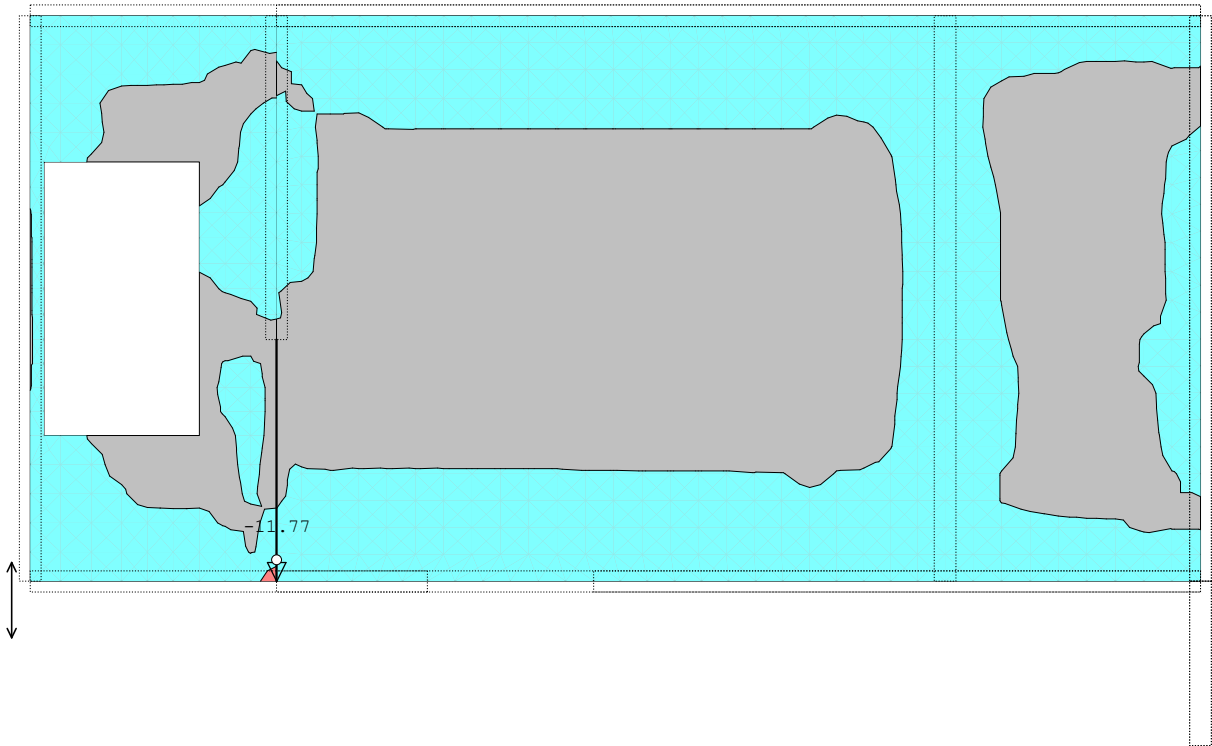
Aa - zg.cona - Smer 1 [cm²/m]
-6.41
-3.21
0.00



Nivo: [0.00 m]  
Aa - zg.cona - Smer 1 - max Aa1,z= -6.41 cm²/m

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=4.00 cm

Aa - zg.cona - Smer 2 [cm²/m]
-11.78
-5.89
0.00

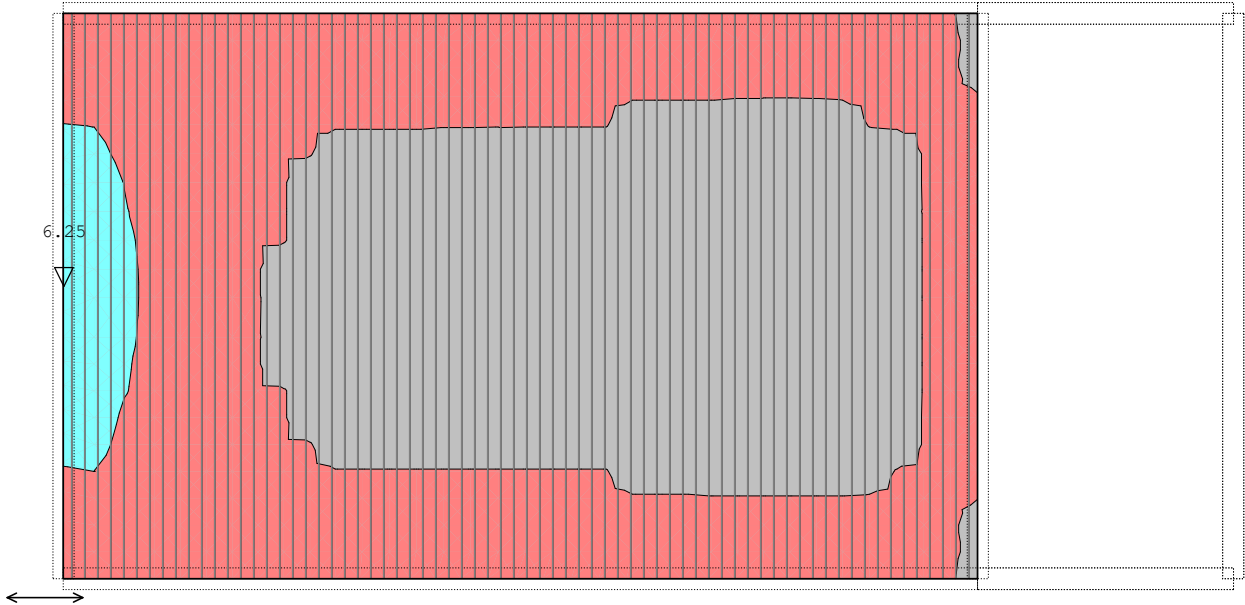


Nivo: [0.00 m]  
Aa - zg.cona - Smer 2 - max Aa2,z= -11.77 cm²/m

Dimenzioniranje (beton)

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=7.00 cm

Aa - sp.cona - Smer 1 [cm²/m]
0.00
3.13
6.26

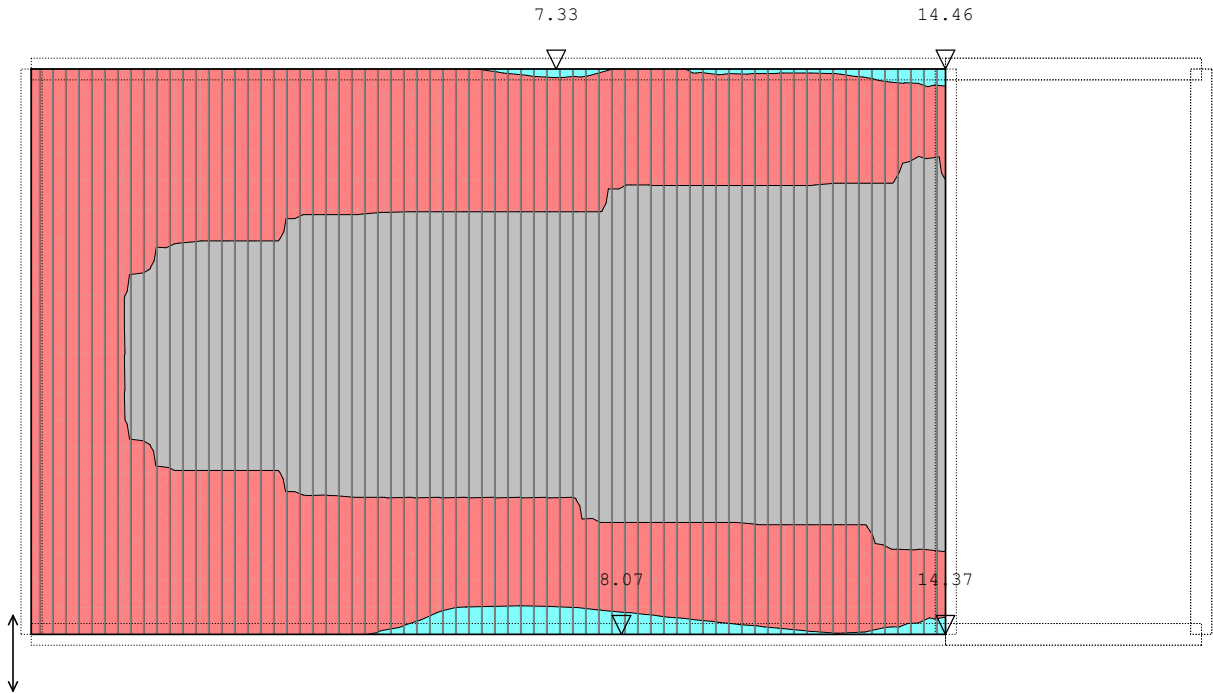


Nivo: [-5.02 m]

Aa - sp.cona - Smer 1 - max Aa1,s= 6.25 cm²/m

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=7.00 cm

Aa - sp.cona - Smer 2 [cm²/m]
0.00
7.23
14.46



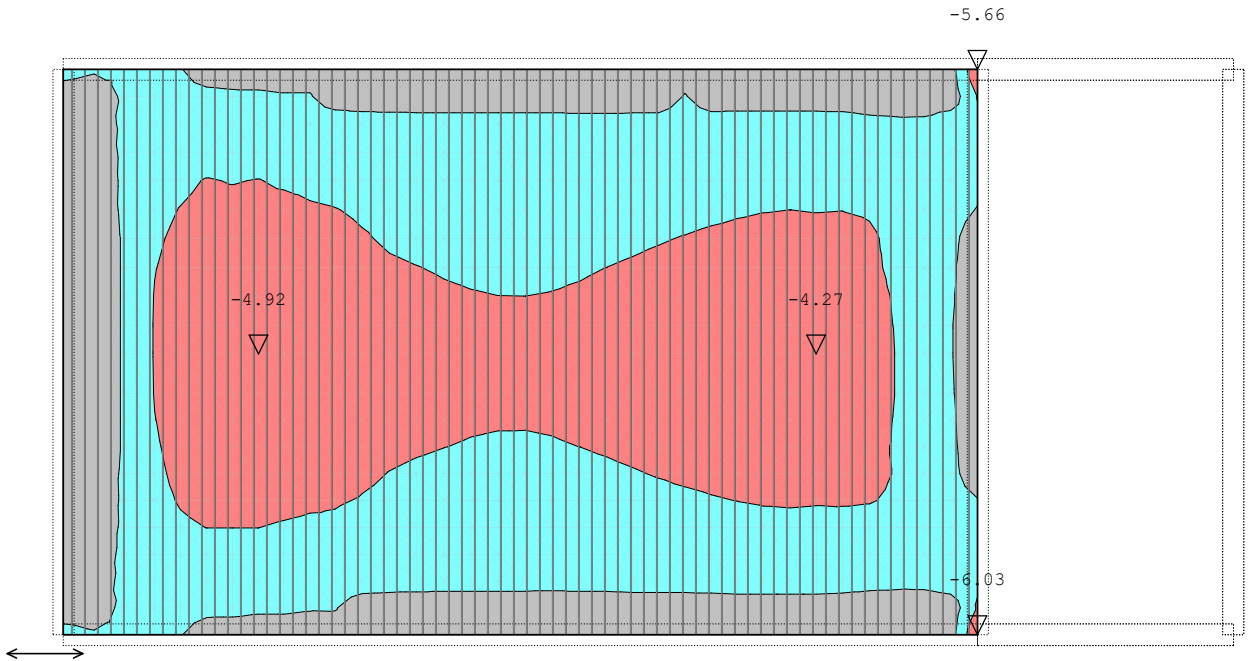
Nivo: [-5.02 m]

Aa - sp.cona - Smer 2 - max Aa2,s= 14.46 cm²/m

Dimenzioniranje (beton)

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N 15%, a=5.00 cm

Aa - zg.cona - Smer 1 [cm <sup>2</sup> /m]
-6.03
-3.02
0.00

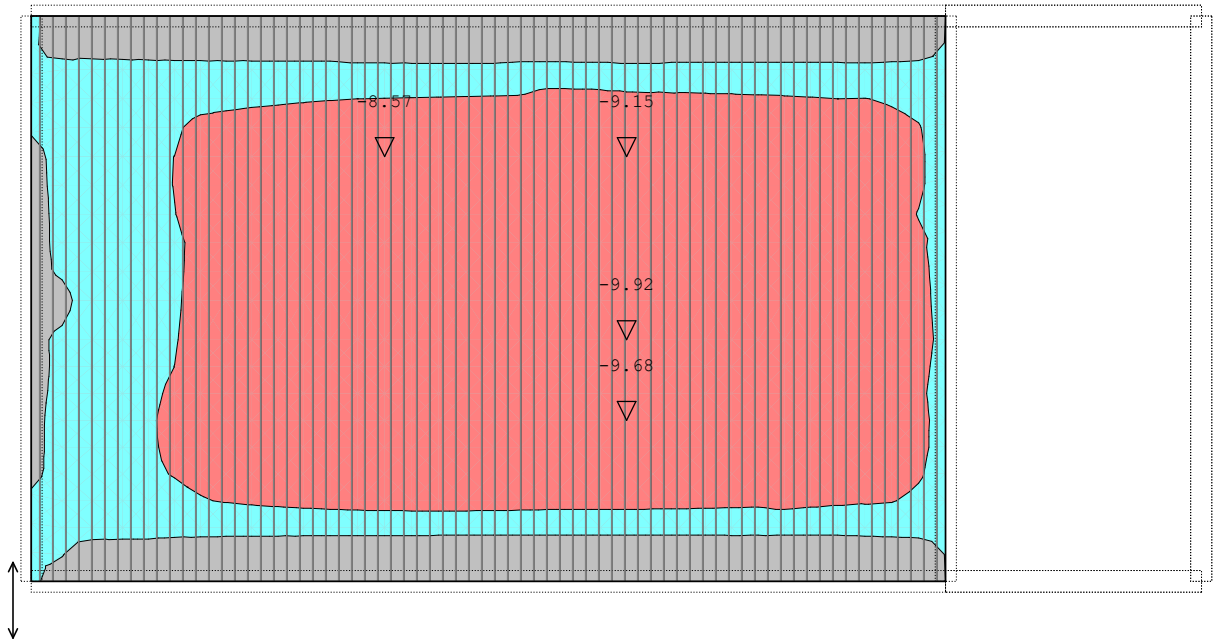


Nivo: [-5.02 m]

Aa - zg.cona - Smer 1 - max Aa1,z= -6.03 cm<sup>2</sup>/m

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N 15%, a=5.00 cm

Aa - zg.cona - Smer 2 [cm <sup>2</sup> /m]
-9.93
-4.97
0.00



Nivo: [-5.02 m]

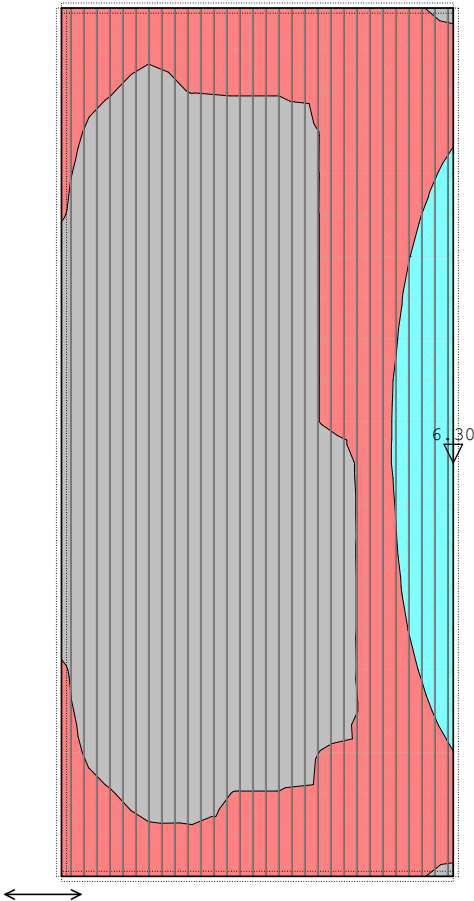
Aa - zg.cona - Smer 2 - max Aa2,z= -9.92 cm<sup>2</sup>/m



Dimenzioniranje (beton)

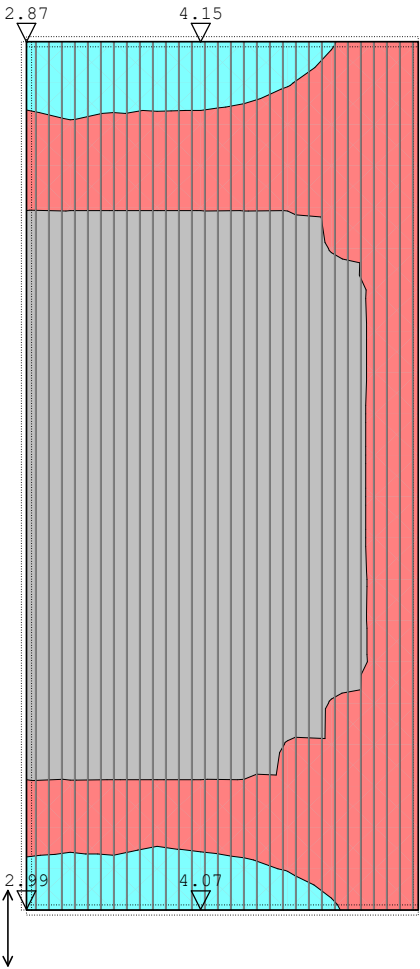
Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - sp.cona - Smer 1 [cm²/m]
0.00
3.15
6.30



Nivo: [-5.52 m]  
Aa - sp.cona - Smer 1 - max Aa1,s= 6.30 cm²/m  
Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - sp.cona - Smer 2 [cm²/m]
0.00
2.08
4.16

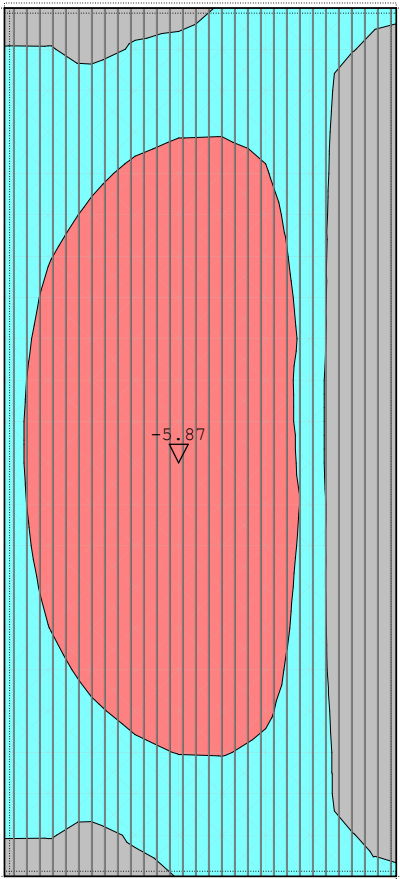


Nivo: [-5.52 m]  
Aa - sp.cona - Smer 2 - max Aa2,s= 4.15 cm²/m

Dimenzioniranje (beton)

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - zg.cona - Smer 1 [cm²/m]
-5.87
-2.94
0.00

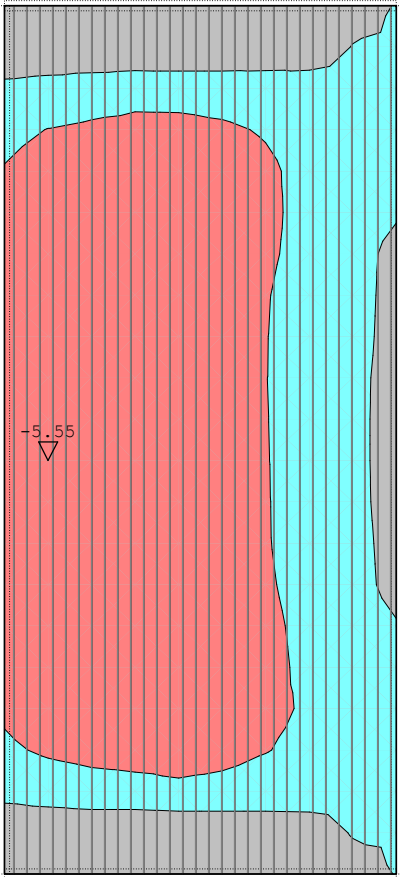


Nivo: [-5.52 m]

Aa - zg.cona - Smer 1 - max Aa1,z= -5.87 cm²/m

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - zg.cona - Smer 2 [cm²/m]
-5.55
-2.78
0.00



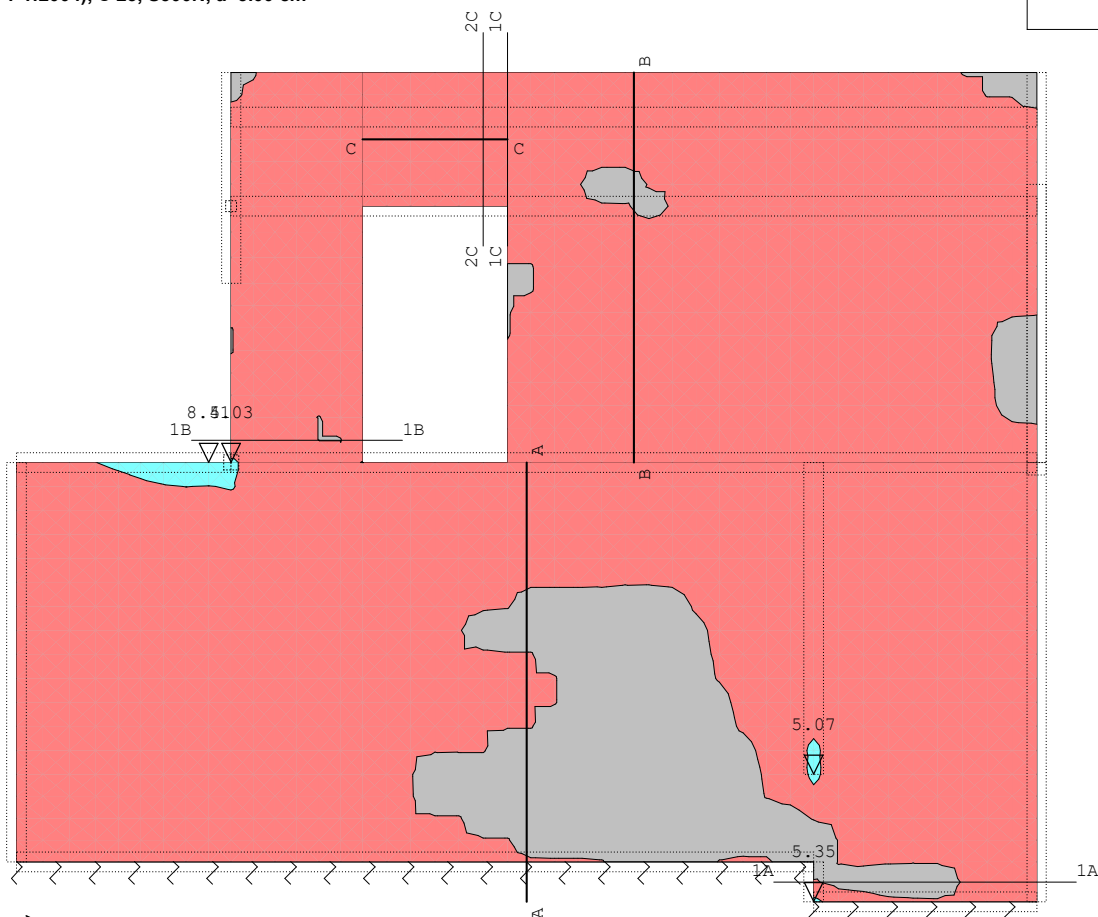
Nivo: [-5.52 m]

Aa - zg.cona - Smer 2 - max Aa2,z= -5.55 cm²/m

### Dimenzioniranje (beton)

**Merodajna obtežba: Kompletna shema**  
**EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm**

Aa - sp.cona - Smer 1 [cm <sup>2</sup> /m]
0.00
4.21
8.42

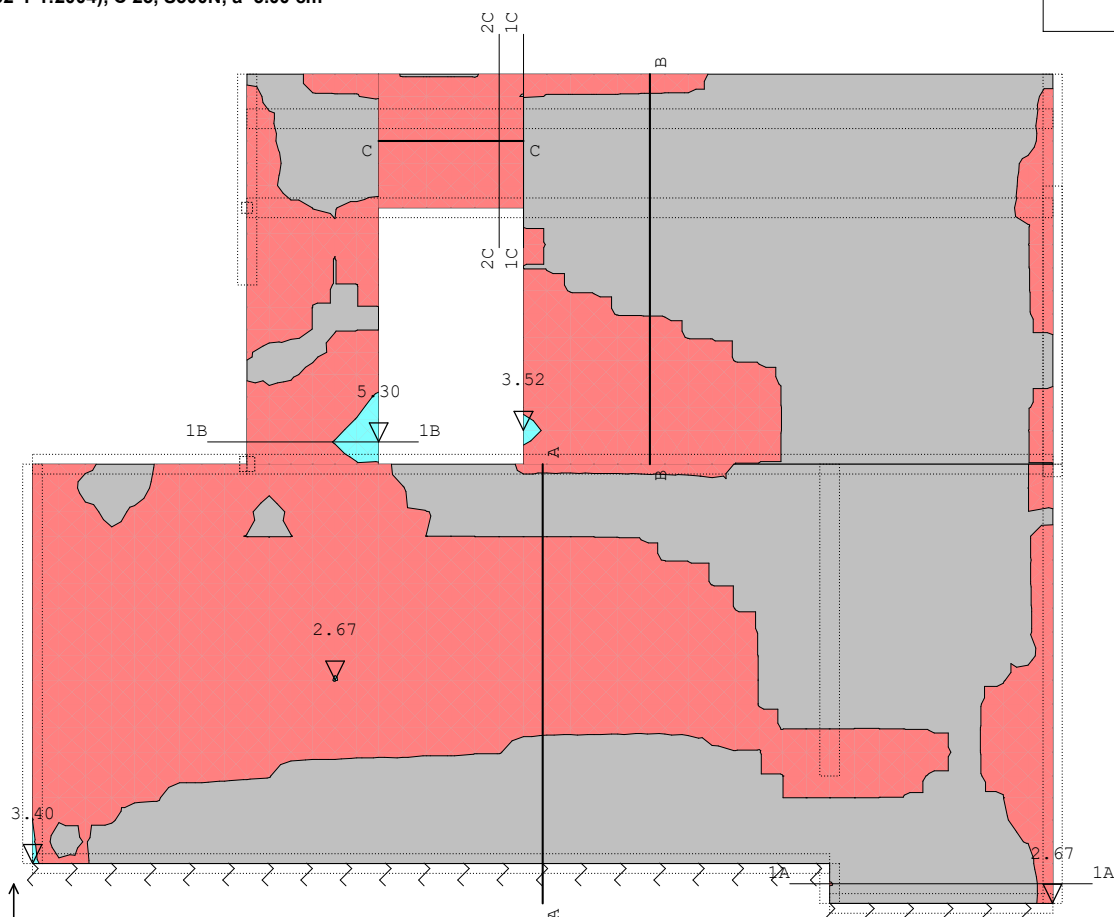


Okvir: H\_2

**Aa - sp.cona - Smer 1 - max Aa1,s= 8.41 cm<sup>2</sup>/m**

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - sp.cona - Smer 2 [cm <sup>2</sup> /m
0.00
2.65
5.30



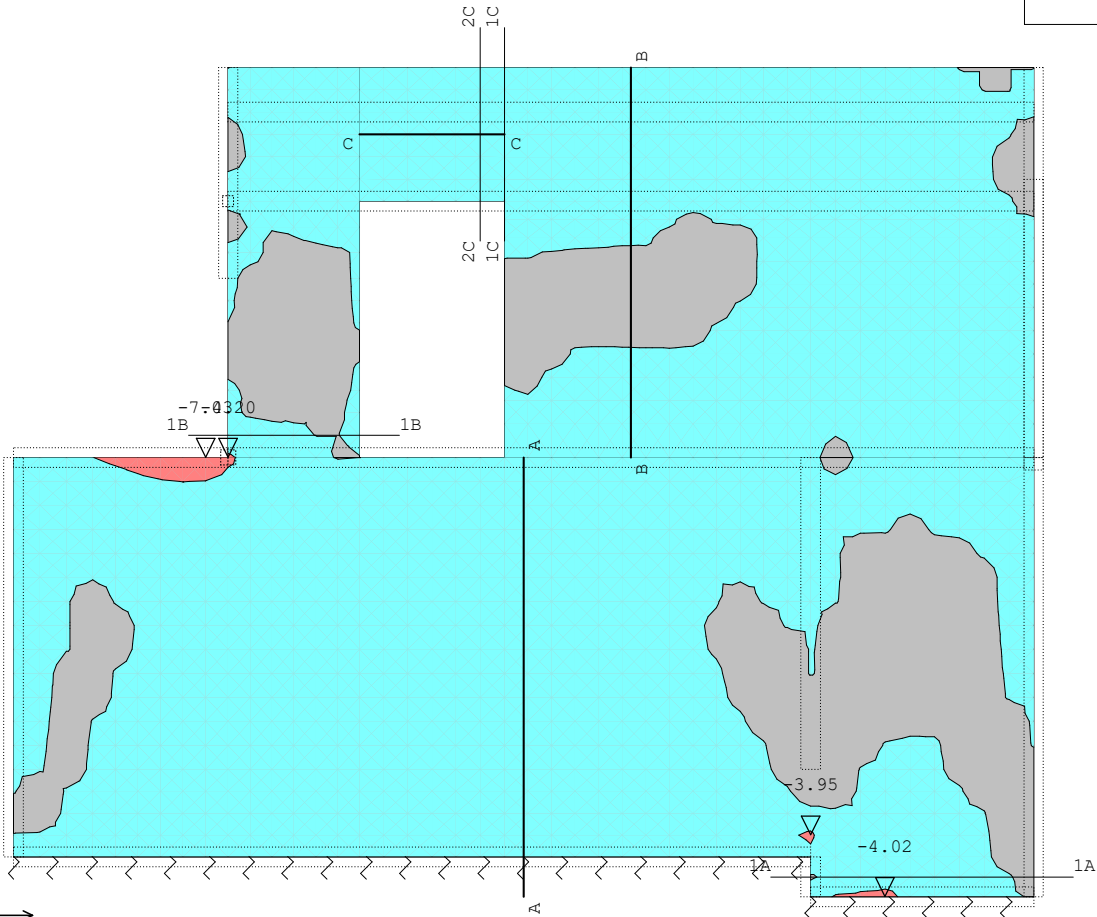
**Okvir: H\_2**

Aa - sp.cona - Smer 2 - max Aa2,s = 5.30 cm<sup>2</sup>/m

Dimenzioniranje (beton)

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - zg.cona - Smer 1 [cm²/m]
-7.03
-3.52
0.00

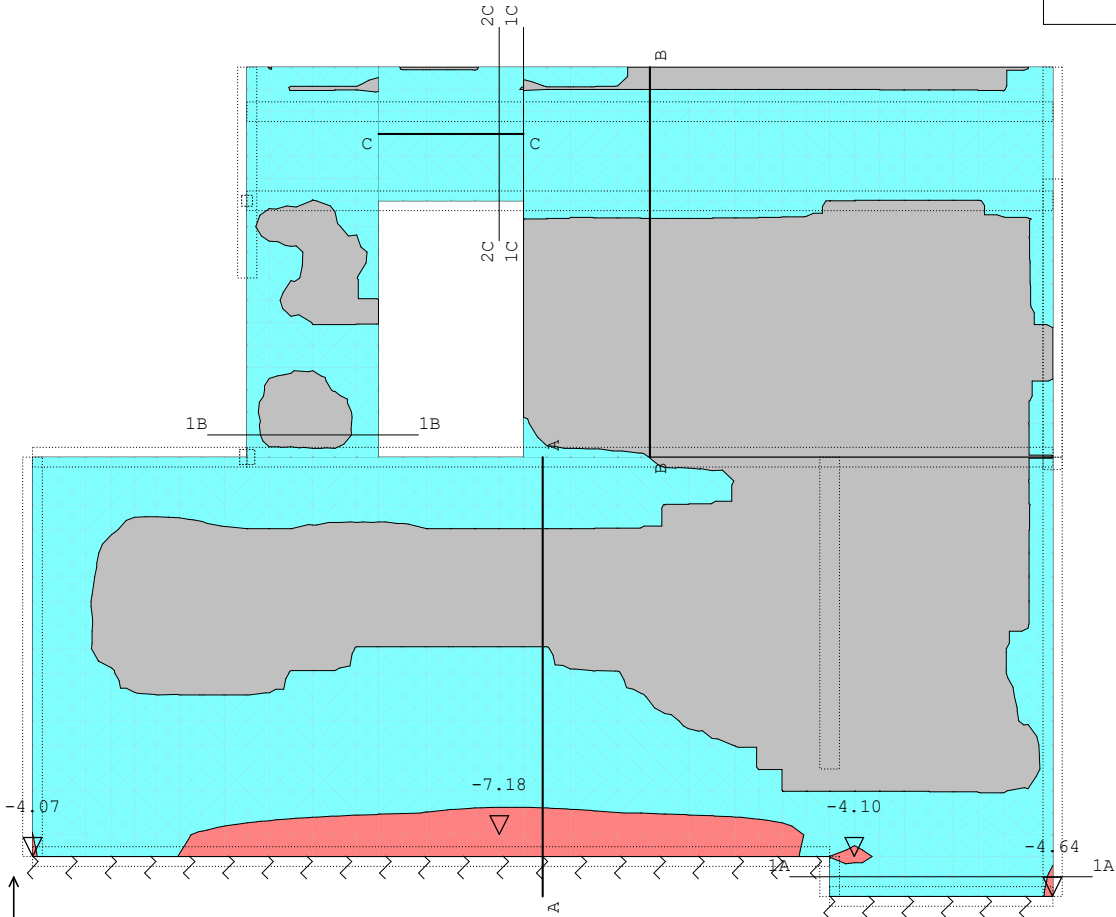


Okvir: H\_2

Aa - zg.cona - Smer 1 - max Aa1,z= -7.03 cm²/m

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - zg.cona - Smer 2 [cm²/m]
-7.18
-3.59
0.00



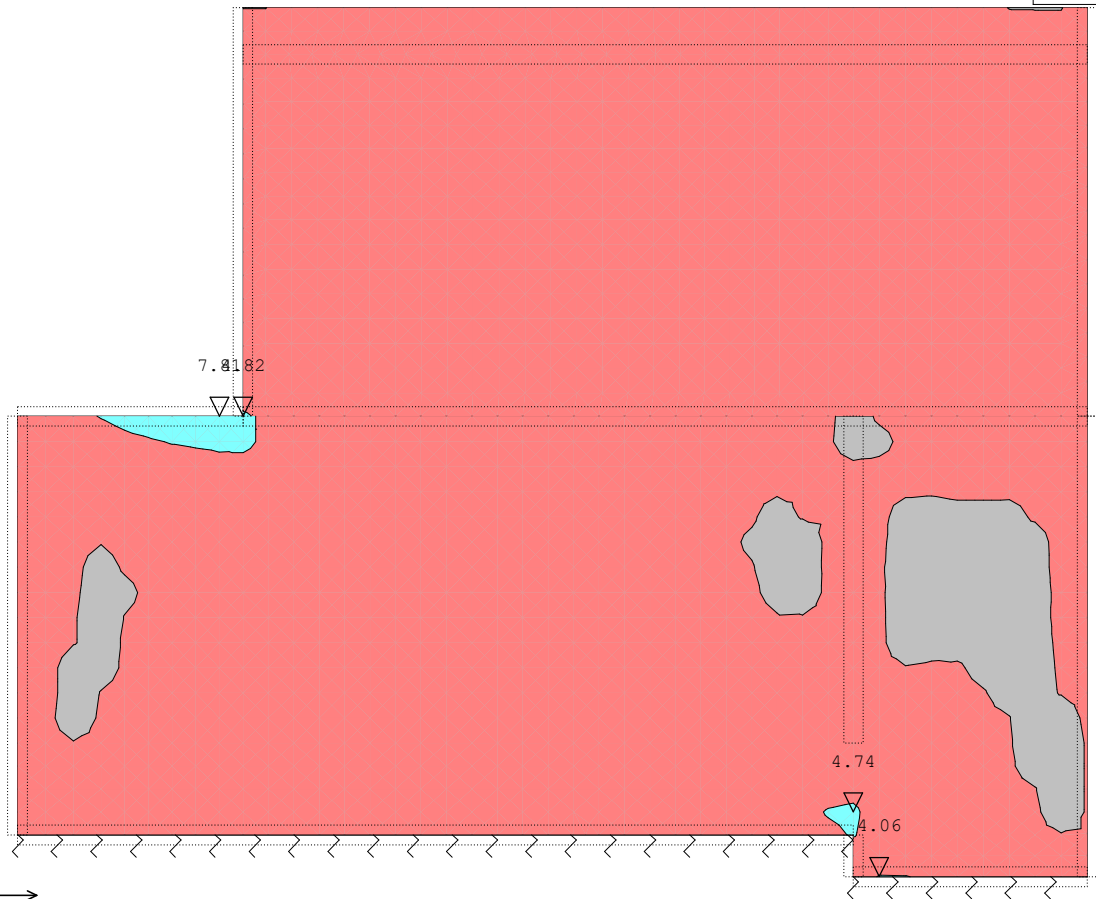
Okvir: H\_2

Aa - zg.cona - Smer 2 - max Aa2,z= -7.18 cm²/m

Dimenzioniranje (beton)

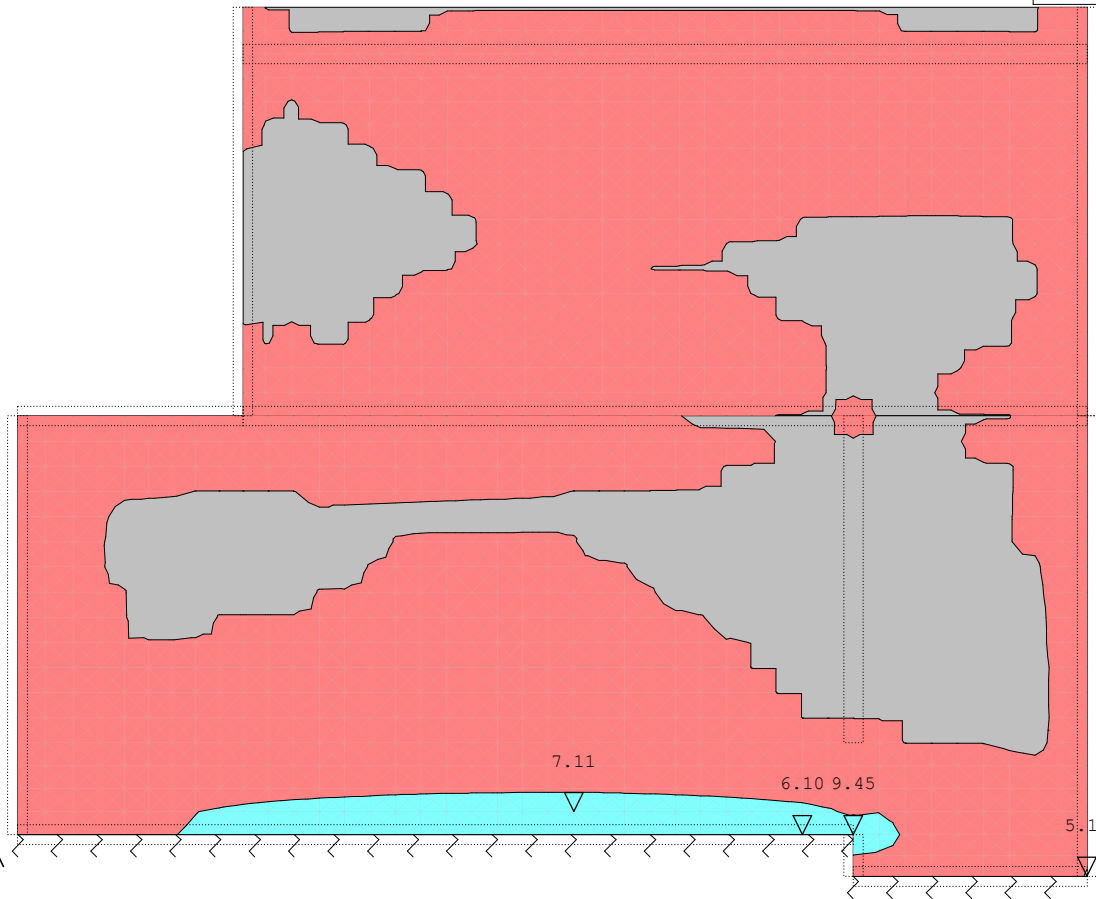
Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - sp.cona - Smer 1 [cm²/m]
0.00
3.91
7.82



Okvir: H\_1  
Aa - sp.cona - Smer 1 - max Aa1,s= 7.81 cm²/m  
Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - sp.cona - Smer 2 [cm²/m]
0.00
4.73
9.45

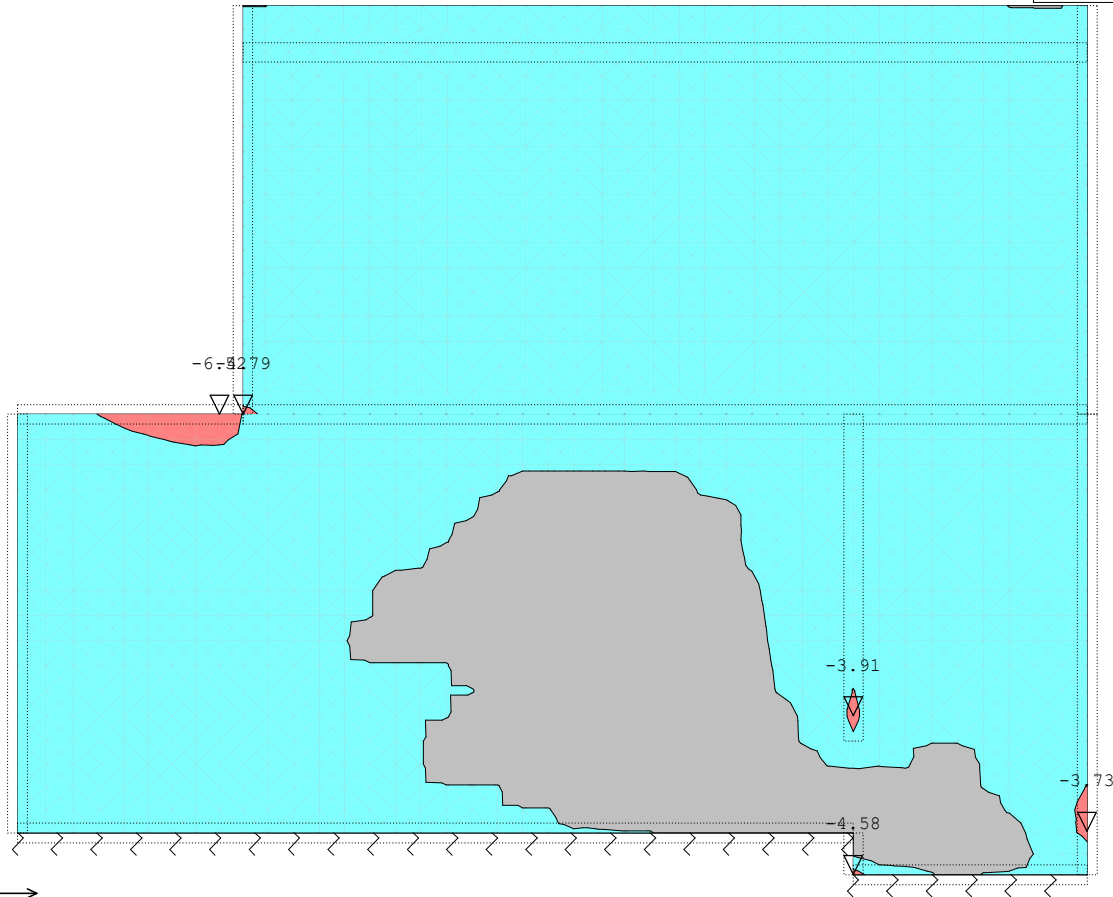


Okvir: H\_1  
Aa - sp.cona - Smer 2 - max Aa2,s= 9.45 cm²/m

Dimenzioniranje (beton)

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

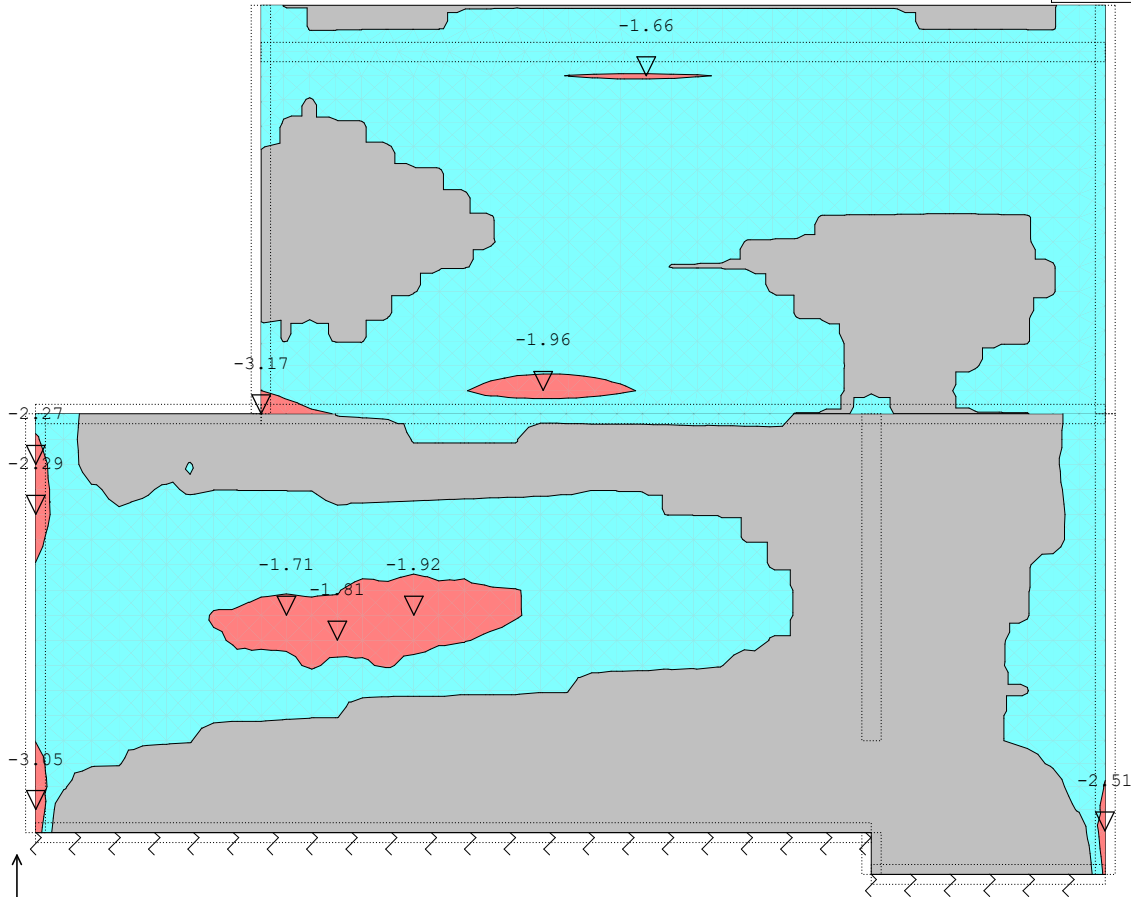
Aa - zg.cona - Smer 1 [cm²/m]
-6.53
-3.27
0.00



Okvir: H\_1  
Aa - zg.cona - Smer 1 - max Aa1,z= -6.52 cm²/m

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - zg.cona - Smer 2 [cm²/m]
-3.18
-1.59
0.00



Okvir: H\_1  
Aa - zg.cona - Smer 2 - max Aa2,z= -3.17 cm²/m



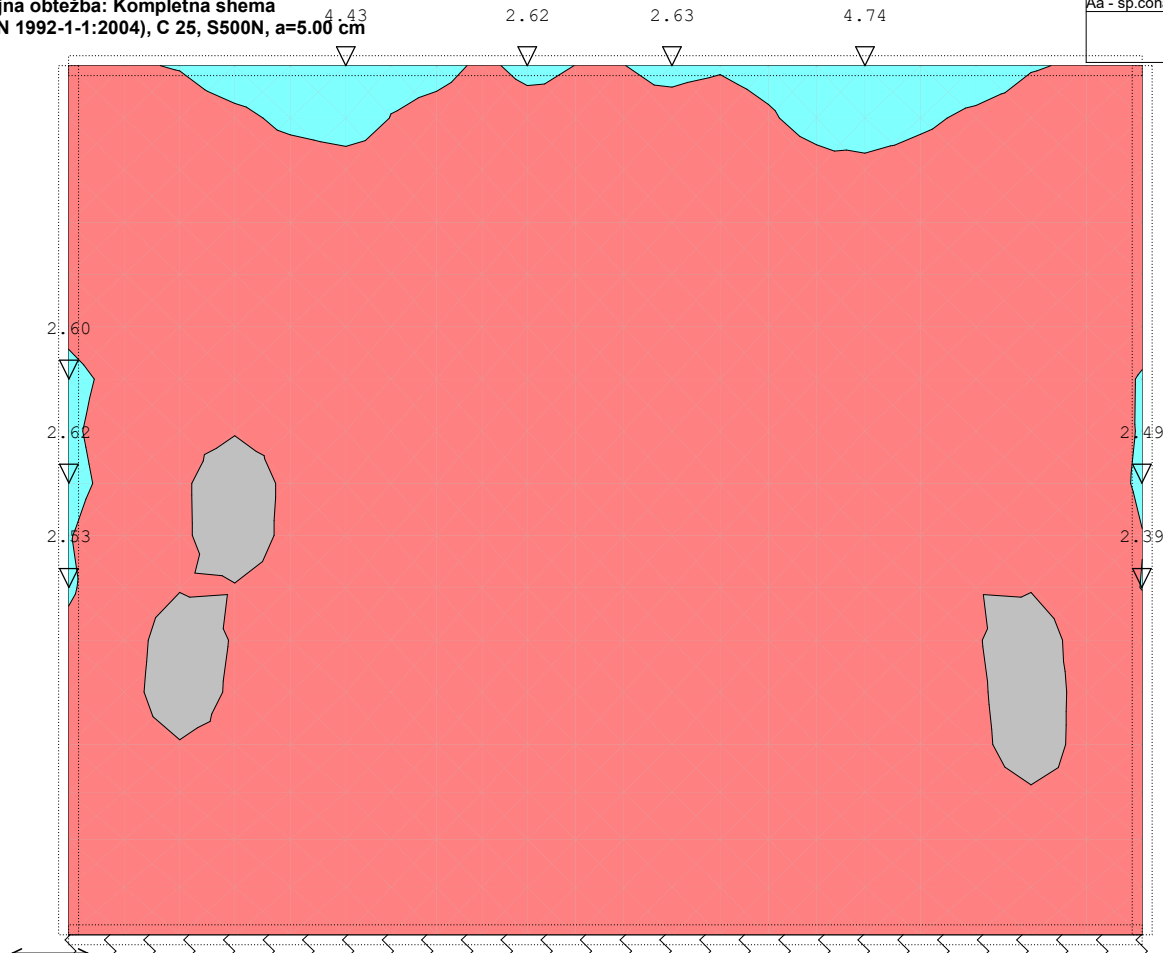
**Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, :**

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N,  $a=5.00^{4.43}$  cm

Aa - sp.cona - Smer 1 [cm <sup>2</sup> /m]
--

0.00

2.37   
4.74 



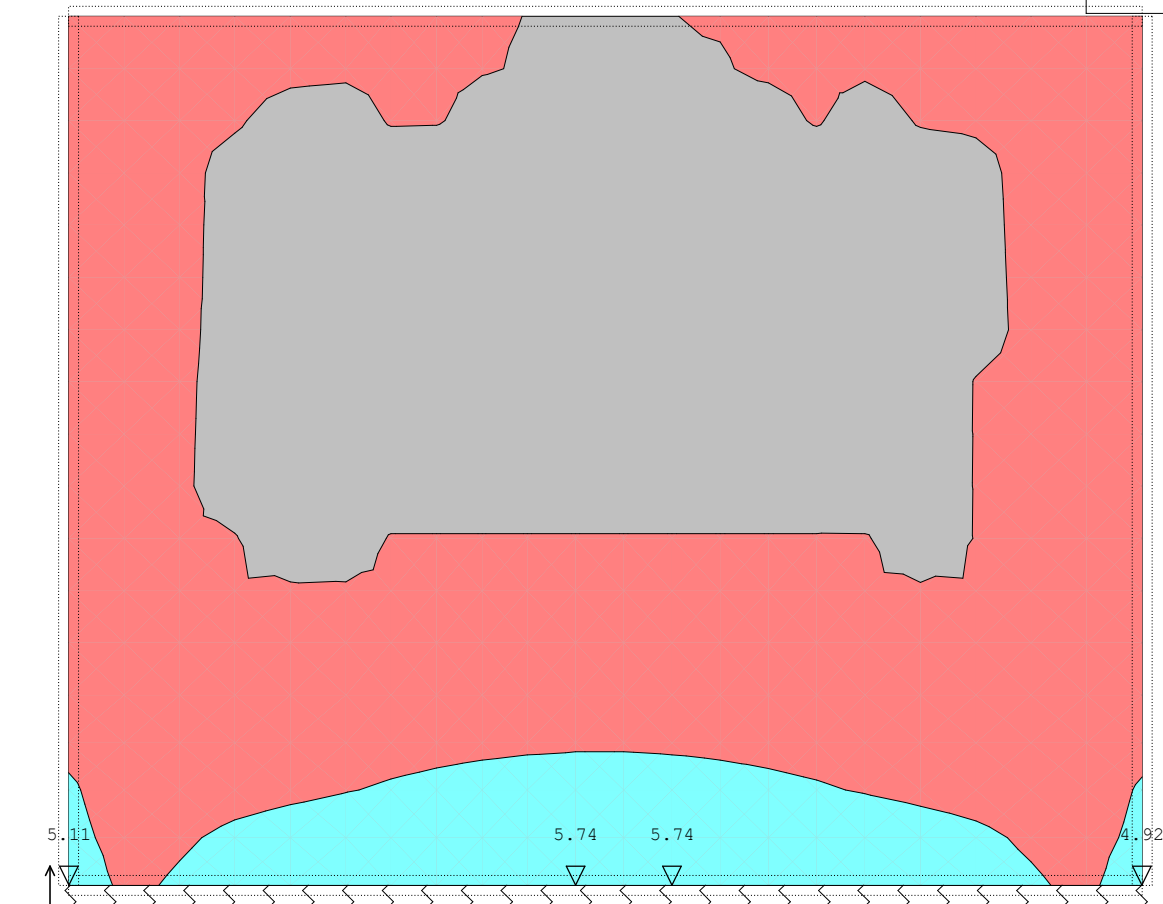
**Aa - sp.cona - Smer 1 - max Aa1,s = 4.74 cm<sup>2</sup>/m**

**Merodajna obtežba: Kompletna shema**  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - sp.cona - Smer 2 [cm <sup>2</sup> /m]
--

0.00

2.87  
5.74

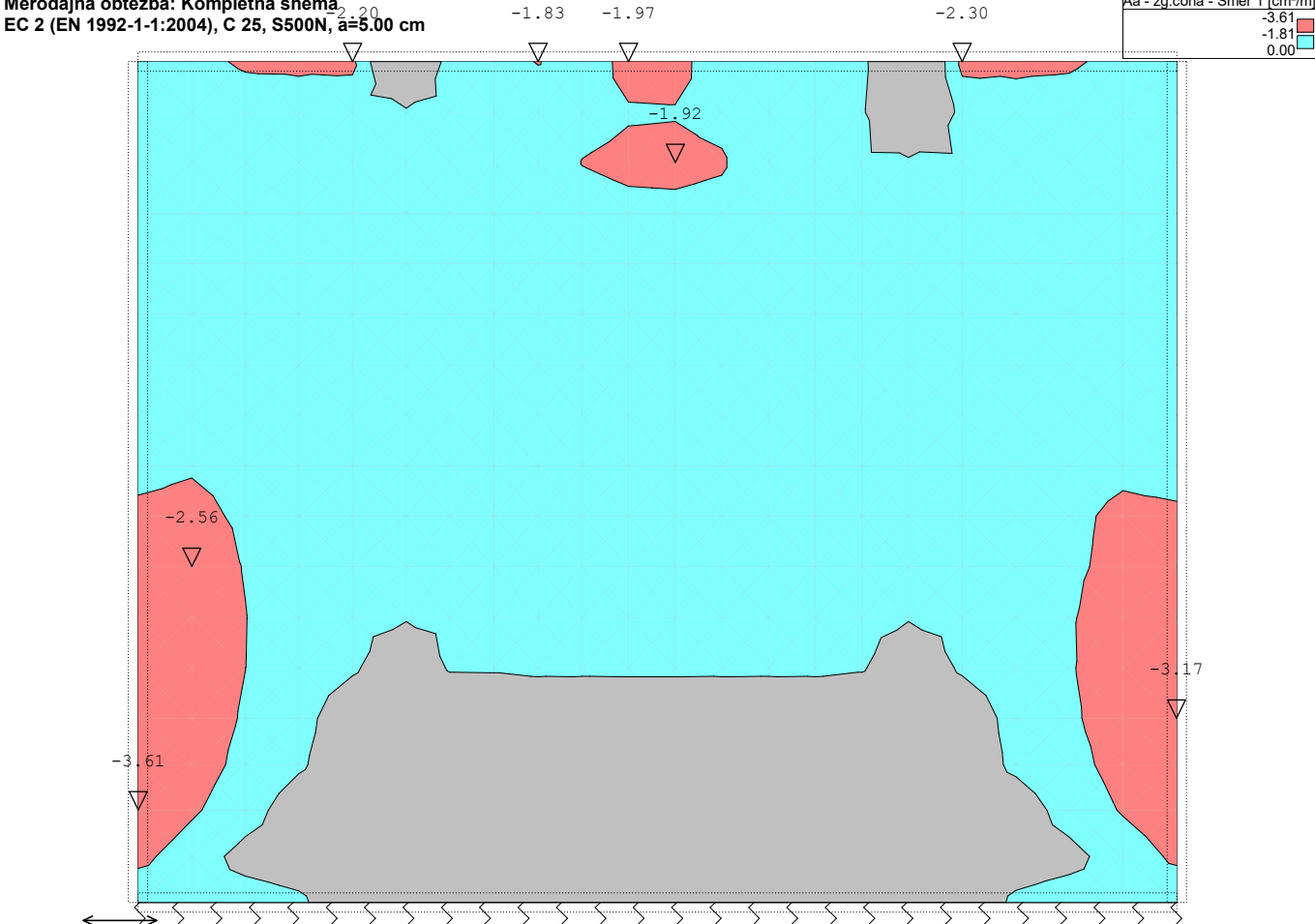


**Aa - sp.cona** - Smer 2 - max Aa<sub>2,s</sub> = 5.74 cm<sup>2</sup>/m

Dimenzioniranje (beton)

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - zg.cona - Smer 1 [cm²/m]  
-3.61  
-1.81  
0.00

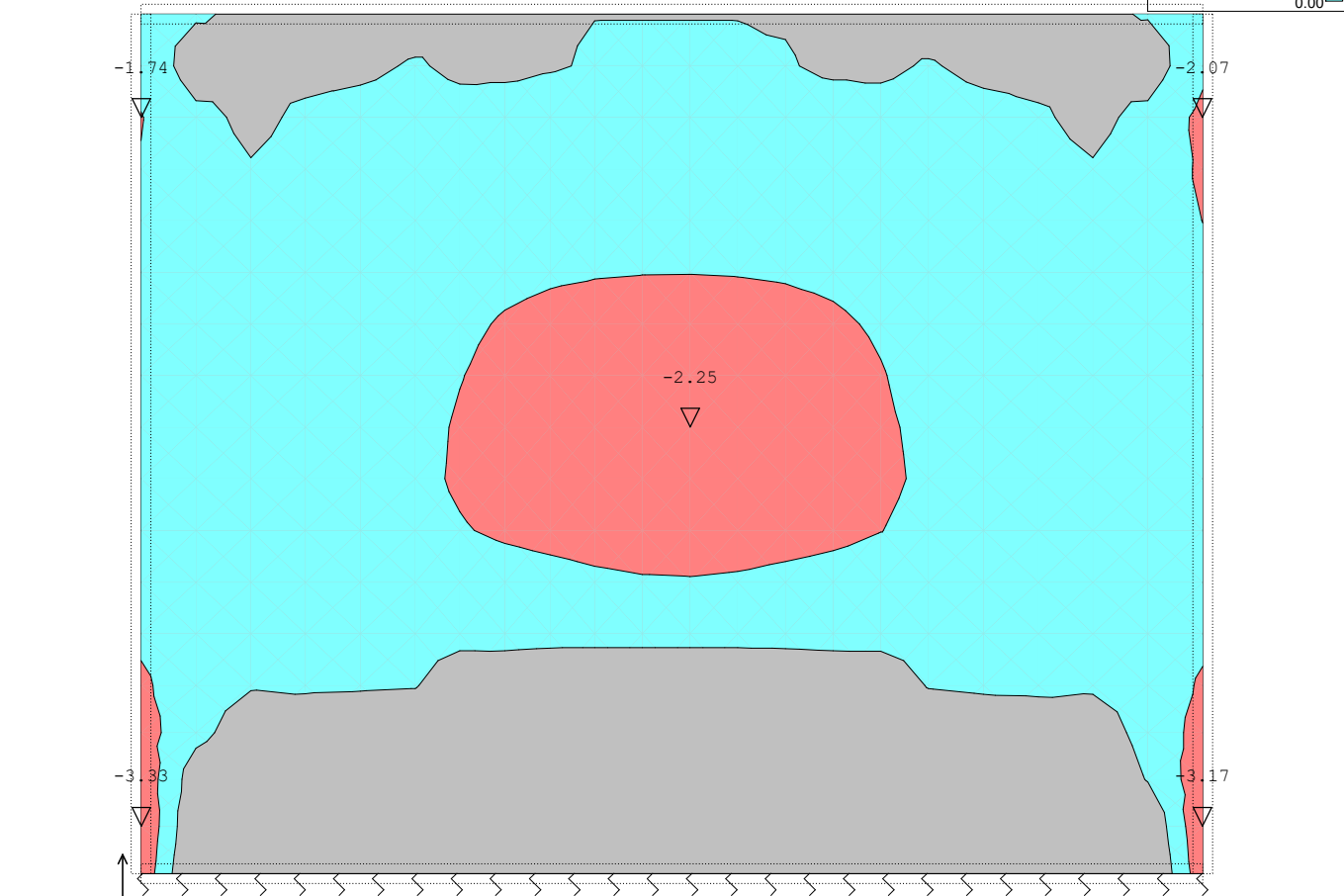


Okvir: V\_2

Aa - zg.cona - Smer 1 - max Aa1,z= -3.61 cm²/m

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - zg.cona - Smer 2 [cm²/m]  
-3.34  
-1.67  
0.00



Okvir: V\_2

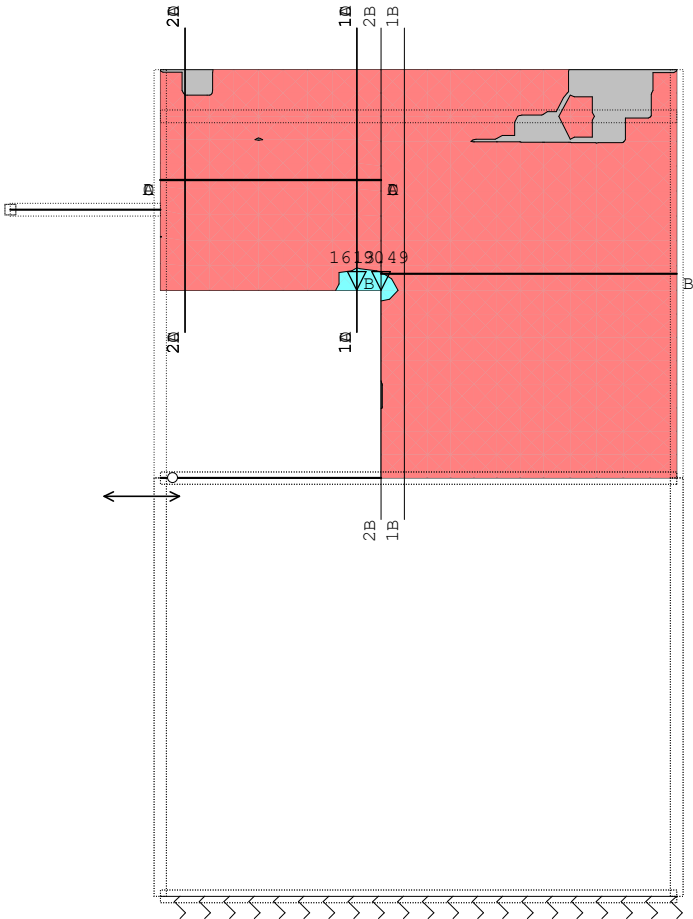
Aa - zg.cona - Smer 2 - max Aa2,z= -3.33 cm²/m



Dimenzioniranje (beton)

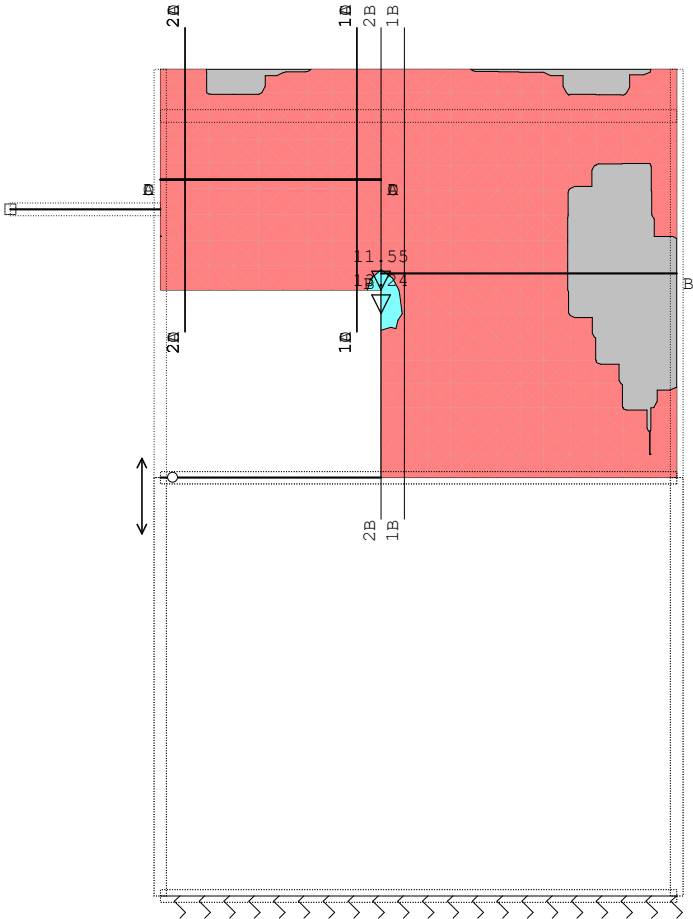
Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - sp.cona - Smer 1 [cm²/m]
0.00
8.45
16.90



Okvir: V\_3  
Aa - sp.cona - Smer 1 - max Aa1,s= 16.90 cm²/m  
Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - sp.cona - Smer 2 [cm²/m]
0.00
6.62
13.24

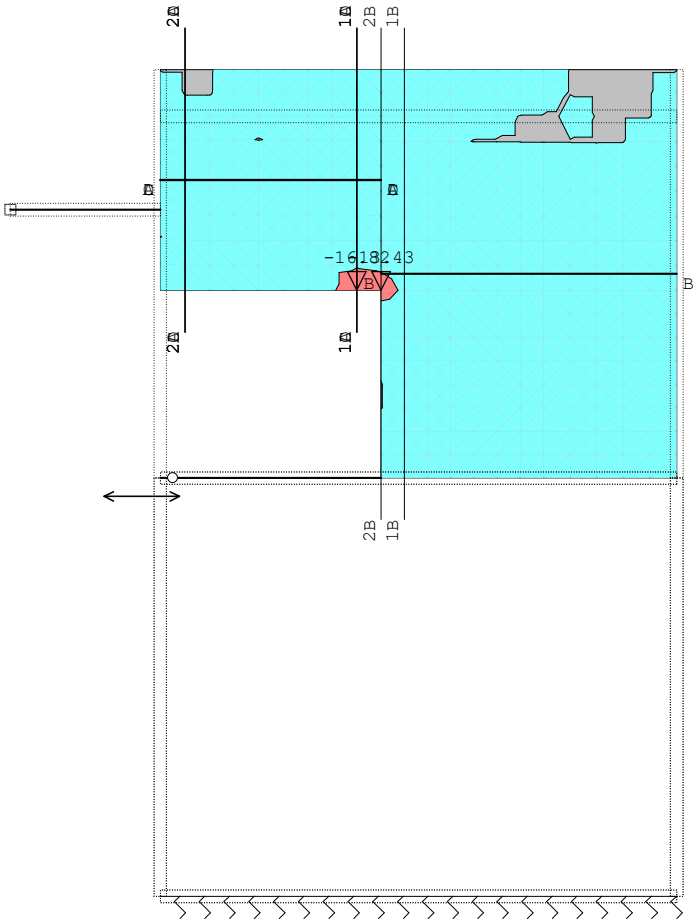


Okvir: V\_3  
Aa - sp.cona - Smer 2 - max Aa2,s= 13.24 cm²/m

Dimenzioniranje (beton)

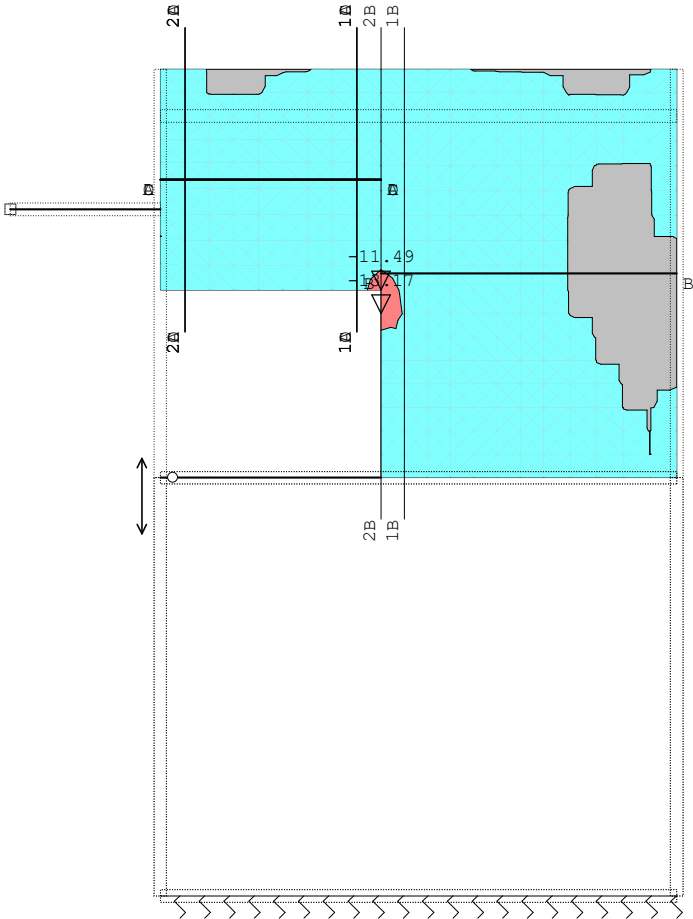
Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - zg.cona - Smer 1 [cm²/m]
-16.82
-8.41
0.00



Okvir: V\_3  
Aa - zg.cona - Smer 1 - max Aa1,z= -16.82 cm²/m  
Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - zg.cona - Smer 2 [cm²/m]
-13.18
-6.59
0.00



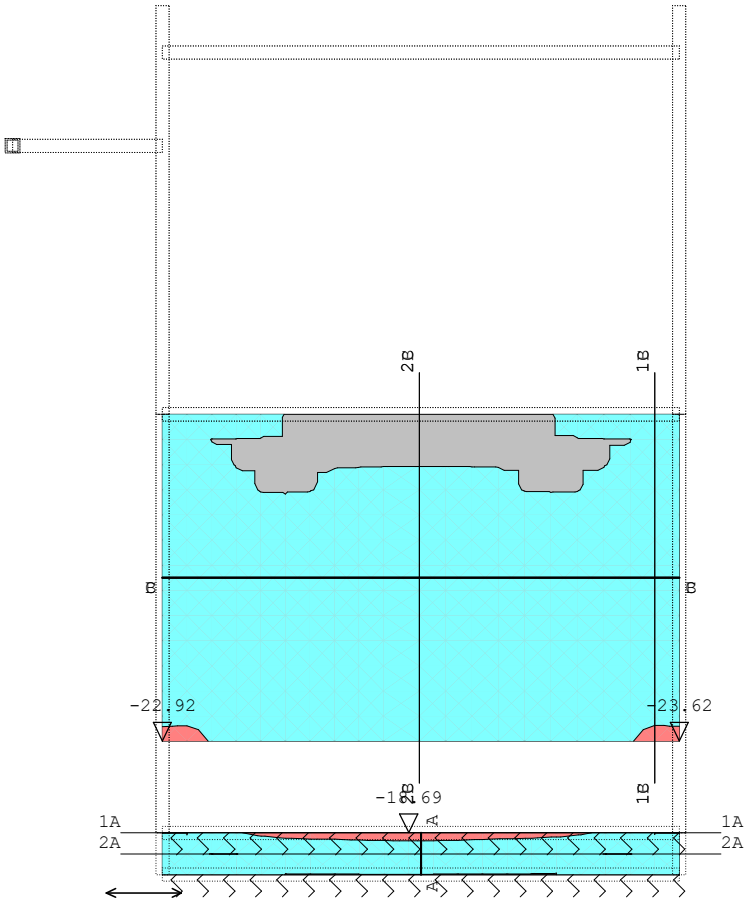
Okvir: V\_3  
Aa - zg.cona - Smer 2 - max Aa2,z= -13.17 cm²/m



Dimenzioniranje (beton)

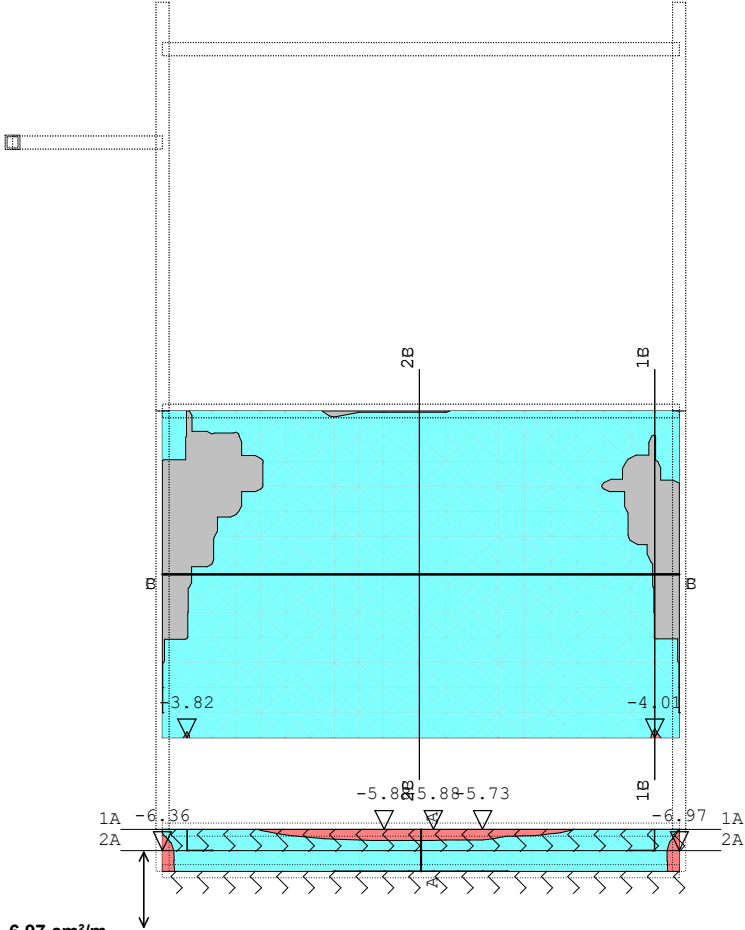
Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - zg.cona - Smer 1 [cm²/m]
-23.63
-11.82
0.00



Okvir: V\_4  
Aa - zg.cona - Smer 1 - max Aa1,z= -23.62 cm²/m  
Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - zg.cona - Smer 2 [cm²/m]
-6.97
-3.49
0.00

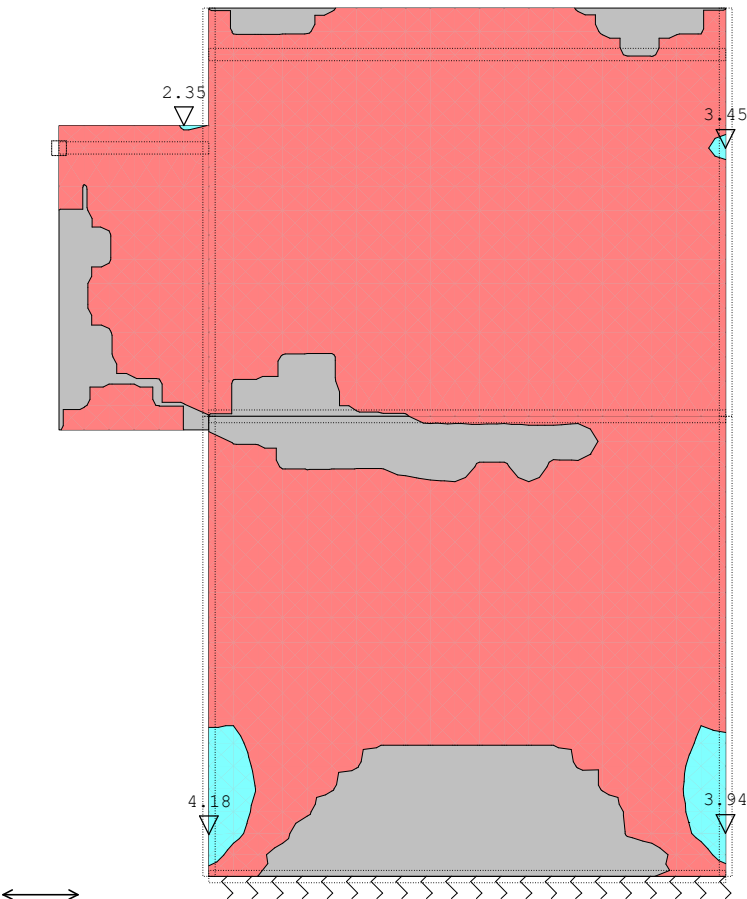


Okvir: V\_4  
Aa - zg.cona - Smer 2 - max Aa2,z= -6.97 cm²/m

Dimenzioniranje (beton)

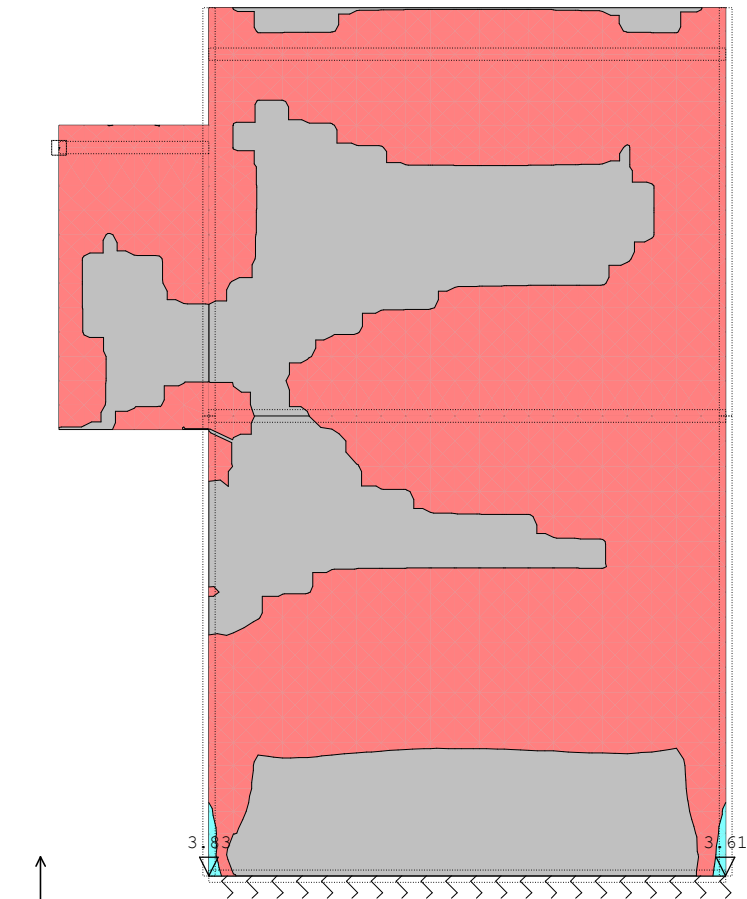
Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - sp.cona - Smer 1 [cm²/m]
0.00
2.09
4.18



Okvir: V\_1  
Aa - sp.cona - Smer 1 - max Aa1,s= 4.18 cm²/m  
Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - sp.cona - Smer 2 [cm²/m]
0.00
1.92
3.84

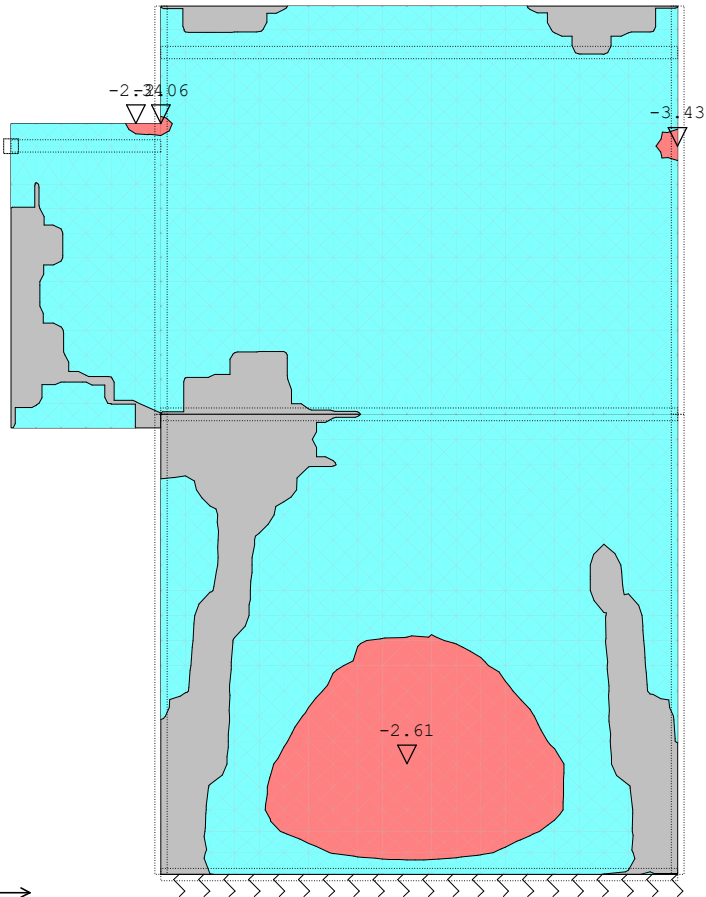


Okvir: V\_1  
Aa - sp.cona - Smer 2 - max Aa2,s= 3.83 cm²/m

Dimenzioniranje (beton)

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

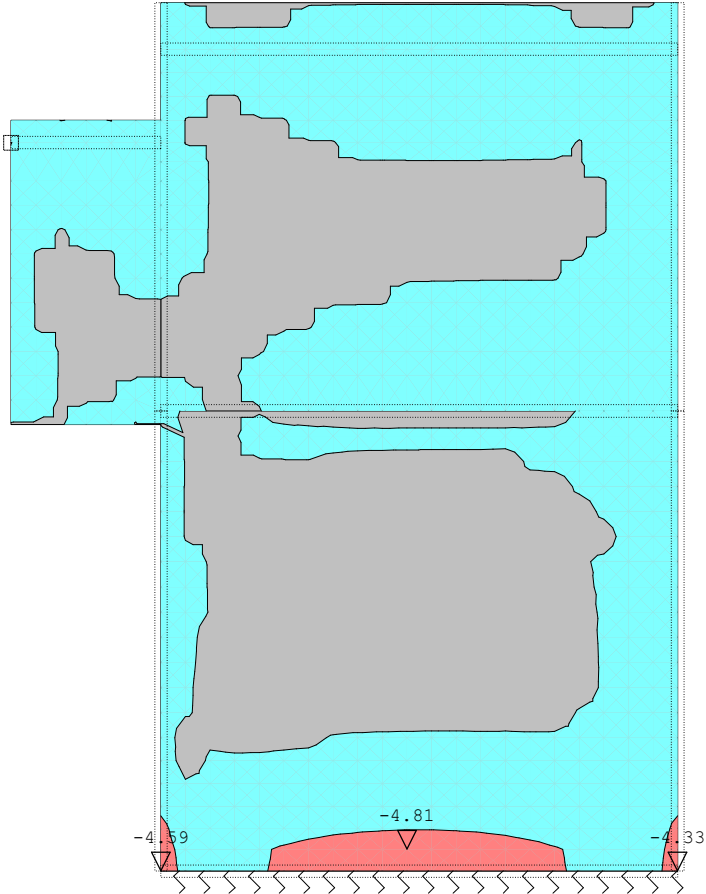
Aa - zg.cona - Smer 1 [cm²/m]
-3.43
-1.72
0.00



Okvir: V\_1  
Aa - zg.cona - Smer 1 - max Aa1,z= -3.43 cm²/m

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - zg.cona - Smer 2 [cm²/m]
-4.82
-2.41
0.00



Okvir: V\_1  
Aa - zg.cona - Smer 2 - max Aa2,z= -4.81 cm²/m

## Cantilever wall analysis

### Input data

Task : KOTLOVNICA Z ZALOGOVNIKOM  
Part : ABS OZ v osi C  
Author : Marko Markoja u.d.i.g  
Date : 14. 03. 2023

### Settings

Slovenia - EN 1997

### Materials and standards

Concrete structures : EN 1992-1-1 (EC2)  
Coefficients EN 1992-1-1 : standard

### Wall analysis

Verification methodology : according to EN 1997  
Active earth pressure calculation : Coulomb  
Passive earth pressure calculation : Caquot-Kerisel  
Earthquake analysis : Mononobe-Okabe  
Shape of earth wedge : Calculate as skew  
Base key : The base key is considered as inclined footing bottom  
Allowable eccentricity : 0,333  
Design approach : 2 - reduction of actions and resistances

Partial factors on actions (A)			
Permanent design situation			
		Unfavourable	Favourable
Permanent actions :	$\gamma_G =$	1,35 [-]	1,00 [-]
Variable actions :	$\gamma_Q =$	1,50 [-]	0,00 [-]
Water load :	$\gamma_w =$	1,35 [-]	

Partial factors for resistances (R)			
Permanent design situation			
Partial factor on overturning :	$\gamma_{Rv} =$	1,40 [-]	
Partial factor on sliding resistance :	$\gamma_{Rh} =$	1,10 [-]	
Partial factor on bearing capacity :	$\gamma_{Re} =$	1,40 [-]	

Partial factors for variable actions			
Permanent design situation			
Factor for combination value :	$\psi_0 =$	0,70 [-]	
Factor for frequent value :	$\psi_1 =$	0,50 [-]	
Factor for quasi-permanent value :	$\psi_2 =$	0,30 [-]	

### Material of structure

Unit weight  $\gamma = 25,00 \text{ kN/m}^3$

Analysis of concrete structures carried out according to the standard EN 1992-1-1 (EC2).

#### Concrete: C 30/37

Cylinder compressive strength  $f_{ck} = 30,00 \text{ MPa}$   
Tensile strength  $f_{ctm} = 2,90 \text{ MPa}$   
Elasticity modulus  $E_{cm} = 33000,00 \text{ MPa}$

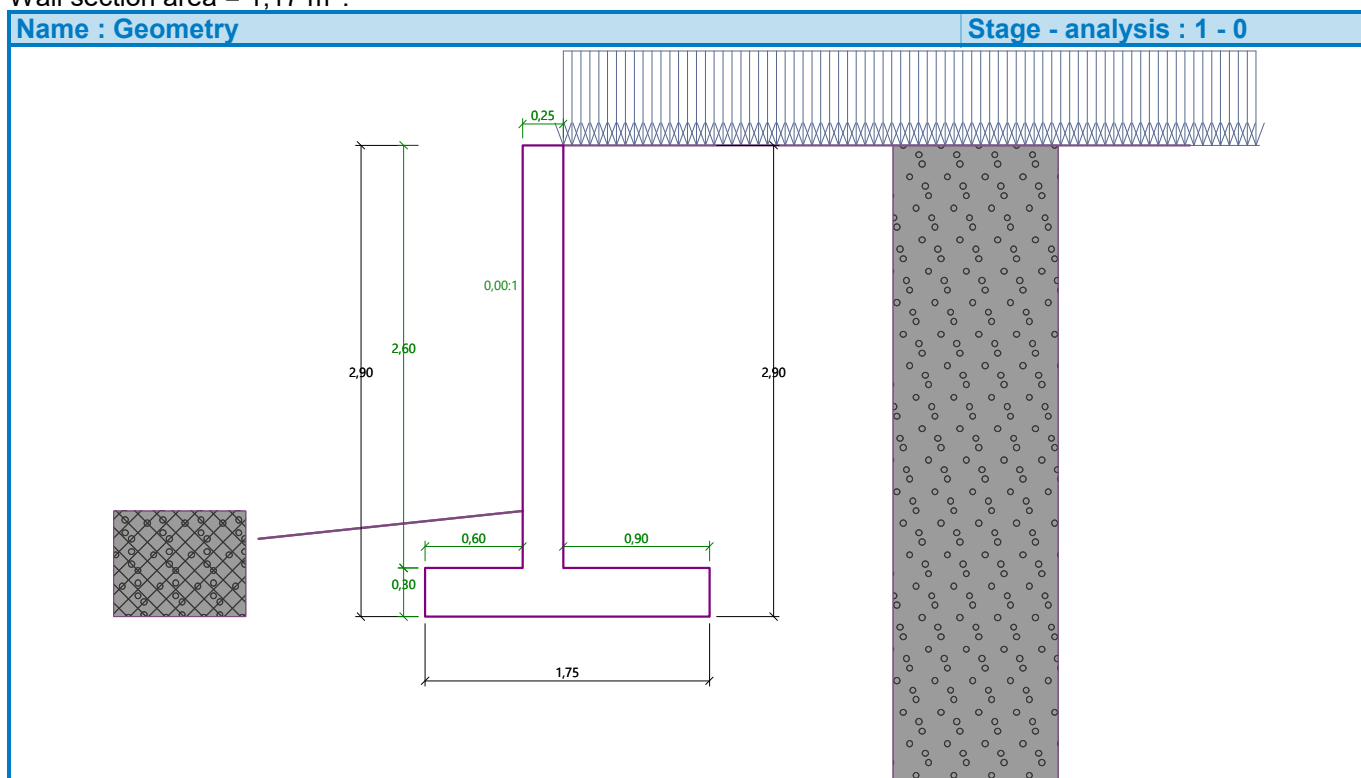
#### Longitudinal steel: B500B

Yield strength  $f_{yk} = 500,00 \text{ MPa}$

## Geometry of structure

No.	Coordinate X [m]	Depth Z [m]
1	0,00	0,00
2	0,00	2,60
3	0,90	2,60
4	0,90	2,90
5	-0,85	2,90
6	-0,85	2,60
7	-0,25	2,60
8	-0,25	0,00

The origin [0,0] is located at the most upper right point of the wall.  
Wall section area = 1,17 m<sup>2</sup>.

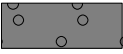
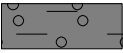




## Basic soil parameters

No.	Name	Pattern	$\Phi_{ef}$ [°]	$C_{ef}$ [kPa]	$\gamma$ [kN/m <sup>3</sup> ]	$\gamma_{su}$ [kN/m <sup>3</sup> ]	$\delta$ [°]
1	nasutje		32,00	0,00	24,00	14,00	21,00
2	flišna preperina		21,00	3,00	19,50	9,50	14,00
3	lapor		36,00	50,00	23,00	13,00	24,00
4	preperel laporovec		30,00	20,00	22,00	12,00	20,00



### Soil parameters to compute pressure at rest

No.	Name	Pattern	Type calculation	$\varphi_{ef}$ [°]	$\nu$ [-]	OCR [-]	$K_r$ [-]
1	nasutje		cohesionless	32,00	-	-	-
2	flišna preperina		cohesive	-	0,30	-	-
3	lapor		cohesionless	36,00	-	-	-
4	preperel laporovec		cohesive	-	0,30	-	-

### Soil parameters

#### nasutje

Unit weight :  $\gamma = 24,00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 32,00^\circ$   
 Cohesion of soil :  $c_{ef} = 0,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 21,00^\circ$   
 Soil : cohesionless  
 Saturated unit weight :  $\gamma_{sat} = 24,00 \text{ kN/m}^3$

#### flišna preperina

Unit weight :  $\gamma = 19,50 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 21,00^\circ$   
 Cohesion of soil :  $c_{ef} = 3,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 14,00^\circ$   
 Soil : cohesive  
 Poisson's ratio :  $\nu = 0,30$   
 Saturated unit weight :  $\gamma_{sat} = 19,50 \text{ kN/m}^3$

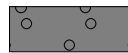
#### lapor

Unit weight :  $\gamma = 23,00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 36,00^\circ$   
 Cohesion of soil :  $c_{ef} = 50,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 24,00^\circ$   
 Soil : cohesionless  
 Saturated unit weight :  $\gamma_{sat} = 23,00 \text{ kN/m}^3$

#### preperel laporovec

Unit weight :  $\gamma = 22,00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 30,00^\circ$   
 Cohesion of soil :  $c_{ef} = 20,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 20,00^\circ$   
 Soil : cohesive  
 Poisson's ratio :  $\nu = 0,30$   
 Saturated unit weight :  $\gamma_{sat} = 22,00 \text{ kN/m}^3$

## Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Assigned soil	Pattern
1	-	0,00 .. ∞	nasutje	

## Foundation

Type of foundation : soil from geological profile

## Terrain profile

Terrain behind the structure is flat.

## Water influence

Ground water table is located below the structure.

## Input surface surcharges

No.	Surcharge new	change	Action	Mag.1 [kN/m <sup>2</sup> ]	Mag.2 [kN/m <sup>2</sup> ]	Ord.x x [m]	Length l [m]	Depth z [m]
1	Yes		variable	7,50				on terrain

No.	Name
1	koristna

## Resistance on front face of the structure

Resistance on front face of the structure: 2/3 pass., 1/3 at rest

Soil on front face of the structure - preperel laporovec

Angle of friction struc.-soil  $\delta = 20,00^\circ$

Soil thickness in front of structure  $h = 0,65$  m

Soil slope in front of structure  $\beta = -6,00^\circ$

## Settings of the stage of construction

Design situation : permanent

The wall is prevented from motion. Earth pressure at rest is therefore assumed.

Reduction of soil/soil friction angle : do not reduce

## Verification No. 1

## Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Coeff. overtur.	Coeff. sliding	Coeff. stress
Weight - wall	0,00	-0,95	29,37	0,79	1,000	1,000	1,350
Weight - soil	0,00	-0,46	4,20	0,31	1,000	1,000	1,350
FF resistance	-47,24	-0,29	-16,90	-0,32	1,000	1,000	1,350
Weight - earth wedge	0,00	-1,60	56,16	1,30	1,000	1,000	1,350
Pressure at rest	47,44	-0,97	0,00	1,75	1,350	1,350	1,350
koristna	10,22	-1,45	0,00	1,75	1,500	1,500	1,500
koristna	0,00	-2,90	6,75	1,30	0,000	0,000	1,500

## Verification of complete wall

## Check for overturning stability

Resisting moment  $M_{res} = 73,52$  kNm/m

Overturning moment  $M_{ovr} = 70,24$  kNm/m

**Wall for overturning is SATISFACTORY**

## Check for slip

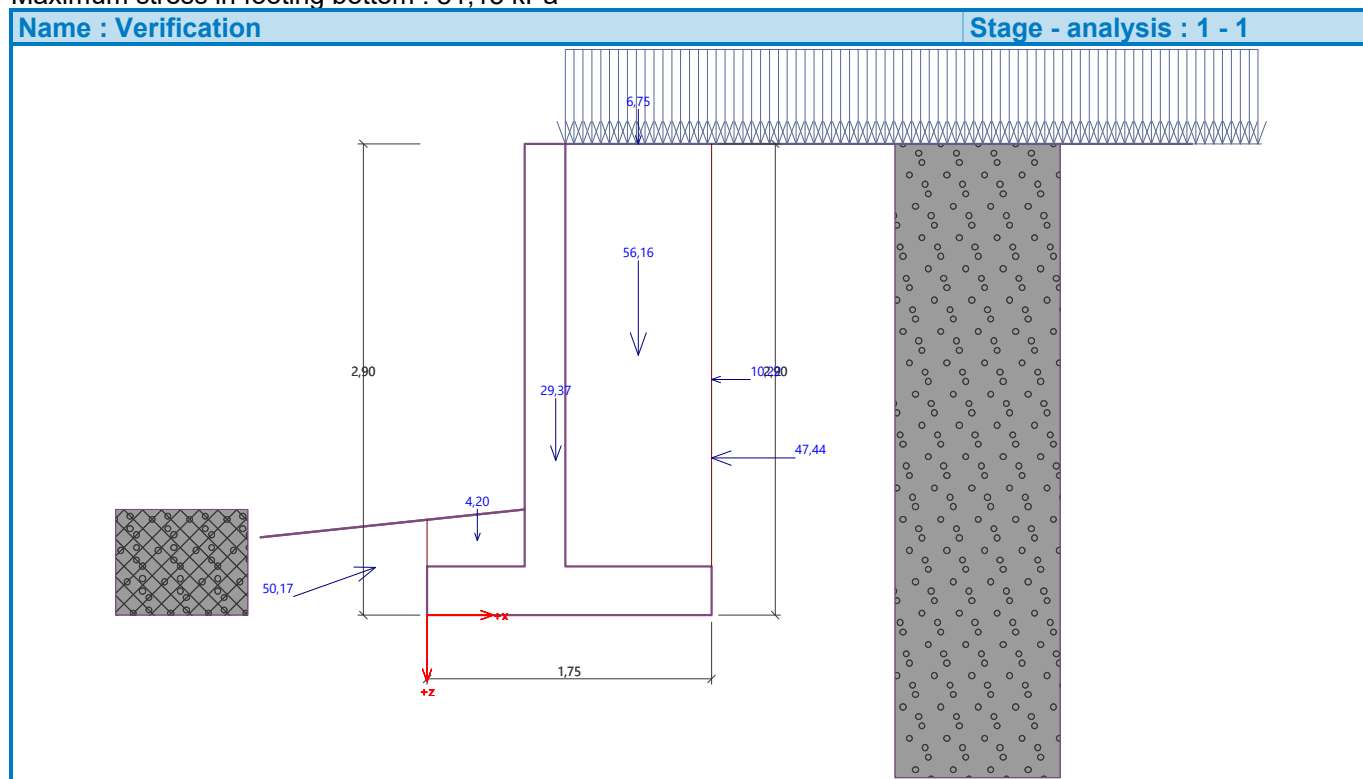
Resisting horizontal force  $H_{res} = 41,38$  kN/m

Active horizontal force  $H_{act} = 32,14$  kN/m

**Wall for slip is SATISFACTORY**

## Overall check - WALL is SATISFACTORY

Maximum stress in footing bottom : 81,15 kPa



## Bearing capacity of foundation soil

Design load acting at the center of footing bottom

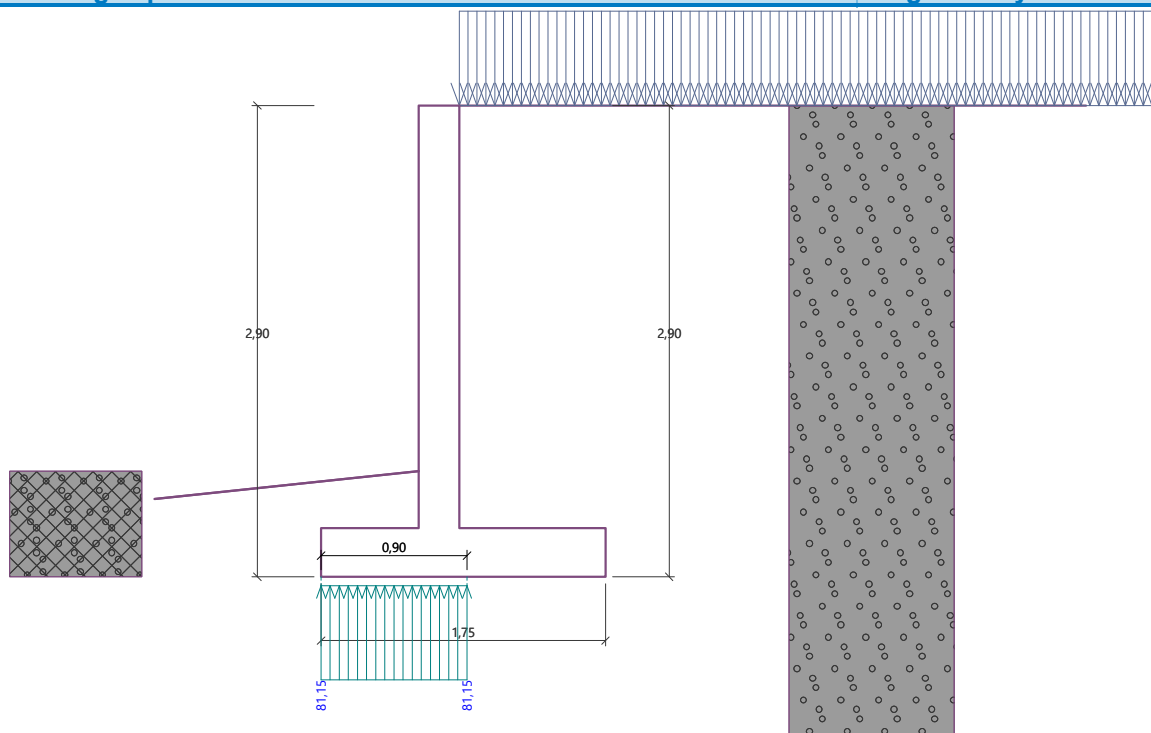
No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]	Eccentricity [-]	Stress [kPa]
1	8,15	108,46	15,61	0,043	67,80
2	31,04	72,84	32,14	0,244	81,15

Service load acting at the center of footing bottom

No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]
1	4,71	79,59	10,43
2	7,58	72,84	10,43

Name : Bearing cap.

Stage - analysis : 1 - -1



## Spread footing verification

### Input data

#### Settings

Slovenia - EN 1997

#### Materials and standards

Concrete structures : EN 1992-1-1 (EC2)

Coefficients EN 1992-1-1 : standard

#### Settlement

Analysis method : Analysis using oedometric modulus

Restriction of influence zone : by percentage of Sigma, Or

Coeff. of restriction of influence zone : 10,0 [%]

#### Spread Footing

Verification methodology : according to EN 1997

Analysis for drained conditions : EC 7-1 (EN 1997-1:2003)

Analysis of uplift : Standard

Allowable eccentricity : 0,333

Design approach : 2 - reduction of actions and resistances

#### Partial factors on actions (A)

##### Permanent design situation

		Unfavourable	Favourable
Permanent actions :	$\gamma_G =$	1,35 [-]	1,00 [-]

#### Partial factors for resistances (R)

##### Permanent design situation

Partial factor on vertical bearing capacity :	$\gamma_{Rvs} =$	1,40 [-]
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### Partial factors for resistances (R)

#### Permanent design situation

Partial factor on sliding resistance :  $\gamma_{Rhs} = 1,10 [-]$

### Basic soil parameters

No.	Name	Pattern	$\varphi_{ef}$ [°]	$c_{ef}$ [kPa]	$\gamma$ [kN/m <sup>3</sup> ]	$\gamma_{su}$ [kN/m <sup>3</sup> ]	$\delta$ [°]
1	nasutje		32,00	0,00	24,00	14,00	21,00
2	flišna preperina		21,00	3,00	19,50	9,50	14,00
3	lapor		36,00	50,00	23,00	13,00	24,00
4	preperel laporovec		30,00	20,00	22,00	12,00	20,00

### Soil parameters to compute pressure at rest

No.	Name	Pattern	Type calculation	$\varphi_{ef}$ [°]	$\nu$ [-]	OCR [-]	$K_r$ [-]
1	nasutje		cohesionless	32,00	-	-	-
2	flišna preperina		cohesive	-	0,30	-	-
3	lapor		cohesionless	36,00	-	-	-
4	preperel laporovec		cohesive	-	0,30	-	-

### Soil parameters

#### nasutje

Unit weight :  $\gamma = 24,00 \text{ kN/m}^3$   
 Angle of internal friction :  $\varphi_{ef} = 32,00^\circ$   
 Cohesion of soil :  $c_{ef} = 0,00 \text{ kPa}$   
 Saturated unit weight :  $\gamma_{sat} = 24,00 \text{ kN/m}^3$

#### flišna preperina

Unit weight :  $\gamma = 19,50 \text{ kN/m}^3$   
 Angle of internal friction :  $\varphi_{ef} = 21,00^\circ$   
 Cohesion of soil :  $c_{ef} = 3,00 \text{ kPa}$   
 Saturated unit weight :  $\gamma_{sat} = 19,50 \text{ kN/m}^3$

#### lapor

Unit weight :  $\gamma = 23,00 \text{ kN/m}^3$   
 Angle of internal friction :  $\varphi_{ef} = 36,00^\circ$   
 Cohesion of soil :  $c_{ef} = 50,00 \text{ kPa}$   
 Saturated unit weight :  $\gamma_{sat} = 23,00 \text{ kN/m}^3$

#### preperel laporovec

Unit weight :  $\gamma = 22,00 \text{ kN/m}^3$   
 Angle of internal friction :  $\varphi_{ef} = 30,00^\circ$   
 Cohesion of soil :  $c_{ef} = 20,00 \text{ kPa}$

Saturated unit weight :  $\gamma_{\text{sat}} = 22,00 \text{ kN/m}^3$

### Foundation

#### Foundation type: strip footing

Depth from original ground surface  $h_z = 2,90 \text{ m}$

Depth of footing bottom  $d = 0,65 \text{ m}$

Foundation thickness  $t = 0,30 \text{ m}$

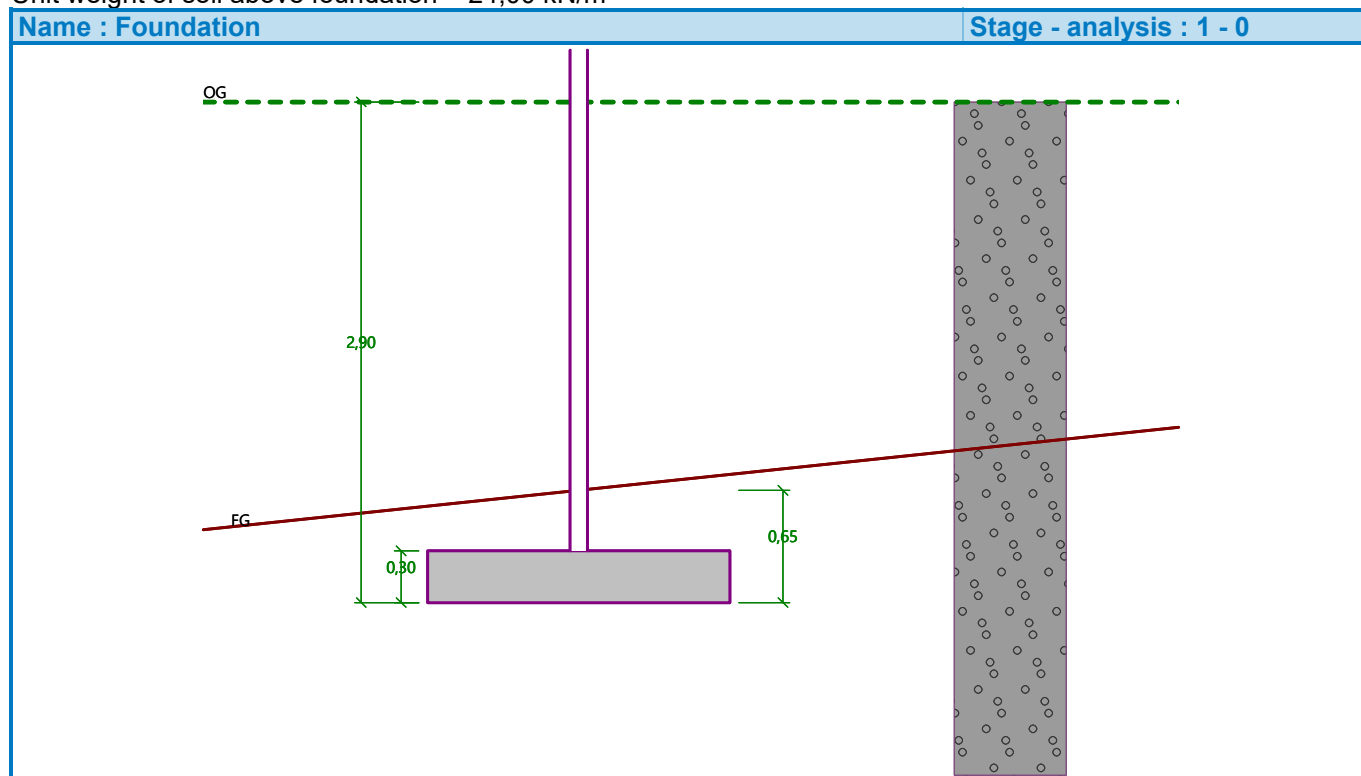
Incl. of finished grade  $s_1 = 6,00^\circ$

Incl. of footing bottom  $s_2 = 0,00^\circ$

#### Overburden

Type: input unit weight

Unit weight of soil above foundation =  $24,00 \text{ kN/m}^3$



### Geometry of structure

#### Foundation type: strip footing

Overall strip footing length =  $10,00 \text{ m}$

Strip footing width (x) =  $1,75 \text{ m}$

Column width in the direction of x =  $0,10 \text{ m}$

Inserted loading is considered per unit length of continuous footing span.

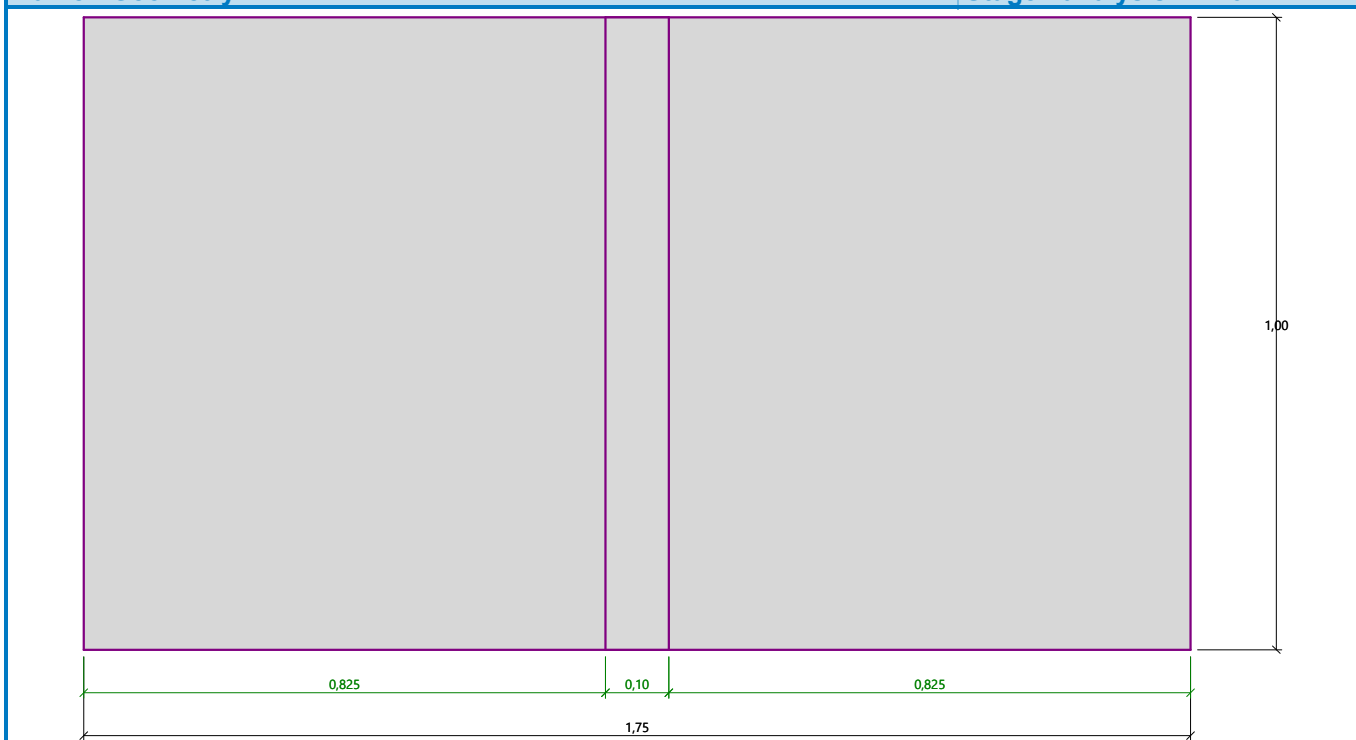
Volume of strip footing =  $0,52 \text{ m}^3/\text{m}$

Volume of excavation =  $1,14 \text{ m}^3/\text{m}$

Volume of fill =  $0,58 \text{ m}^3/\text{m}$

## Name : Geometry

## Stage - analysis : 1 - 0



## Material of structure

Unit weight  $\gamma = 25,00 \text{ kN/m}^3$

Analysis of concrete structures carried out according to the standard EN 1992-1-1 (EC2).

### Concrete: C 30/37

Cylinder compressive strength  $f_{ck} = 30,00 \text{ MPa}$

Tensile strength  $f_{ctm} = 2,90 \text{ MPa}$

Elasticity modulus  $E_{cm} = 33000,00 \text{ MPa}$

### Longitudinal steel: B500B

Yield strength  $f_{yk} = 500,00 \text{ MPa}$

### Transverse steel: B500B

Yield strength  $f_{yk} = 500,00 \text{ MPa}$

## Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Assigned soil	Pattern
1		- 0,00 .. ∞	nasutje	

## Load

No.	Load		Name	Type	N [kN/m]	$M_y$ [kNm/m]	$H_x$ [kN/m]
	new	change					
1	Yes		LC 1	Design	82,63	3,47	-15,61
2	Yes		LC 2	Design	47,01	21,40	-32,14
3	Yes		LC 3	Service	53,76	1,58	-10,43
4	Yes		LC 4	Service	47,01	4,45	-10,43

## Global settings

Type of analysis : analysis for drained conditions

The settlement is not analyzed.

### Settings of the stage of construction

Design situation : permanent

### Verification No. 1

#### Load case verification

Name	Self w. in favor	$e_x$ [m]	$e_y$ [m]	$\sigma$ [kPa]	$R_d$ [kPa]	Utilization [%]	Is satisfactory
LC 1	Yes	-0,07	0,00	68,46	338,77	20,21	Yes
LC 1	No	-0,07	0,00	68,46	338,77	20,21	Yes
LC 2	Yes	-0,42	0,00	81,23	99,84	81,36	Yes
LC 2	No	-0,42	0,00	81,23	99,84	81,36	Yes

Analysis carried out with automatic selection of the most unfavourable load cases.

Computed self weight of strip foundation  $G = 13,12$  kN/m

Computed weight of overburden  $Z = 13,86$  kN/m

#### Vertical bearing capacity check

Shape of contact stress : rectangle

Most unfavorable load case No. 2. (LC 2)

Parameters of slip surface below foundation:

Depth of slip surface  $z_{sp} = 2,98$  m

Length of slip surface  $l_{sp} = 9,31$  m

Design bearing capacity of found.soil  $R_d = 99,84$  kPa

Extreme contact stress  $\sigma = 81,23$  kPa

**Bearing capacity in the vertical direction is SATISFACTORY**

#### Verification of load eccentricity

Max. eccentricity in direction of base length  $e_x = 0,240 < 0,333$

Max. eccentricity in direction of base width  $e_y = 0,000 < 0,333$

Max. overall eccentricity  $e_t = 0,240 < 0,333$

**Eccentricity of load is SATISFACTORY**

#### Horizontal bearing capacity check

Most unfavorable load case No. 2. (LC 2)

Earth resistance: not considered

Horizontal bearing capacity  $R_{dh} = 42,04$  kN

Extreme horizontal force  $H = 32,14$  kN

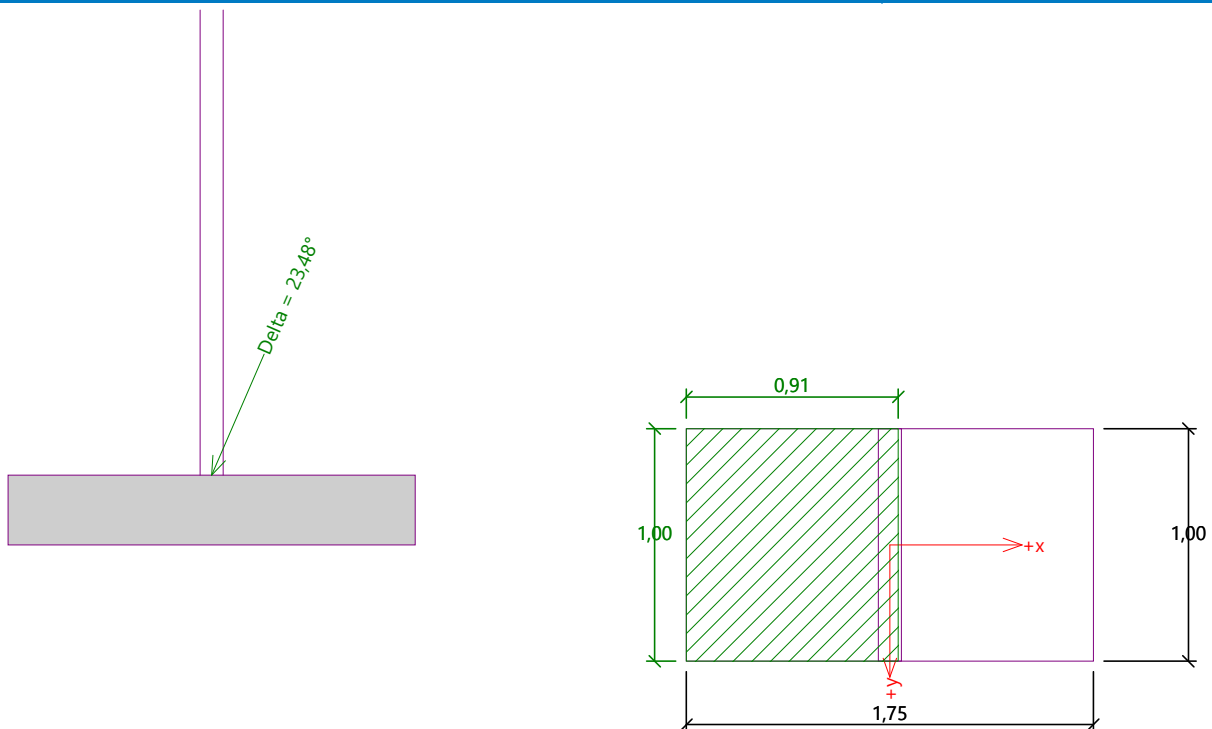
**Bearing capacity in the horizontal direction is SATISFACTORY**

**Bearing capacity of foundation is SATISFACTORY**



Name : Bearing cap.

Stage - analysis : 1 - 1



## Dimensioning No. 1

Analysis carried out with automatic selection of the most unfavourable load cases.

### Verification of longitudinal reinforcement of foundation in the direction of x

5 prof. 10,0 mm, cover 60,0 mm

Cross-section width = 1,00 m

Cross-section depth = 0,30 m

Reinforcement ratio  $\rho = 0,17 \% > 0,15 \% = \rho_{min}$

Position of neutral axis  $x = 0,01 \text{ m} < 0,14 \text{ m} = x_{max}$

Ultimate moment  $M_{Rd} = 39,39 \text{ kNm} > 24,22 \text{ kNm} = M_{Ed}$

**Cross-section is SATISFACTORY.**

### Spread footing for punching shear failure check

Column normal force = 47,01 kN

#### Maximum resistance at the column perimeter

Force transferred into found. soil = 2,69 kN

Force transferred by shear strength of foundation = 44,33 kN

Considered column perimeter  $u_0 = 2,00 \text{ m}$

Shear resistance at the column perimeter  $v_{Ed,max} = 0,50 \text{ MPa}$

Resistance at the column perimeter  $v_{Rd,max} = 4,22 \text{ MPa}$

#### Critical section without shear reinforcement

Force transferred into found. soil = 24,78 kN

Force transferred by shear strength of foundation = 22,23 kN

Distance of section from the column = 0,41 m

Section perimeter  $u = 2,00 \text{ m}$

Shear stress at section  $v_{Ed} = 0,09 \text{ MPa}$

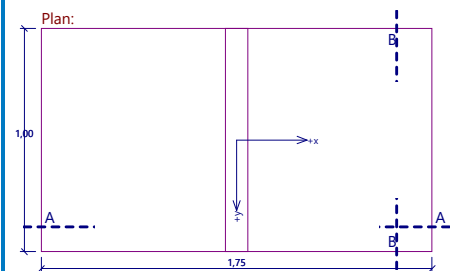
Shear resistance of section without shear reinforcement  $v_{Rd,c} = 0,58 \text{ MPa}$

$v_{Ed} < v_{Rd,c} \Rightarrow$  Reinforcement is not required

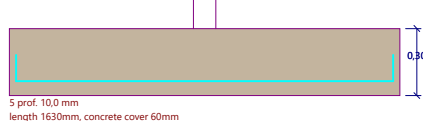
**Spread footing for punching shear is SATISFACTORY**

Name : Dimensioning

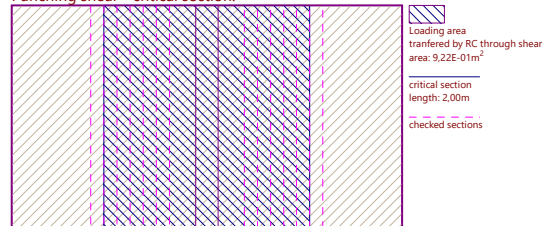
Stage - analysis : 1 - 1



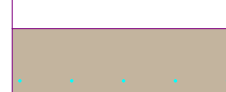
Section A-A:



Punching shear - critical section:



Section B-B:



## Dimensioning No. 1

### Wall stem check - front reinf.

#### Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Coeff. moment	Coeff. norm.force	Coeff. shear for.
Weight - wall	0,00	-1,30	16,24	0,12	1,000	1,350	1,000
FF resistance	-22,08	-0,16	-7,97	0,00	1,000	1,000	1,000
Pressure at rest	38,10	-0,87	0,00	0,25	1,350	1,000	1,350
koristna	9,16	-1,30	0,00	0,25	1,500	0,000	1,500

### Wall stem check - front reinf.

Front reinforcement is not required.

### Wall stem check - back reinf.

#### Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Coeff. moment	Coeff. norm.force	Coeff. shear for.
Weight - wall	0,00	-1,30	16,24	0,12	1,000	1,350	1,000
FF resistance	-22,08	-0,16	-7,97	0,00	1,000	1,000	1,000
Pressure at rest	38,10	-0,87	0,00	0,25	1,350	1,000	1,350
koristna	9,16	-1,30	0,00	0,25	1,500	0,000	1,500

### Wall stem check - back reinf.

Wall check at the construction joint 2,60 m from the wall crest

Reinforcement and dimensions of the cross-section

6,66 prof. 8,0 mm, cover 60,0 mm

6,20 prof. 10,0 mm, cover 60,0 mm

Inputted reinforcement area = 334,8 mm<sup>2</sup>

Required reinforcement area = 747,2 mm<sup>2</sup>

Cross-section width = 1,00 m

Cross-section height = 0,25 m

Reinforcement ratio  $\rho$  = 0,44 % > 0,15 % =  $\rho_{min}$

Position of neutral axis  $x$  = 0,03 m < 0,11 m =  $x_{max}$

Ultimate shear force  $V_{Rd}$  = 105,42 kN > 43,10 kN =  $V_{Ed}$

Ultimate moment  $M_{Rd} = 66,34 \text{ kNm} > 57,79 \text{ kNm} = M_{Ed}$

**Cross-section is SATISFACTORY.**

#### Wall stem check - back reinf. - $M_{Ed}$

Wall check at the construction joint 2,05 m from the wall crest

Reinforcement and dimensions of the cross-section

6,66 prof. 8,0 mm, cover 60,0 mm

Inputted reinforcement area = 334,8 mm<sup>2</sup>

Required reinforcement area = 747,2 mm<sup>2</sup>

Cross-section width = 1,00 m

Cross-section height = 0,25 m

Reinforcement ratio  $\rho = 0,18 \% > 0,15 \% = \rho_{min}$

Position of neutral axis  $x = 0,03 \text{ m} < 0,11 \text{ m} = x_{max}$

Ultimate moment  $M_{Rd} = 34,82 \text{ kNm} > 32,93 \text{ kNm} = M_{Ed}$

**Cross-section is SATISFACTORY.**

#### Wall stem check - back reinf. - $V_{Ed}$

Wall check at the construction joint 2,25 m from the wall crest

Reinforcement and dimensions of the cross-section

6,66 prof. 8,0 mm, cover 60,0 mm

6,20 prof. 10,0 mm, cover 60,0 mm

Inputted reinforcement area = 334,8 mm<sup>2</sup>

Required reinforcement area = 747,2 mm<sup>2</sup>

Cross-section width = 1,00 m

Cross-section height = 0,25 m

Ultimate shear force  $V_{Rd} = 105,42 \text{ kN} > 50,46 \text{ kN} = V_{Ed}$

**Cross-section is SATISFACTORY.**

#### Wall stem check - back reinf. - Crack width

Wall check at the construction joint 2,60 m from the wall crest

Reinforcement and dimensions of the cross-section

6,66 prof. 8,0 mm, cover 60,0 mm

6,20 prof. 10,0 mm, cover 60,0 mm

Cross-section width = 1,00 m

Cross-section height = 0,25 m

$M = 31,95 \text{ kNm}$ ,  $A_s = 821,7 \text{ mm}^2$

Crack width = 0,296 mm < Allowable crack width = 0,300 mm

**Crack width is SATISFACTORY**

#### Wall jump check

##### Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Design coefficient
Weight - wall	0,00	-0,95	29,37	0,79	1,350
Weight - soil	0,00	-0,46	4,20	0,31	1,350
FF resistance	-47,24	-0,29	-16,90	-0,32	1,350
Weight - earth wedge	0,00	-1,60	56,16	1,30	1,350
Pressure at rest	47,44	-0,97	0,00	1,75	1,350
koristna	10,22	-1,45	0,00	1,75	1,500
koristna	0,00	-2,90	6,75	1,30	1,500

### Wall jump check

Reinforcement and dimensions of the cross-section

5 prof. 20,0 mm, cover 60,0 mm

Inputted reinforcement area = 1570,8 mm<sup>2</sup>

Required reinforcement area = 346,8 mm<sup>2</sup>

Cross-section width = 1,00 m

Cross-section height = 0,30 m

Reinforcement ratio  $\rho$  = 0,68 % > 0,15 % =  $\rho_{min}$

Position of neutral axis  $x$  = 0,04 m < 0,14 m =  $x_{max}$

Ultimate shear force  $V_{Rd}$  = 145,95 kN > 38,99 kN =  $V_{Ed}$

Ultimate moment  $M_{Rd}$  = 145,42 kNm > 20,47 kNm =  $M_{Ed}$

**Cross-section is SATISFACTORY.**

### Wall heel check

Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Design coefficient
Weight - wall	0,00	-0,15	6,75	1,30	1,350
Weight - earth wedge	0,00	-1,60	56,16	1,30	1,350
Pressure at rest	47,44	-0,97	0,00	1,75	1,350
koristna	10,22	-1,45	0,00	1,75	1,500
Contact stress	0,00	0,00	-48,80	1,28	1,000
Gravity surch. 1	0,00	-2,90	6,75	1,30	1,500

### Wall heel check

Reinforcement and dimensions of the cross-section

5 prof. 20,0 mm, cover 60,0 mm

Inputted reinforcement area = 1570,8 mm<sup>2</sup>

Required reinforcement area = 380,0 mm<sup>2</sup>

Cross-section width = 1,00 m

Cross-section height = 0,30 m

Reinforcement ratio  $\rho$  = 0,68 % > 0,15 % =  $\rho_{min}$

Position of neutral axis  $x$  = 0,04 m < 0,14 m =  $x_{max}$

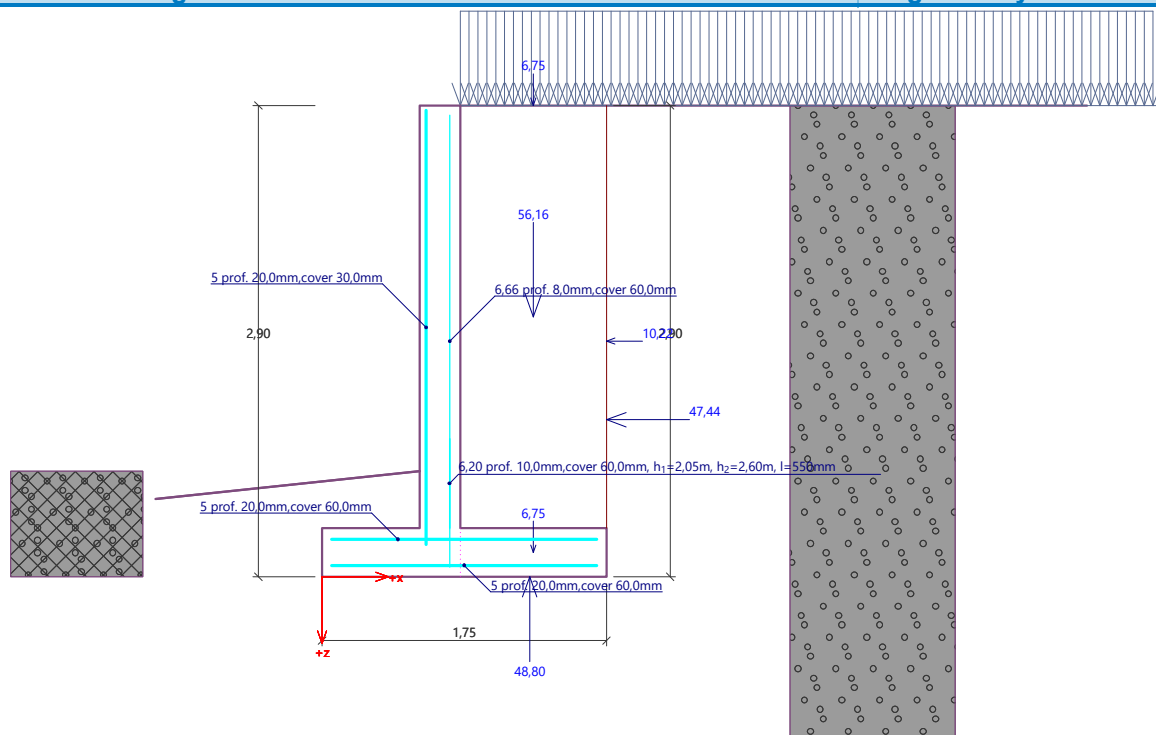
Ultimate shear force  $V_{Rd}$  = 145,95 kN > 46,26 kN =  $V_{Ed}$

Ultimate moment  $M_{Rd}$  = 145,42 kNm > 37,32 kNm =  $M_{Ed}$

**Cross-section is SATISFACTORY.**

Name : Dimensioning

Stage - analysis : 1 - 1



## Cantilever wall analysis

### Input data

Task : KOTLOVNICA Z ZALOGOVNIKOM  
Part : ABS OZ v osi 3  
Author : Marko Markoja u.d.i.g  
Date : 14. 03. 2023

### Settings

Slovenia - EN 1997

### Materials and standards

Concrete structures : EN 1992-1-1 (EC2)  
Coefficients EN 1992-1-1 : standard

### Wall analysis

Verification methodology : according to EN 1997  
Active earth pressure calculation : Coulomb  
Passive earth pressure calculation : Caquot-Kerisel  
Earthquake analysis : Mononobe-Okabe  
Shape of earth wedge : Calculate as skew  
Base key : The base key is considered as inclined footing bottom  
Allowable eccentricity : 0,333  
Design approach : 2 - reduction of actions and resistances

Partial factors on actions (A)			
Permanent design situation			
		Unfavourable	Favourable
Permanent actions :	$\gamma_G =$	1,35 [-]	1,00 [-]
Variable actions :	$\gamma_Q =$	1,50 [-]	0,00 [-]
Water load :	$\gamma_w =$	1,35 [-]	

Partial factors for resistances (R)			
Permanent design situation			
Partial factor on overturning :		$\gamma_{Rv} =$	1,40 [-]
Partial factor on sliding resistance :		$\gamma_{Rh} =$	1,10 [-]
Partial factor on bearing capacity :		$\gamma_{Re} =$	1,40 [-]

Partial factors for variable actions			
Permanent design situation			
Factor for combination value :		$\psi_0 =$	0,70 [-]
Factor for frequent value :		$\psi_1 =$	0,50 [-]
Factor for quasi-permanent value :		$\psi_2 =$	0,30 [-]

### Material of structure

Unit weight  $\gamma = 25,00 \text{ kN/m}^3$

Analysis of concrete structures carried out according to the standard EN 1992-1-1 (EC2).

#### Concrete: C 30/37

Cylinder compressive strength  $f_{ck} = 30,00 \text{ MPa}$   
Tensile strength  $f_{ctm} = 2,90 \text{ MPa}$   
Elasticity modulus  $E_{cm} = 33000,00 \text{ MPa}$

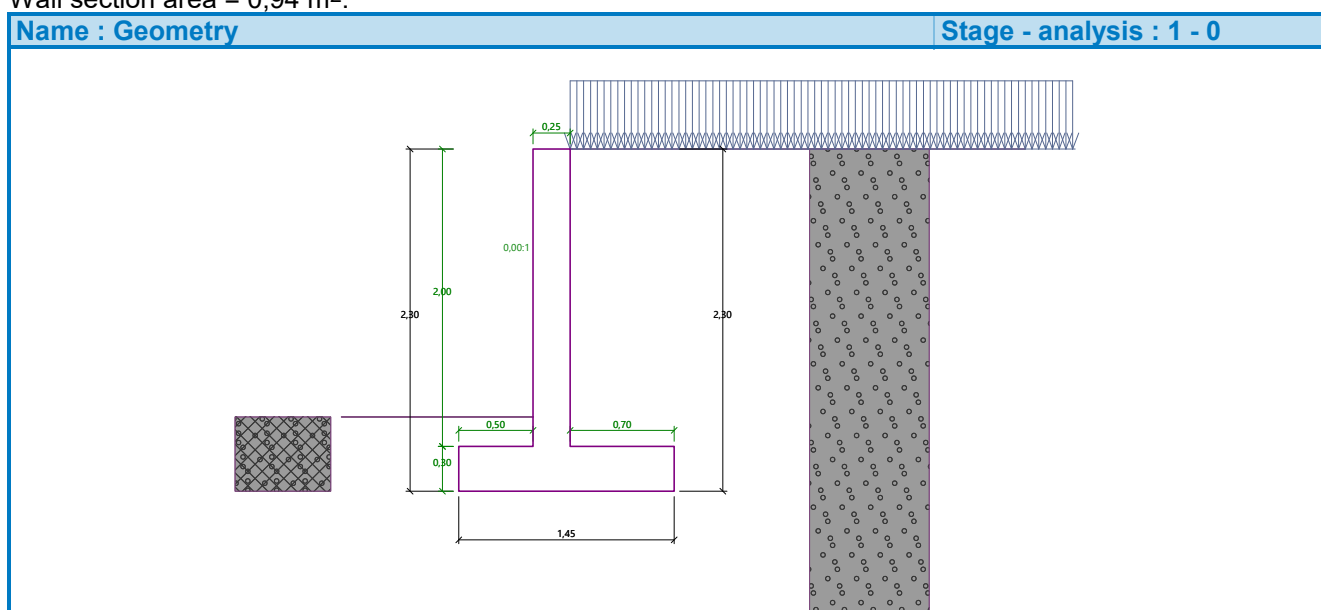
#### Longitudinal steel: B500B

Yield strength  $f_{yk} = 500,00 \text{ MPa}$

### Geometry of structure

No.	Coordinate X [m]	Depth Z [m]
1	0,00	0,00
2	0,00	2,00
3	0,70	2,00
4	0,70	2,30
5	-0,75	2,30
6	-0,75	2,00
7	-0,25	2,00
8	-0,25	0,00

The origin [0,0] is located at the most upper right point of the wall.  
Wall section area = 0,94 m<sup>2</sup>.

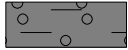

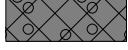


### Basic soil parameters

No.	Name	Pattern	$\Phi_{ef}$ [°]	$C_{ef}$ [kPa]	$\gamma$ [kN/m <sup>3</sup> ]	$\gamma_{su}$ [kN/m <sup>3</sup> ]	$\delta$ [°]
1	nasutje		32,00	0,00	24,00	14,00	21,00
2	flišna preperina		21,00	3,00	19,50	9,50	14,00
3	lapor		36,00	50,00	23,00	13,00	24,00
4	preperel laporovec		30,00	20,00	22,00	12,00	20,00

### Soil parameters to compute pressure at rest

No.	Name	Pattern	Type calculation	$\Phi_{ef}$ [°]	$\nu$ [-]	OCR [-]	$K_r$ [-]
1	nasutje		cohesionless	32,00	-	-	-

No.	Name	Pattern	Type calculation	$\varphi_{ef}$ [°]	$\nu$ [-]	OCR [-]	$K_r$ [-]
2	flišna preperina		cohesive	-	0,30	-	-
3	lapor		cohesionless	36,00	-	-	-
4	preperel laporovec		cohesive	-	0,30	-	-

### Soil parameters

#### nasutje

Unit weight :  $\gamma = 24,00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 32,00^\circ$   
 Cohesion of soil :  $c_{ef} = 0,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 21,00^\circ$   
 Soil : cohesionless  
 Saturated unit weight :  $\gamma_{sat} = 24,00 \text{ kN/m}^3$

#### flišna preperina

Unit weight :  $\gamma = 19,50 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 21,00^\circ$   
 Cohesion of soil :  $c_{ef} = 3,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 14,00^\circ$   
 Soil : cohesive  
 Poisson's ratio :  $\nu = 0,30$   
 Saturated unit weight :  $\gamma_{sat} = 19,50 \text{ kN/m}^3$


#### lapor

Unit weight :  $\gamma = 23,00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 36,00^\circ$   
 Cohesion of soil :  $c_{ef} = 50,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 24,00^\circ$   
 Soil : cohesionless  
 Saturated unit weight :  $\gamma_{sat} = 23,00 \text{ kN/m}^3$

#### preperel laporovec

Unit weight :  $\gamma = 22,00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 30,00^\circ$   
 Cohesion of soil :  $c_{ef} = 20,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 20,00^\circ$   
 Soil : cohesive  
 Poisson's ratio :  $\nu = 0,30$   
 Saturated unit weight :  $\gamma_{sat} = 22,00 \text{ kN/m}^3$

### Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Assigned soil	Pattern
1	-	0,00 .. $\infty$	nasutje	



## Foundation

Type of foundation : soil from geological profile

## Terrain profile

Terrain behind the structure is flat.

## Water influence

Ground water table is located below the structure.

## Input surface surcharges

No.	Surcharge new	change	Action	Mag.1 [kN/m <sup>2</sup> ]	Mag.2 [kN/m <sup>2</sup> ]	Ord.x x [m]	Length l [m]	Depth z [m]
1	Yes		variable	7,50				on terrain

No.	Name
1	koristna

## Resistance on front face of the structure

Resistance on front face of the structure: 2/3 pass., 1/3 at rest

Soil on front face of the structure - preperel laporovec

Angle of friction struc.-soil  $\delta = 20,00^\circ$

Soil thickness in front of structure  $h = 0,50$  m

Terrain in front of structure is flat.

## Settings of the stage of construction

Design situation : permanent

The wall is prevented from motion. Earth pressure at rest is therefore assumed.

Reduction of soil/soil friction angle : do not reduce

## Verification No. 1

## Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Coeff. overtur.	Coeff. sliding	Coeff. stress
Weight - wall	0,00	-0,76	23,38	0,67	1,000	1,000	1,350
Weight - soil	0,00	-0,40	2,20	0,25	1,000	1,000	1,350
FF resistance	-39,09	-0,23	-14,01	-0,33	1,000	1,000	1,350
Weight - earth wedge	0,00	-1,30	33,60	1,10	1,000	1,000	1,350
Pressure at rest	29,84	-0,77	0,00	1,45	1,350	1,350	1,350
koristna	8,11	-1,15	0,00	1,45	1,500	1,500	1,500
koristna	0,00	-2,30	5,25	1,10	0,000	0,000	1,500

## Verification of complete wall

### Check for overturning stability

Resisting moment  $M_{res} = 41,30$  kNm/m

Overturning moment  $M_{ovr} = 35,92$  kNm/m

**Wall for overturning is SATISFACTORY**

### Check for slip

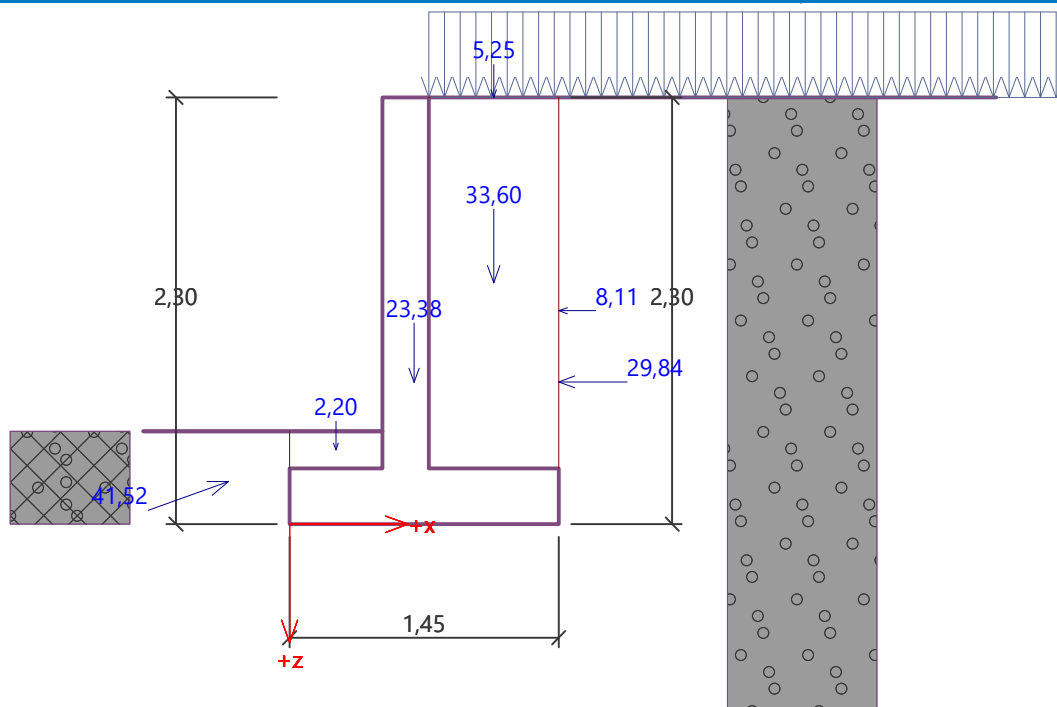
Resisting horizontal force  $H_{res} = 25,65$  kN/m

Active horizontal force  $H_{act} = 13,36$  kN/m

**Wall for slip is SATISFACTORY**

**Overall check - WALL is SATISFACTORY**

Maximum stress in footing bottom : 47,48 kPa



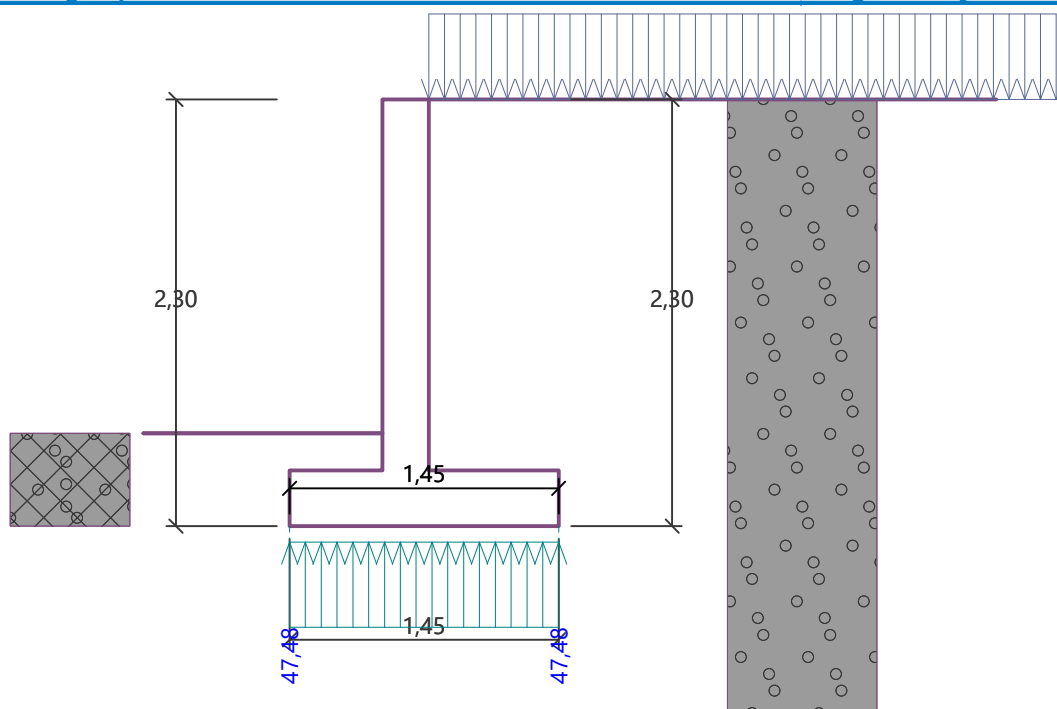
**Design load acting at the center of footing bottom**

No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]	Eccentricity [–]	Stress [kPa]
1	-4,02	68,84	-0,32	0,000	47,48
2	10,85	45,16	13,36	0,166	46,58

No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]
1	-3,79	50,41	-1,14
2	-1,82	45,16	-1,14

Name : Bearing cap.

Stage - analysis : 1 - -1



## Spread footing verification

### Input data

#### Settings

Slovenia - EN 1997

#### Materials and standards

Concrete structures : EN 1992-1-1 (EC2)  
Coefficients EN 1992-1-1 : standard

#### Settlement

Analysis method : Analysis using oedometric modulus  
Restriction of influence zone : by percentage of Sigma, Or  
Coeff. of restriction of influence zone : 10,0 [%]

#### Spread Footing

Verification methodology : according to EN 1997  
Analysis for drained conditions : EC 7-1 (EN 1997-1:2003)  
Analysis of uplift : Standard  
Allowable eccentricity : 0,333  
Design approach : 2 - reduction of actions and resistances





Partial factors on actions (A)			
Permanent design situation			
		Unfavourable	Favourable
Permanent actions :	$\gamma_G =$	1,35 [-]	1,00 [-]
Partial factors for resistances (R)			
Permanent design situation			
Partial factor on vertical bearing capacity :	$\gamma_{Rvs} =$	1,40 [-]	

### Partial factors for resistances (R)

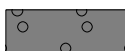



#### Permanent design situation

Partial factor on sliding resistance :  $\gamma_{Rhs} = 1,10 [-]$

### Basic soil parameters

No.	Name	Pattern	$\varphi_{ef}$ [°]	$c_{ef}$ [kPa]	$\gamma$ [kN/m <sup>3</sup> ]	$\gamma_{su}$ [kN/m <sup>3</sup> ]	$\delta$ [°]
1	nasutje		32,00	0,00	24,00	14,00	21,00
2	flišna preperina		21,00	3,00	19,50	9,50	14,00
3	lapor		36,00	50,00	23,00	13,00	24,00
4	preperel laporovec		30,00	20,00	22,00	12,00	20,00

### Soil parameters to compute pressure at rest

No.	Name	Pattern	Type calculation	$\varphi_{ef}$ [°]	$\nu$ [-]	OCR [-]	$K_r$ [-]
1	nasutje		cohesionless	32,00	-	-	-
2	flišna preperina		cohesive	-	0,30	-	-
3	lapor		cohesionless	36,00	-	-	-
4	preperel laporovec		cohesive	-	0,30	-	-

### Soil parameters

#### nasutje

Unit weight :  $\gamma = 24,00 \text{ kN/m}^3$   
 Angle of internal friction :  $\varphi_{ef} = 32,00^\circ$   
 Cohesion of soil :  $c_{ef} = 0,00 \text{ kPa}$   
 Saturated unit weight :  $\gamma_{sat} = 24,00 \text{ kN/m}^3$

#### flišna preperina

Unit weight :  $\gamma = 19,50 \text{ kN/m}^3$   
 Angle of internal friction :  $\varphi_{ef} = 21,00^\circ$   
 Cohesion of soil :  $c_{ef} = 3,00 \text{ kPa}$   
 Saturated unit weight :  $\gamma_{sat} = 19,50 \text{ kN/m}^3$

#### lapor

Unit weight :  $\gamma = 23,00 \text{ kN/m}^3$   
 Angle of internal friction :  $\varphi_{ef} = 36,00^\circ$   
 Cohesion of soil :  $c_{ef} = 50,00 \text{ kPa}$   
 Saturated unit weight :  $\gamma_{sat} = 23,00 \text{ kN/m}^3$

#### preperel laporovec

Unit weight :  $\gamma = 22,00 \text{ kN/m}^3$   
 Angle of internal friction :  $\varphi_{ef} = 30,00^\circ$   
 Cohesion of soil :  $c_{ef} = 20,00 \text{ kPa}$

Saturated unit weight :  $\gamma_{\text{sat}} = 22,00 \text{ kN/m}^3$

### Foundation

#### Foundation type: strip footing

Depth from original ground surface  $h_z = 2,30 \text{ m}$

Depth of footing bottom  $d = 0,50 \text{ m}$

Foundation thickness  $t = 0,30 \text{ m}$

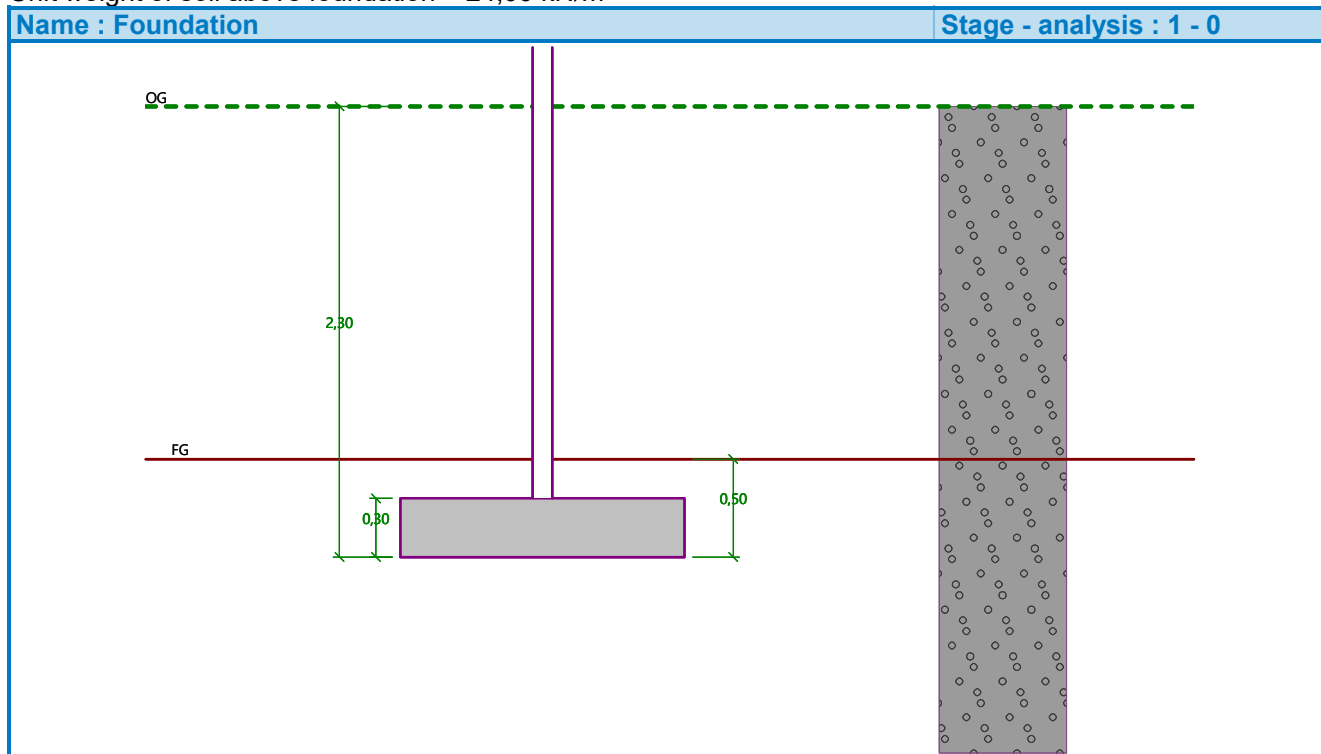
Incl. of finished grade  $s_1 = 0,00^\circ$

Incl. of footing bottom  $s_2 = 0,00^\circ$

#### Overburden

Type: input unit weight

Unit weight of soil above foundation =  $24,00 \text{ kN/m}^3$



### Geometry of structure

#### Foundation type: strip footing

Overall strip footing length =  $10,00 \text{ m}$

Strip footing width (x) =  $1,45 \text{ m}$

Column width in the direction of x =  $0,10 \text{ m}$

Inserted loading is considered per unit length of continuous footing span.

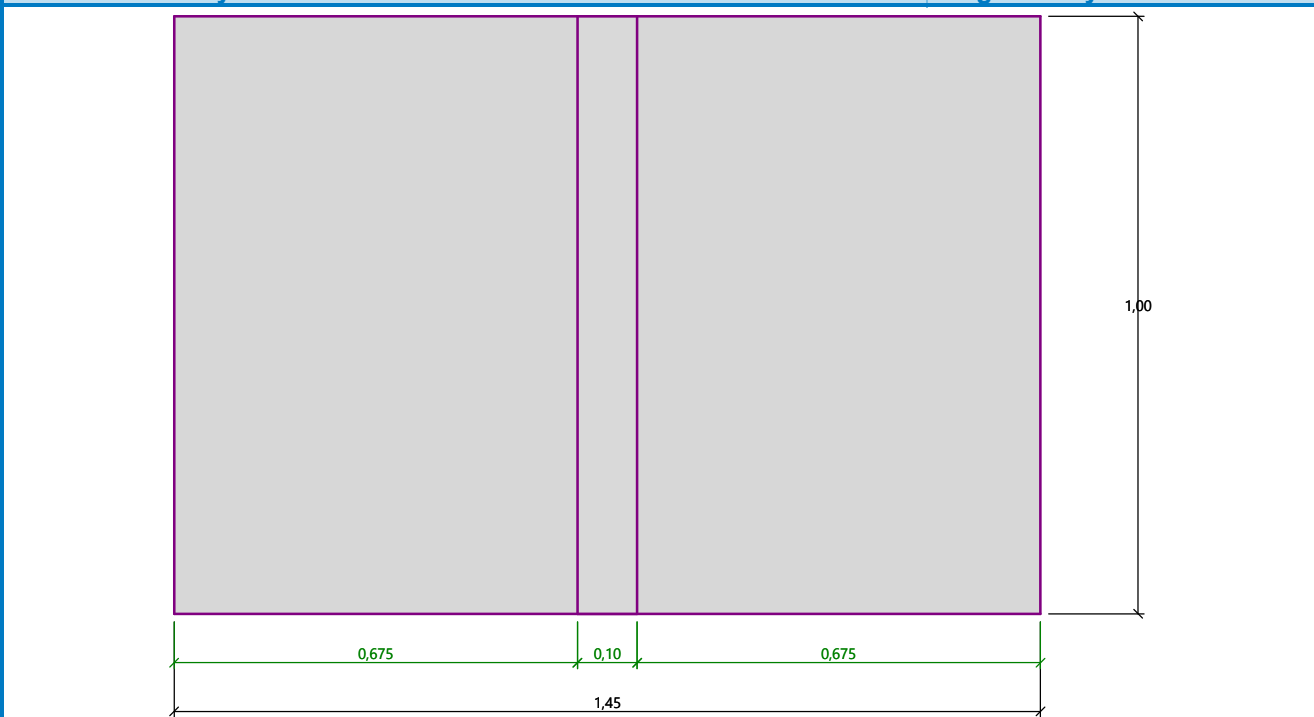
Volume of strip footing =  $0,44 \text{ m}^3/\text{m}$

Volume of excavation =  $0,73 \text{ m}^3/\text{m}$

Volume of fill =  $0,27 \text{ m}^3/\text{m}$

Name : Geometry

Stage - analysis : 1 - 0



Material of structure

Unit weight  $\gamma = 25,00 \text{ kN/m}^3$

Analysis of concrete structures carried out according to the standard EN 1992-1-1 (EC2).

Concrete: C 30/37

Cylinder compressive strength

$f_{ck} = 30,00 \text{ MPa}$

Tensile strength

$f_{ctm} = 2,90 \text{ MPa}$

Elasticity modulus

$E_{cm} = 33000,00 \text{ MPa}$

Longitudinal steel: B500B

Yield strength

$f_{yk} = 500,00 \text{ MPa}$

Transverse steel: B500B

Yield strength

$f_{yk} = 500,00 \text{ MPa}$

Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Assigned soil	Pattern
1		- 0,00 .. $\infty$	nasutje	

Load

No.	Load		Name	Type	N [kN/m]	$M_y$ [kNm/m]	$H_x$ [kN/m]
	new	change					
1	Yes		LC 1	Design	52,03	0,00	0,00
2	Yes		LC 2	Design	28,35	6,84	-13,36
3	Yes		LC 3	Service	33,60	0,00	0,00
4	Yes		LC 4	Service	28,35	0,00	0,00

Global settings

Type of analysis : analysis for drained conditions

The settlement is not analyzed.

## Settings of the stage of construction

Design situation : permanent

## Verification No. 1

### Load case verification

Name	Self w. in favor	$e_x$ [m]	$e_y$ [m]	$\sigma$ [kPa]	$R_d$ [kPa]	Utilization [%]	Is satisfactory
LC 1	Yes	0,00	0,00	47,85	543,40	8,81	Yes
LC 1	No	0,00	0,00	47,85	543,40	8,81	Yes
LC 2	Yes	-0,24	0,00	46,86	190,09	24,65	Yes
LC 2	No	-0,24	0,00	46,86	190,09	24,65	Yes

Analysis carried out with automatic selection of the most unfavourable load cases.

Computed self weight of strip foundation  $G = 10,88 \text{ kN/m}$

Computed weight of overburden  $Z = 6,48 \text{ kN/m}$

### Vertical bearing capacity check

Shape of contact stress : rectangle

Most unfavorable load case No. 2. (LC 2)

Parameters of slip surface below foundation:

Depth of slip surface  $z_{sp} = 2,47 \text{ m}$

Length of slip surface  $l_{sp} = 7,72 \text{ m}$

Design bearing capacity of found.soil  $R_d = 190,09 \text{ kPa}$

Extreme contact stress  $\sigma = 46,86 \text{ kPa}$

**Bearing capacity in the vertical direction is SATISFACTORY**

### Verification of load eccentricity

Max. eccentricity in direction of base length  $e_x = 0,164 < 0,333$

Max. eccentricity in direction of base width  $e_y = 0,000 < 0,333$

Max. overall eccentricity  $e_t = 0,164 < 0,333$

**Eccentricity of load is SATISFACTORY**

### Horizontal bearing capacity check

Most unfavorable load case No. 2. (LC 2)

Earth resistance: not considered

Horizontal bearing capacity  $R_{dh} = 25,96 \text{ kN}$

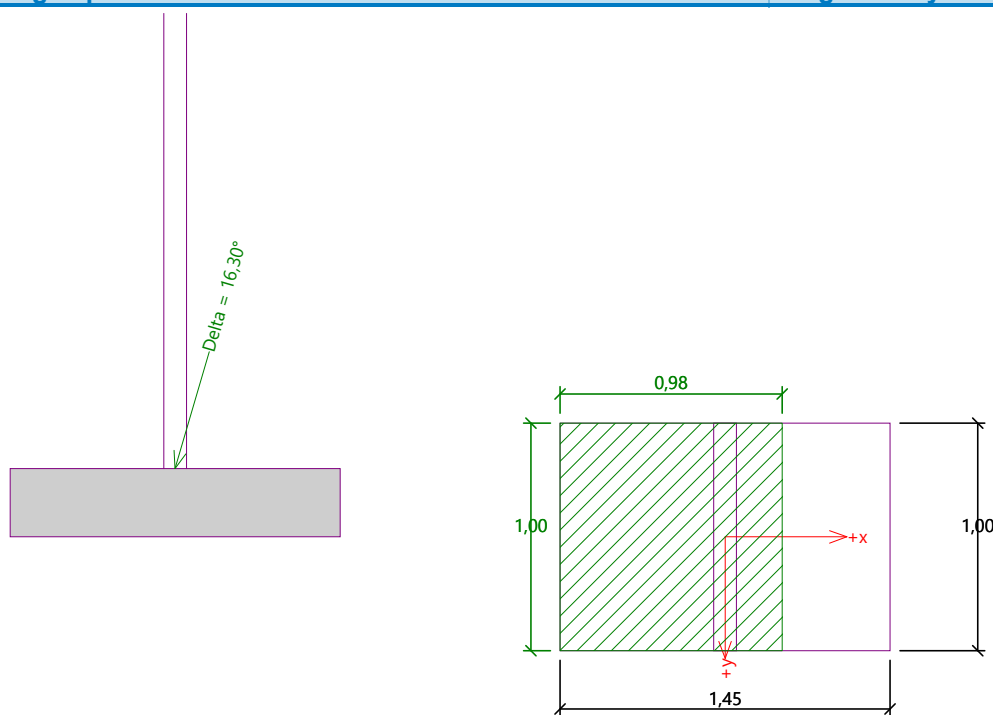
Extreme horizontal force  $H = 13,36 \text{ kN}$

**Bearing capacity in the horizontal direction is SATISFACTORY**

**Bearing capacity of foundation is SATISFACTORY**

Name : Bearing cap.

Stage - analysis : 1 - 1



## Dimensioning No. 1

Analysis carried out with automatic selection of the most unfavourable load cases.

### Verification of longitudinal reinforcement of foundation in the direction of x

5 prof. 10,0 mm, cover 60,0 mm

Cross-section width = 1,00 m

Cross-section depth = 0,30 m

Reinforcement ratio  $\rho = 0,17 \% > 0,15 \% = \rho_{min}$

Position of neutral axis  $x = 0,01 \text{ m} < 0,14 \text{ m} = x_{max}$

Ultimate moment  $M_{Rd} = 39,39 \text{ kNm} > 9,19 \text{ kNm} = M_{Ed}$

**Cross-section is SATISFACTORY.**

### Spread footing for punching shear failure check

Column normal force = 52,03 kN

#### Maximum resistance at the column perimeter

Force transferred into found. soil = 3,59 kN

Force transferred by shear strength of foundation = 48,44 kN

Considered column perimeter  $u_0 = 2,00 \text{ m}$

Shear resistance at the column perimeter  $V_{Ed,max} = 0,10 \text{ MPa}$

Resistance at the column perimeter  $V_{Rd,max} = 4,22 \text{ MPa}$

#### Critical section without shear reinforcement

Force transferred into found. soil = 28,89 kN

Force transferred by shear strength of foundation = 23,14 kN

Distance of section from the column = 0,35 m

Section perimeter  $u = 2,00 \text{ m}$

Shear stress at section  $V_{Ed} = 0,05 \text{ MPa}$

Shear resistance of section without shear reinforcement  $V_{Rd,c} = 0,68 \text{ MPa}$

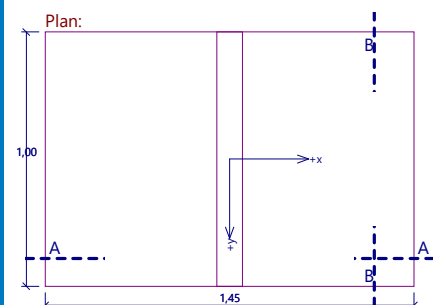
$V_{Ed} < V_{Rd,c} \Rightarrow$  Reinforcement is not required

**Spread footing for punching shear is SATISFACTORY**

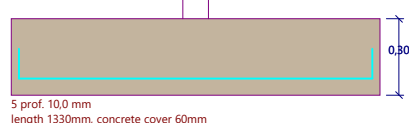


Name : Dimensioning

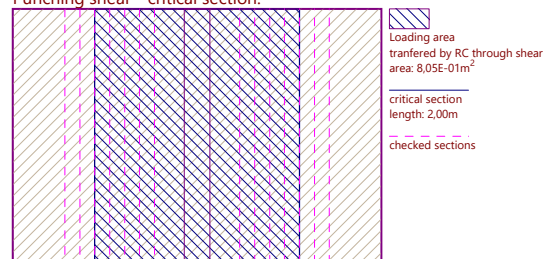
Stage - analysis : 1 - 1



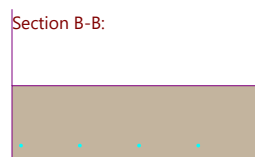
Section A-A:



Punching shear - critical section:



Section B-B:



## Dimensioning No. 1

### Wall stem check - front reinf.

#### Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Coeff. moment	Coeff. norm.force	Coeff. shear for.
Weight - wall	0,00	-1,00	12,49	0,12	1,000	1,350	1,000
FF resistance	-13,22	-0,10	-4,79	0,00	1,000	1,000	1,000
Pressure at rest	22,54	-0,67	0,00	0,25	1,350	1,000	1,350
koristna	7,05	-1,00	0,00	0,25	1,500	0,000	1,500

### Wall stem check - front reinf.

Front reinforcement is not required.

### Wall stem check - back reinf.

#### Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Coeff. moment	Coeff. norm.force	Coeff. shear for.
Weight - wall	0,00	-1,00	12,49	0,12	1,000	1,350	1,000
FF resistance	-13,22	-0,10	-4,79	0,00	1,000	1,000	1,000
Pressure at rest	22,54	-0,67	0,00	0,25	1,350	1,000	1,350
koristna	7,05	-1,00	0,00	0,25	1,500	0,000	1,500

### Wall stem check - back reinf.

Wall check at the construction joint 2,00 m from the wall crest

Reinforcement and dimensions of the cross-section

6,66 prof. 8,0 mm, cover 60,0 mm

Inputted reinforcement area = 334,8 mm<sup>2</sup>

Required reinforcement area = 280,5 mm<sup>2</sup>

Cross-section width = 1,00 m

Cross-section height = 0,25 m

Reinforcement ratio  $\rho$  = 0,18 % > 0,15 % =  $\rho_{min}$

Position of neutral axis x = 0,02 m < 0,11 m =  $x_{max}$

Ultimate shear force  $V_{Rd} = 100,85 \text{ kN} > 27,78 \text{ kN} = V_{Ed}$   
Ultimate moment  $M_{Rd} = 34,27 \text{ kNm} > 28,97 \text{ kNm} = M_{Ed}$

**Cross-section is SATISFACTORY.**

#### Wall stem check - back reinf. - $V_{Ed}$

Wall check at the construction joint 1,80 m from the wall crest

Reinforcement and dimensions of the cross-section

6,66 prof. 8,0 mm, cover 60,0 mm

Inputted reinforcement area = 334,8 mm<sup>2</sup>

Required reinforcement area = 280,5 mm<sup>2</sup>

Cross-section width = 1,00 m

Cross-section height = 0,25 m

Ultimate shear force  $V_{Rd} = 100,85 \text{ kN} > 34,09 \text{ kN} = V_{Ed}$

**Cross-section is SATISFACTORY.**

#### Wall stem check - back reinf. - Crack width

Wall check at the construction joint 2,00 m from the wall crest

Reinforcement and dimensions of the cross-section

6,66 prof. 8,0 mm, cover 60,0 mm

Cross-section width = 1,00 m

Cross-section height = 0,25 m

$M = 15,27 \text{ kNm}$ ,  $A_s = 334,8 \text{ mm}^2$

Maximum tensile stress in concrete = 1,45 MPa

Tensile strength  $f_{ctm} = 2,90 \text{ MPa}$

**No cracks will appear. The strength of concrete in tension  $f_{ctm}$  was not exceed.**

#### Wall jump check

##### Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Design coefficient
Weight - wall	0,00	-0,76	23,38	0,67	1,350
Weight - soil	0,00	-0,40	2,20	0,25	1,350
FF resistance	-39,09	-0,23	-14,01	-0,33	1,350
Weight - earth wedge	0,00	-1,30	33,60	1,10	1,350
Pressure at rest	29,84	-0,77	0,00	1,45	1,350
koristna	8,11	-1,15	0,00	1,45	1,500
koristna	0,00	-2,30	5,25	1,10	1,500

#### Wall jump check

Reinforcement and dimensions of the cross-section

5 prof. 10,0 mm, cover 60,0 mm

Inputted reinforcement area = 392,7 mm<sup>2</sup>

Required reinforcement area = 354,4 mm<sup>2</sup>

Cross-section width = 1,00 m

Cross-section height = 0,30 m

Reinforcement ratio  $\rho = 0,17 \% > 0,15 \% = \rho_{min}$

Position of neutral axis  $x = 0,01 \text{ m} < 0,14 \text{ m} = x_{max}$

Ultimate shear force  $V_{Rd} = 120,09 \text{ kN} > 19,99 \text{ kN} = V_{Ed}$

Ultimate moment  $M_{Rd} = 39,39 \text{ kNm} > 11,51 \text{ kNm} = M_{Ed}$

**Cross-section is SATISFACTORY.**

## Wall heel check

### Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Design coefficient
Weight - wall	0,00	-0,15	5,25	1,10	1,350
Weight - earth wedge	0,00	-1,30	33,60	1,10	1,350
Pressure at rest	29,84	-0,77	0,00	1,45	1,350
koristna	8,11	-1,15	0,00	1,45	1,500
Contact stress	0,00	0,00	-37,38	1,11	1,000
Gravity surch. 1	0,00	-2,30	5,25	1,10	1,500

## Wall heel check

Reinforcement and dimensions of the cross-section

5 prof. 10,0 mm, cover 60,0 mm

Inputted reinforcement area = 392,7 mm<sup>2</sup>

Required reinforcement area = 354,4 mm<sup>2</sup>

Cross-section width = 1,00 m

Cross-section height = 0,30 m

Reinforcement ratio  $\rho$  = 0,17 % > 0,15 % =  $\rho_{min}$

Position of neutral axis x = 0,01 m < 0,14 m =  $x_{max}$

Ultimate shear force  $V_{Rd}$  = 120,09 kN > 22,94 kN =  $V_{Ed}$

Ultimate moment  $M_{Rd}$  = 39,39 kNm > 17,46 kNm =  $M_{Ed}$

**Cross-section is SATISFACTORY.**

## Cantilever wall analysis

### Input data

Task : KOTLOVNICA Z ZALOGOVNIKOM  
Part : ABS OZ v osi 1  
Author : Marko Markoja u.d.i.g.  
Date : 14. 03. 2023

### Settings

(input for current task)

### Materials and standards

Concrete structures : EN 1992-1-1 (EC2)  
Coefficients EN 1992-1-1 : standard

### Wall analysis

Verification methodology : according to EN 1997  
Active earth pressure calculation : Coulomb  
Passive earth pressure calculation : Caquot-Kerisel  
Earthquake analysis : Mononobe-Okabe  
Shape of earth wedge : Calculate as skew  
Base key : The base key is considered as inclined footing bottom  
Allowable eccentricity : 0,333  
Design approach : 2 - reduction of actions and resistances

Partial factors on actions (A)			
Permanent design situation			
		Unfavourable	Favourable
Permanent actions :	$\gamma_G =$	1,35 [-]	1,00 [-]
Variable actions :	$\gamma_Q =$	1,50 [-]	0,00 [-]
Water load :	$\gamma_w =$	1,35 [-]	

Partial factors for resistances (R)			
Permanent design situation			
Partial factor on overturning :	$\gamma_{Rv} =$	1,40 [-]	
Partial factor on sliding resistance :	$\gamma_{Rh} =$	1,10 [-]	
Partial factor on bearing capacity :	$\gamma_{Re} =$	1,40 [-]	

Partial factors for variable actions			
Permanent design situation			
Factor for combination value :	$\psi_0 =$	0,70 [-]	
Factor for frequent value :	$\psi_1 =$	0,50 [-]	
Factor for quasi-permanent value :	$\psi_2 =$	0,30 [-]	

### Material of structure

Unit weight  $\gamma = 25,00 \text{ kN/m}^3$

Analysis of concrete structures carried out according to the standard EN 1992-1-1 (EC2).

#### Concrete: C 30/37

Cylinder compressive strength  $f_{ck} = 30,00 \text{ MPa}$   
Tensile strength  $f_{ctm} = 2,90 \text{ MPa}$   
Elasticity modulus  $E_{cm} = 33000,00 \text{ MPa}$

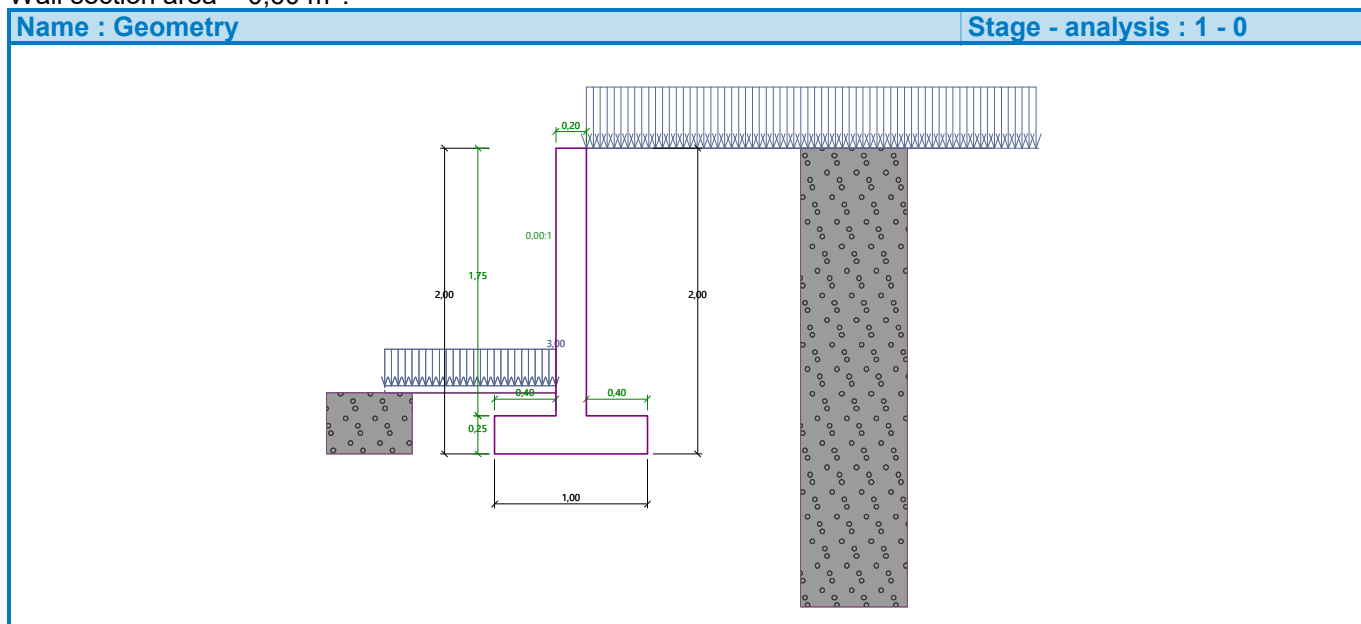
#### Longitudinal steel: B500B

Yield strength  $f_{yk} = 500,00 \text{ MPa}$

### Geometry of structure

No.	Coordinate X [m]	Depth Z [m]
1	0,00	0,00
2	0,00	1,75
3	0,40	1,75
4	0,40	2,00
5	-0,60	2,00
6	-0,60	1,75
7	-0,20	1,75
8	-0,20	0,00

The origin [0,0] is located at the most upper right point of the wall.  
Wall section area = 0,60 m<sup>2</sup>.

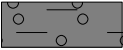




### Basic soil parameters

No.	Name	Pattern	$\Phi_{ef}$ [°]	$C_{ef}$ [kPa]	$\gamma$ [kN/m <sup>3</sup> ]	$\gamma_{su}$ [kN/m <sup>3</sup> ]	$\delta$ [°]
1	nasutje		30,00	0,00	24,00	14,00	20,00
2	flišna preperina		21,00	3,00	19,50	9,50	14,00
3	lapor		36,00	50,00	23,00	13,00	24,00
4	preperel laporovec		30,00	20,00	22,00	12,00	20,00

### Soil parameters to compute pressure at rest

No.	Name	Pattern	Type calculation	$\Phi_{ef}$ [°]	$\nu$ [-]	OCR [-]	$K_r$ [-]
1	nasutje		cohesionless	30,00	-	-	-

No.	Name	Pattern	Type calculation	$\varphi_{ef}$ [°]	$\nu$ [-]	OCR [-]	$K_r$ [-]
2	flišna preperina		cohesive	-	0,30	-	-
3	lapor		cohesionless	36,00	-	-	-
4	preperel laporovec		cohesive	-	0,30	-	-

### Soil parameters

#### nasutje

Unit weight :  $\gamma = 24,00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 30,00^\circ$   
 Cohesion of soil :  $c_{ef} = 0,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 20,00^\circ$   
 Soil : cohesionless  
 Saturated unit weight :  $\gamma_{sat} = 24,00 \text{ kN/m}^3$

#### flišna preperina

Unit weight :  $\gamma = 19,50 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 21,00^\circ$   
 Cohesion of soil :  $c_{ef} = 3,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 14,00^\circ$   
 Soil : cohesive  
 Poisson's ratio :  $\nu = 0,30$   
 Saturated unit weight :  $\gamma_{sat} = 19,50 \text{ kN/m}^3$

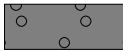
#### lapor

Unit weight :  $\gamma = 23,00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 36,00^\circ$   
 Cohesion of soil :  $c_{ef} = 50,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 24,00^\circ$   
 Soil : cohesionless  
 Saturated unit weight :  $\gamma_{sat} = 23,00 \text{ kN/m}^3$

#### preperel laporovec

Unit weight :  $\gamma = 22,00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 30,00^\circ$   
 Cohesion of soil :  $c_{ef} = 20,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 20,00^\circ$   
 Soil : cohesive  
 Poisson's ratio :  $\nu = 0,30$   
 Saturated unit weight :  $\gamma_{sat} = 22,00 \text{ kN/m}^3$

### Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Assigned soil	Pattern
1	-	0,00 .. ∞	nasutje	

## Foundation

Type of foundation : soil from geological profile

### Terrain profile

Terrain behind the structure is flat.

### Water influence

Ground water table is located below the structure.

### Input surface surcharges

No.	Surcharge		Action	Mag.1 [kN/m <sup>2</sup> ]	Mag.2 [kN/m <sup>2</sup> ]	Ord.x x [m]	Length l [m]	Depth z [m]
	new	change						
1	Yes		variable	5,00				on terrain

No.	Name
1	koristna

### Resistance on front face of the structure

Resistance on front face of the structure: 2/3 pass., 1/3 at rest

Soil on front face of the structure - nasutje

Angle of friction struc.-soil  $\delta = 20,00^\circ$

Soil thickness in front of structure  $h = 0,40$  m

Terrain surcharge  $f = 3,00$  kN/m<sup>2</sup>

Terrain in front of structure is flat.

### Settings of the stage of construction

Design situation : permanent

The wall is free to move. Active earth pressure is therefore assumed.

Reduction of soil/soil friction angle : do not reduce

### Verification No. 1

#### Forces acting on construction

Name	F <sub>hor</sub> [kN/m]	App.Pt. z [m]	F <sub>vert</sub> [kN/m]	App.Pt. x [m]	Coeff. overtur.	Coeff. sliding	Coeff. stress
Weight - wall	0,00	-0,71	15,00	0,50	1,000	1,000	1,350
Weight - soil	0,00	-0,32	1,44	0,20	1,000	1,000	1,350
FF resistance	-6,90	-0,13	-2,38	-0,34	1,000	1,000	1,350
Resistance on front face	-0,60	-0,20	0,00	0,20	1,000	1,000	1,350
Weight - earth wedge	0,00	-0,48	3,33	0,73	1,000	1,000	1,350
Active pressure	14,67	-0,66	15,98	0,81	1,350	1,350	1,350
koristna	2,98	-0,97	2,66	0,77	1,500	1,500	1,500

### Verification of complete wall

#### Check for overturning stability

Resisting moment  $M_{res} = 22,59$  kNm/m

Overturning moment  $M_{ovr} = 16,36$  kNm/m

**Wall for overturning is SATISFACTORY**

#### Check for slip

Resisting horizontal force  $H_{res} = 22,55$  kN/m

Active horizontal force  $H_{act} = 16,78$  kN/m

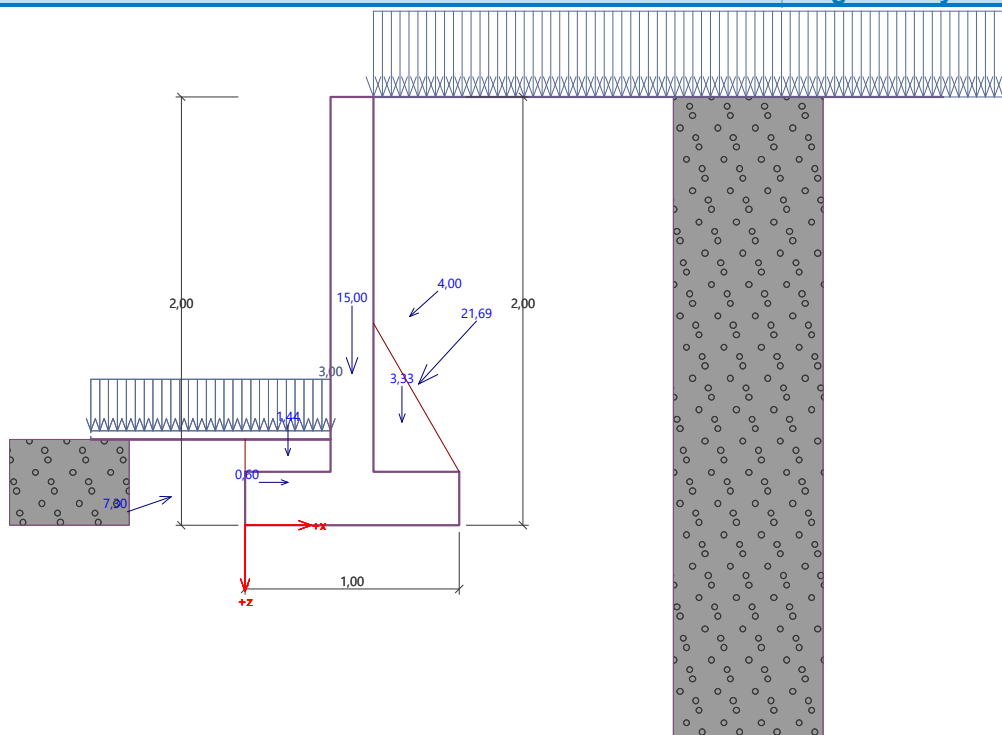
**Wall for slip is SATISFACTORY**

**Overall check - WALL is SATISFACTORY**

Maximum stress in footing bottom : 61,68 kPa

Name : Verification

Stage - analysis : 1 - 1



### Bearing capacity of foundation soil

#### Design load acting at the center of footing bottom

No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]	Eccentricity [-]	Stress [kPa]
1	5,02	49,04	14,16	0,102	61,68
2	6,21	42,96	16,78	0,145	60,43

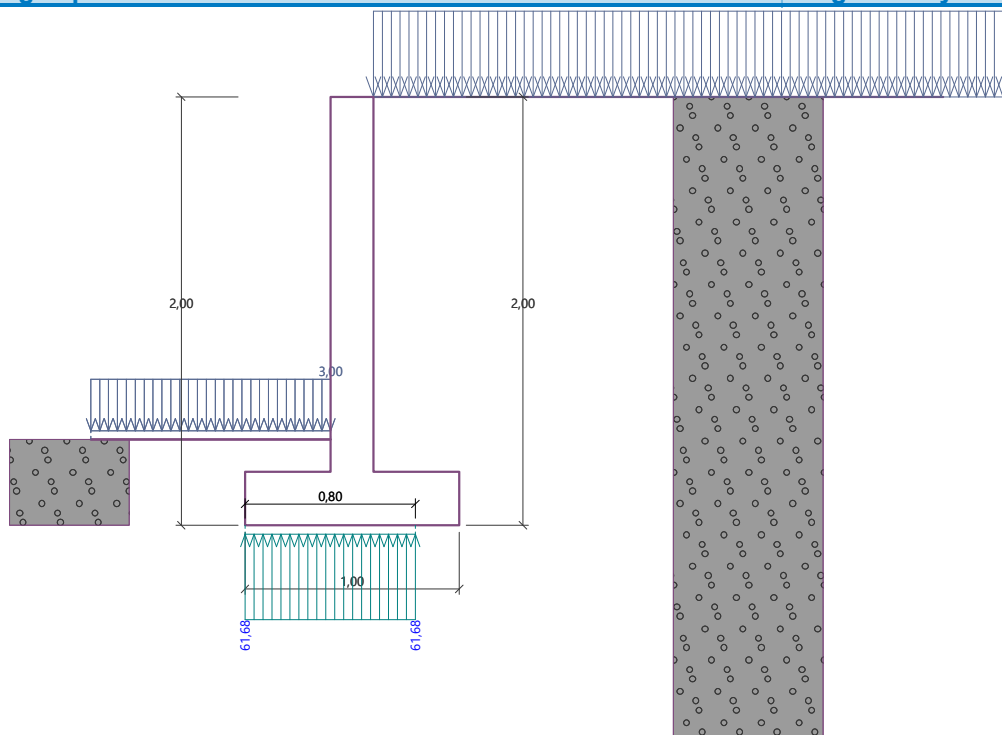
#### Service load acting at the center of footing bottom

No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]
1	3,48	36,03	10,16



Name : Bearing cap.

Stage - analysis : 1 - -1



## Spread footing verification

### Input data

#### Settings

(input for current task)

#### Materials and standards

Concrete structures : EN 1992-1-1 (EC2)  
Coefficients EN 1992-1-1 : standard

#### Settlement

Analysis method : Analysis using oedometric modulus  
Restriction of influence zone : by percentage of Sigma, Or  
Coeff. of restriction of influence zone : 10,0 [%]

#### Spread Footing

Verification methodology : according to EN 1997  
Analysis for drained conditions : EC 7-1 (EN 1997-1:2003)  
Analysis of uplift : Standard  
Allowable eccentricity : 0,333  
Design approach : 2 - reduction of actions and resistances

#### Partial factors on actions (A)

##### Permanent design situation

		Unfavourable	Favourable
Permanent actions :	$\gamma_G =$	1,35 [-]	1,00 [-]

#### Partial factors for resistances (R)

##### Permanent design situation

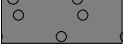
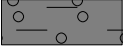
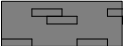

Partial factor on vertical bearing capacity :	$\gamma_{Rvs} =$	1,40 [-]
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### Partial factors for resistances (R)

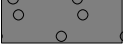
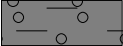


#### Permanent design situation

Partial factor on sliding resistance :  $\gamma_{Rhs} = 1,10 [-]$

### Basic soil parameters

No.	Name	Pattern	$\varphi_{ef}$ [°]	$c_{ef}$ [kPa]	$\gamma$ [kN/m <sup>3</sup> ]	$\gamma_{su}$ [kN/m <sup>3</sup> ]	$\delta$ [°]
1	nasutje		30,00	0,00	24,00	14,00	20,00
2	flišna preperina		21,00	3,00	19,50	9,50	14,00
3	lapor		36,00	50,00	23,00	13,00	24,00
4	preperel laporovec		30,00	20,00	22,00	12,00	20,00

### Soil parameters to compute pressure at rest

No.	Name	Pattern	Type calculation	$\varphi_{ef}$ [°]	$\nu$ [-]	OCR [-]	$K_r$ [-]
1	nasutje		cohesionless	30,00	-	-	-
2	flišna preperina		cohesive	-	0,30	-	-
3	lapor		cohesionless	36,00	-	-	-
4	preperel laporovec		cohesive	-	0,30	-	-

### Soil parameters

#### nasutje

Unit weight :  $\gamma = 24,00 \text{ kN/m}^3$   
 Angle of internal friction :  $\varphi_{ef} = 30,00^\circ$   
 Cohesion of soil :  $c_{ef} = 0,00 \text{ kPa}$   
 Saturated unit weight :  $\gamma_{sat} = 24,00 \text{ kN/m}^3$

#### flišna preperina

Unit weight :  $\gamma = 19,50 \text{ kN/m}^3$   
 Angle of internal friction :  $\varphi_{ef} = 21,00^\circ$   
 Cohesion of soil :  $c_{ef} = 3,00 \text{ kPa}$   
 Saturated unit weight :  $\gamma_{sat} = 19,50 \text{ kN/m}^3$

#### lapor

Unit weight :  $\gamma = 23,00 \text{ kN/m}^3$   
 Angle of internal friction :  $\varphi_{ef} = 36,00^\circ$   
 Cohesion of soil :  $c_{ef} = 50,00 \text{ kPa}$   
 Saturated unit weight :  $\gamma_{sat} = 23,00 \text{ kN/m}^3$

#### preperel laporovec

Unit weight :  $\gamma = 22,00 \text{ kN/m}^3$   
 Angle of internal friction :  $\varphi_{ef} = 30,00^\circ$   
 Cohesion of soil :  $c_{ef} = 20,00 \text{ kPa}$

Saturated unit weight :  $\gamma_{\text{sat}} = 22,00 \text{ kN/m}^3$

### Foundation

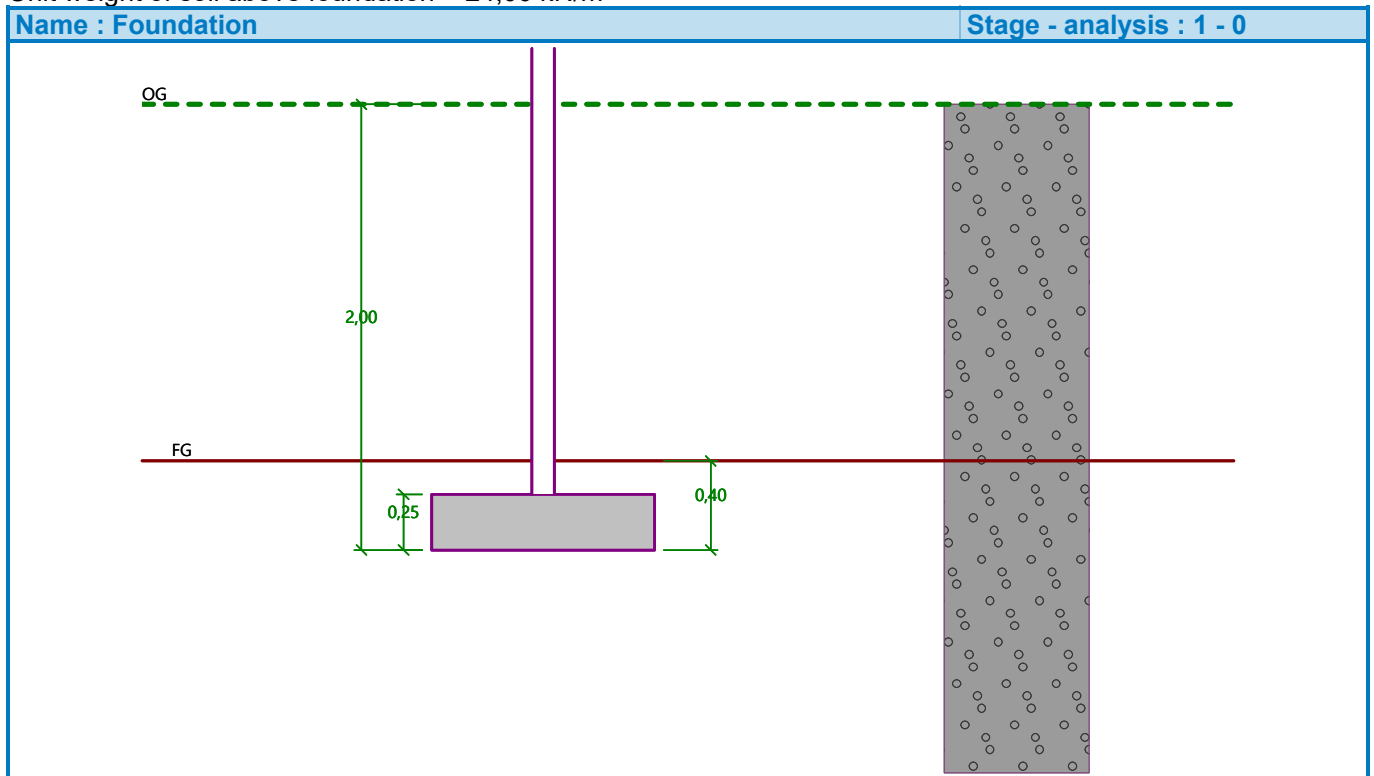
#### Foundation type: strip footing

Depth from original ground surface  $h_z = 2,00 \text{ m}$   
Depth of footing bottom  $d = 0,40 \text{ m}$   
Foundation thickness  $t = 0,25 \text{ m}$   
Incl. of finished grade  $s_1 = 0,00^\circ$   
Incl. of footing bottom  $s_2 = 0,00^\circ$

#### Overburden

Type: input unit weight

Unit weight of soil above foundation =  $24,00 \text{ kN/m}^3$



### Geometry of structure

#### Foundation type: strip footing

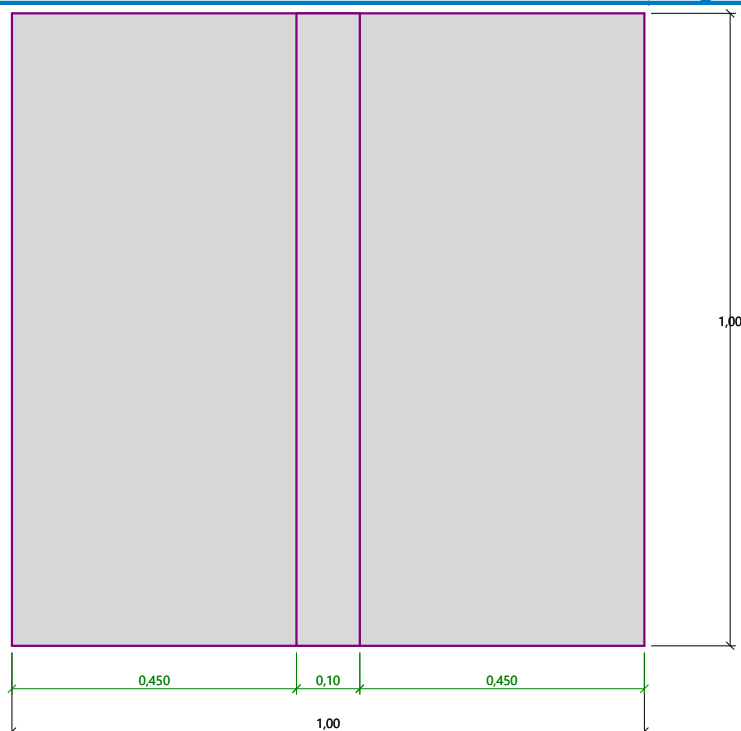
Overall strip footing length =  $10,00 \text{ m}$   
Strip footing width (x) =  $1,00 \text{ m}$   
Column width in the direction of x =  $0,10 \text{ m}$

Inserted loading is considered per unit length of continuous footing span.

Volume of strip footing =  $0,25 \text{ m}^3/\text{m}$   
Volume of excavation =  $0,40 \text{ m}^3/\text{m}$   
Volume of fill =  $0,14 \text{ m}^3/\text{m}$

## Name : Geometry

## Stage - analysis : 1 - 0



## Material of structure

Unit weight  $\gamma = 25,00 \text{ kN/m}^3$

Analysis of concrete structures carried out according to the standard EN 1992-1-1 (EC2).

### Concrete: C 30/37

Cylinder compressive strength

$$f_{ck} = 30,00 \text{ MPa}$$

Tensile strength

$$f_{ctm} = 2,90 \text{ MPa}$$

Elasticity modulus

$$E_{cm} = 33000,00 \text{ MPa}$$

### Longitudinal steel: B500B

Yield strength

$$f_{yk} = 500,00 \text{ MPa}$$

### Transverse steel: B500B

Yield strength

$$f_{yk} = 500,00 \text{ MPa}$$

## Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Assigned soil	Pattern
1		- 0,00 .. ∞	nasutje	

## Load

No.	new	Load change	Name	Type	N [kN/m]	M <sub>y</sub> [kNm/m]	H <sub>x</sub> [kN/m]
1	Yes		LC 1	Design	39,55	1,48	-14,16
2	Yes		LC 2	Design	33,47	2,02	-16,78
3	Yes		LC 3	Service	26,54	0,94	-10,16

## Global settings

Type of analysis : analysis for drained conditions

The settlement is not analyzed.

## Settings of the stage of construction

Design situation : permanent

## Verification No. 1

### Load case verification

Name	Self w. in favor	$e_x$ [m]	$e_y$ [m]	$\sigma$ [kPa]	$R_d$ [kPa]	Utilization [%]	Is satisfactory
LC 1	Yes	-0,10	0,00	61,68	117,39	52,54	Yes
LC 1	No	-0,10	0,00	61,68	117,39	52,54	Yes
LC 2	Yes	-0,14	0,00	60,43	78,15	77,33	Yes
LC 2	No	-0,14	0,00	60,43	78,15	77,33	Yes

Analysis carried out with automatic selection of the most unfavourable load cases.

Computed self weight of strip foundation  $G = 6,25$  kN/m

Computed weight of overburden  $Z = 3,24$  kN/m

### Vertical bearing capacity check

Shape of contact stress : rectangle

Most unfavorable load case No. 2. (LC 2)

Parameters of slip surface below foundation:

Depth of slip surface  $z_{sp} = 1,58$  m

Length of slip surface  $l_{sp} = 4,78$  m

Design bearing capacity of found.soil  $R_d = 78,15$  kPa

Extreme contact stress  $\sigma = 60,43$  kPa

**Bearing capacity in the vertical direction is SATISFACTORY**

### Verification of load eccentricity

Max. eccentricity in direction of base length  $e_x = 0,145 < 0,333$

Max. eccentricity in direction of base width  $e_y = 0,000 < 0,333$

Max. overall eccentricity  $e_t = 0,145 < 0,333$

**Eccentricity of load is SATISFACTORY**

### Horizontal bearing capacity check

Most unfavorable load case No. 2. (LC 2)

Earth resistance: 2/3 pass., 1/3 at rest

Design magnitude of earth resistance  $S_{pd} = 3,71$  kN

Horizontal bearing capacity  $R_{dh} = 25,92$  kN

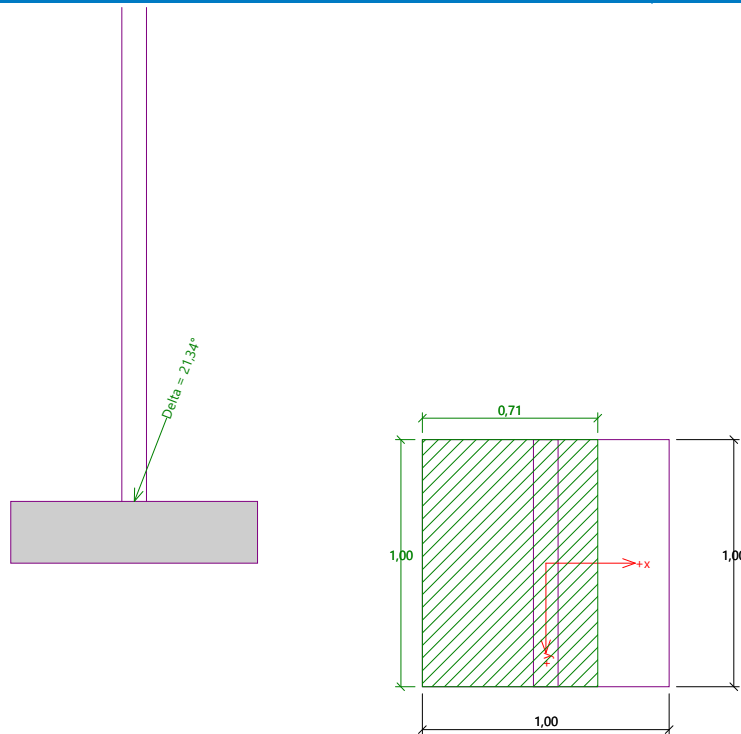
Extreme horizontal force  $H = 16,78$  kN

**Bearing capacity in the horizontal direction is SATISFACTORY**

**Bearing capacity of foundation is SATISFACTORY**

Name : Bearing cap.

Stage - analysis : 1 - 1



## Dimensioning No. 1

Analysis carried out with automatic selection of the most unfavourable load cases.

### Verification of longitudinal reinforcement of foundation in the direction of x

4 prof. 16,0 mm, cover 40,0 mm

Cross-section width = 1,00 m

Cross-section depth = 0,25 m

Reinforcement ratio  $\rho = 0,40 \% > 0,15 \% = \rho_{min}$

Position of neutral axis  $x = 0,02 \text{ m} < 0,12 \text{ m} = x_{max}$

Ultimate moment  $M_{Rd} = 67,58 \text{ kNm} > 6,20 \text{ kNm} = M_{Ed}$

**Cross-section is SATISFACTORY.**

### Spread footing for punching shear failure check

Column normal force = 39,55 kN

#### Maximum resistance at the column perimeter

Force transferred into found. soil = 3,96 kN

Force transferred by shear strength of foundation = 35,60 kN

Considered column perimeter  $u_0 = 2,00 \text{ m}$

Shear resistance at the column perimeter  $v_{Ed,max} = 0,12 \text{ MPa}$

Resistance at the column perimeter  $v_{Rd,max} = 4,22 \text{ MPa}$

#### Critical section without shear reinforcement

Force transferred into found. soil = 23,93 kN

Force transferred by shear strength of foundation = 15,62 kN

Distance of section from the column = 0,25 m

Section perimeter  $u = 2,00 \text{ m}$

Shear stress at section  $v_{Ed} = 0,04 \text{ MPa}$

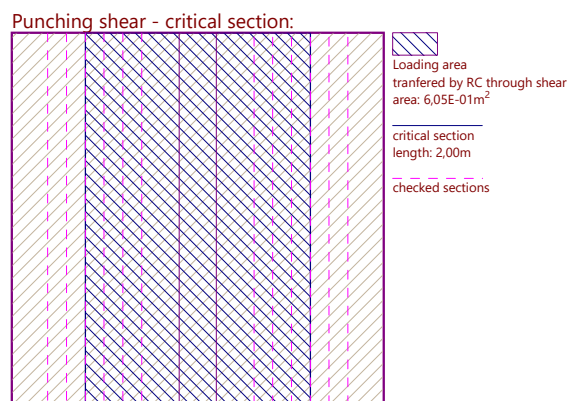
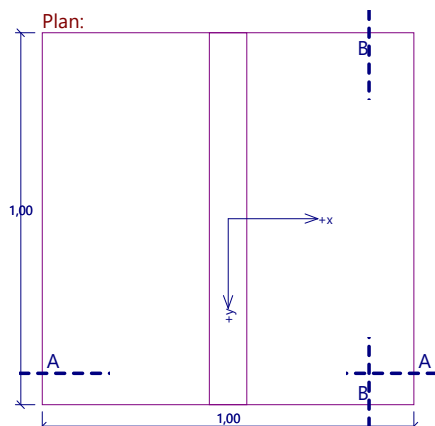
Shear resistance of section without shear reinforcement  $v_{Rd,c} = 0,86 \text{ MPa}$

$v_{Ed} < v_{Rd,c} \Rightarrow$  Reinforcement is not required

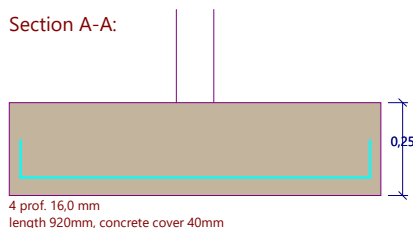
**Spread footing for punching shear is SATISFACTORY**

Name : Dimensioning

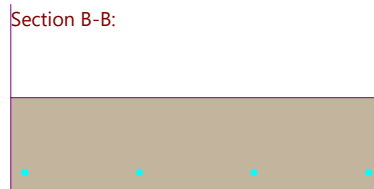
Stage - analysis : 1 - 1



Section A-A:



Section B-B:



## Dimensioning No. 1

### Wall stem check - front reinf.

#### Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Coeff. moment	Coeff. norm.force	Coeff. shear for.
Weight - wall	0,00	-0,87	8,74	0,10	1,000	1,350	1,000
FF resistance	-0,96	-0,05	-0,33	0,00	1,000	1,000	1,000
Resistance on front face	-0,22	-0,07	0,00	0,00	1,000	1,000	1,000
Pressure at rest	18,35	-0,58	0,00	0,20	1,350	1,000	1,350
koristna	4,37	-0,87	0,00	0,20	1,500	0,000	1,500

### Wall stem check - front reinf.

Front reinforcement is not required.

### Wall stem check - back reinf.

#### Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Coeff. moment	Coeff. norm.force	Coeff. shear for.
Weight - wall	0,00	-0,87	8,74	0,10	1,000	1,350	1,000
FF resistance	-0,96	-0,05	-0,33	0,00	1,000	1,000	1,000
Resistance on front face	-0,22	-0,07	0,00	0,00	1,000	1,000	1,000
Pressure at rest	18,35	-0,58	0,00	0,20	1,350	1,000	1,350
koristna	4,37	-0,87	0,00	0,20	1,500	0,000	1,500

### Wall stem check - back reinf.

Wall check at the construction joint 1,75 m from the wall crest  
Reinforcement and dimensions of the cross-section

5 prof. 8,0 mm, cover 60,0 mm  
 Inputted reinforcement area = 251,3 mm<sup>2</sup>  
 Required reinforcement area = 240,6 mm<sup>2</sup>  
 Cross-section width = 1,00 m  
 Cross-section height = 0,20 m  
 Reinforcement ratio  $\rho$  = 0,18 % > 0,15 % =  $\rho_{min}$   
 Position of neutral axis  $x$  = 0,01 m < 0,08 m =  $x_{max}$   
 Ultimate shear force  $V_{Rd}$  = 73,74 kN > 30,15 kN =  $V_{Ed}$   
 Ultimate moment  $M_{Rd}$  = 20,66 kNm > 20,08 kNm =  $M_{Ed}$

**Cross-section is SATISFACTORY.**

#### Wall stem check - back reinf. - Crack width

Wall check at the construction joint 1,75 m from the wall crest

Reinforcement and dimensions of the cross-section

5 prof. 8,0 mm, cover 60,0 mm

Cross-section width = 1,00 m

Cross-section height = 0,20 m

$M = 11,75$  kNm,  $A_s = 251,3$  mm<sup>2</sup>

Maximum tensile stress in concrete = 1,75 MPa

Tensile strength  $f_{ctm} = 2,90$  MPa

**No cracks will appear. The strength of concrete in tension  $f_{ctm}$  was not exceed.**

#### Wall jump check

##### Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Design coefficient
Weight - wall	0,00	-0,71	15,00	0,50	1,350
Weight - soil	0,00	-0,32	1,44	0,20	1,350
FF resistance	-6,90	-0,13	-2,38	-0,34	1,350
Resistance on front face	-0,60	-0,20	0,00	0,20	1,350
Weight - earth wedge	0,00	-0,48	3,33	0,73	1,350
Active pressure	14,67	-0,66	15,98	0,81	1,350
koristna	2,98	-0,97	2,66	0,77	1,500

#### Wall jump check

Reinforcement and dimensions of the cross-section

5 prof. 10,0 mm, cover 60,0 mm

Inputted reinforcement area = 392,7 mm<sup>2</sup>

Required reinforcement area = 279,0 mm<sup>2</sup>

Cross-section width = 1,00 m

Cross-section height = 0,25 m

Reinforcement ratio  $\rho$  = 0,21 % > 0,15 % =  $\rho_{min}$

Position of neutral axis  $x$  = 0,01 m < 0,11 m =  $x_{max}$

Ultimate shear force  $V_{Rd}$  = 100,31 kN > 24,35 kN =  $V_{Ed}$

Ultimate moment  $M_{Rd}$  = 30,86 kNm > 10,92 kNm =  $M_{Ed}$

**Cross-section is SATISFACTORY.**



## Wall heel check

### Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Design coefficient
Weight - wall	0,00	-0,12	2,50	0,80	1,350
Weight - earth wedge	0,00	-0,48	3,33	0,73	1,350
Active pressure	14,67	-0,66	15,98	0,81	1,350
koristna	2,98	-0,97	2,66	0,77	1,500
Contact stress	0,00	0,00	-12,38	0,77	1,000

## Wall heel check

Reinforcement and dimensions of the cross-section

5 prof. 10,0 mm, cover 60,0 mm

Inputted reinforcement area = 392,7 mm<sup>2</sup>

Required reinforcement area = 279,0 mm<sup>2</sup>

Cross-section width = 1,00 m

Cross-section height = 0,25 m

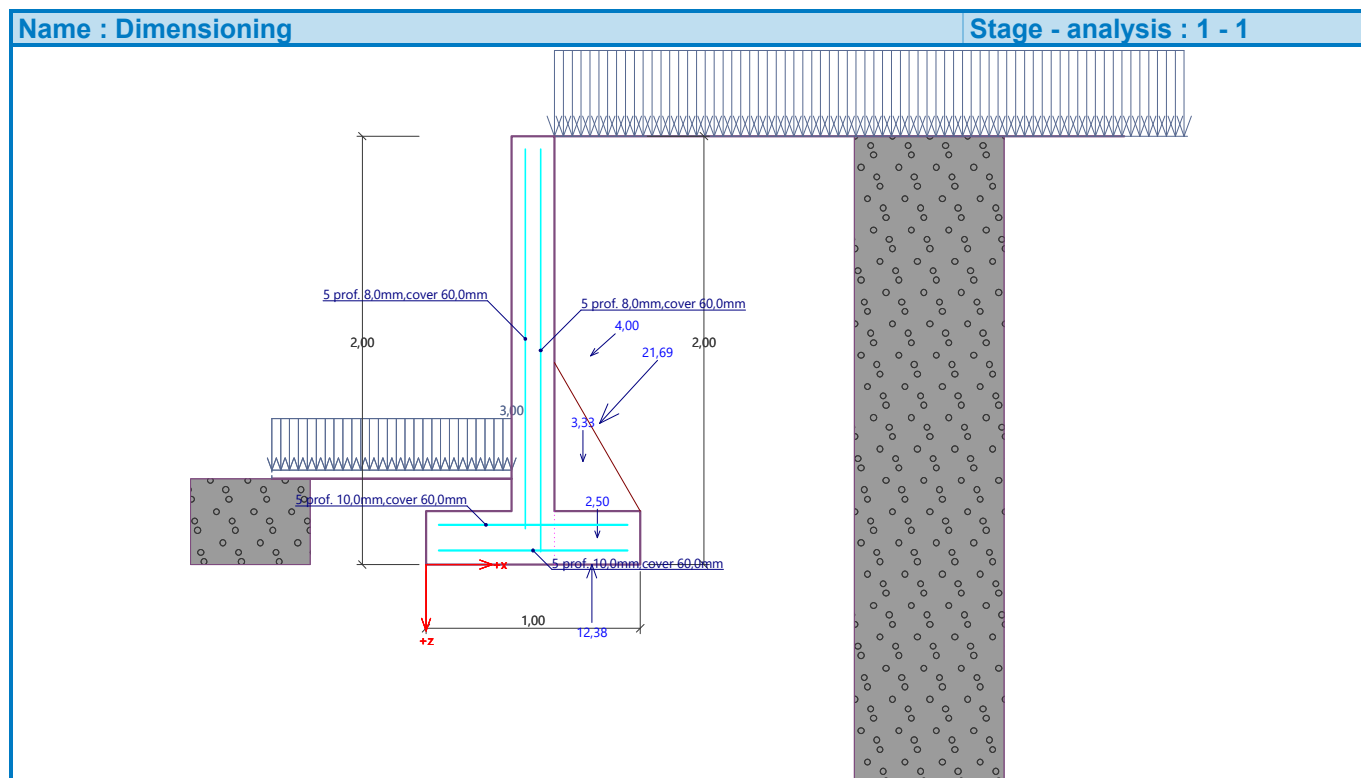
Reinforcement ratio  $\rho$  = 0,21 % > 0,15 % =  $\rho_{min}$

Position of neutral axis x = 0,01 m < 0,11 m =  $x_{max}$

Ultimate shear force  $V_{Rd}$  = 100,31 kN > 21,05 kN =  $V_{Ed}$

Ultimate moment  $M_{Rd}$  = 30,86 kNm > 9,15 kNm =  $M_{Ed}$

**Cross-section is SATISFACTORY.**



## Cantilever wall analysis

### Input data

Task : KOTLOVNICA Z ZALOGOVNIKOM  
Part : Pozicija južni zid - prerez1  
Author : Marko Markoja u.d.i.g.  
Date : 14. 03. 2023

### Settings

(input for current task)

### Materials and standards

Concrete structures : EN 1992-1-1 (EC2)  
Coefficients EN 1992-1-1 : standard

### Wall analysis

Verification methodology : according to EN 1997  
Active earth pressure calculation : Coulomb  
Passive earth pressure calculation : Caquot-Kerisel  
Earthquake analysis : Mononobe-Okabe  
Shape of earth wedge : Calculate as skew  
Base key : The base key is considered as inclined footing bottom  
Allowable eccentricity : 0,333  
Design approach : 2 - reduction of actions and resistances

Partial factors on actions (A)			
Permanent design situation			
		Unfavourable	Favourable
Permanent actions :	$\gamma_G =$	1,35 [-]	1,00 [-]
Variable actions :	$\gamma_Q =$	1,50 [-]	0,00 [-]
Water load :	$\gamma_w =$	1,35 [-]	

Partial factors for resistances (R)			
Permanent design situation			
Partial factor on overturning :	$\gamma_{Rv} =$	1,40 [-]	
Partial factor on sliding resistance :	$\gamma_{Rh} =$	1,10 [-]	
Partial factor on bearing capacity :	$\gamma_{Re} =$	1,40 [-]	

Partial factors for variable actions			
Permanent design situation			
Factor for combination value :	$\psi_0 =$	0,70 [-]	
Factor for frequent value :	$\psi_1 =$	0,50 [-]	
Factor for quasi-permanent value :	$\psi_2 =$	0,30 [-]	

### Material of structure

Unit weight  $\gamma = 25,00 \text{ kN/m}^3$   
Analysis of concrete structures carried out according to the standard EN 1992-1-1 (EC2).

#### Concrete: C 30/37

Cylinder compressive strength  $f_{ck} = 30,00 \text{ MPa}$   
Tensile strength  $f_{ctm} = 2,90 \text{ MPa}$   
Elasticity modulus  $E_{cm} = 33000,00 \text{ MPa}$

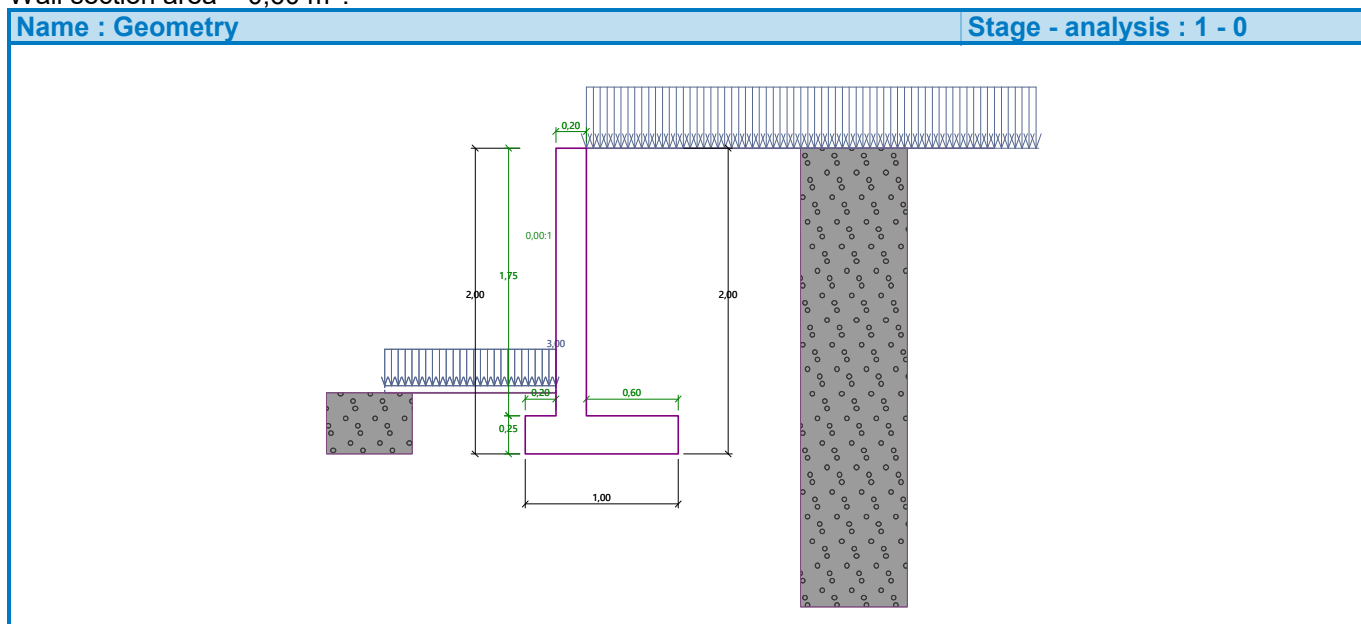
#### Longitudinal steel: B500B

Yield strength  $f_{yk} = 500,00 \text{ MPa}$

### Geometry of structure

No.	Coordinate X [m]	Depth Z [m]
1	0,00	0,00
2	0,00	1,75
3	0,60	1,75
4	0,60	2,00
5	-0,40	2,00
6	-0,40	1,75
7	-0,20	1,75
8	-0,20	0,00

The origin [0,0] is located at the most upper right point of the wall.  
Wall section area = 0,60 m<sup>2</sup>.

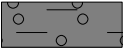




### Basic soil parameters

No.	Name	Pattern	$\Phi_{ef}$ [°]	$C_{ef}$ [kPa]	$\gamma$ [kN/m <sup>3</sup> ]	$\gamma_{su}$ [kN/m <sup>3</sup> ]	$\delta$ [°]
1	nasutje		30,00	0,00	24,00	14,00	20,00
2	flišna preperina		21,00	3,00	19,50	9,50	14,00
3	lapor		36,00	50,00	23,00	13,00	24,00
4	preperel laporovec		30,00	20,00	22,00	12,00	20,00

### Soil parameters to compute pressure at rest

No.	Name	Pattern	Type calculation	$\Phi_{ef}$ [°]	$\nu$ [-]	OCR [-]	$K_r$ [-]
1	nasutje		cohesionless	30,00	-	-	-

No.	Name	Pattern	Type calculation	$\varphi_{ef}$ [°]	$\nu$ [-]	OCR [-]	$K_r$ [-]
2	flišna preperina		cohesive	-	0,30	-	-
3	lapor		cohesionless	36,00	-	-	-
4	preperel laporovec		cohesive	-	0,30	-	-

### Soil parameters

#### nasutje

Unit weight :  $\gamma = 24,00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 30,00^\circ$   
 Cohesion of soil :  $c_{ef} = 0,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 20,00^\circ$   
 Soil : cohesionless  
 Saturated unit weight :  $\gamma_{sat} = 24,00 \text{ kN/m}^3$

#### flišna preperina

Unit weight :  $\gamma = 19,50 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 21,00^\circ$   
 Cohesion of soil :  $c_{ef} = 3,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 14,00^\circ$   
 Soil : cohesive  
 Poisson's ratio :  $\nu = 0,30$   
 Saturated unit weight :  $\gamma_{sat} = 19,50 \text{ kN/m}^3$

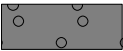
#### lapor

Unit weight :  $\gamma = 23,00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 36,00^\circ$   
 Cohesion of soil :  $c_{ef} = 50,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 24,00^\circ$   
 Soil : cohesionless  
 Saturated unit weight :  $\gamma_{sat} = 23,00 \text{ kN/m}^3$

#### preperel laporovec

Unit weight :  $\gamma = 22,00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 30,00^\circ$   
 Cohesion of soil :  $c_{ef} = 20,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 20,00^\circ$   
 Soil : cohesive  
 Poisson's ratio :  $\nu = 0,30$   
 Saturated unit weight :  $\gamma_{sat} = 22,00 \text{ kN/m}^3$

### Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Assigned soil	Pattern
1	-	0,00 .. $\infty$	nasutje	

## Foundation

Type of foundation : soil from geological profile

### Terrain profile

Terrain behind the structure is flat.

### Water influence

Ground water table is located below the structure.

### Input surface surcharges

No.	Surcharge		Action	Mag.1 [kN/m <sup>2</sup> ]	Mag.2 [kN/m <sup>2</sup> ]	Ord.x x [m]	Length l [m]	Depth z [m]
	new	change						
1	Yes		variable	5,00				on terrain

No.	Name
1	koristna

### Resistance on front face of the structure

Resistance on front face of the structure: 2/3 pass., 1/3 at rest

Soil on front face of the structure - nasutje

Angle of friction struc.-soil  $\delta = 20,00^\circ$

Soil thickness in front of structure  $h = 0,40$  m

Terrain surcharge  $f = 3,00$  kN/m<sup>2</sup>

Terrain in front of structure is flat.

### Settings of the stage of construction

Design situation : permanent

The wall is free to move. Active earth pressure is therefore assumed.

Reduction of soil/soil friction angle : do not reduce

### Verification No. 1

#### Forces acting on construction

Name	F <sub>hor</sub> [kN/m]	App.Pt. z [m]	F <sub>vert</sub> [kN/m]	App.Pt. x [m]	Coeff. overtur.	Coeff. sliding	Coeff. stress
Weight - wall	0,00	-0,71	15,00	0,38	1,000	1,000	1,350
Weight - soil	0,00	-0,32	0,72	0,10	1,000	1,000	1,350
FF resistance	-6,90	-0,13	-2,38	-0,17	1,000	1,000	1,350
Resistance on front face	-0,60	-0,20	0,00	0,10	1,000	1,000	1,350
Weight - earth wedge	0,00	-0,60	7,48	0,60	1,000	1,000	1,350
Active pressure	15,07	-0,67	19,48	0,75	1,350	1,350	1,350
koristna	3,07	-0,98	3,49	0,68	1,500	1,500	1,500

### Verification of complete wall

#### Check for overturning stability

Resisting moment  $M_{res} = 24,22$  kNm/m

Overturning moment  $M_{ovr} = 17,10$  kNm/m

**Wall for overturning is SATISFACTORY**

#### Check for slip

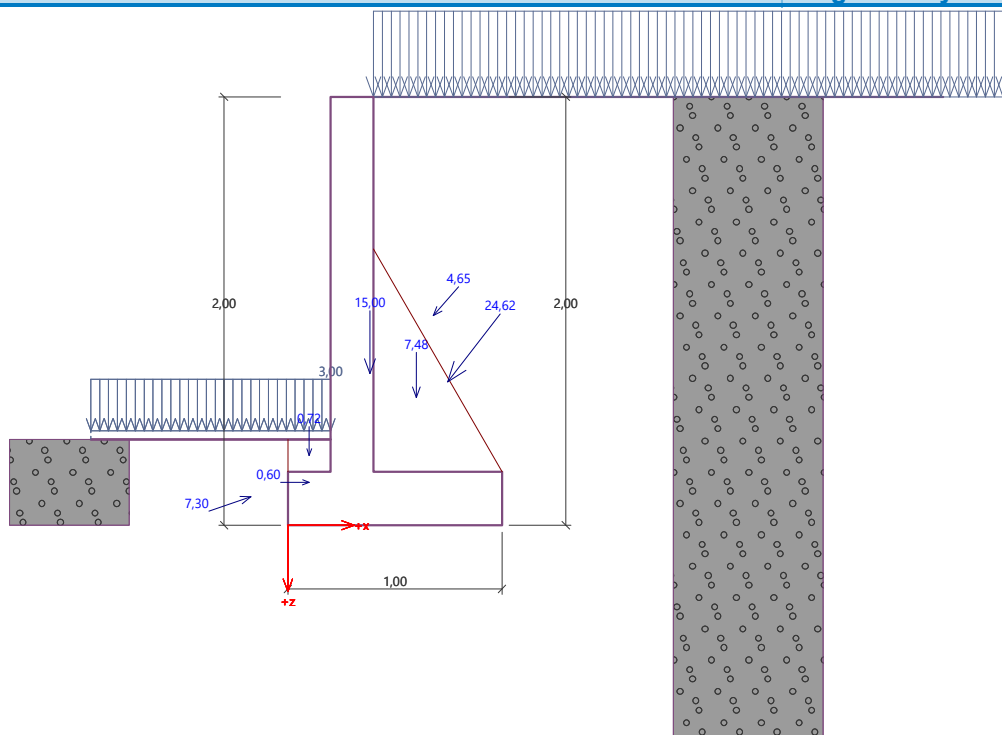
Resisting horizontal force  $H_{res} = 27,48$  kN/m

Active horizontal force  $H_{act} = 17,46$  kN/m

**Wall for slip is SATISFACTORY**

**Overall check - WALL is SATISFACTORY**

Maximum stress in footing bottom : 84,99 kPa



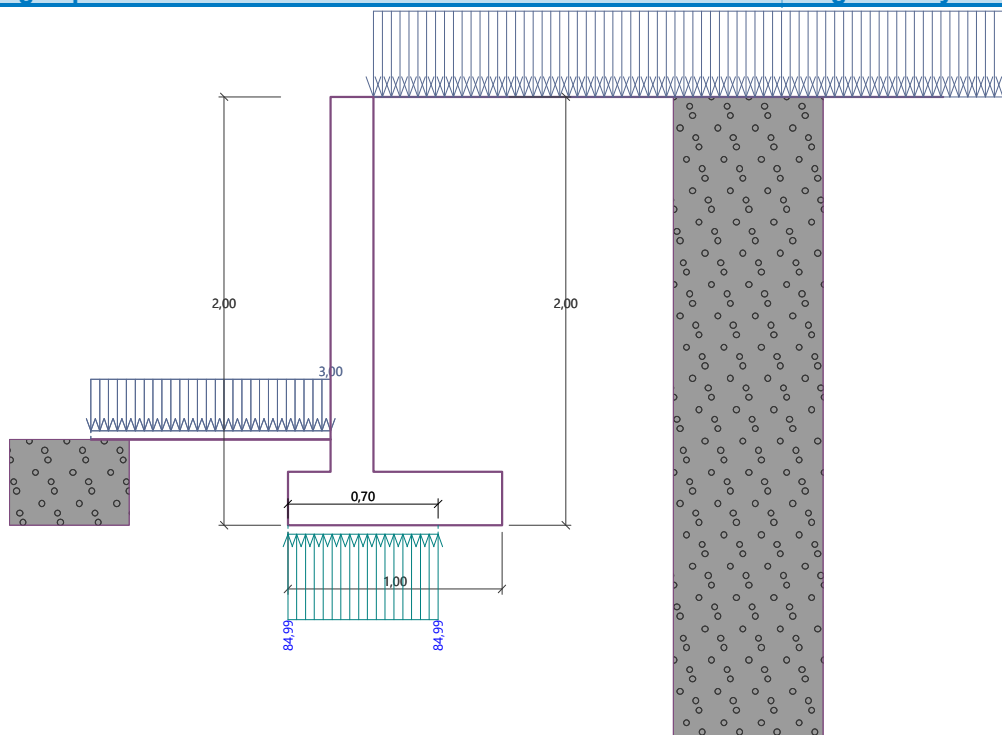
**Design load acting at the center of footing bottom**

No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]	Eccentricity [–]	Stress [kPa]
1	8,90	59,63	14,83	0,149	84,99
2	9,37	52,35	17,46	0,179	81,52

No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]
1	6,32	43,79	10,65

Name : Bearing cap.

Stage - analysis : 1 - -1



## Spread footing verification

### Input data

#### Settings

(input for current task)

#### Materials and standards

Concrete structures : EN 1992-1-1 (EC2)  
Coefficients EN 1992-1-1 : standard

#### Settlement

Analysis method : Analysis using oedometric modulus  
Restriction of influence zone : by percentage of Sigma, Or  
Coeff. of restriction of influence zone : 10,0 [%]

#### Spread Footing

Verification methodology : according to EN 1997  
Analysis for drained conditions : EC 7-1 (EN 1997-1:2003)  
Analysis of uplift : Standard  
Allowable eccentricity : 0,333  
Design approach : 2 - reduction of actions and resistances

#### Partial factors on actions (A)

##### Permanent design situation

		Unfavourable	Favourable
Permanent actions :	$\gamma_G =$	1,35 [-]	1,00 [-]

#### Partial factors for resistances (R)

##### Permanent design situation

Partial factor on vertical bearing capacity :	$\gamma_{Rvs} =$	1,40 [-]
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### Partial factors for resistances (R)

#### Permanent design situation

Partial factor on sliding resistance :  $\gamma_{Rhs} = 1,10 [-]$

### Basic soil parameters

No.	Name	Pattern	$\varphi_{ef}$ [°]	$c_{ef}$ [kPa]	$\gamma$ [kN/m <sup>3</sup> ]	$\gamma_{su}$ [kN/m <sup>3</sup> ]	$\delta$ [°]
1	nasutje		30,00	0,00	24,00	14,00	20,00
2	flišna preperina		21,00	3,00	19,50	9,50	14,00
3	lapor		36,00	50,00	23,00	13,00	24,00
4	preperel laporovec		30,00	20,00	22,00	12,00	20,00

### Soil parameters to compute pressure at rest

No.	Name	Pattern	Type calculation	$\varphi_{ef}$ [°]	$\nu$ [-]	OCR [-]	$K_r$ [-]
1	nasutje		cohesionless	30,00	-	-	-
2	flišna preperina		cohesive	-	0,30	-	-
3	lapor		cohesionless	36,00	-	-	-
4	preperel laporovec		cohesive	-	0,30	-	-

### Soil parameters

#### nasutje

Unit weight :  $\gamma = 24,00 \text{ kN/m}^3$   
 Angle of internal friction :  $\varphi_{ef} = 30,00^\circ$   
 Cohesion of soil :  $c_{ef} = 0,00 \text{ kPa}$   
 Saturated unit weight :  $\gamma_{sat} = 24,00 \text{ kN/m}^3$

#### flišna preperina

Unit weight :  $\gamma = 19,50 \text{ kN/m}^3$   
 Angle of internal friction :  $\varphi_{ef} = 21,00^\circ$   
 Cohesion of soil :  $c_{ef} = 3,00 \text{ kPa}$   
 Saturated unit weight :  $\gamma_{sat} = 19,50 \text{ kN/m}^3$

#### lapor

Unit weight :  $\gamma = 23,00 \text{ kN/m}^3$   
 Angle of internal friction :  $\varphi_{ef} = 36,00^\circ$   
 Cohesion of soil :  $c_{ef} = 50,00 \text{ kPa}$   
 Saturated unit weight :  $\gamma_{sat} = 23,00 \text{ kN/m}^3$

#### preperel laporovec

Unit weight :  $\gamma = 22,00 \text{ kN/m}^3$   
 Angle of internal friction :  $\varphi_{ef} = 30,00^\circ$   
 Cohesion of soil :  $c_{ef} = 20,00 \text{ kPa}$



Saturated unit weight :  $\gamma_{\text{sat}} = 22,00 \text{ kN/m}^3$

### Foundation

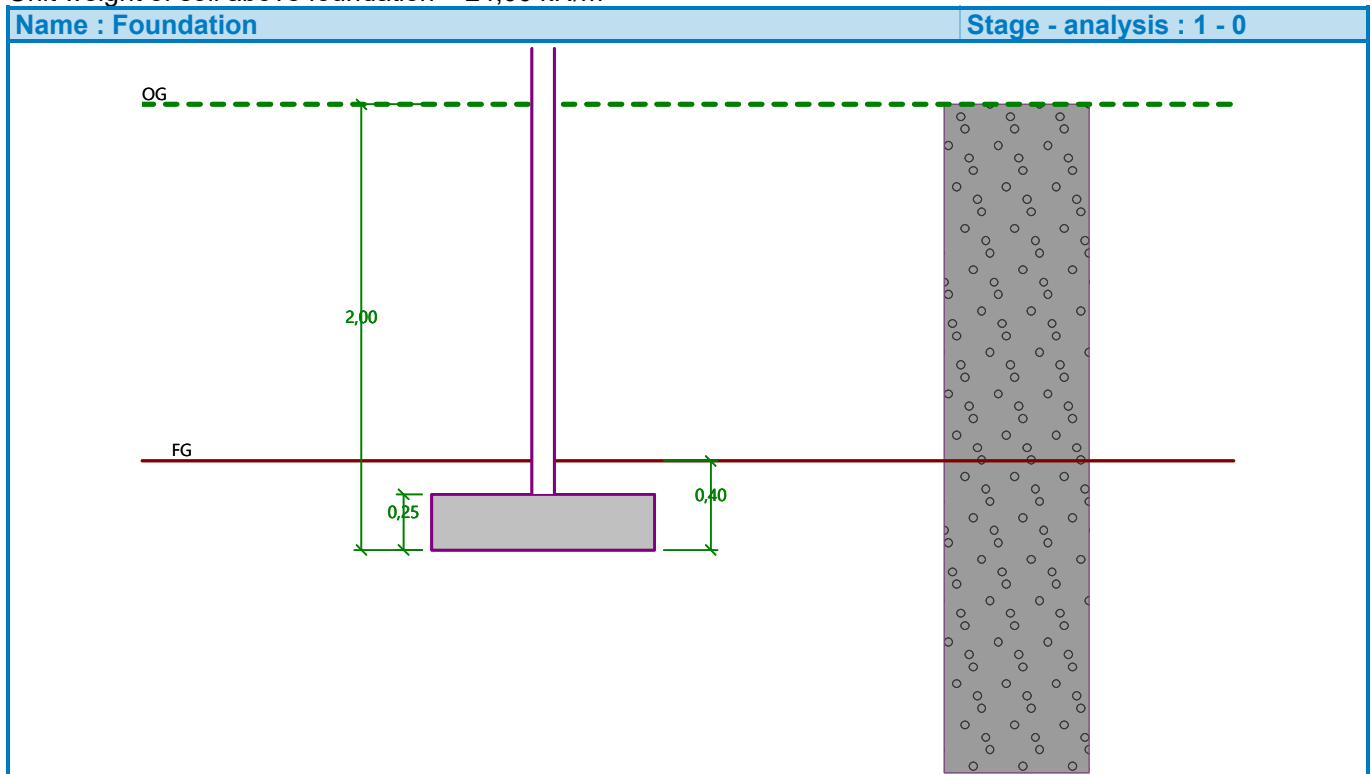
#### Foundation type: strip footing

Depth from original ground surface  $h_z = 2,00 \text{ m}$   
Depth of footing bottom  $d = 0,40 \text{ m}$   
Foundation thickness  $t = 0,25 \text{ m}$   
Incl. of finished grade  $s_1 = 0,00^\circ$   
Incl. of footing bottom  $s_2 = 0,00^\circ$

#### Overburden

Type: input unit weight

Unit weight of soil above foundation =  $24,00 \text{ kN/m}^3$



### Geometry of structure

#### Foundation type: strip footing

Overall strip footing length =  $10,00 \text{ m}$   
Strip footing width (x) =  $1,00 \text{ m}$   
Column width in the direction of x =  $0,10 \text{ m}$

Inserted loading is considered per unit length of continuous footing span.

Volume of strip footing =  $0,25 \text{ m}^3/\text{m}$   
Volume of excavation =  $0,40 \text{ m}^3/\text{m}$   
Volume of fill =  $0,14 \text{ m}^3/\text{m}$

### Material of structure

Unit weight  $\gamma = 25,00 \text{ kN/m}^3$

Analysis of concrete structures carried out according to the standard EN 1992-1-1 (EC2).

#### Concrete: C 30/37

Cylinder compressive strength  $f_{ck} = 30,00 \text{ MPa}$   
Tensile strength  $f_{ctm} = 2,90 \text{ MPa}$   
Elasticity modulus  $E_{cm} = 33000,00 \text{ MPa}$

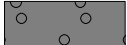
**Longitudinal steel: B500B**

Yield strength  $f_{yk} = 500,00$  MPa

**Transverse steel: B500B**

Yield strength  $f_{yk} = 500,00$  MPa

**Geological profile and assigned soils**

No.	Thickness of layer t [m]	Depth z [m]	Assigned soil	Pattern
1		- 0,00 .. ∞	nasutje	

**Load**

No.	Load		Name	Type	N [kN/m]	$M_y$ [kNm/m]	$H_x$ [kN/m]
	new	change					
1	Yes		LC 1	Design	50,14	5,19	-14,83
2	Yes		LC 2	Design	42,86	5,00	-17,46
3	Yes		LC 3	Service	34,30	3,66	-10,65

**Global settings**

Type of analysis : analysis for drained conditions

The settlement is not analyzed.

**Settings of the stage of construction**

Design situation : permanent

**Verification No. 1**

**Load case verification**

Name	Self w. in favor	$e_x$ [m]	$e_y$ [m]	$\sigma$ [kPa]	$R_d$ [kPa]	Utilization [%]	Is satisfactory
LC 1	Yes	-0,15	0,00	84,99	126,22	67,33	Yes
LC 1	No	-0,15	0,00	84,99	126,22	67,33	Yes
LC 2	Yes	-0,18	0,00	81,52	92,20	88,42	Yes
LC 2	No	-0,18	0,00	81,52	92,20	88,42	Yes

Analysis carried out with automatic selection of the most unfavourable load cases.

Computed self weight of strip foundation  $G = 6,25$  kN/m

Computed weight of overburden  $Z = 3,24$  kN/m

**Vertical bearing capacity check**

Shape of contact stress : rectangle

Most unfavorable load case No. 2. (LC 2)

Parameters of slip surface below foundation:

Depth of slip surface  $z_{sp} = 1,58$  m

Length of slip surface  $l_{sp} = 4,78$  m

Design bearing capacity of found.soil  $R_d = 92,20$  kPa

Extreme contact stress  $\sigma = 81,52$  kPa

**Bearing capacity in the vertical direction is SATISFACTORY**

**Verification of load eccentricity**

Max. eccentricity in direction of base length  $e_x = 0,179 < 0,333$

Max. eccentricity in direction of base width  $e_y = 0,000 < 0,333$

Max. overall eccentricity  $e_t = 0,179 < 0,333$

**Eccentricity of load is SATISFACTORY**

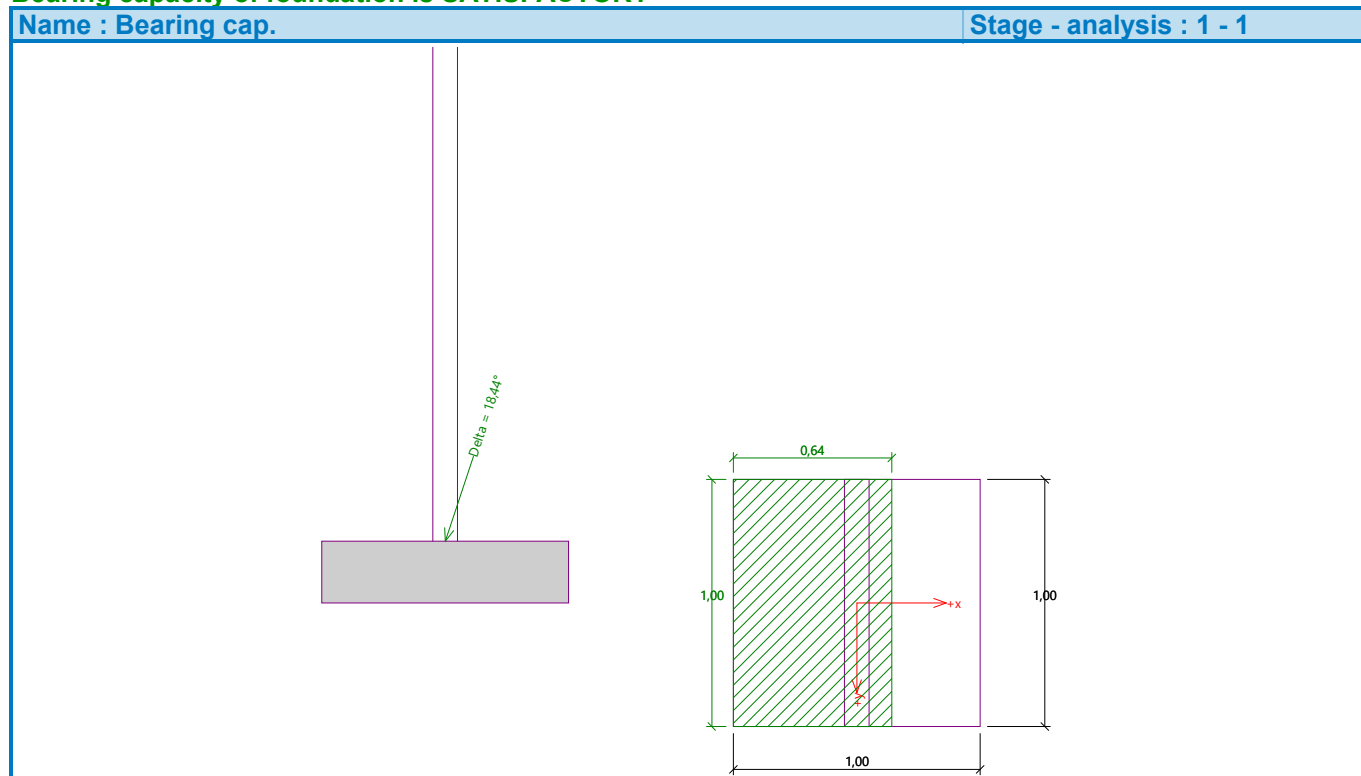
## Horizontal bearing capacity check

Most unfavorable load case No. 2. (LC 2)  
Earth resistance: 2/3 pass., 1/3 at rest  
Design magnitude of earth resistance  $S_{pd} = 3,71 \text{ kN}$

Horizontal bearing capacity  $R_{dh} = 30,85 \text{ kN}$   
Extreme horizontal force  $H = 17,46 \text{ kN}$

**Bearing capacity in the horizontal direction is SATISFACTORY**

**Bearing capacity of foundation is SATISFACTORY**



## Dimensioning No. 1

Analysis carried out with automatic selection of the most unfavourable load cases.

### Verification of longitudinal reinforcement of foundation in the direction of x

5 prof. 10,0 mm, cover 60,0 mm

Cross-section width = 1,00 m

Cross-section depth = 0,25 m

Reinforcement ratio  $\rho = 0,21 \% > 0,15 \% = \rho_{min}$

Position of neutral axis  $x = 0,01 \text{ m} < 0,11 \text{ m} = x_{max}$

Ultimate moment  $M_{Rd} = 30,86 \text{ kNm} > 8,79 \text{ kNm} = M_{Ed}$

**Cross-section is SATISFACTORY.**

### Spread footing for punching shear failure check

Column normal force = 50,14 kN

#### Maximum resistance at the column perimeter

Force transferred into found. soil = 5,01 kN

Force transferred by shear strength of foundation = 45,13 kN

Considered column perimeter  $u_0 = 2,00 \text{ m}$

Shear resistance at the column perimeter  $v_{Ed,max} = 0,25 \text{ MPa}$

Resistance at the column perimeter  $v_{Rd,max} = 4,22 \text{ MPa}$

### Critical section without shear reinforcement

Force transferred into found. soil = 28,21 kN  
 Force transferred by shear strength of foundation = 21,94 kN  
 Distance of section from the column = 0,23 m  
 Section perimeter  $u$  = 2,00 m  
 Shear stress at section  $v_{Ed}$  = 0,08 MPa  
 Shear resistance of section without shear reinforcement  $v_{Rd,c}$  = 0,87 MPa

$v_{Ed} < v_{Rd,c} \Rightarrow$  Reinforcement is not required

### Spread footing for punching shear is SATISFACTORY

#### Dimensioning No. 1

#### Wall stem check - front reinf.

##### Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Coeff. moment	Coeff. norm.force	Coeff. shear for.
Weight - wall	0,00	-0,87	8,74	0,10	1,000	1,350	1,000
FF resistance	-0,96	-0,05	-0,33	0,00	1,000	1,000	1,000
Resistance on front face	-0,22	-0,07	0,00	0,00	1,000	1,000	1,000
Pressure at rest	18,35	-0,58	0,00	0,20	1,350	1,000	1,350
koristna	4,37	-0,87	0,00	0,20	1,500	0,000	1,500

#### Wall stem check - front reinf.

Front reinforcement is not required.

#### Wall stem check - back reinf.

##### Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Coeff. moment	Coeff. norm.force	Coeff. shear for.
Weight - wall	0,00	-0,87	8,74	0,10	1,000	1,350	1,000
FF resistance	-0,96	-0,05	-0,33	0,00	1,000	1,000	1,000
Resistance on front face	-0,22	-0,07	0,00	0,00	1,000	1,000	1,000
Pressure at rest	18,35	-0,58	0,00	0,20	1,350	1,000	1,350
koristna	4,37	-0,87	0,00	0,20	1,500	0,000	1,500

#### Wall stem check - back reinf.

Wall check at the construction joint 1,75 m from the wall crest

Reinforcement and dimensions of the cross-section

5 prof. 10,0 mm, cover 60,0 mm

Inputted reinforcement area = 392,7 mm<sup>2</sup>

Required reinforcement area = 203,6 mm<sup>2</sup>

Cross-section width = 1,00 m

Cross-section height = 0,20 m

Reinforcement ratio  $\rho$  = 0,29 % > 0,15 % =  $\rho_{min}$

Position of neutral axis  $x$  = 0,02 m < 0,08 m =  $x_{max}$

Ultimate shear force  $V_{Rd}$  = 73,20 kN > 30,15 kN =  $V_{Ed}$

Ultimate moment  $M_{Rd}$  = 31,23 kNm > 20,08 kNm =  $M_{Ed}$

### Cross-section is SATISFACTORY.

#### Wall stem check - back reinf. - Crack width

Wall check at the construction joint 1,75 m from the wall crest

Reinforcement and dimensions of the cross-section

5 prof. 10,0 mm, cover 60,0 mm

Cross-section width = 1,00 m

Cross-section height = 0,20 m

$M = 11,75 \text{ kNm}$ ,  $A_s = 392,7 \text{ mm}^2$

Maximum tensile stress in concrete = 1,75 MPa

Tensile strength  $f_{ctm} = 2,90 \text{ MPa}$

**No cracks will appear. The strength of concrete in tension  $f_{ctm}$  was not exceed.**

### Wall jump check

#### Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Design coefficient
Weight - wall	0,00	-0,71	15,00	0,38	1,350
Weight - soil	0,00	-0,32	0,72	0,10	1,350
FF resistance	-6,90	-0,13	-2,38	-0,17	1,350
Resistance on front face	-0,60	-0,20	0,00	0,10	1,350
Weight - earth wedge	0,00	-0,60	7,48	0,60	1,350
Active pressure	15,07	-0,67	19,48	0,75	1,350
koristna	3,07	-0,98	3,49	0,68	1,500

### Wall jump check

Reinforcement and dimensions of the cross-section

5 prof. 10,0 mm, cover 60,0 mm

Inputted reinforcement area = 392,7 mm<sup>2</sup>

Required reinforcement area = 279,0 mm<sup>2</sup>

Cross-section width = 1,00 m

Cross-section height = 0,25 m

Reinforcement ratio  $\rho = 0,21 \% > 0,15 \% = \rho_{min}$

Position of neutral axis  $x = 0,01 \text{ m} < 0,11 \text{ m} = x_{max}$

Ultimate shear force  $V_{Rd} = 100,31 \text{ kN} > 19,22 \text{ kN} = V_{Ed}$

Ultimate moment  $M_{Rd} = 30,86 \text{ kNm} > 3,59 \text{ kNm} = M_{Ed}$

**Cross-section is SATISFACTORY.**

### Wall heel check

#### Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Design coefficient
Weight - wall	0,00	-0,12	3,75	0,70	1,350
Weight - earth wedge	0,00	-0,60	7,48	0,60	1,350
Active pressure	15,07	-0,67	19,48	0,75	1,350
koristna	3,07	-0,98	3,49	0,68	1,500
Contact stress	0,00	0,00	-22,97	0,62	1,000

### Wall heel check

Reinforcement and dimensions of the cross-section

5 prof. 10,0 mm, cover 60,0 mm

Inputted reinforcement area = 392,7 mm<sup>2</sup>

Required reinforcement area = 279,0 mm<sup>2</sup>

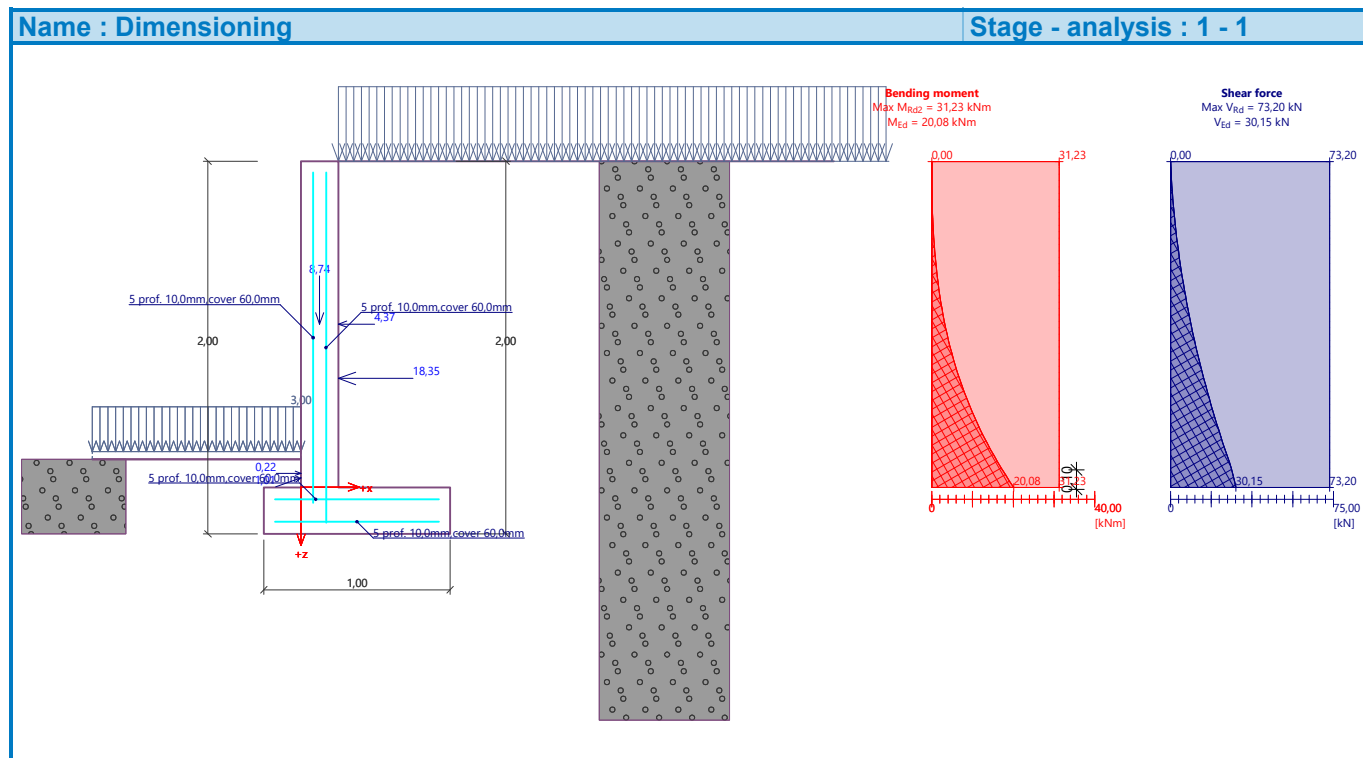
Cross-section width = 1,00 m

Cross-section height = 0,25 m

Reinforcement ratio  $\rho = 0,21 \% > 0,15 \% = \rho_{min}$

Position of neutral axis  $x = 0,01 \text{ m} < 0,11 \text{ m} = x_{\max}$   
 Ultimate shear force  $V_{Rd} = 100,31 \text{ kN} > 23,72 \text{ kN} = V_{Ed}$   
 Ultimate moment  $M_{Rd} = 30,86 \text{ kNm} > 16,48 \text{ kNm} = M_{Ed}$

**Cross-section is SATISFACTORY.**



## Cantilever wall analysis

### Input data

Task : KOTLOVNICA Z ZALOGOVNIKOM  
Part : Pozicija južni zid - prerez 2  
Author : Marko Markoja u.d.i.g.  
Date : 14. 03. 2023

### Settings

(input for current task)

### Materials and standards

Concrete structures : EN 1992-1-1 (EC2)  
Coefficients EN 1992-1-1 : standard

### Wall analysis

Verification methodology : according to EN 1997  
Active earth pressure calculation : Coulomb  
Passive earth pressure calculation : Caquot-Kerisel  
Earthquake analysis : Mononobe-Okabe  
Shape of earth wedge : Calculate as skew  
Base key : The base key is considered as inclined footing bottom  
Allowable eccentricity : 0,333  
Design approach : 2 - reduction of actions and resistances

Partial factors on actions (A)			
Permanent design situation			
		Unfavourable	Favourable
Permanent actions :	$\gamma_G =$	1,35 [-]	1,00 [-]
Variable actions :	$\gamma_Q =$	1,50 [-]	0,00 [-]
Water load :	$\gamma_w =$	1,35 [-]	

Partial factors for resistances (R)			
Permanent design situation			
Partial factor on overturning :	$\gamma_{Rv} =$	1,40 [-]	
Partial factor on sliding resistance :	$\gamma_{Rh} =$	1,10 [-]	
Partial factor on bearing capacity :	$\gamma_{Re} =$	1,40 [-]	

Partial factors for variable actions			
Permanent design situation			
Factor for combination value :	$\psi_0 =$	0,70 [-]	
Factor for frequent value :	$\psi_1 =$	0,50 [-]	
Factor for quasi-permanent value :	$\psi_2 =$	0,30 [-]	

### Material of structure

Unit weight  $\gamma = 25,00 \text{ kN/m}^3$   
Analysis of concrete structures carried out according to the standard EN 1992-1-1 (EC2).

#### Concrete: C 30/37

Cylinder compressive strength  $f_{ck} = 30,00 \text{ MPa}$   
Tensile strength  $f_{ctm} = 2,90 \text{ MPa}$   
Elasticity modulus  $E_{cm} = 33000,00 \text{ MPa}$

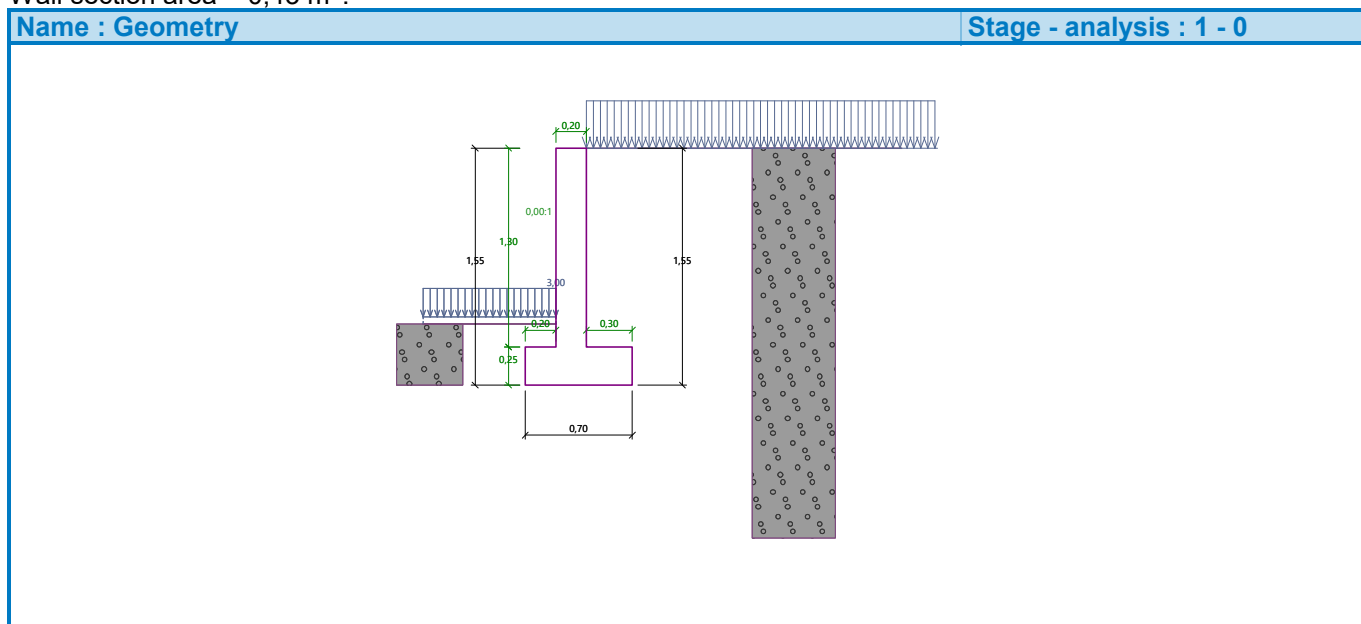
#### Longitudinal steel: B500B

Yield strength  $f_{yk} = 500,00 \text{ MPa}$

### Geometry of structure

No.	Coordinate X [m]	Depth Z [m]
1	0,00	0,00
2	0,00	1,30
3	0,30	1,30
4	0,30	1,55
5	-0,40	1,55
6	-0,40	1,30
7	-0,20	1,30
8	-0,20	0,00

The origin [0,0] is located at the most upper right point of the wall.  
Wall section area = 0,43 m<sup>2</sup>.



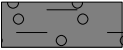


### Basic soil parameters

No.	Name	Pattern	$\Phi_{ef}$ [°]	$C_{ef}$ [kPa]	$\gamma$ [kN/m <sup>3</sup> ]	$\gamma_{su}$ [kN/m <sup>3</sup> ]	$\delta$ [°]
1	nasutje		30,00	0,00	24,00	14,00	20,00
2	flišna preperina		21,00	3,00	19,50	9,50	14,00
3	lapor		36,00	50,00	23,00	13,00	24,00
4	preperel laporovec		30,00	20,00	22,00	12,00	20,00

### Soil parameters to compute pressure at rest

No.	Name	Pattern	Type calculation	$\Phi_{ef}$ [°]	$\nu$ [-]	OCR [-]	$K_r$ [-]
1	nasutje		cohesionless	30,00	-	-	-



No.	Name	Pattern	Type calculation	$\Phi_{ef}$ [°]	$\nu$ [-]	OCR [-]	$K_r$ [-]
2	flišna preperina		cohesive	-	0,30	-	-
3	lapor		cohesionless	36,00	-	-	-
4	preperel laporovec		cohesive	-	0,30	-	-

### Soil parameters

#### nasutje

Unit weight :  $\gamma = 24,00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\Phi_{ef} = 30,00^\circ$   
 Cohesion of soil :  $c_{ef} = 0,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 20,00^\circ$   
 Soil : cohesionless  
 Saturated unit weight :  $\gamma_{sat} = 24,00 \text{ kN/m}^3$

#### flišna preperina

Unit weight :  $\gamma = 19,50 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\Phi_{ef} = 21,00^\circ$   
 Cohesion of soil :  $c_{ef} = 3,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 14,00^\circ$   
 Soil : cohesive  
 Poisson's ratio :  $\nu = 0,30$   
 Saturated unit weight :  $\gamma_{sat} = 19,50 \text{ kN/m}^3$

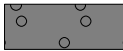
#### lapor

Unit weight :  $\gamma = 23,00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\Phi_{ef} = 36,00^\circ$   
 Cohesion of soil :  $c_{ef} = 50,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 24,00^\circ$   
 Soil : cohesionless  
 Saturated unit weight :  $\gamma_{sat} = 23,00 \text{ kN/m}^3$

#### preperel laporovec

Unit weight :  $\gamma = 22,00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\Phi_{ef} = 30,00^\circ$   
 Cohesion of soil :  $c_{ef} = 20,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 20,00^\circ$   
 Soil : cohesive  
 Poisson's ratio :  $\nu = 0,30$   
 Saturated unit weight :  $\gamma_{sat} = 22,00 \text{ kN/m}^3$

### Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Assigned soil	Pattern
1	-	0,00 .. $\infty$	nasutje	

## Foundation

Type of foundation : soil from geological profile

### Terrain profile

Terrain behind the structure is flat.

### Water influence

Ground water table is located below the structure.

### Input surface surcharges

No.	Surcharge		Action	Mag.1 [kN/m <sup>2</sup> ]	Mag.2 [kN/m <sup>2</sup> ]	Ord.x x [m]	Length l [m]	Depth z [m]
	new	change						
1	Yes		variable	5,00				on terrain

No.	Name
1	koristna

### Resistance on front face of the structure

Resistance on front face of the structure: 2/3 pass., 1/3 at rest

Soil on front face of the structure - nasutje

Angle of friction struc.-soil  $\delta = 20,00^\circ$

Soil thickness in front of structure  $h = 0,40$  m

Terrain surcharge  $f = 3,00$  kN/m<sup>2</sup>

Terrain in front of structure is flat.

### Settings of the stage of construction

Design situation : permanent

The wall is free to move. Active earth pressure is therefore assumed.

Reduction of soil/soil friction angle : do not reduce

### Verification No. 1

#### Forces acting on construction

Name	F <sub>hor</sub> [kN/m]	App.Pt. z [m]	F <sub>vert</sub> [kN/m]	App.Pt. x [m]	Coeff. overtur.	Coeff. sliding	Coeff. stress
Weight - wall	0,00	-0,59	10,88	0,32	1,000	1,000	1,350
Weight - soil	0,00	-0,32	0,72	0,10	1,000	1,000	1,350
FF resistance	-6,90	-0,13	-2,38	-0,17	1,000	1,000	1,350
Resistance on front face	-0,60	-0,20	0,00	0,10	1,000	1,000	1,350
Weight - earth wedge	0,00	-0,42	1,87	0,50	1,000	1,000	1,350
Active pressure	8,75	-0,51	9,10	0,56	1,350	1,350	1,350
koristna	2,31	-0,76	2,02	0,53	1,500	1,500	1,500

### Verification of complete wall

#### Check for overturning stability

Resisting moment  $M_{res} = 9,58$  kNm/m

Overturning moment  $M_{ovr} = 7,67$  kNm/m

**Wall for overturning is SATISFACTORY**

#### Check for slip

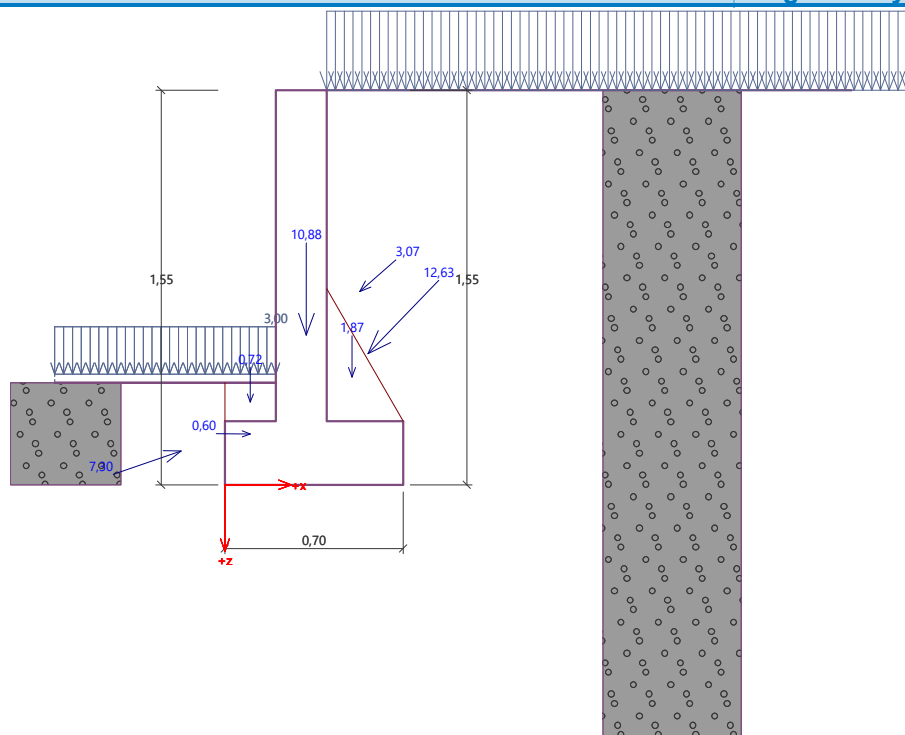
Resisting horizontal force  $H_{res} = 13,86$  kN/m

Active horizontal force  $H_{act} = 7,78$  kN/m

**Wall for slip is SATISFACTORY**

**Overall check - WALL is SATISFACTORY**

Maximum stress in footing bottom : 60,62 kPa



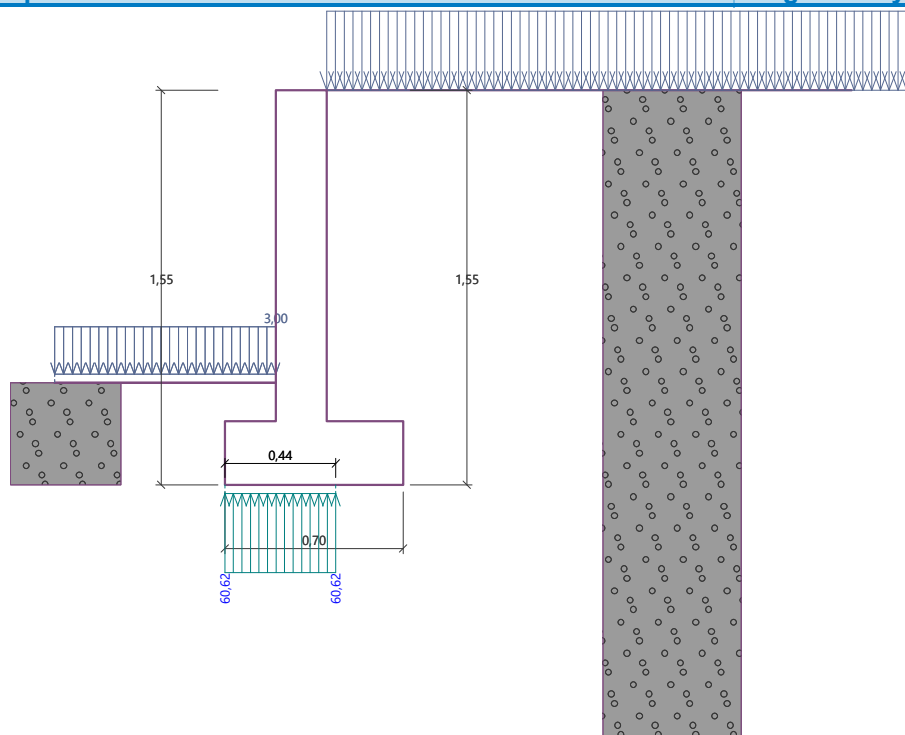
**Design load acting at the center of footing bottom**

No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]	Eccentricity [-]	Stress [kPa]
1	2,77	30,29	5,16	0,131	58,58
2	3,49	26,41	7,78	0,189	60,62

No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]
1	1,90	22,21	3,57

Name : Bearing cap.

Stage - analysis : 1 - -1



## Spread footing verification

### Input data

#### Settings

(input for current task)

#### Materials and standards

Concrete structures : EN 1992-1-1 (EC2)  
Coefficients EN 1992-1-1 : standard

#### Settlement

Analysis method : Analysis using oedometric modulus  
Restriction of influence zone : by percentage of Sigma, Or  
Coeff. of restriction of influence zone : 10,0 [%]

#### Spread Footing

Verification methodology : according to EN 1997  
Analysis for drained conditions : EC 7-1 (EN 1997-1:2003)  
Analysis of uplift : Standard  
Allowable eccentricity : 0,333  
Design approach : 2 - reduction of actions and resistances

Partial factors on actions (A)			
Permanent design situation			
		Unfavourable	Favourable
Permanent actions :	$\gamma_G =$	1,35 [-]	1,00 [-]

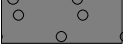
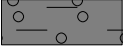
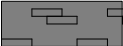

Partial factors for resistances (R)			
Permanent design situation			
Partial factor on vertical bearing capacity :	$\gamma_{Rvs} =$	1,40 [-]	

### Partial factors for resistances (R)

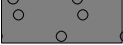
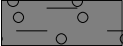


#### Permanent design situation

Partial factor on sliding resistance :  $\gamma_{Rhs} = 1,10$  [-]

### Basic soil parameters

No.	Name	Pattern	$\varphi_{ef}$ [°]	$c_{ef}$ [kPa]	$\gamma$ [kN/m <sup>3</sup> ]	$\gamma_{su}$ [kN/m <sup>3</sup> ]	$\delta$ [°]
1	nasutje		30,00	0,00	24,00	14,00	20,00
2	flišna preperina		21,00	3,00	19,50	9,50	14,00
3	lapor		36,00	50,00	23,00	13,00	24,00
4	preperel laporovec		30,00	20,00	22,00	12,00	20,00

### Soil parameters to compute pressure at rest

No.	Name	Pattern	Type calculation	$\varphi_{ef}$ [°]	$\nu$ [-]	OCR [-]	$K_r$ [-]
1	nasutje		cohesionless	30,00	-	-	-
2	flišna preperina		cohesive	-	0,30	-	-
3	lapor		cohesionless	36,00	-	-	-
4	preperel laporovec		cohesive	-	0,30	-	-

### Soil parameters

#### nasutje

Unit weight :  $\gamma = 24,00$  kN/m<sup>3</sup>  
 Angle of internal friction :  $\varphi_{ef} = 30,00$  °  
 Cohesion of soil :  $c_{ef} = 0,00$  kPa  
 Saturated unit weight :  $\gamma_{sat} = 24,00$  kN/m<sup>3</sup>

#### flišna preperina

Unit weight :  $\gamma = 19,50$  kN/m<sup>3</sup>  
 Angle of internal friction :  $\varphi_{ef} = 21,00$  °  
 Cohesion of soil :  $c_{ef} = 3,00$  kPa  
 Saturated unit weight :  $\gamma_{sat} = 19,50$  kN/m<sup>3</sup>

#### lapor

Unit weight :  $\gamma = 23,00$  kN/m<sup>3</sup>  
 Angle of internal friction :  $\varphi_{ef} = 36,00$  °  
 Cohesion of soil :  $c_{ef} = 50,00$  kPa  
 Saturated unit weight :  $\gamma_{sat} = 23,00$  kN/m<sup>3</sup>

#### preperel laporovec

Unit weight :  $\gamma = 22,00$  kN/m<sup>3</sup>  
 Angle of internal friction :  $\varphi_{ef} = 30,00$  °  
 Cohesion of soil :  $c_{ef} = 20,00$  kPa

Saturated unit weight :  $\gamma_{\text{sat}} = 22,00 \text{ kN/m}^3$

### Foundation

#### Foundation type: strip footing

Depth from original ground surface  $h_z = 1,55 \text{ m}$   
Depth of footing bottom  $d = 0,40 \text{ m}$   
Foundation thickness  $t = 0,25 \text{ m}$   
Incl. of finished grade  $s_1 = 0,00^\circ$   
Incl. of footing bottom  $s_2 = 0,00^\circ$

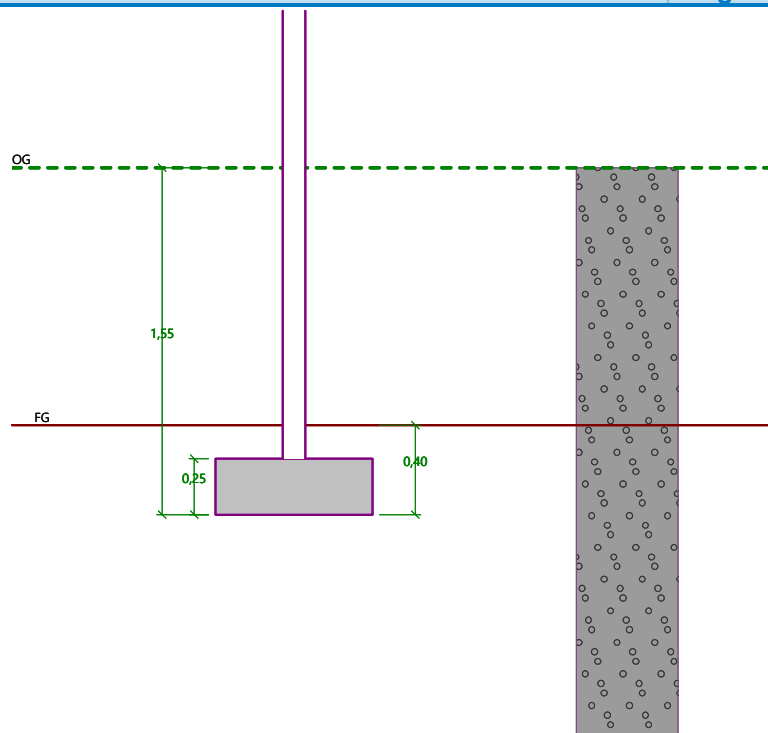
#### Overburden

Type: input unit weight

Unit weight of soil above foundation =  $24,00 \text{ kN/m}^3$

Name : Foundation

Stage - analysis : 1 - 0



### Geometry of structure

#### Foundation type: strip footing

Overall strip footing length =  $10,00 \text{ m}$   
Strip footing width (x) =  $0,70 \text{ m}$   
Column width in the direction of x =  $0,10 \text{ m}$

Inserted loading is considered per unit length of continuous footing span.

Volume of strip footing =  $0,18 \text{ m}^3/\text{m}$   
Volume of excavation =  $0,28 \text{ m}^3/\text{m}$   
Volume of fill =  $0,09 \text{ m}^3/\text{m}$

## Name : Geometry

## Stage - analysis : 1 - 0



## Material of structure

Unit weight  $\gamma = 25,00 \text{ kN/m}^3$

Analysis of concrete structures carried out according to the standard EN 1992-1-1 (EC2).

### Concrete: C 30/37

Cylinder compressive strength

$$f_{ck} = 30,00 \text{ MPa}$$

Tensile strength

$$f_{ctm} = 2,90 \text{ MPa}$$

Elasticity modulus

$$E_{cm} = 33000,00 \text{ MPa}$$

### Longitudinal steel: B500B

Yield strength

$$f_{yk} = 500,00 \text{ MPa}$$

### Transverse steel: B500B

Yield strength

$$f_{yk} = 500,00 \text{ MPa}$$

## Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Assigned soil	Pattern
1	-	0,00 .. ∞	nasutje	

## Load

No.	new	Load change	Name	Type	N [kN/m]	$M_y$ [kNm/m]	$H_x$ [kN/m]
1	Yes		LC 1	Design	23,75	1,48	-5,16
2	Yes		LC 2	Design	19,87	1,55	-7,78
3	Yes		LC 3	Service	15,67	1,01	-3,57

## Global settings

Type of analysis : analysis for drained conditions

The settlement is not analyzed.

## Settings of the stage of construction

Design situation : permanent

## Verification No. 1

### Load case verification

Name	Self w. in favor	$e_x$ [m]	$e_y$ [m]	$\sigma$ [kPa]	$R_d$ [kPa]	Utilization [%]	Is satisfactory
LC 1	Yes	-0,09	0,00	58,58	140,43	41,71	Yes
LC 1	No	-0,09	0,00	58,58	140,43	41,71	Yes
LC 2	Yes	-0,13	0,00	60,62	91,43	66,30	Yes
LC 2	No	-0,13	0,00	60,62	91,43	66,30	Yes

Analysis carried out with automatic selection of the most unfavourable load cases.

Computed self weight of strip foundation  $G = 4,38 \text{ kN/m}$

Computed weight of overburden  $Z = 2,16 \text{ kN/m}$

### Vertical bearing capacity check

Shape of contact stress : rectangle

Most unfavorable load case No. 2. (LC 2)

Parameters of slip surface below foundation:

Depth of slip surface  $z_{sp} = 1,11 \text{ m}$

Length of slip surface  $l_{sp} = 3,35 \text{ m}$

Design bearing capacity of found.soil  $R_d = 91,43 \text{ kPa}$

Extreme contact stress  $\sigma = 60,62 \text{ kPa}$

**Bearing capacity in the vertical direction is SATISFACTORY**

### Verification of load eccentricity

Max. eccentricity in direction of base length  $e_x = 0,189 < 0,333$

Max. eccentricity in direction of base width  $e_y = 0,000 < 0,333$

Max. overall eccentricity  $e_t = 0,189 < 0,333$

**Eccentricity of load is SATISFACTORY**

### Horizontal bearing capacity check

Most unfavorable load case No. 2. (LC 2)

Earth resistance: 2/3 pass., 1/3 at rest

Design magnitude of earth resistance  $S_{pd} = 2,60 \text{ kN}$

Horizontal bearing capacity  $R_{dh} = 16,22 \text{ kN}$

Extreme horizontal force  $H = 7,78 \text{ kN}$

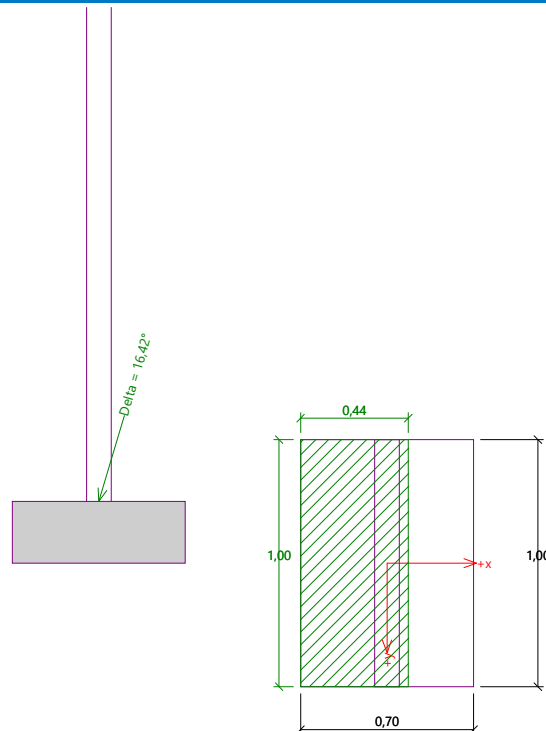
**Bearing capacity in the horizontal direction is SATISFACTORY**

**Bearing capacity of foundation is SATISFACTORY**



Name : Bearing cap.

Stage - analysis : 1 - 1



## Dimensioning No. 1

Analysis carried out with automatic selection of the most unfavourable load cases.

### Verification of longitudinal reinforcement of foundation in the direction of x

5 prof. 10,0 mm, cover 60,0 mm

Cross-section width = 1,00 m

Cross-section depth = 0,25 m

Reinforcement ratio  $\rho = 0,21 \% > 0,15 \% = \rho_{min}$

Position of neutral axis  $x = 0,01 \text{ m} < 0,11 \text{ m} = x_{max}$

Ultimate moment  $M_{Rd} = 30,86 \text{ kNm} > 2,60 \text{ kNm} = M_{Ed}$

**Cross-section is SATISFACTORY.**

### Spread footing for punching shear failure check

Column normal force = 23,75 kN

#### Maximum resistance at the column perimeter

Force transferred into found. soil = 3,39 kN

Force transferred by shear strength of foundation = 20,36 kN

Considered column perimeter  $u_0 = 2,00 \text{ m}$

Shear resistance at the column perimeter  $v_{Ed,max} = 0,09 \text{ MPa}$

Resistance at the column perimeter  $v_{Rd,max} = 4,22 \text{ MPa}$

#### Critical section without shear reinforcement

Force transferred into found. soil = 12,81 kN

Force transferred by shear strength of foundation = 10,94 kN

Distance of section from the column = 0,14 m

Section perimeter  $u = 2,00 \text{ m}$

Shear stress at section  $v_{Ed} = 0,04 \text{ MPa}$

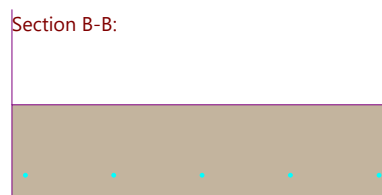
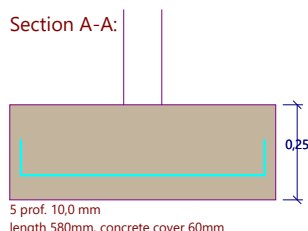
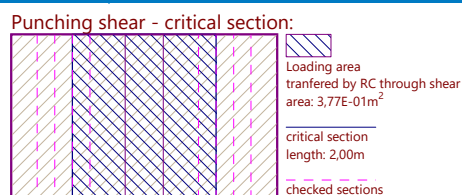
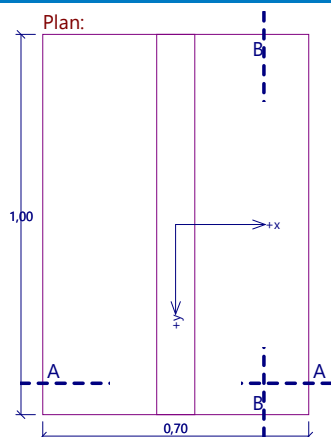
Shear resistance of section without shear reinforcement  $v_{Rd,c} = 1,45 \text{ MPa}$

$v_{Ed} < v_{Rd,c} \Rightarrow$  Reinforcement is not required

**Spread footing for punching shear is SATISFACTORY**

Name : Dimensioning

Stage - analysis : 1 - 1



## Dimensioning No. 1

### Wall stem check - front reinf.

#### Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Coeff. moment	Coeff. norm.force	Coeff. shear for.
Weight - wall	0,00	-0,65	6,49	0,10	1,000	1,350	1,000
FF resistance	-0,96	-0,05	-0,33	0,00	1,000	1,000	1,000
Resistance on front face	-0,22	-0,07	0,00	0,00	1,000	1,000	1,000
Pressure at rest	10,12	-0,43	0,00	0,20	1,350	1,000	1,350
koristna	3,25	-0,65	0,00	0,20	1,500	0,000	1,500

### Wall stem check - front reinf.

Front reinforcement is not required.

### Wall stem check - back reinf.

#### Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Coeff. moment	Coeff. norm.force	Coeff. shear for.
Weight - wall	0,00	-0,65	6,49	0,10	1,000	1,350	1,000
FF resistance	-0,96	-0,05	-0,33	0,00	1,000	1,000	1,000
Resistance on front face	-0,22	-0,07	0,00	0,00	1,000	1,000	1,000
Pressure at rest	10,12	-0,43	0,00	0,20	1,350	1,000	1,350
koristna	3,25	-0,65	0,00	0,20	1,500	0,000	1,500

### Wall stem check - back reinf.

Wall check at the construction joint 1,30 m from the wall crest  
Reinforcement and dimensions of the cross-section

5 prof. 8,0 mm, cover 60,0 mm  
 Inputted reinforcement area = 251,3 mm<sup>2</sup>  
 Required reinforcement area = 205,1 mm<sup>2</sup>  
 Cross-section width = 1,00 m  
 Cross-section height = 0,20 m  
 Reinforcement ratio  $\rho$  = 0,18 % > 0,15 % =  $\rho_{min}$   
 Position of neutral axis  $x$  = 0,01 m < 0,08 m =  $x_{max}$   
 Ultimate shear force  $V_{Rd}$  = 73,74 kN > 17,35 kN =  $V_{Ed}$   
 Ultimate moment  $M_{Rd}$  = 20,66 kNm > 8,98 kNm =  $M_{Ed}$

**Cross-section is SATISFACTORY.**

### Wall jump check

#### Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Design coefficient
Weight - wall	0,00	-0,59	10,88	0,32	1,350
Weight - soil	0,00	-0,32	0,72	0,10	1,350
FF resistance	-6,90	-0,13	-2,38	-0,17	1,350
Resistance on front face	-0,60	-0,20	0,00	0,10	1,350
Weight - earth wedge	0,00	-0,42	1,87	0,50	1,350
Active pressure	8,75	-0,51	9,10	0,56	1,350
koristna	2,31	-0,76	2,02	0,53	1,500

### Wall jump check

Reinforcement and dimensions of the cross-section  
 5 prof. 10,0 mm, cover 60,0 mm  
 Inputted reinforcement area = 392,7 mm<sup>2</sup>  
 Required reinforcement area = 279,0 mm<sup>2</sup>  
 Cross-section width = 1,00 m  
 Cross-section height = 0,25 m  
 Reinforcement ratio  $\rho$  = 0,21 % > 0,15 % =  $\rho_{min}$   
 Position of neutral axis  $x$  = 0,01 m < 0,11 m =  $x_{max}$   
 Ultimate shear force  $V_{Rd}$  = 100,31 kN > 12,25 kN =  $V_{Ed}$   
 Ultimate moment  $M_{Rd}$  = 30,86 kNm > 3,35 kNm =  $M_{Ed}$

**Cross-section is SATISFACTORY.**

### Wall heel check

#### Forces acting on construction

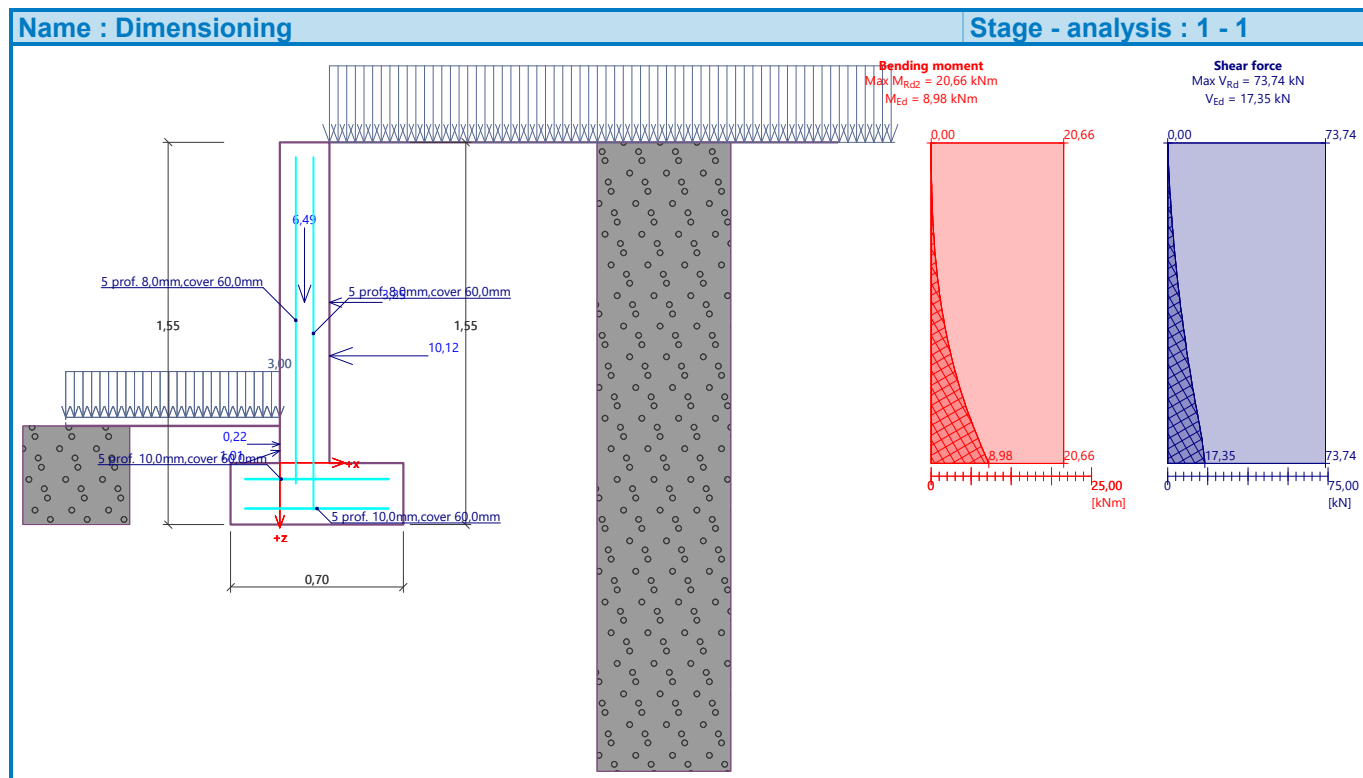
Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Design coefficient
Weight - wall	0,00	-0,12	1,88	0,55	1,350
Weight - earth wedge	0,00	-0,42	1,87	0,50	1,350
Active pressure	8,75	-0,51	9,10	0,56	1,350
koristna	2,31	-0,76	2,02	0,53	1,500
Contact stress	0,00	0,00	-7,16	0,52	1,000

### Wall heel check

Reinforcement and dimensions of the cross-section  
 5 prof. 10,0 mm, cover 60,0 mm  
 Inputted area = 392,7 mm<sup>2</sup>  
 Required reinforcement area = 279,0 mm<sup>2</sup>  
 Cross-section width = 1,00 m

Cross-section height = 0,25 m  
Reinforcement ratio  $\rho = 0,21 \% > 0,15 \% = \rho_{\min}$   
Position of neutral axis  $x = 0,01 \text{ m} < 0,11 \text{ m} = x_{\max}$   
Ultimate shear force  $V_{Rd} = 100,31 \text{ kN} > 13,22 \text{ kN} = V_{Ed}$   
Ultimate moment  $M_{Rd} = 30,86 \text{ kNm} > 5,63 \text{ kNm} = M_{Ed}$

**Cross-section is SATISFACTORY.**



## Cantilever wall analysis

### Input data

Task : KOTLOVNICA Z ZALOGOVNIKOM  
Part : Pozicija južni zid - prerez 3  
Author : Marko Markoja u.d.i.g.  
Date : 14. 03. 2023

### Settings

(input for current task)

### Materials and standards

Concrete structures : EN 1992-1-1 (EC2)  
Coefficients EN 1992-1-1 : standard

### Wall analysis

Verification methodology : according to EN 1997  
Active earth pressure calculation : Coulomb  
Passive earth pressure calculation : Caquot-Kerisel  
Earthquake analysis : Mononobe-Okabe  
Shape of earth wedge : Calculate as skew  
Base key : The base key is considered as inclined footing bottom  
Allowable eccentricity : 0,333  
Design approach : 2 - reduction of actions and resistances

Partial factors on actions (A)			
Permanent design situation			
		Unfavourable	Favourable
Permanent actions :	$\gamma_G =$	1,35 [-]	1,00 [-]
Variable actions :	$\gamma_Q =$	1,50 [-]	0,00 [-]
Water load :	$\gamma_w =$	1,35 [-]	

Partial factors for resistances (R)			
Permanent design situation			
Partial factor on overturning :	$\gamma_{Rv} =$	1,40 [-]	
Partial factor on sliding resistance :	$\gamma_{Rh} =$	1,10 [-]	
Partial factor on bearing capacity :	$\gamma_{Re} =$	1,40 [-]	

Partial factors for variable actions			
Permanent design situation			
Factor for combination value :	$\psi_0 =$	0,70 [-]	
Factor for frequent value :	$\psi_1 =$	0,50 [-]	
Factor for quasi-permanent value :	$\psi_2 =$	0,30 [-]	

### Material of structure

Unit weight  $\gamma = 25,00 \text{ kN/m}^3$   
Analysis of concrete structures carried out according to the standard EN 1992-1-1 (EC2).

#### Concrete: C 30/37

Cylinder compressive strength  $f_{ck} = 30,00 \text{ MPa}$   
Tensile strength  $f_{ctm} = 2,90 \text{ MPa}$   
Elasticity modulus  $E_{cm} = 33000,00 \text{ MPa}$

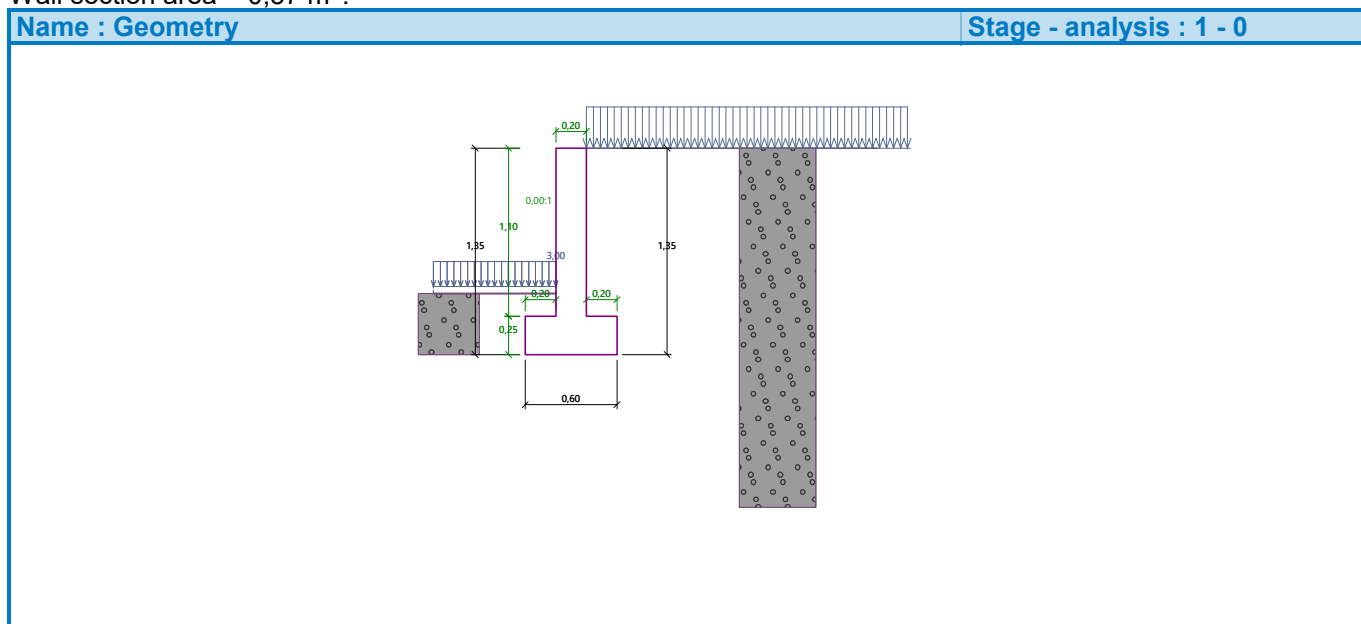
#### Longitudinal steel: B500B

Yield strength  $f_{yk} = 500,00 \text{ MPa}$

### Geometry of structure

No.	Coordinate X [m]	Depth Z [m]
1	0,00	0,00
2	0,00	1,10
3	0,20	1,10
4	0,20	1,35
5	-0,40	1,35
6	-0,40	1,10
7	-0,20	1,10
8	-0,20	0,00

The origin [0,0] is located at the most upper right point of the wall.  
Wall section area = 0,37 m<sup>2</sup>.

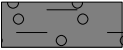




### Basic soil parameters

No.	Name	Pattern	$\Phi_{ef}$ [°]	$C_{ef}$ [kPa]	$\gamma$ [kN/m <sup>3</sup> ]	$\gamma_{su}$ [kN/m <sup>3</sup> ]	$\delta$ [°]
1	nasutje		30,00	0,00	24,00	14,00	20,00
2	flišna preperina		21,00	3,00	19,50	9,50	14,00
3	lapor		36,00	50,00	23,00	13,00	24,00
4	preperel laporovec		30,00	20,00	22,00	12,00	20,00

### Soil parameters to compute pressure at rest

No.	Name	Pattern	Type calculation	$\Phi_{ef}$ [°]	$\nu$ [-]	OCR [-]	$K_r$ [-]
1	nasutje		cohesionless	30,00	-	-	-

No.	Name	Pattern	Type calculation	$\Phi_{ef}$ [°]	$\nu$ [-]	OCR [-]	$K_r$ [-]
2	flišna preperina		cohesive	-	0,30	-	-
3	lapor		cohesionless	36,00	-	-	-
4	preperel laporovec		cohesive	-	0,30	-	-

### Soil parameters

#### nasutje

Unit weight :  $\gamma = 24,00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\Phi_{ef} = 30,00^\circ$   
 Cohesion of soil :  $c_{ef} = 0,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 20,00^\circ$   
 Soil : cohesionless  
 Saturated unit weight :  $\gamma_{sat} = 24,00 \text{ kN/m}^3$

#### flišna preperina

Unit weight :  $\gamma = 19,50 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\Phi_{ef} = 21,00^\circ$   
 Cohesion of soil :  $c_{ef} = 3,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 14,00^\circ$   
 Soil : cohesive  
 Poisson's ratio :  $\nu = 0,30$   
 Saturated unit weight :  $\gamma_{sat} = 19,50 \text{ kN/m}^3$

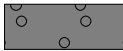
#### lapor

Unit weight :  $\gamma = 23,00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\Phi_{ef} = 36,00^\circ$   
 Cohesion of soil :  $c_{ef} = 50,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 24,00^\circ$   
 Soil : cohesionless  
 Saturated unit weight :  $\gamma_{sat} = 23,00 \text{ kN/m}^3$

#### preperel laporovec

Unit weight :  $\gamma = 22,00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\Phi_{ef} = 30,00^\circ$   
 Cohesion of soil :  $c_{ef} = 20,00 \text{ kPa}$   
 Angle of friction struc.-soil :  $\delta = 20,00^\circ$   
 Soil : cohesive  
 Poisson's ratio :  $\nu = 0,30$   
 Saturated unit weight :  $\gamma_{sat} = 22,00 \text{ kN/m}^3$

### Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Assigned soil	Pattern
1	-	0,00 .. ∞	nasutje	

## Foundation

Type of foundation : soil from geological profile

### Terrain profile

Terrain behind the structure is flat.

### Water influence

Ground water table is located below the structure.

### Input surface surcharges

No.	Surcharge		Action	Mag.1 [kN/m <sup>2</sup> ]	Mag.2 [kN/m <sup>2</sup> ]	Ord.x x [m]	Length l [m]	Depth z [m]
	new	change						
1	Yes		variable	5,00				on terrain

No.	Name
1	koristna

### Resistance on front face of the structure

Resistance on front face of the structure: 2/3 pass., 1/3 at rest

Soil on front face of the structure - nasutje

Angle of friction struc.-soil  $\delta = 20,00^\circ$

Soil thickness in front of structure  $h = 0,40$  m

Terrain surcharge  $f = 3,00$  kN/m<sup>2</sup>

Terrain in front of structure is flat.

### Settings of the stage of construction

Design situation : permanent

The wall is free to move. Active earth pressure is therefore assumed.

Reduction of soil/soil friction angle : do not reduce

### Verification No. 1

#### Forces acting on construction

Name	F <sub>hor</sub> [kN/m]	App.Pt. z [m]	F <sub>vert</sub> [kN/m]	App.Pt. x [m]	Coeff. overtur.	Coeff. sliding	Coeff. stress
Weight - wall	0,00	-0,53	9,25	0,30	1,000	1,000	1,350
Weight - soil	0,00	-0,32	0,72	0,10	1,000	1,000	1,350
FF resistance	-6,90	-0,13	-2,38	-0,17	1,000	1,000	1,350
Resistance on front face	-0,60	-0,20	0,00	0,10	1,000	1,000	1,350
Weight - earth wedge	0,00	-0,37	0,83	0,47	1,000	1,000	1,350
Active pressure	6,53	-0,45	5,89	0,51	1,350	1,350	1,350
koristna	1,98	-0,66	1,51	0,48	1,500	1,500	1,500

### Verification of complete wall

#### Check for overturning stability

Resisting moment  $M_{res} = 6,26$  kNm/m

Overturning moment  $M_{ovr} = 4,87$  kNm/m

**Wall for overturning is SATISFACTORY**

#### Check for slip

Resisting horizontal force  $H_{res} = 9,78$  kN/m

Active horizontal force  $H_{act} = 4,29$  kN/m

**Wall for slip is SATISFACTORY**

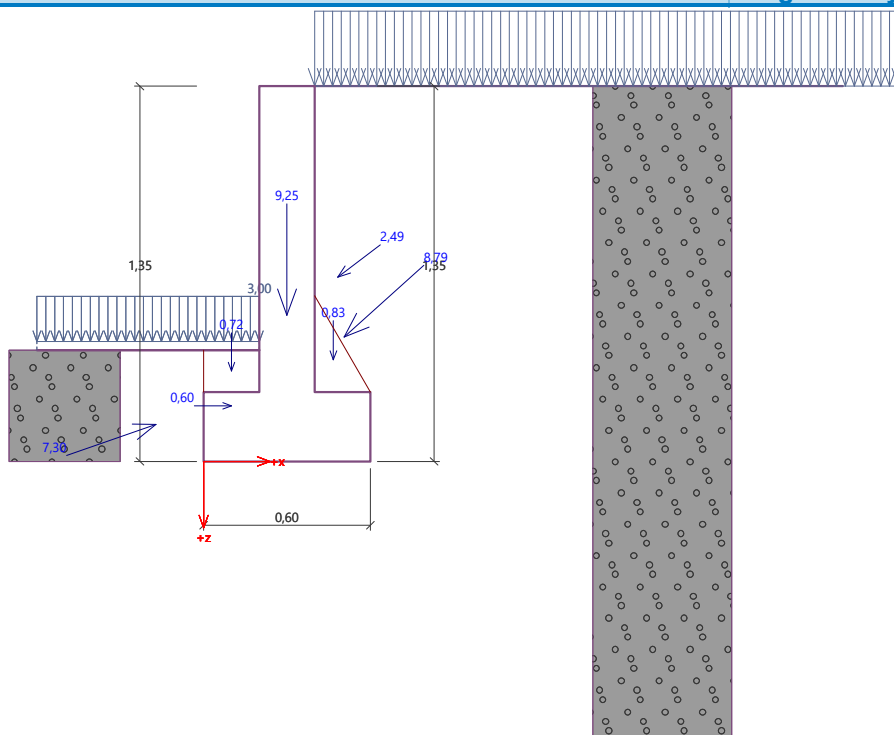
**Overall check - WALL is SATISFACTORY**

Maximum stress in footing bottom : 44,70 kPa



Name : Verification

Stage - analysis : 1 - 1



### Bearing capacity of foundation soil

#### Design load acting at the center of footing bottom

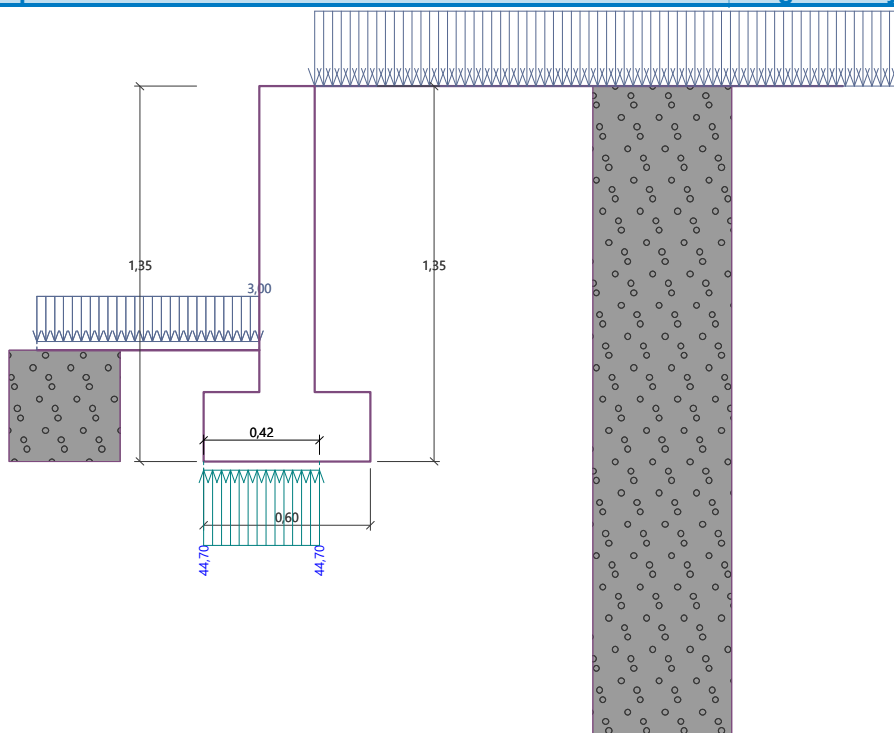
No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]	Eccentricity [-]	Stress [kPa]
1	0,95	21,58	1,66	0,073	42,16
2	1,71	18,64	4,29	0,153	44,70

#### Service load acting at the center of footing bottom

No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]
1	0,59	15,82	1,01

Name : Bearing cap.

Stage - analysis : 1 - -1



## Spread footing verification

### Input data

#### Settings

(input for current task)

#### Materials and standards

Concrete structures : EN 1992-1-1 (EC2)  
Coefficients EN 1992-1-1 : standard

#### Settlement

Analysis method : Analysis using oedometric modulus  
Restriction of influence zone : by percentage of Sigma, Or  
Coeff. of restriction of influence zone : 10,0 [%]

#### Spread Footing

Verification methodology : according to EN 1997  
Analysis for drained conditions : EC 7-1 (EN 1997-1:2003)  
Analysis of uplift : Standard  
Allowable eccentricity : 0,333  
Design approach : 2 - reduction of actions and resistances

Partial factors on actions (A)			
Permanent design situation			
		Unfavourable	Favourable
Permanent actions :	$\gamma_G =$	1,35 [-]	1,00 [-]

Partial factors for resistances (R)			
Permanent design situation			
Partial factor on vertical bearing capacity :	$\gamma_{Rvs} =$	1,40 [-]	

### Partial factors for resistances (R)

#### Permanent design situation

Partial factor on sliding resistance :  $\gamma_{Rhs} = 1,10 [-]$

### Basic soil parameters

No.	Name	Pattern	$\varphi_{ef}$ [°]	$c_{ef}$ [kPa]	$\gamma$ [kN/m <sup>3</sup> ]	$\gamma_{su}$ [kN/m <sup>3</sup> ]	$\delta$ [°]
1	nasutje		30,00	0,00	24,00	14,00	20,00
2	flišna preperina		21,00	3,00	19,50	9,50	14,00
3	lapor		36,00	50,00	23,00	13,00	24,00
4	preperel laporovec		30,00	20,00	22,00	12,00	20,00

### Soil parameters to compute pressure at rest

No.	Name	Pattern	Type calculation	$\varphi_{ef}$ [°]	$\nu$ [-]	OCR [-]	$K_r$ [-]
1	nasutje		cohesionless	30,00	-	-	-
2	flišna preperina		cohesive	-	0,30	-	-
3	lapor		cohesionless	36,00	-	-	-
4	preperel laporovec		cohesive	-	0,30	-	-

### Soil parameters

#### nasutje

Unit weight :  $\gamma = 24,00 \text{ kN/m}^3$   
 Angle of internal friction :  $\varphi_{ef} = 30,00^\circ$   
 Cohesion of soil :  $c_{ef} = 0,00 \text{ kPa}$   
 Saturated unit weight :  $\gamma_{sat} = 24,00 \text{ kN/m}^3$

#### flišna preperina

Unit weight :  $\gamma = 19,50 \text{ kN/m}^3$   
 Angle of internal friction :  $\varphi_{ef} = 21,00^\circ$   
 Cohesion of soil :  $c_{ef} = 3,00 \text{ kPa}$   
 Saturated unit weight :  $\gamma_{sat} = 19,50 \text{ kN/m}^3$

#### lapor

Unit weight :  $\gamma = 23,00 \text{ kN/m}^3$   
 Angle of internal friction :  $\varphi_{ef} = 36,00^\circ$   
 Cohesion of soil :  $c_{ef} = 50,00 \text{ kPa}$   
 Saturated unit weight :  $\gamma_{sat} = 23,00 \text{ kN/m}^3$

#### preperel laporovec

Unit weight :  $\gamma = 22,00 \text{ kN/m}^3$   
 Angle of internal friction :  $\varphi_{ef} = 30,00^\circ$   
 Cohesion of soil :  $c_{ef} = 20,00 \text{ kPa}$

Saturated unit weight :  $\gamma_{\text{sat}} = 22,00 \text{ kN/m}^3$

### Foundation

#### Foundation type: strip footing

Depth from original ground surface  $h_z = 1,35 \text{ m}$

Depth of footing bottom  $d = 0,40 \text{ m}$

Foundation thickness  $t = 0,25 \text{ m}$

Incl. of finished grade  $s_1 = 0,00^\circ$

Incl. of footing bottom  $s_2 = 0,00^\circ$

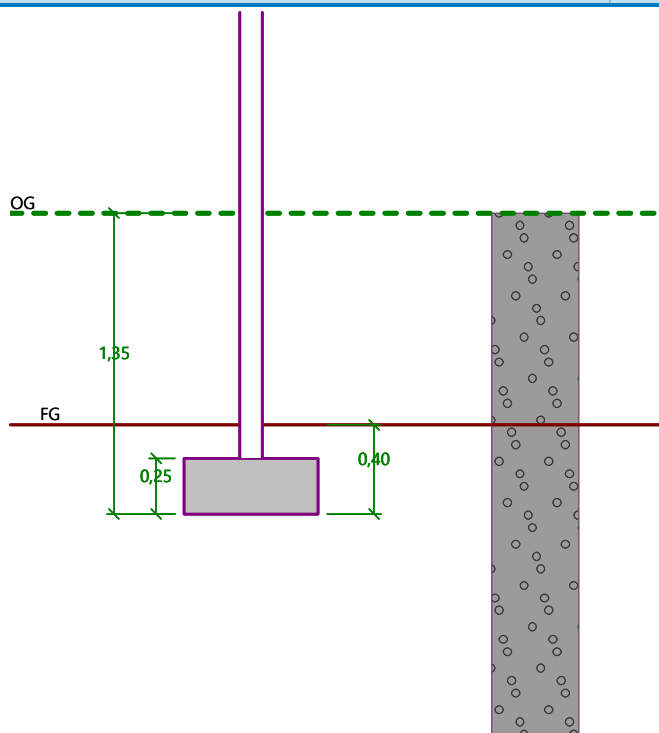
#### Overburden

Type: input unit weight

Unit weight of soil above foundation =  $24,00 \text{ kN/m}^3$

Name : Foundation

Stage - analysis : 1 - 0



### Geometry of structure

#### Foundation type: strip footing

Overall strip footing length =  $10,00 \text{ m}$

Strip footing width (x) =  $0,60 \text{ m}$

Column width in the direction of x =  $0,10 \text{ m}$

Inserted loading is considered per unit length of continuous footing span.

Volume of strip footing =  $0,15 \text{ m}^3/\text{m}$

Volume of excavation =  $0,24 \text{ m}^3/\text{m}$

Volume of fill =  $0,08 \text{ m}^3/\text{m}$

Name : Geometry

Stage - analysis : 1 - 0



Material of structure

Unit weight  $\gamma = 25,00 \text{ kN/m}^3$

Analysis of concrete structures carried out according to the standard EN 1992-1-1 (EC2).

Concrete: C 30/37

Cylinder compressive strength

$$f_{ck} = 30,00 \text{ MPa}$$

Tensile strength

$$f_{ctm} = 2,90 \text{ MPa}$$

Elasticity modulus

$$E_{cm} = 33000,00 \text{ MPa}$$

Longitudinal steel: B500B

Yield strength

$$f_{yk} = 500,00 \text{ MPa}$$

Transverse steel: B500B

Yield strength

$$f_{yk} = 500,00 \text{ MPa}$$

Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Assigned soil	Pattern
1		- 0,00 .. ∞	nasutje	

Load

No.	new	Load change	Name	Type	N [kN/m]	M <sub>y</sub> [kNm/m]	H <sub>x</sub> [kN/m]
1	Yes		LC 1	Design	16,03	0,54	-1,66
2	Yes		LC 2	Design	13,09	0,63	-4,29
3	Yes		LC 3	Service	10,27	0,34	-1,01

Global settings

Type of analysis : analysis for drained conditions

The settlement is not analyzed.

## Settings of the stage of construction

Design situation : permanent

## Verification No. 1

### Load case verification

Name	Self w. in favor	$e_x$ [m]	$e_y$ [m]	$\sigma$ [kPa]	$R_d$ [kPa]	Utilization [%]	Is satisfactory
LC 1	Yes	-0,04	0,00	42,16	179,18	23,53	Yes
LC 1	No	-0,04	0,00	42,16	179,18	23,53	Yes
LC 2	Yes	-0,09	0,00	44,70	109,90	40,67	Yes
LC 2	No	-0,09	0,00	44,70	109,90	40,67	Yes

Analysis carried out with automatic selection of the most unfavourable load cases.

Computed self weight of strip foundation  $G = 3,75 \text{ kN/m}$

Computed weight of overburden  $Z = 1,80 \text{ kN/m}$

### Vertical bearing capacity check

Shape of contact stress : rectangle

Most unfavorable load case No. 2. (LC 2)

Parameters of slip surface below foundation:

Depth of slip surface  $z_{sp} = 0,95 \text{ m}$

Length of slip surface  $l_{sp} = 2,87 \text{ m}$

Design bearing capacity of found.soil  $R_d = 109,90 \text{ kPa}$

Extreme contact stress  $\sigma = 44,70 \text{ kPa}$

**Bearing capacity in the vertical direction is SATISFACTORY**

### Verification of load eccentricity

Max. eccentricity in direction of base length  $e_x = 0,153 < 0,333$

Max. eccentricity in direction of base width  $e_y = 0,000 < 0,333$

Max. overall eccentricity  $e_t = 0,153 < 0,333$

**Eccentricity of load is SATISFACTORY**

### Horizontal bearing capacity check

Most unfavorable load case No. 2. (LC 2)

Earth resistance: 2/3 pass., 1/3 at rest

Design magnitude of earth resistance  $S_{pd} = 2,23 \text{ kN}$

Horizontal bearing capacity  $R_{dh} = 11,81 \text{ kN}$

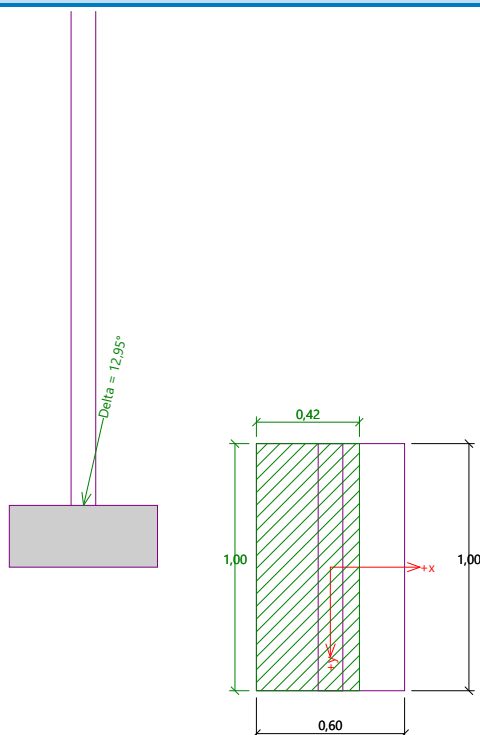
Extreme horizontal force  $H = 4,29 \text{ kN}$

**Bearing capacity in the horizontal direction is SATISFACTORY**

**Bearing capacity of foundation is SATISFACTORY**

Name : Bearing cap.

Stage - analysis : 1 - 1



## Dimensioning No. 1

Analysis carried out with automatic selection of the most unfavourable load cases.

### Verification of longitudinal reinforcement of foundation in the direction of x

4 prof. 10,0 mm, cover 60,0 mm

Cross-section width = 1,00 m

Cross-section depth = 0,25 m

Reinforcement ratio  $\rho = 0,17 \% > 0,15 \% = \rho_{min}$

Position of neutral axis  $x = 0,01 \text{ m} < 0,11 \text{ m} = x_{max}$

Ultimate moment  $M_{Rd} = 24,80 \text{ kNm} > 1,29 \text{ kNm} = M_{Ed}$

**Cross-section is SATISFACTORY.**

### Spread footing for punching shear failure check

Column normal force = 16,03 kN

#### Maximum resistance at the column perimeter

Force transferred into found. soil = 2,67 kN

Force transferred by shear strength of foundation = 13,36 kN

Considered column perimeter  $u_0 = 2,00 \text{ m}$

Shear resistance at the column perimeter  $v_{Ed,max} = 0,05 \text{ MPa}$

Resistance at the column perimeter  $v_{Rd,max} = 4,22 \text{ MPa}$

#### Critical section without shear reinforcement

Force transferred into found. soil = 10,09 kN

Force transferred by shear strength of foundation = 5,94 kN

Distance of section from the column = 0,14 m

Section perimeter  $u = 2,00 \text{ m}$

Shear stress at section  $v_{Ed} = 0,02 \text{ MPa}$

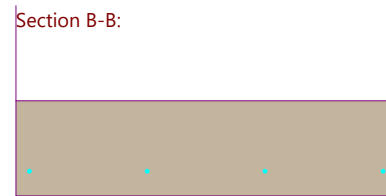
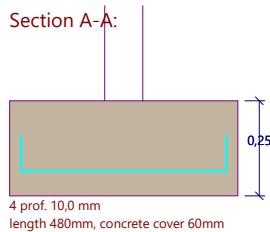
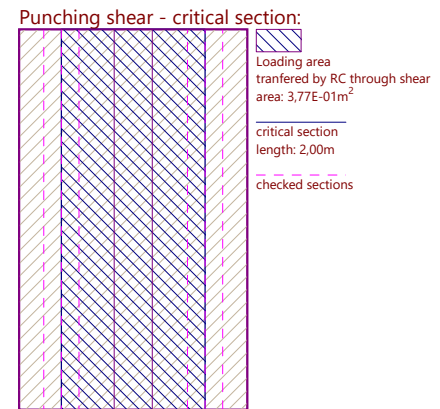
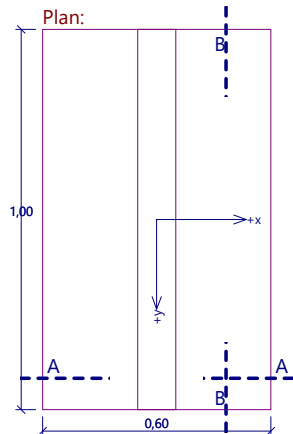
Shear resistance of section without shear reinforcement  $v_{Rd,c} = 1,45 \text{ MPa}$

$v_{Ed} < v_{Rd,c} \Rightarrow$  Reinforcement is not required

**Spread footing for punching shear is SATISFACTORY**

Name : Dimensioning

Stage - analysis : 1 - 1



## Dimensioning No. 1

### Wall stem check - front reinf.

#### Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Coeff. moment	Coeff. norm.force	Coeff. shear for.
Weight - wall	0,00	-0,55	5,49	0,10	1,000	1,350	1,000
FF resistance	-0,96	-0,05	-0,33	0,00	1,000	1,000	1,000
Resistance on front face	-0,22	-0,07	0,00	0,00	1,000	1,000	1,000
Pressure at rest	7,24	-0,37	0,00	0,20	1,350	1,000	1,350
koristna	2,75	-0,55	0,00	0,20	1,500	0,000	1,500

### Wall stem check - front reinf.

Front reinforcement is not required.

### Wall stem check - back reinf.

#### Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Coeff. moment	Coeff. norm.force	Coeff. shear for.
Weight - wall	0,00	-0,55	5,49	0,10	1,000	1,350	1,000
FF resistance	-0,96	-0,05	-0,33	0,00	1,000	1,000	1,000
Resistance on front face	-0,22	-0,07	0,00	0,00	1,000	1,000	1,000
Pressure at rest	7,24	-0,37	0,00	0,20	1,350	1,000	1,350
koristna	2,75	-0,55	0,00	0,20	1,500	0,000	1,500

### Wall stem check - back reinf.

Wall check at the construction joint 1,10 m from the wall crest  
Reinforcement and dimensions of the cross-section



5 prof. 8,0 mm, cover 60,0 mm  
 Inputted reinforcement area = 251,3 mm<sup>2</sup>  
 Required reinforcement area = 205,1 mm<sup>2</sup>  
 Cross-section width = 1,00 m  
 Cross-section height = 0,20 m  
 Reinforcement ratio  $\rho$  = 0,18 % > 0,15 % =  $\rho_{min}$   
 Position of neutral axis  $x$  = 0,01 m < 0,08 m =  $x_{max}$   
 Ultimate shear force  $V_{Rd}$  = 73,74 kN > 12,72 kN =  $V_{Ed}$   
 Ultimate moment  $M_{Rd}$  = 20,66 kNm > 5,75 kNm =  $M_{Ed}$

**Cross-section is SATISFACTORY.**

### Wall jump check

#### Forces acting on construction

Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Design coefficient
Weight - wall	0,00	-0,53	9,25	0,30	1,350
Weight - soil	0,00	-0,32	0,72	0,10	1,350
FF resistance	-6,90	-0,13	-2,38	-0,17	1,350
Resistance on front face	-0,60	-0,20	0,00	0,10	1,350
Weight - earth wedge	0,00	-0,37	0,83	0,47	1,350
Active pressure	6,53	-0,45	5,89	0,51	1,350
koristna	1,98	-0,66	1,51	0,48	1,500

### Wall jump check

Reinforcement and dimensions of the cross-section  
 5 prof. 10,0 mm, cover 60,0 mm  
 Inputted reinforcement area = 392,7 mm<sup>2</sup>  
 Required reinforcement area = 279,0 mm<sup>2</sup>  
 Cross-section width = 1,00 m  
 Cross-section height = 0,25 m  
 Reinforcement ratio  $\rho$  = 0,21 % > 0,15 % =  $\rho_{min}$   
 Position of neutral axis  $x$  = 0,01 m < 0,11 m =  $x_{max}$   
 Ultimate shear force  $V_{Rd}$  = 100,31 kN > 8,06 kN =  $V_{Ed}$   
 Ultimate moment  $M_{Rd}$  = 30,86 kNm > 2,95 kNm =  $M_{Ed}$

**Cross-section is SATISFACTORY.**

### Wall heel check

#### Forces acting on construction

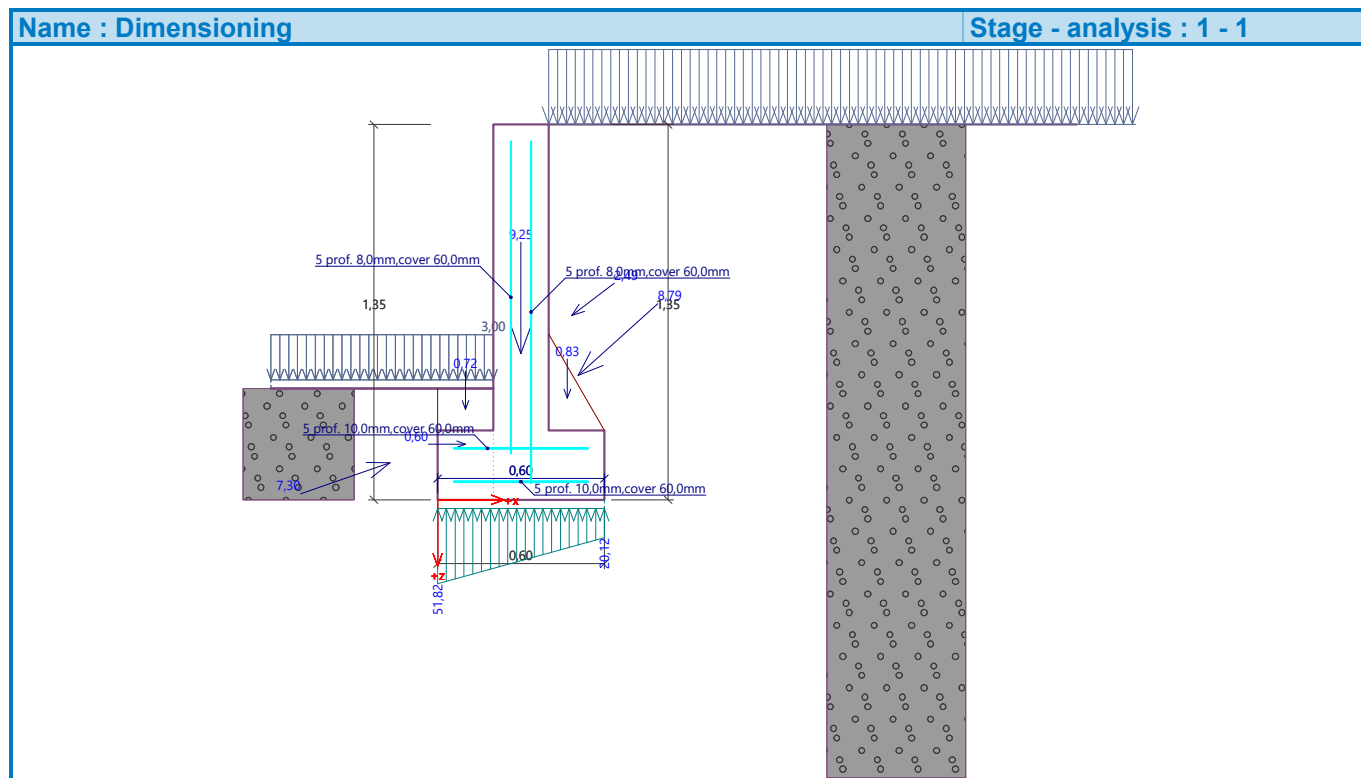
Name	$F_{hor}$ [kN/m]	App.Pt. z [m]	$F_{vert}$ [kN/m]	App.Pt. x [m]	Design coefficient
Weight - wall	0,00	-0,12	1,25	0,50	1,350
Weight - earth wedge	0,00	-0,37	0,83	0,47	1,350
Active pressure	6,53	-0,45	5,89	0,51	1,350
koristna	1,98	-0,66	1,51	0,48	1,500
Contact stress	0,00	0,00	-5,08	0,49	1,000

### Wall heel check

Reinforcement and dimensions of the cross-section  
 5 prof. 10,0 mm, cover 60,0 mm  
 Inputted area = 392,7 mm<sup>2</sup>  
 Required reinforcement area = 279,0 mm<sup>2</sup>  
 Cross-section width = 1,00 m

Cross-section height = 0,25 m  
Reinforcement ratio  $\rho = 0,21 \% > 0,15 \% = \rho_{\min}$   
Position of neutral axis  $x = 0,01 \text{ m} < 0,11 \text{ m} = x_{\max}$   
Ultimate shear force  $V_{Rd} = 100,31 \text{ kN} > 7,94 \text{ kN} = V_{Ed}$   
Ultimate moment  $M_{Rd} = 30,86 \text{ kNm} > 2,80 \text{ kNm} = M_{Ed}$

**Cross-section is SATISFACTORY.**



<b>Objekt:</b> KOTLOVNICA Z ZALOGOVNIKOM	Str.:136/138
<b>POZ.: ST - ZUNANJE STOPNICE</b>	Štev. načrta: 6710
<b>Vsebina</b>	

#### Vhodni podatki

Vhodni podatki - Konstrukcija	137
Vhodni podatki - Obtežba	137

#### Rezultati

Statični preračun	138
Dimenzioniranje (beton)	138

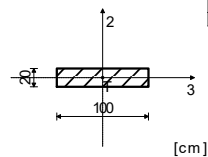
## Vhodni podatki - Konstrukcija, Vhodni podatki - Obtežba

Tabele materialov							
No	Naziv materiala	E[kN/m <sup>2</sup> ]	$\mu$	$\gamma$ [kN/m <sup>3</sup> ]	$\alpha$ [1/C]	Em[kN/m <sup>2</sup> ]	$\mu$ m
1	C 25/30	3.100e+7	0.20	25.00	1.000e-5	3.100e+7	0.20

## Seti gred

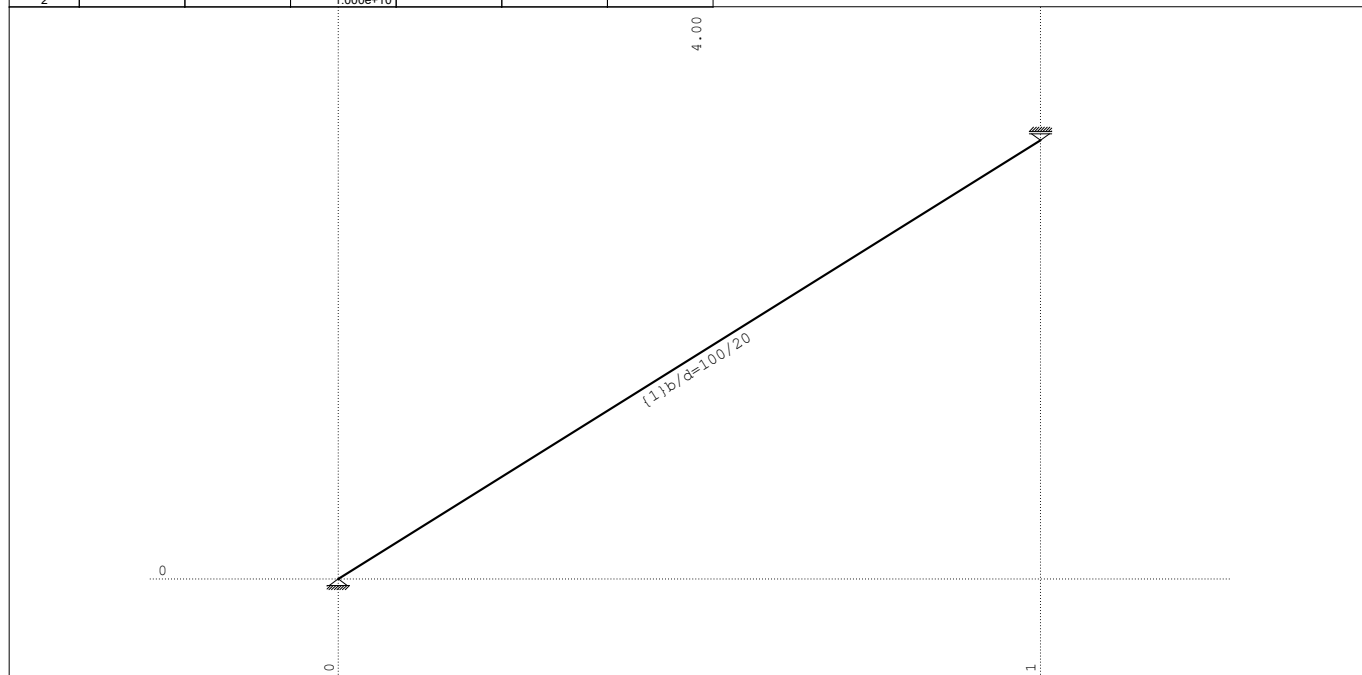
Set: 1 Prerez: b/d=100/20, Fiktivna ekscentričnost

Mat	A1	A2	A3	I1	I2	I3
1 - C 25/30	2.000e-1	1.667e-1	1.667e-1	2.331e-3	1.667e-2	6.667e-4



## 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			
2			1.000e+10			

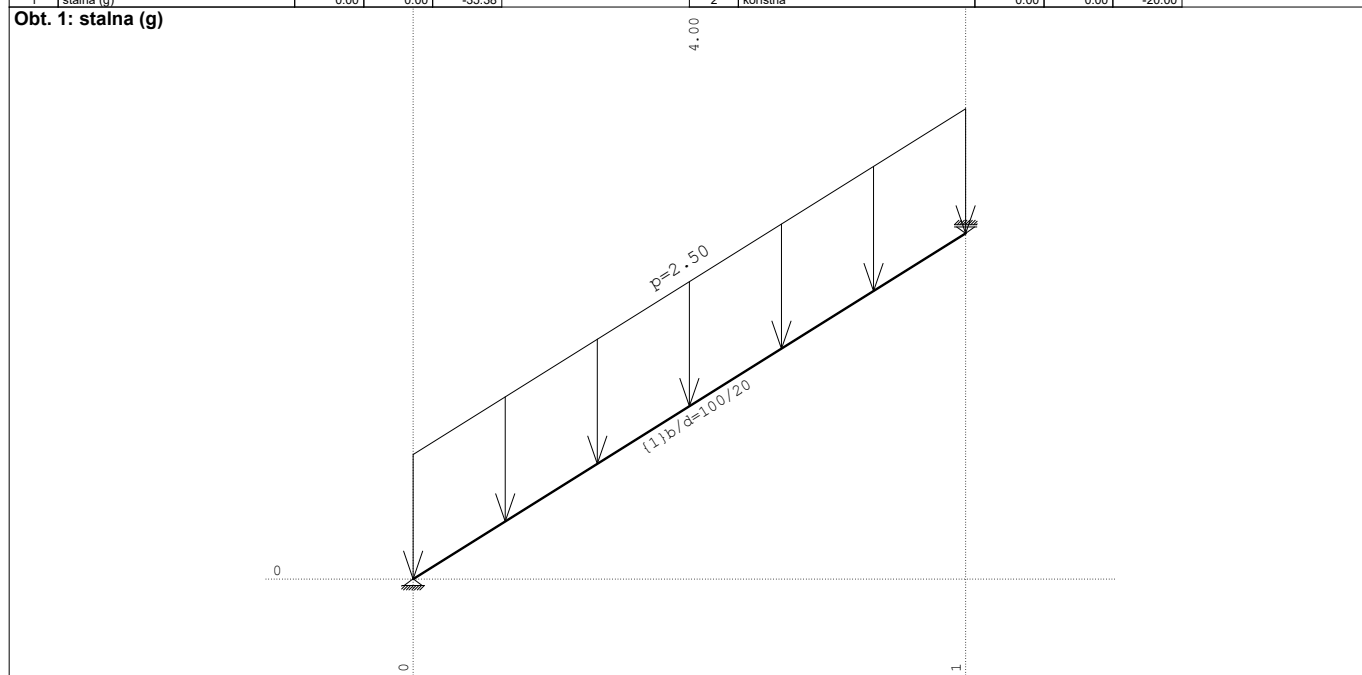


## Lista obtežnih primerov

LC	Naziv	pX [kN]	pY [kN]	pZ [kN]
1	stalna (g)	0.00	0.00	-35.38

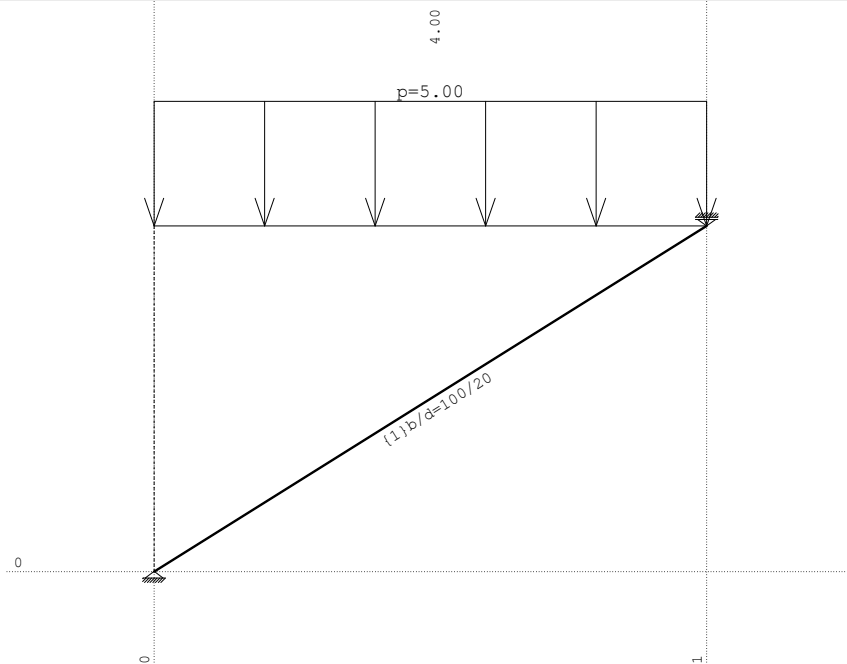
## Obt. 1: stalna (g)

LC	Naziv	pX [kN]	pY [kN]	pZ [kN]
2	koristna	0.00	0.00	-20.00

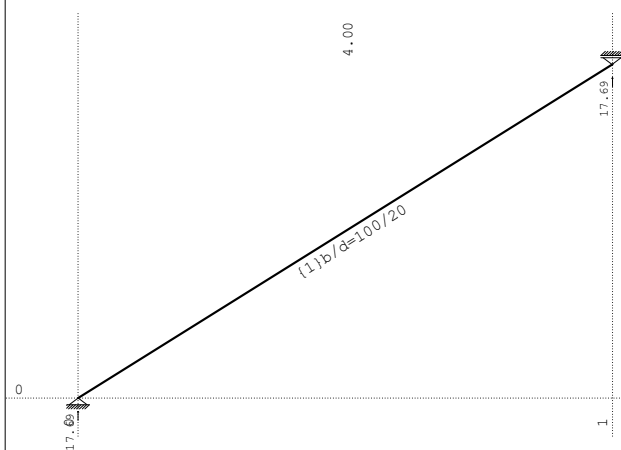


Vhodni podatki - Obtežba, Statični preračun, Dimenzioniranje (beton)

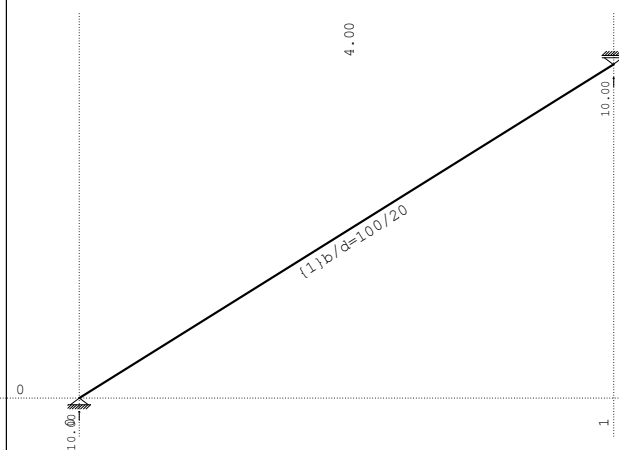
Obt. 2: koristna



Obt. 1: stalna (g)



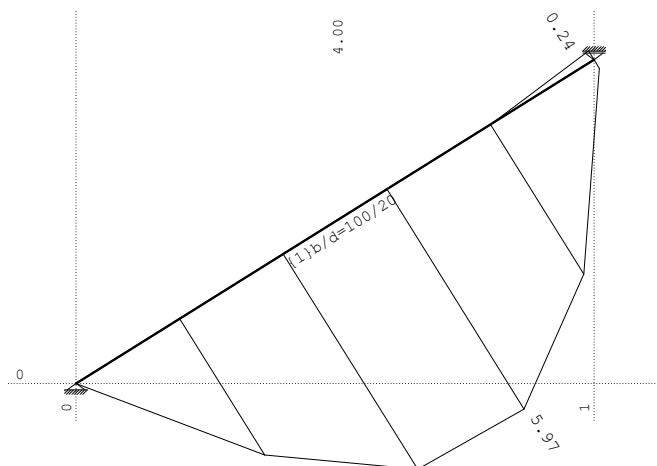
Obt. 2: koristna



Reakcije podpor

Merodajna obtežba: Kompletna shema  
EC 2 (EN 1992-1-1:2004), C 30, S500N

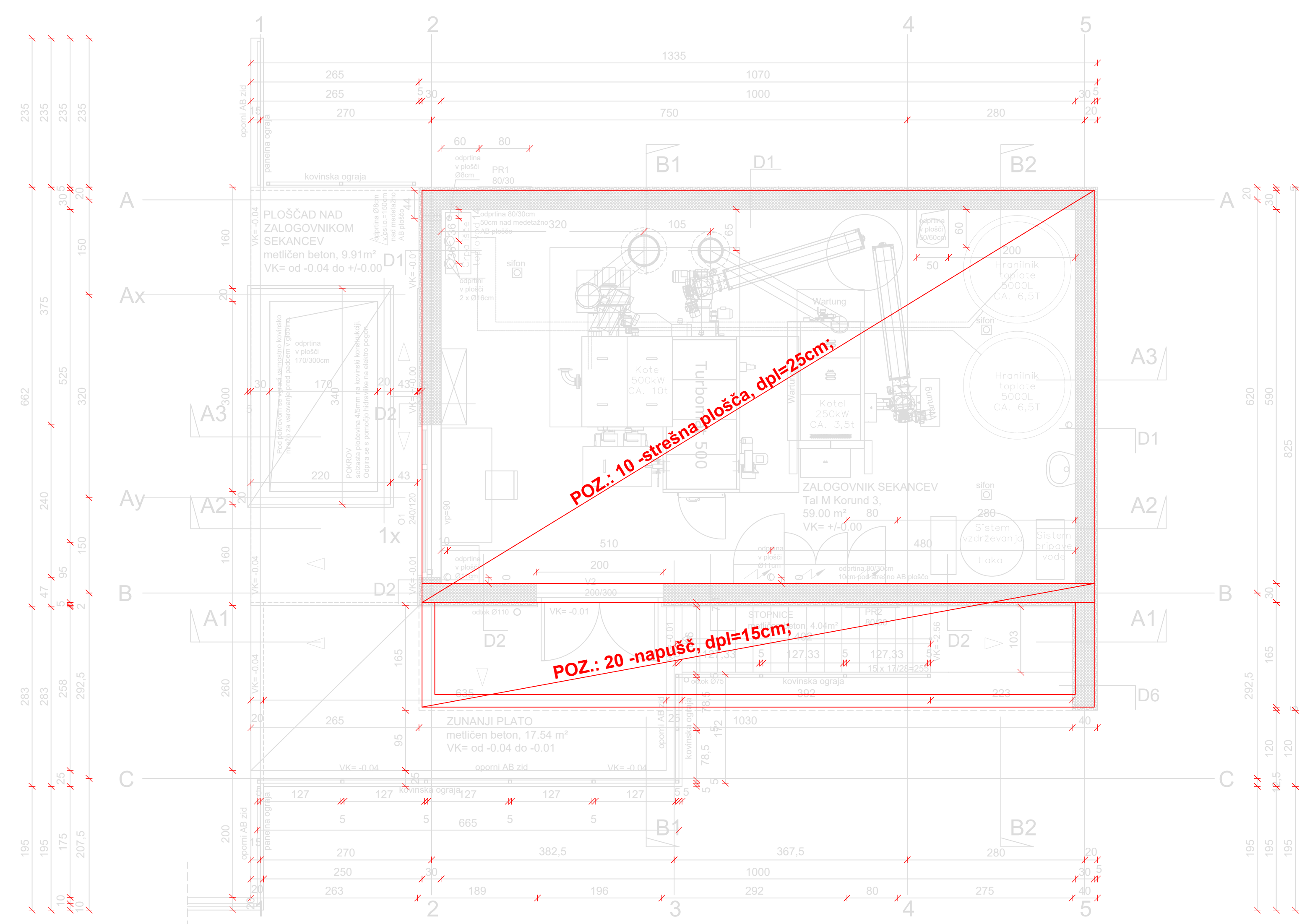
Reakcije podpor



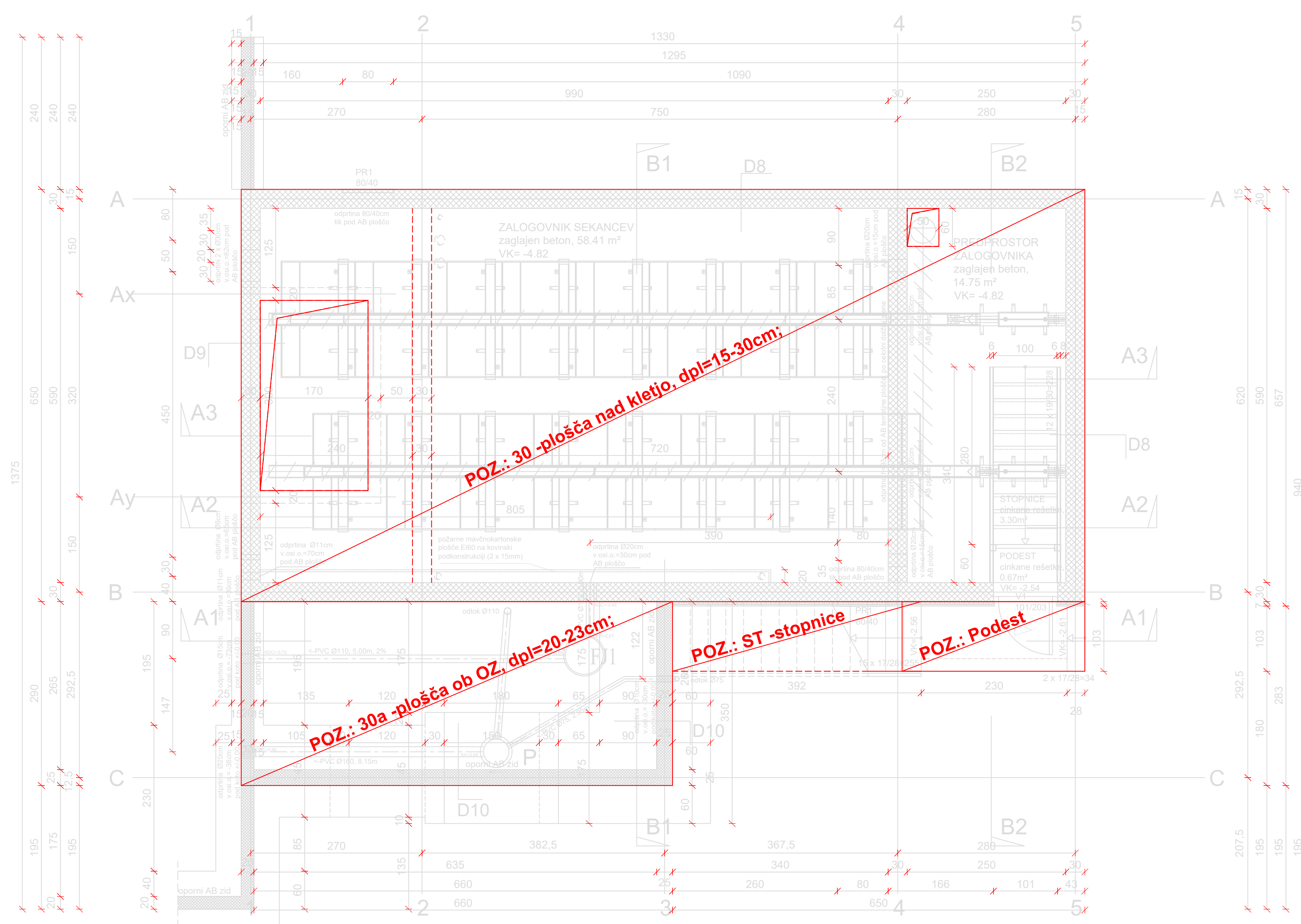
Armatura v gredah: max  $A_{a2}/A_{a1} = 0.24 / 5.97 \text{ cm}^2$



TLORIS TEMELJEV



## TLORIS PRITLIČJA



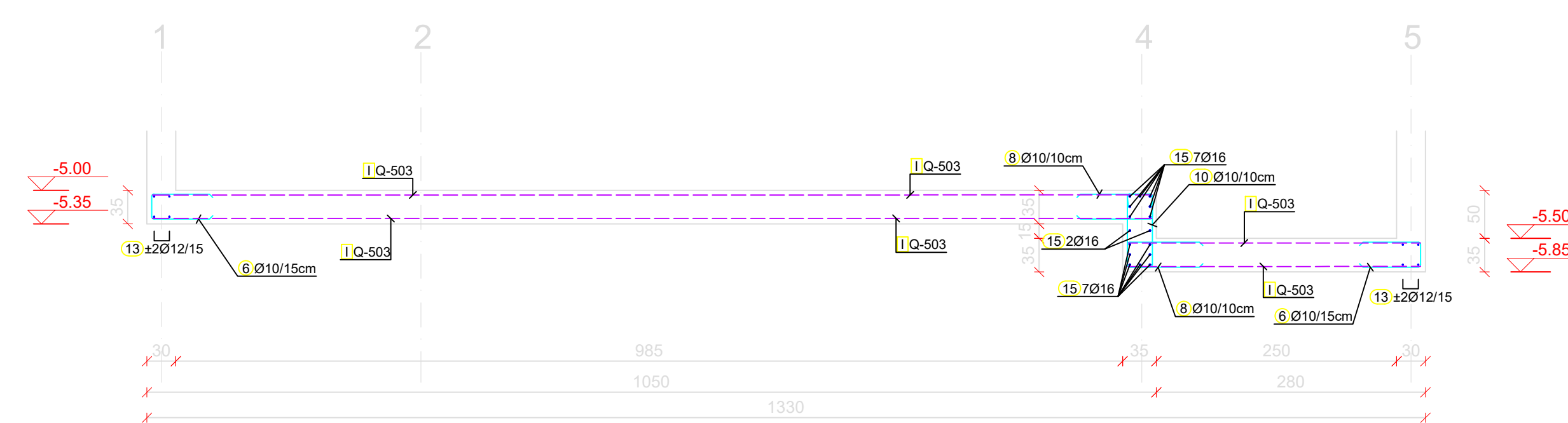
## TLORIS KLETI

TLORIS STREHE

[illegible]



TLORIS TEMELJEV



5 190210 Jahačič

5 190210 L=132 (160)

VIŠINO JAHACHEV DOLOČITI NA KRAJU SAMEM!!

[illegible]


TLORIS TEMELJEV

Architectural floor plan of the ground floor (Prizemlje) of the 'Duga' building. The plan shows a large rectangular building footprint with a central courtyard. The building is divided into several sections, including a large hall (A1) and a smaller hall (A2). The plan includes dimensions, room numbers, and structural elements like columns and walls. The building is situated on a plot with a red line indicating the boundary. The plan is labeled 'PRIZEMLJE' and 'DUGA'.

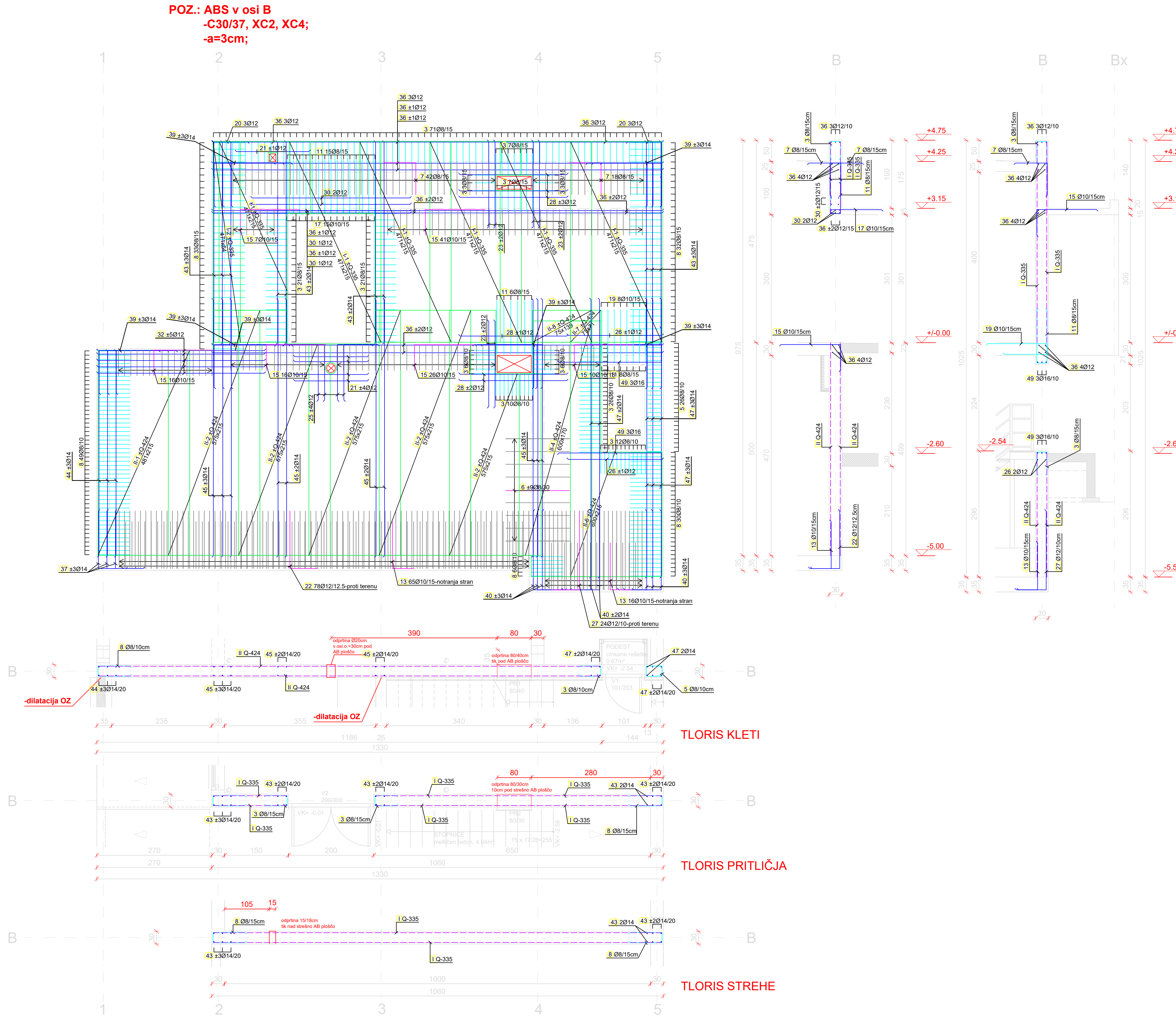
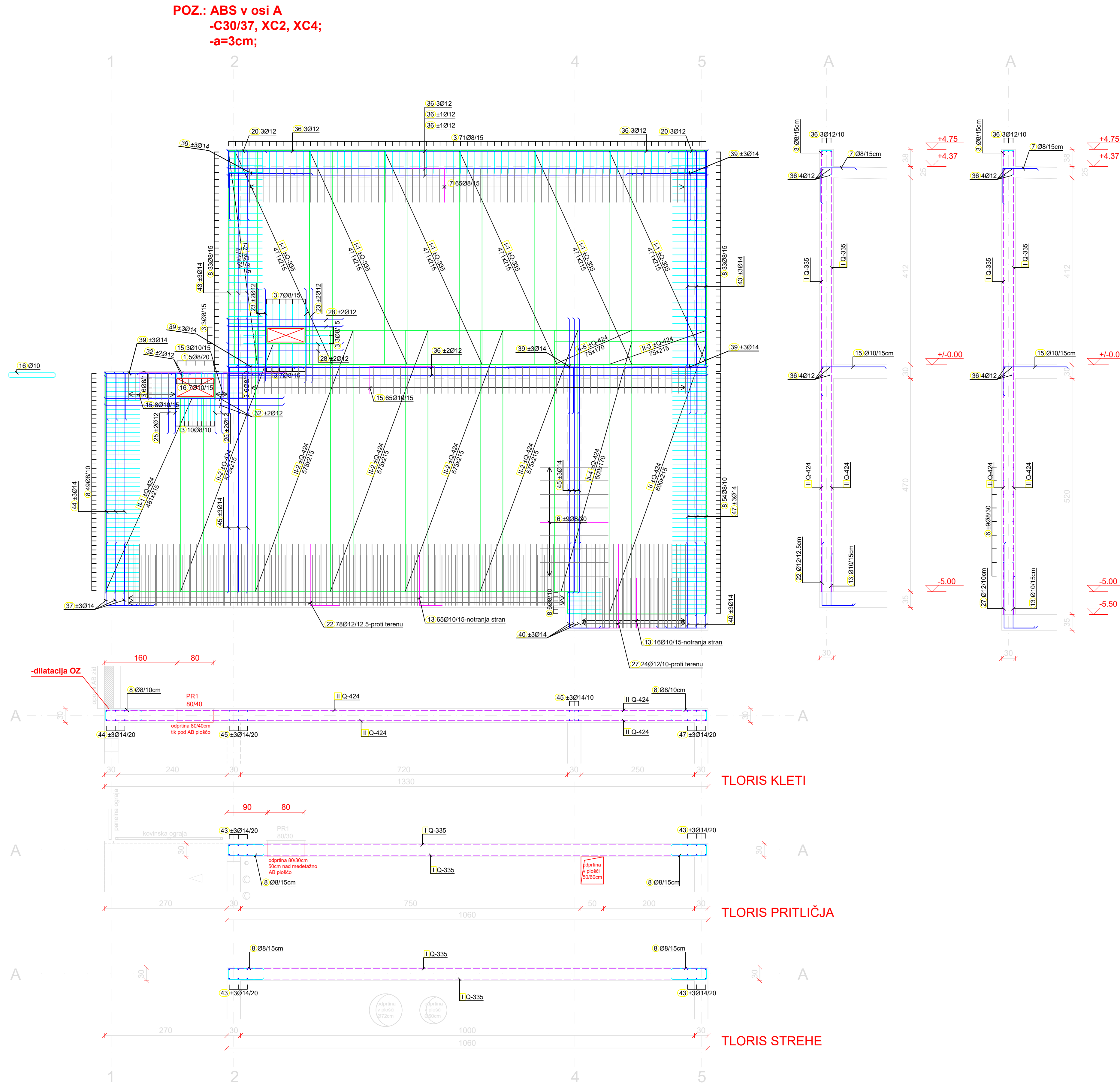
TLORIS TEMELJEV

TLORIS TEMELJEV

**POZ.: TP -temeljna plošča**

projektor:		 <b>Projektivni biro Velenje d.d.</b>		naslov: Poslovna cesta 8, 1110 Velenje telefon: (03) 896 48 00 e-mail: projekt@pbv.si	
izpolni:		<b>KOTLONICA Z ZAOLJNOVODOM</b> projekt: revizija št. 991/1, 991/2 k.a. 1255 Iliriska Bistrica		vrsta projekta: <b>projektna dokumentacija za izvedbo</b> št. projekta: <b>478</b>	
izpolni:		glavni projektant: <b>gora gata</b>		št. projekta: <b>21 + 940/1 + 940/2a gradbeništvu</b> št. projekta: <b>678</b>	
izpolni:		Domo starejših občanov Ilirska Bistrica Kid-Kova 15 4200 Ilirska Bistrica		vrsta projekta: <b>izvedba</b> št. projekta: <b>678</b>	
izpolni:		izpolni: <b>Unik Lekani urad. dipl. inž. arh. PA</b>		datum: <b>marec 2023</b>	
izpolni:		arh. pomočnik: <b>Marko Mlakar urad. dipl. inž. grad. F</b>		(izd. vseh listov)	
izpolni:		arh. pomočnik: <b>Arturč Novak</b>		A-1000 C-3002	
izpolni:		arh. pomočnik: <b>Arturč Novak</b>		ARMATURNI ROKI POZ.: Tr: temeljna plošča m = 1:50	
izpolni:		izpolni: <b>izpolni</b>		list: <b>A01</b>	





POZ.: ABS v osi A in B - stene

a=3cm,

C30/37 XC4, XC2;

S500B

Mere preveriti na kraju samem!!!  
Odprtine preveriti na kraju samem!!!  
SPECIFIKATORJE GLEJ IZVLEČEK ARMATURE!  
PREVERITI VSE INSTALACIJSKE ODPRTINE Z  
INSTALACIJSKIMI NAČRTI!!!

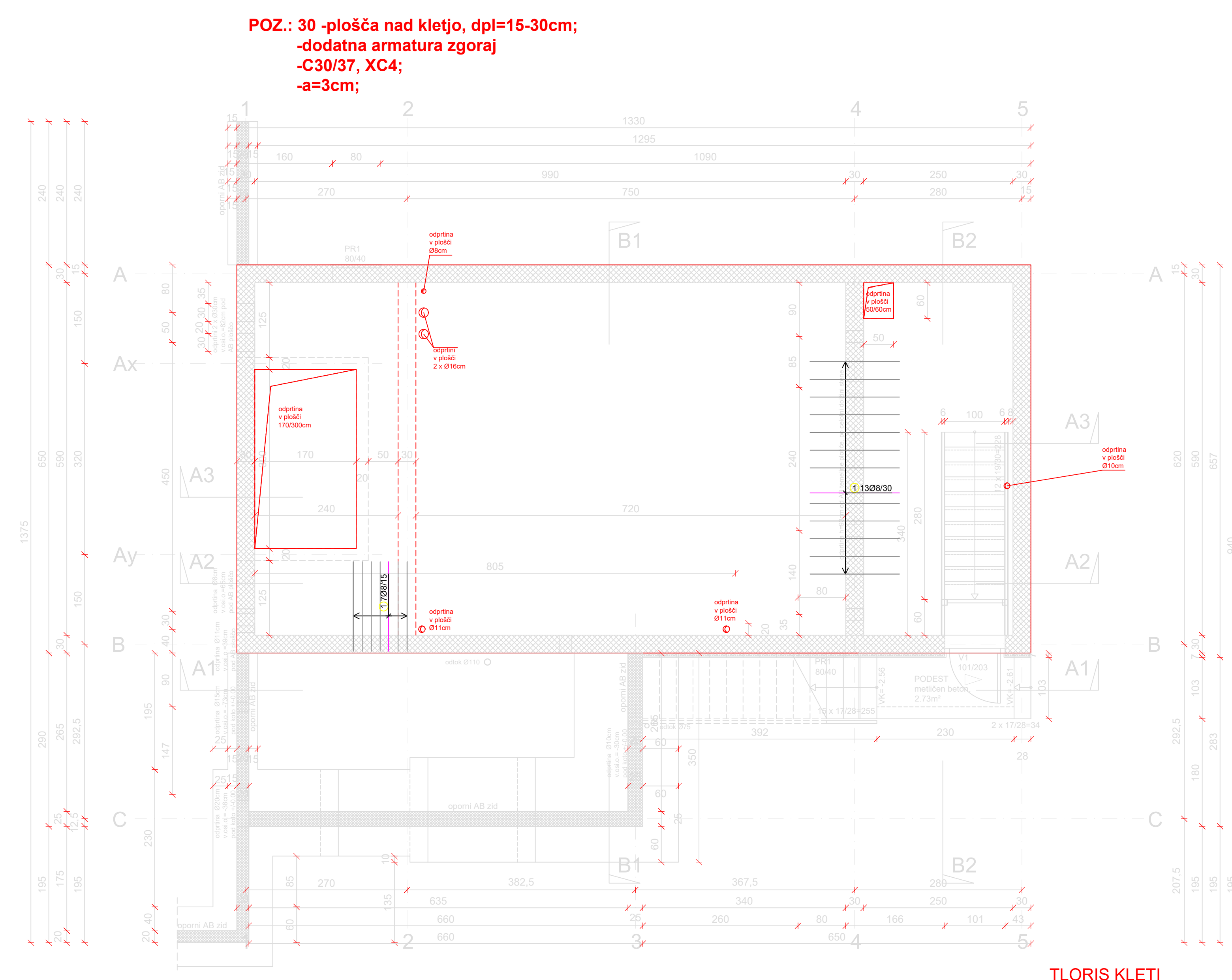
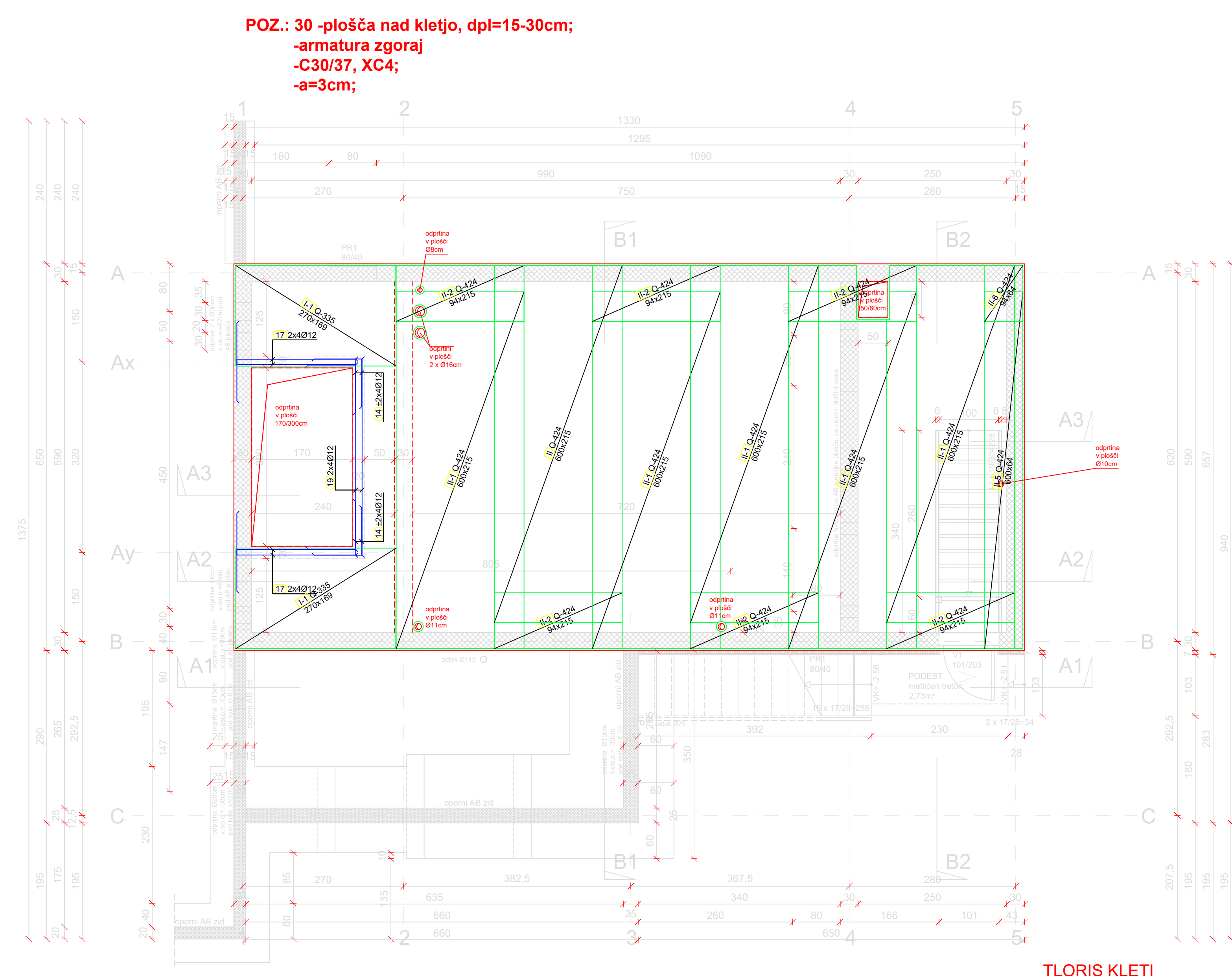
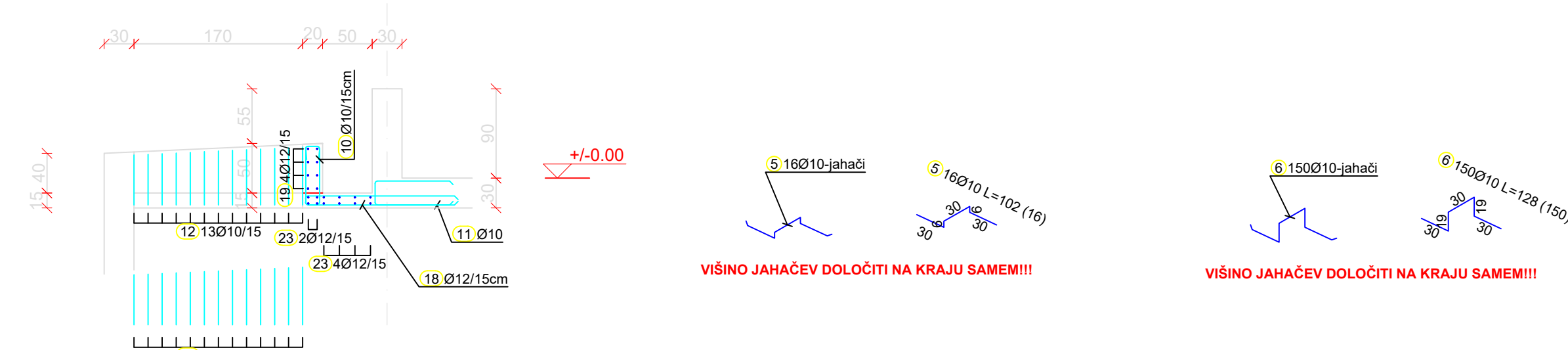
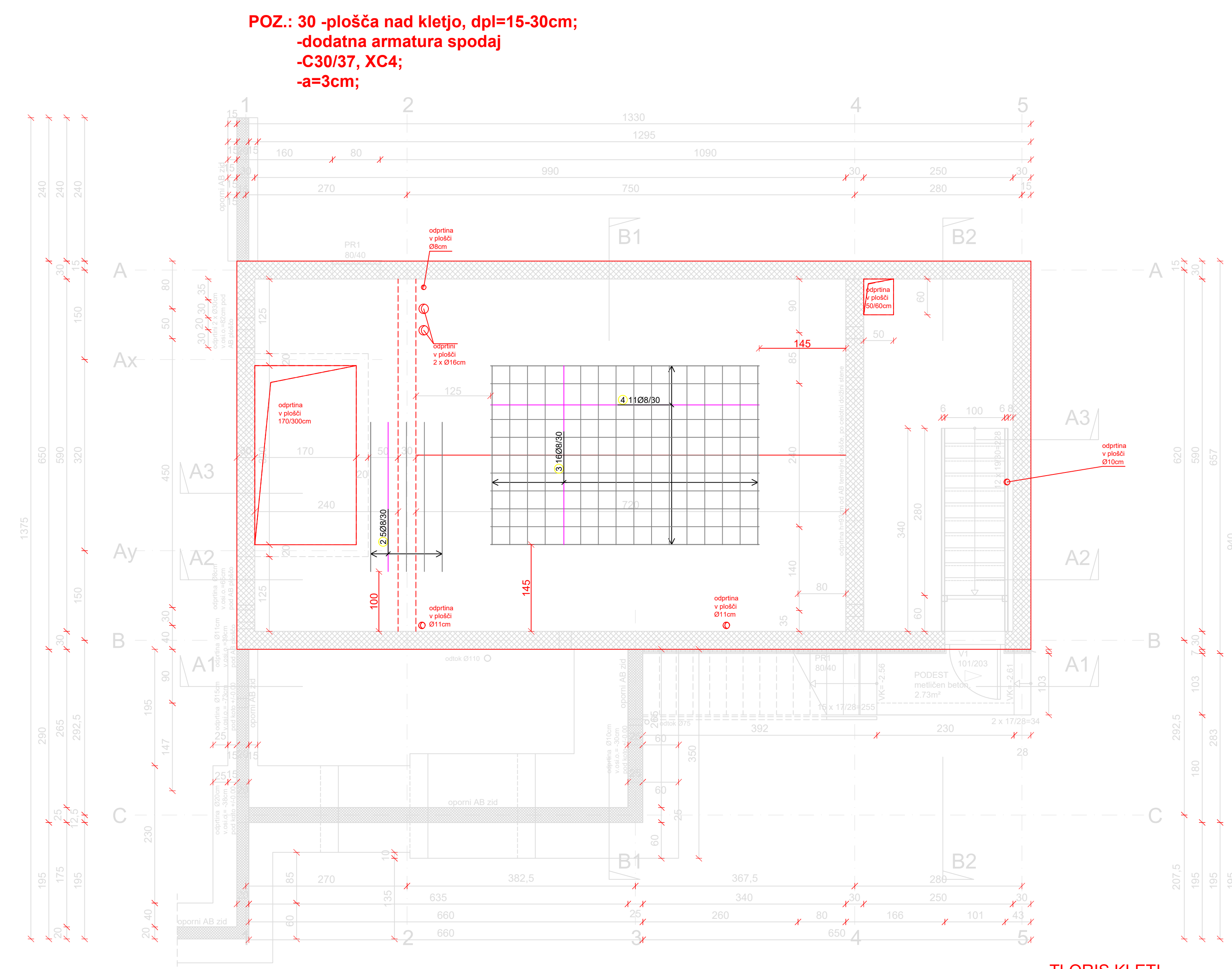
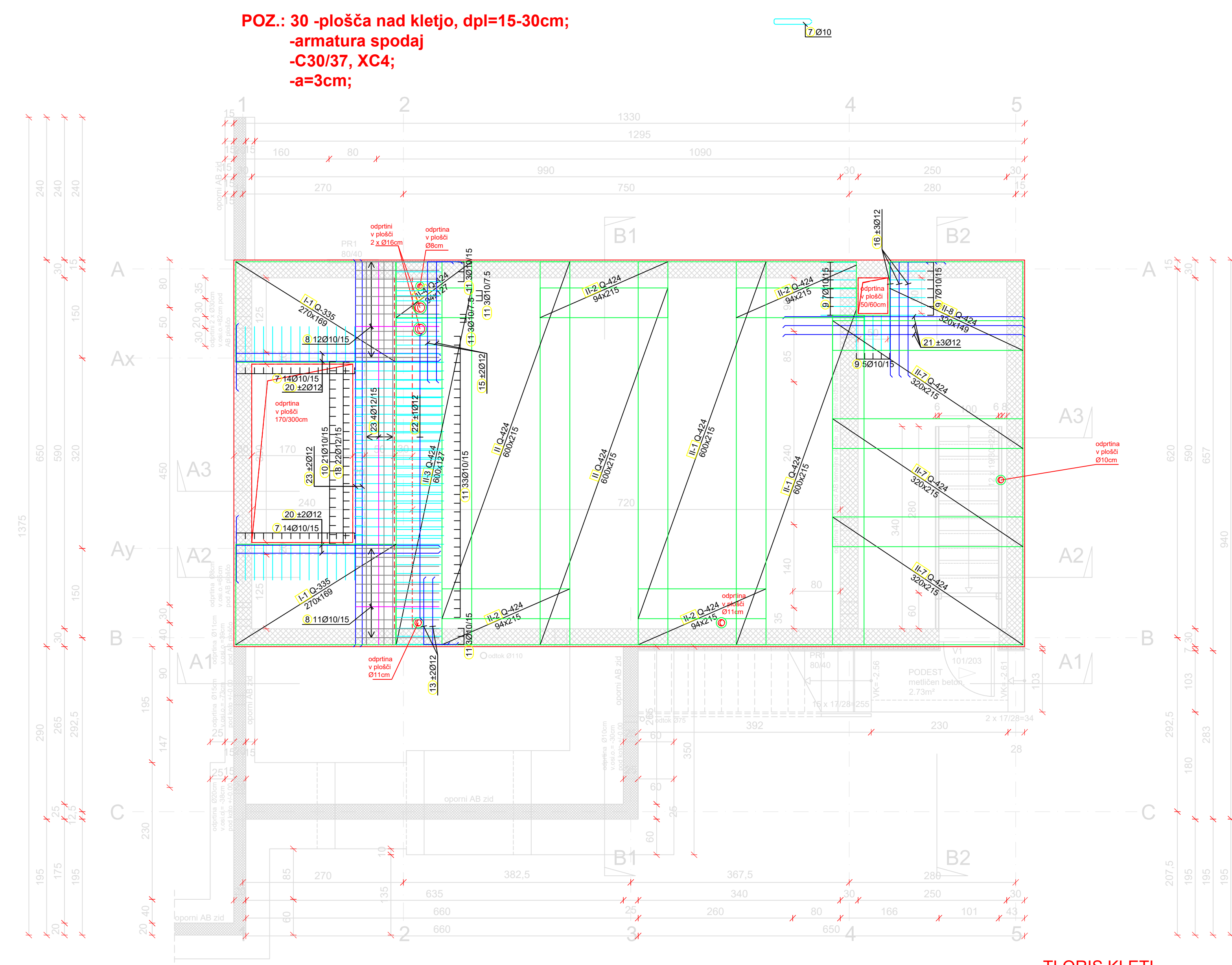
POZ.: ABS v osi A in B

projekant:	Projektno biro Velenje d.d.	naslov: Prešernova cesta 8, 3320 Velenje
objekt:	KOTLOVNICA Z ZALOGOVNIKOM	telefon: (03) 898-48-50
lokacija:	parcelna št. 959/1, 959/2 k.o. 2525 Ilirska Bistrica	e-mail: glavni@velenje.si
vrsta gradnje:	nova gradnja	vrsta projekta: projektna dokumentacija za izvedbo
investitor:	Dom starejših občanov Ilirska Bistrica	vrsta računa: 2.1 - načrt s področja gradbeništva
vrsta projekta:	Arhitekturni načrt	vrsta računa: 6710
avtor projekta:	Urša Lukar, dipl. inž. arh. PA	datum: maj 2023
avtor projekta:	Marko Marko, dipl. inž. grad. PI	avtor projekta: ARHITECTURNI NAČRT
avtor projekta:	Marko Marko	POZ.: ABS v osi A in B - STENE
avtor projekta:	Marko Marko	merilo: m = 1:50
avtor projekta:	Marko Marko	list: A02









POZ.: 30 -plošča na kletjo, dpl=15-30cm,


 $a=3\text{cm},$ 

C30/37 XC4,

S500B

Mere preveriti na kraju samem!!!  
 Odprtime preveriti na kraju samem!!!  
 SPECIFIKATORJE GLEJ IZVLEČEK ARMATURE!  
 PREVERITI VSE INSTALACIJSKE ODPRTIME Z  
 INSTALACIJSKIMI NAČRTI!!!

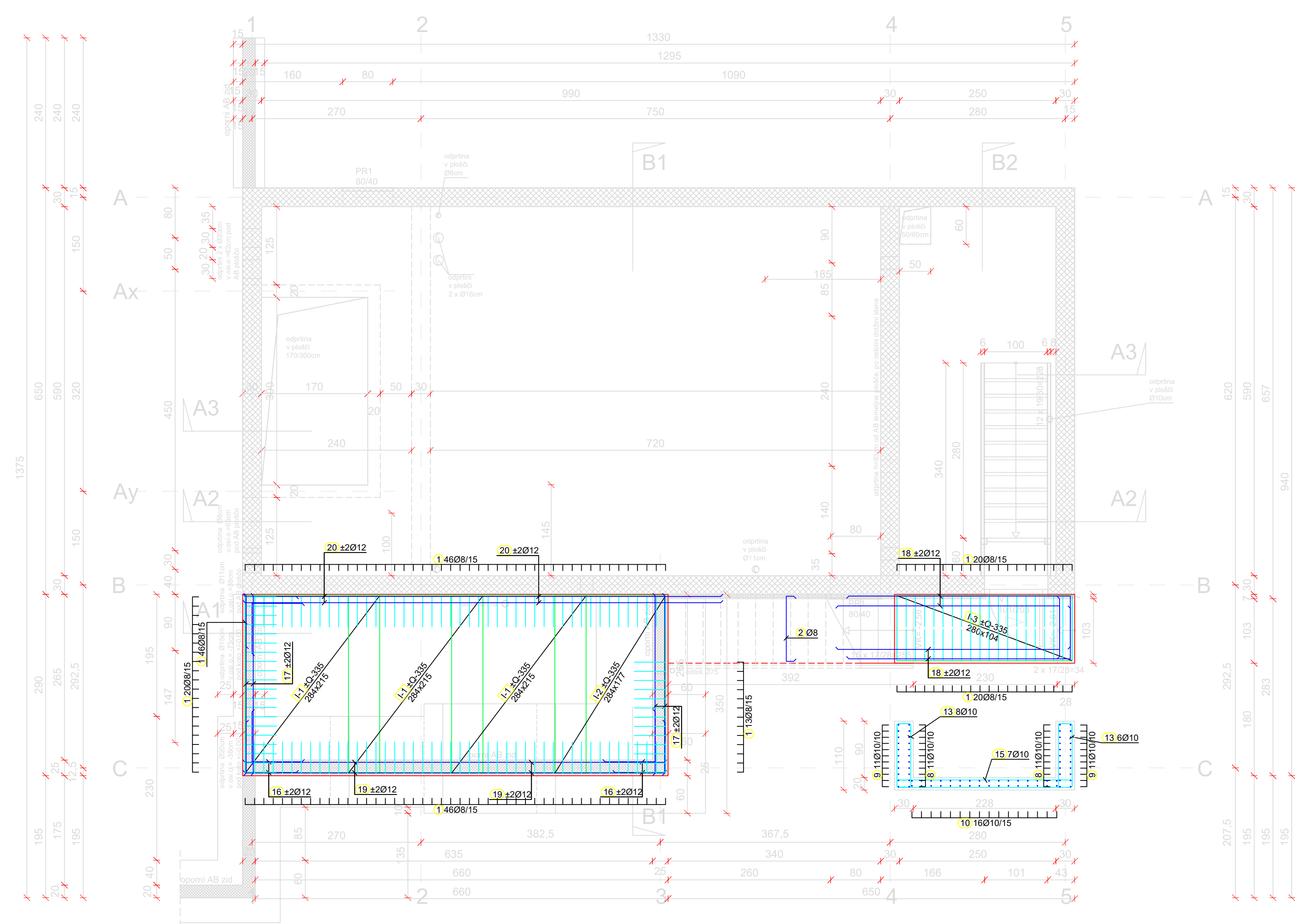
**POZ.: 30 -plošča nad kletjo**

projekat:		 <b>Projektivni biro Velenje d.d.</b>		naslov: Prehrambena cesta 8, 33020 Velenje telefon: (03) 9884 45 00 e-mail: pbiro@vbiroje.si	
zloženje	<b>KOTLOVNICA Z ZALOGOVIRKOM</b>			P21: projektna dokumentacija za izvedbo	
lokacije	parčeta št. 999/1, 999/2-c.o. 2525 Bistrica			P210	
novi gradnja	novo gradnja			P2101	
investitor	Društvo za občinski obhodi Bistrica Kotlovnica Bistrica 62096 Bistrica			P2102	
				P2103	
nadalje projektna dokumentacija za izvedbo			P2104		
izvedbeni deli			P2105		
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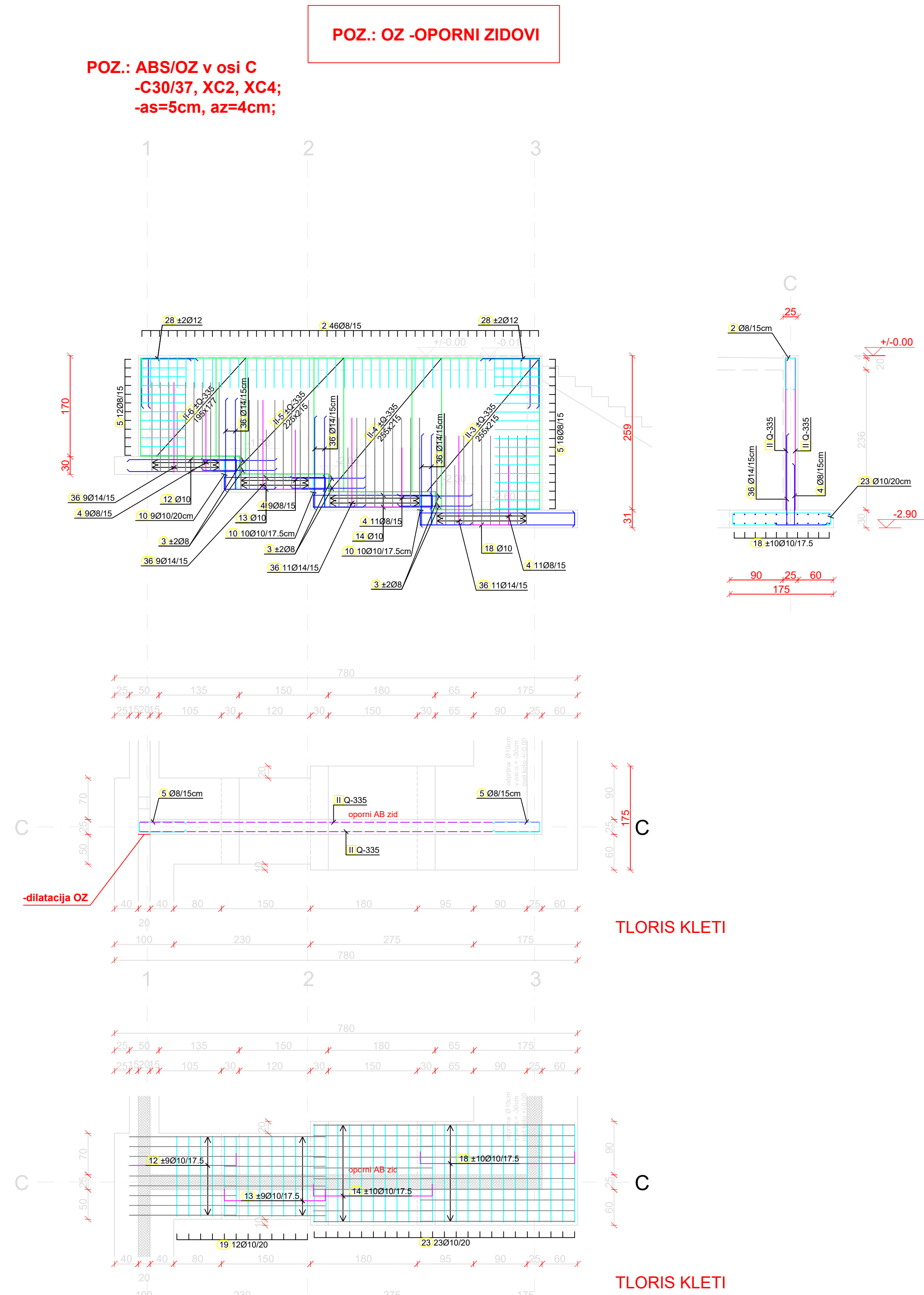
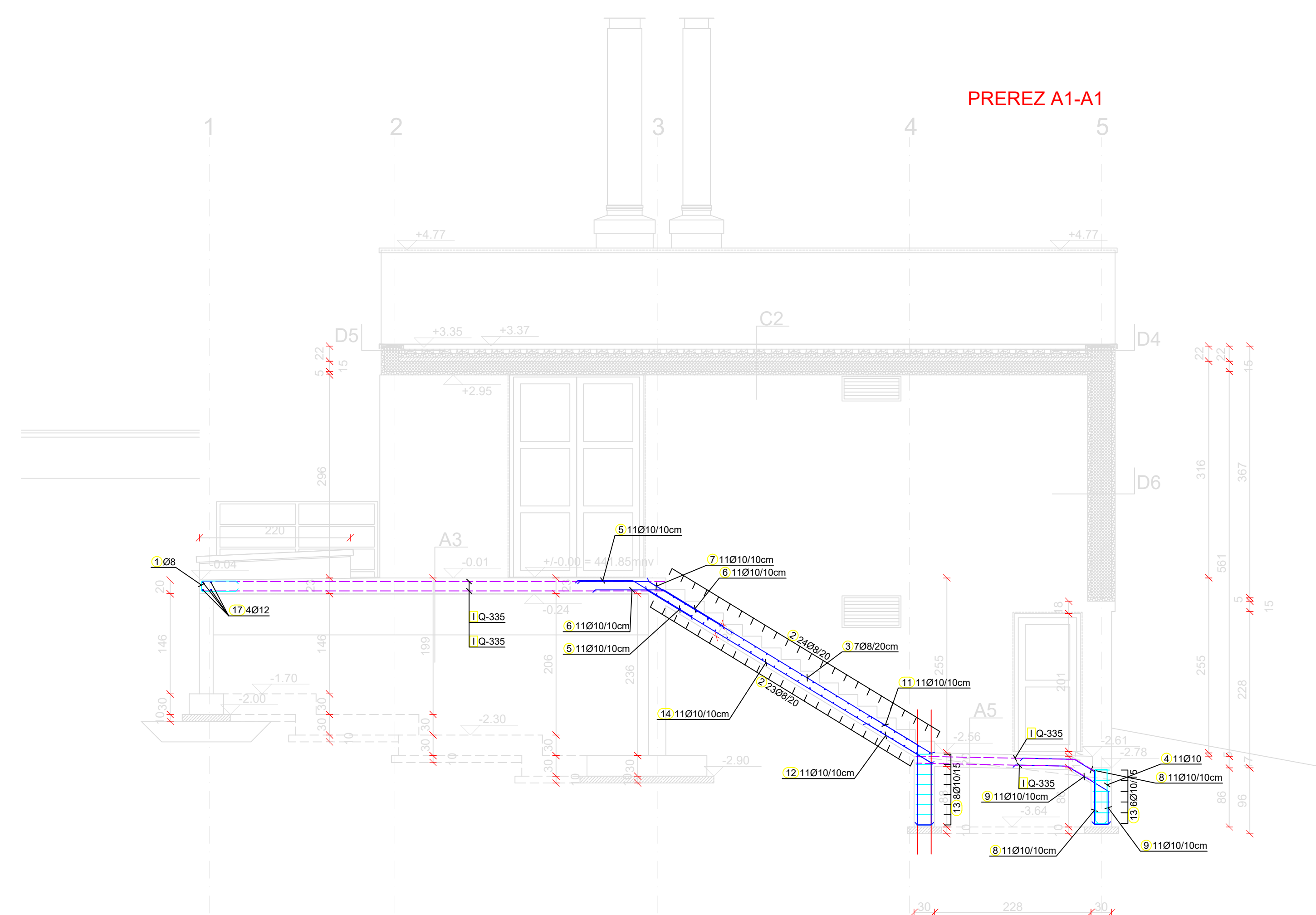


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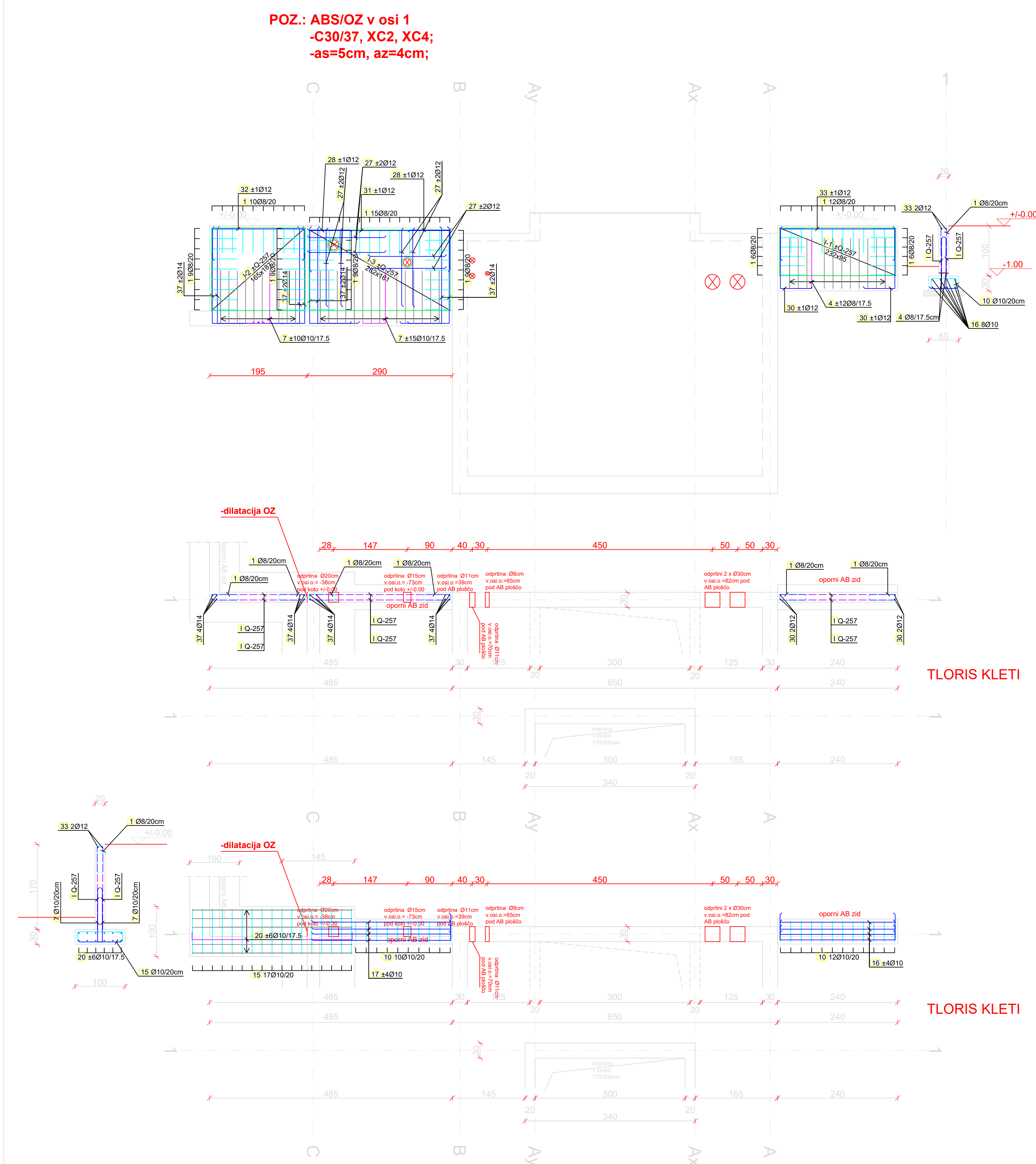


POZ.: ST -stopnice, dpl=20cm; + Pedesti + 30a  
-C30/37, XC4, XF3;  
-C35/45, XC4, XM1, XF4, XD3;(30a-plošča med objektom in opornim zidom)  
-a=4cm;



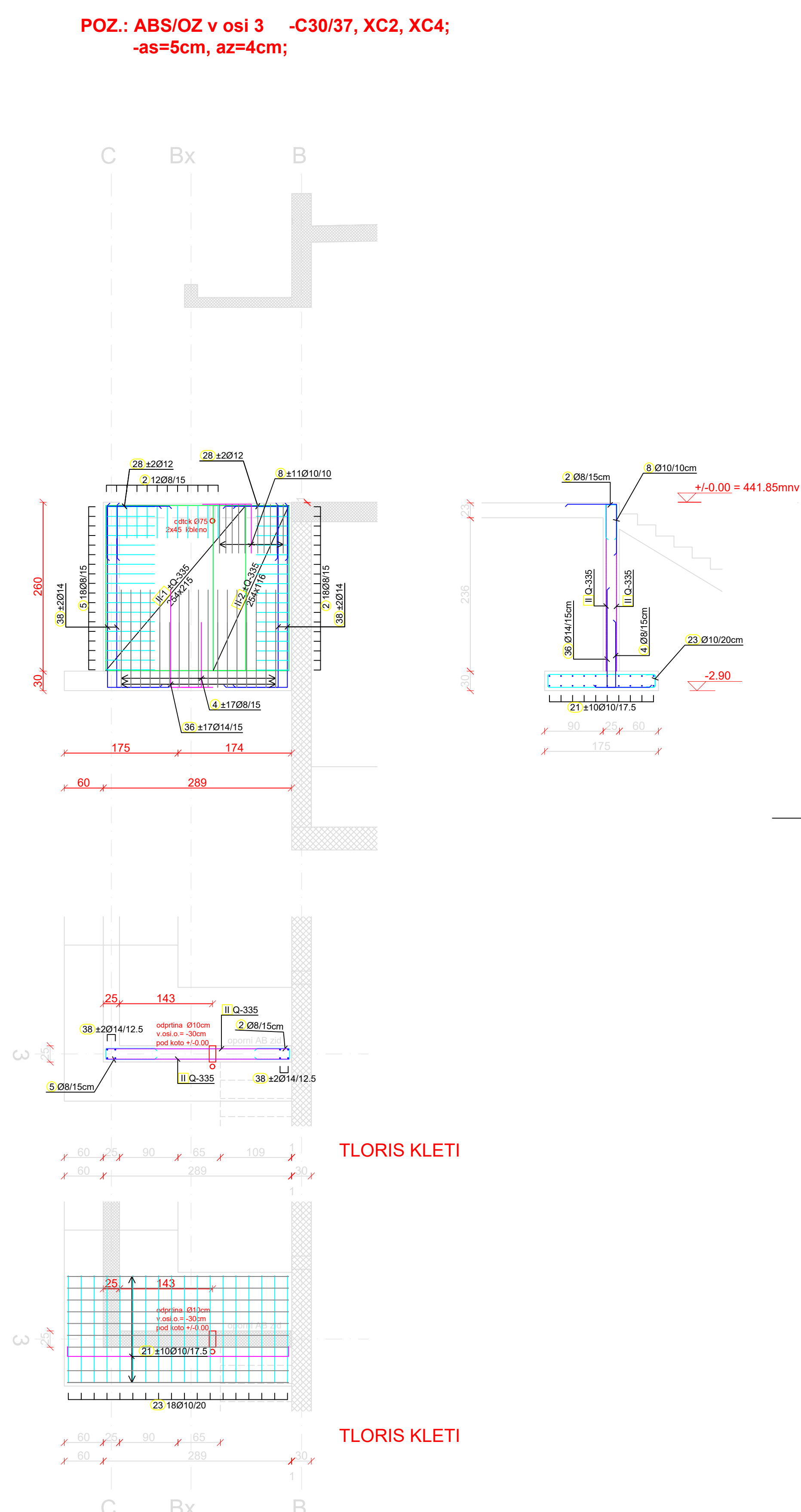
## TLORIS KLETI

## TLORIS KLETI



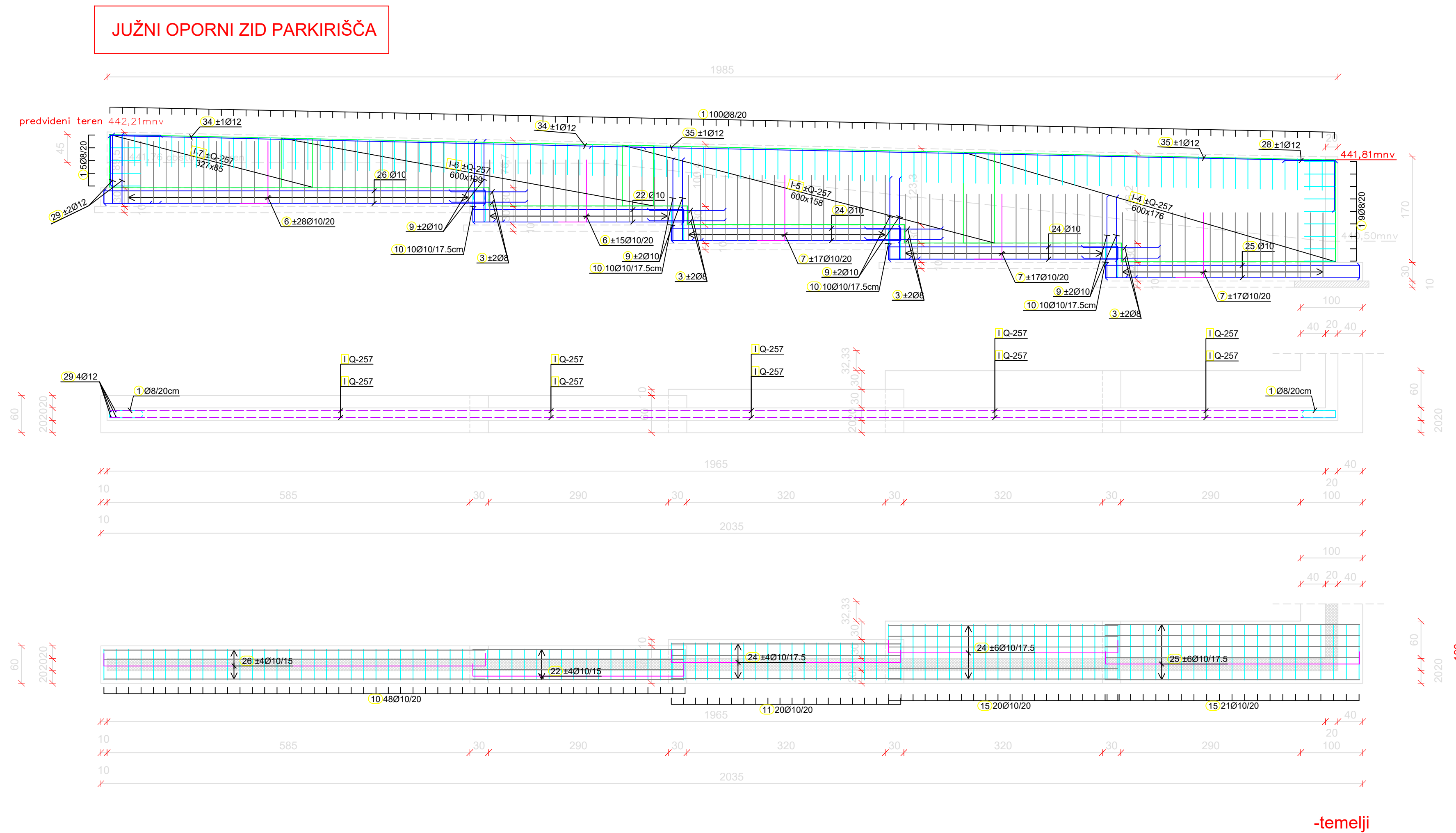
TLORIS KLET

TLORIS KLET



## TLORIS KLETI

## TLORIS KLETI



-temelji

POZ.: ST -stopnice,  
Podesti  
OZ -oporni zidovi

$$\begin{aligned}as &= 5\text{cm}, \\az &= 4\text{cm},\end{aligned}$$

C30/37 XC4, XF3;  
C35/45 XC4, XF4, XM1, XD3; (Plošča med objektom in OZ)

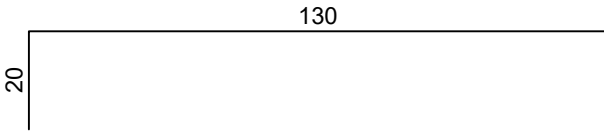
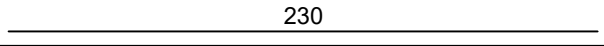
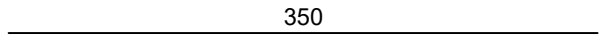
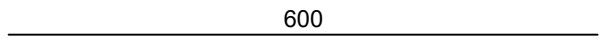
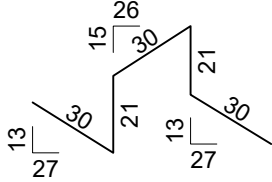
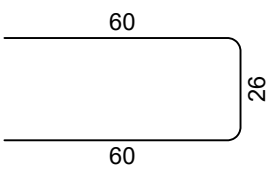
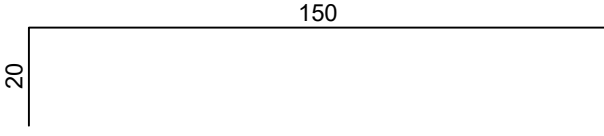
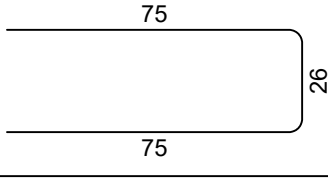
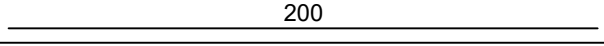
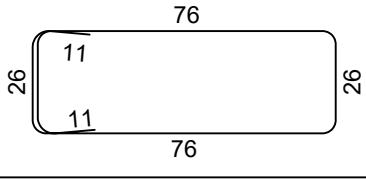
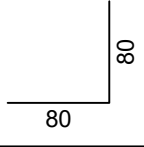
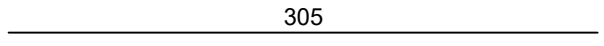
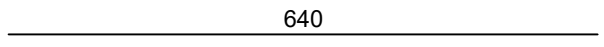
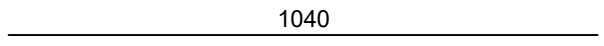
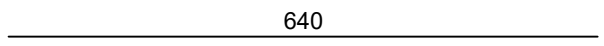
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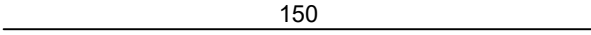
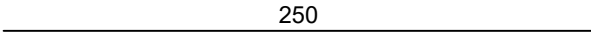
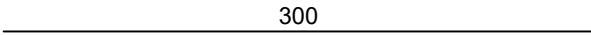
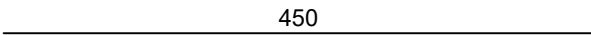
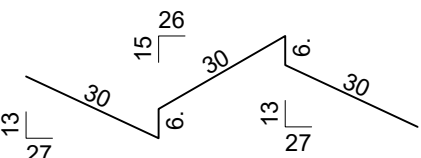
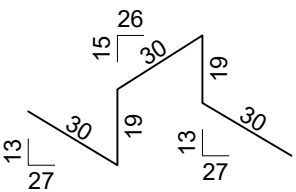
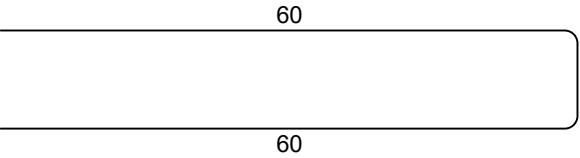
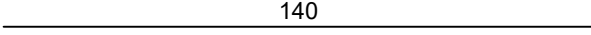
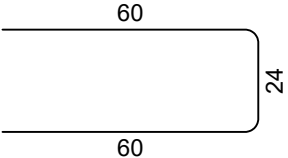
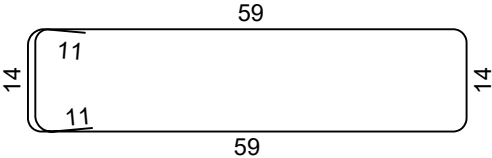
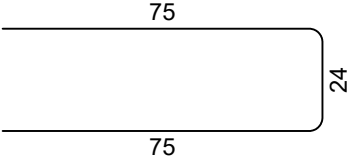
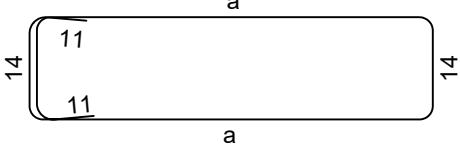
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 Odprtine preveriti na kraju samem!!!  
 SPECIFIKATORJE GLEJ IZVLEČEK ARMATURE!  
 PREVERITI VSE INSTALACIJSKE ODPRTINE Z  
 INSTALACIJSKIMI NAČRTI!!!!

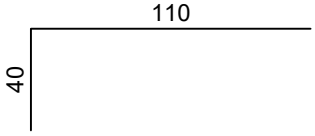
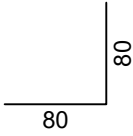
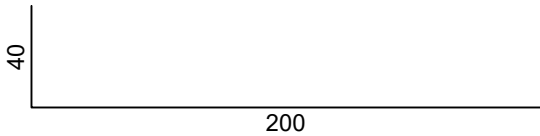
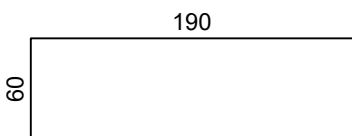
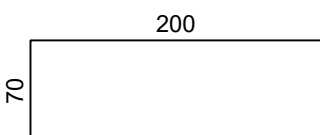
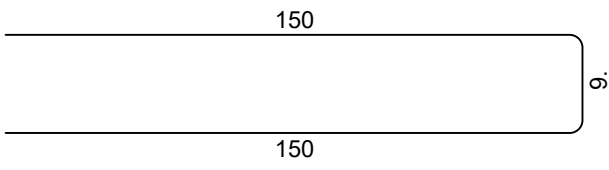
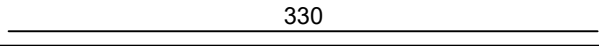
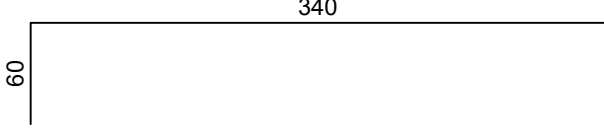
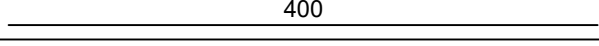
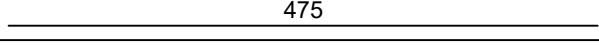
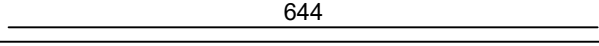
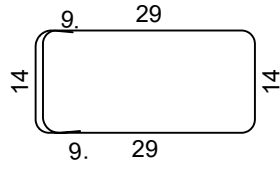
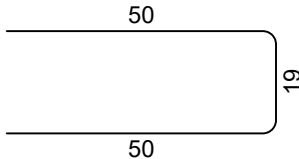
**POZ.: ST -stopnice**  
**Podesti**  
**OZ -oporni zidovi**

[illegible]



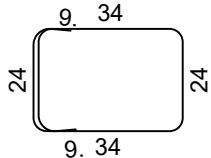
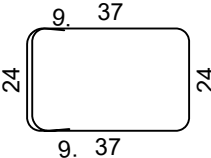
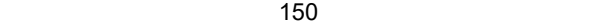
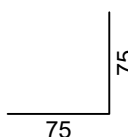
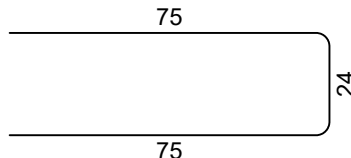
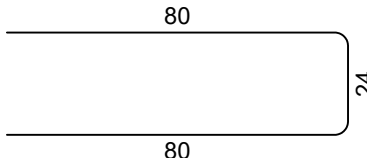
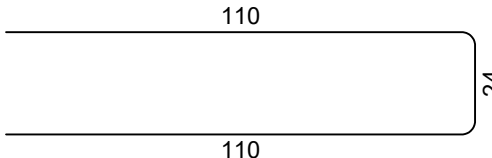
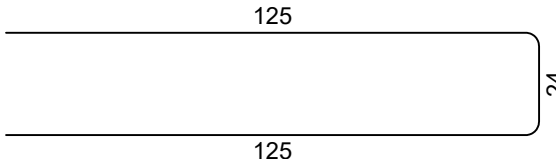
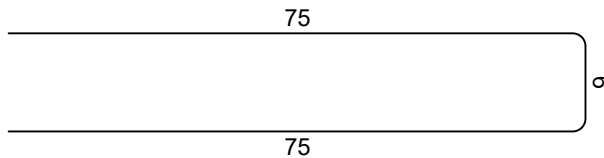
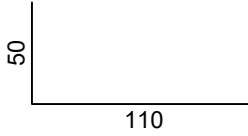
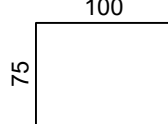
Palice - specifikacija					
ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lg <sub>n</sub> [m]
POZ.: TP -temeljna plošča, dpl=35cm; (1 kos)					
1		8	1.50	34	51.00
2		8	2.30	13	29.90
3		8	3.50	9	31.50
4		8	6.00	98	588.00
5		10	1.32	190	250.80
6		10	1.46	270	394.20
7		10	1.70	110	187.00
8		10	1.76	130	228.80
9		10	2.00	22	44.00
10		10	2.52	65	163.80
11		12	1.60	32	51.20
12		12	3.05	8	24.40
13		12	6.40	4	25.60
14		12	10.40	8	83.20
15		16	6.40	10	64.00

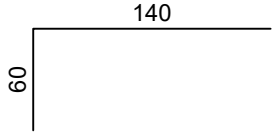
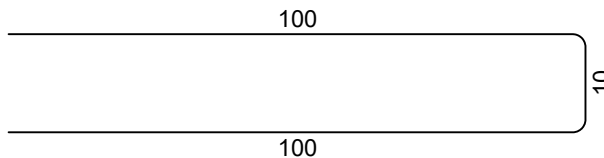
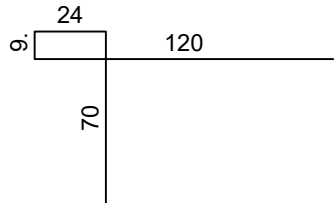
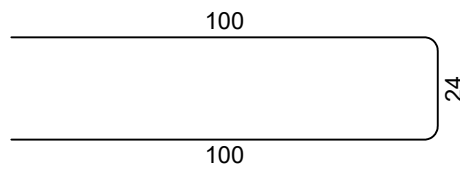
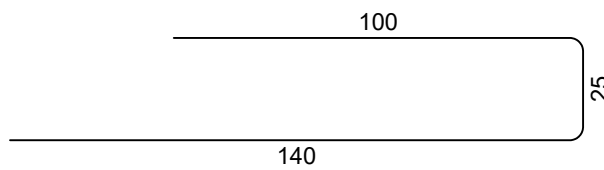
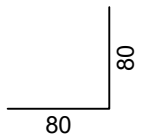
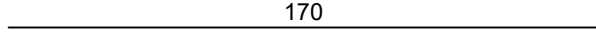
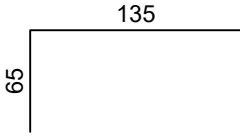
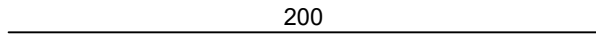
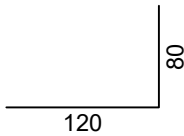
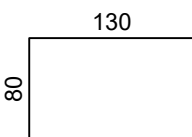

Palice - specifikacija					
ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lg <sub>n</sub> [m]
POZ.: 30 -plošča nad kletjo, dpl=15-30cm; (1 kos)					
1		8	1.50	20	30.00
2		8	2.50	5	12.50
3		8	3.00	16	48.00
4		8	4.50	11	49.50
5		10	1.02	16	16.32
6		10	1.28	150	192.00
7		10	1.29	28	36.12
8		10	1.40	23	32.20
9		10	1.44	19	27.36
10		10	1.82	21	38.22
11		10	1.74	45	78.30
12	 2 x : a = 58, 57, 57, 56, 56, 55, 54, 54, 53, 52, 52, 51, 50	10	*1.72	2 x 13	44.84

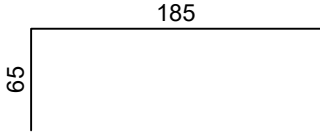
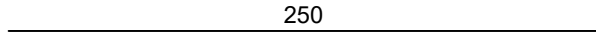
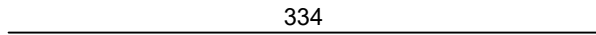
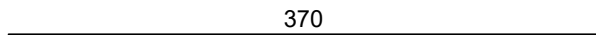
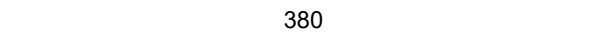

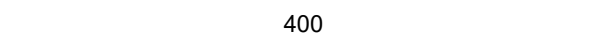
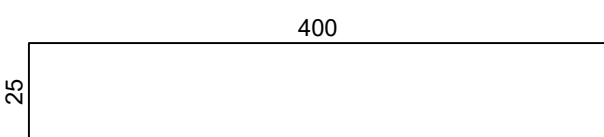
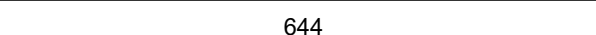
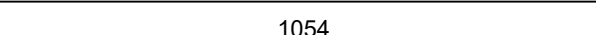
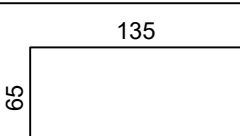
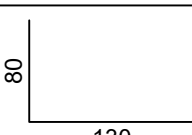
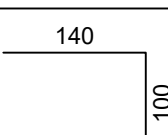
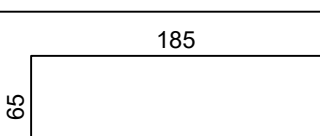
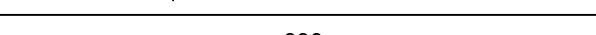
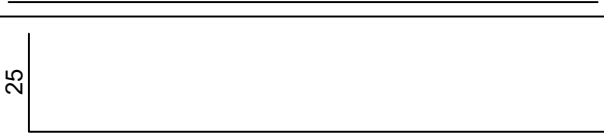
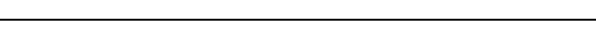
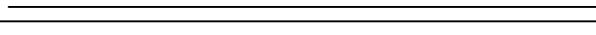
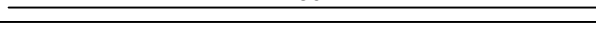
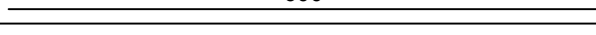
Palice - specifikacija					
ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]
13		12	1.50	4	6.00
14		12	1.60	32	51.20
15		12	2.40	4	9.60
16		12	2.50	6	15.00
17		12	2.70	16	43.20
18		12	3.09	22	67.98
19		12	3.30	8	26.40
20		12	4.00	8	32.00
21		12	4.00	6	24.00
22		12	4.75	2	9.50
23		12	6.44	8	51.52
POZ.: 10-20 -strešna plošča + napušč (1 kos)					
1		8	1.18	102	120.36
2		8	1.19	60	71.40

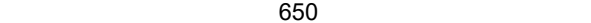
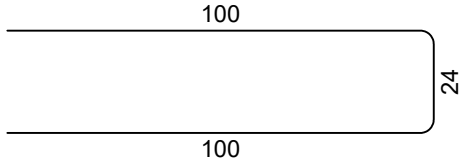
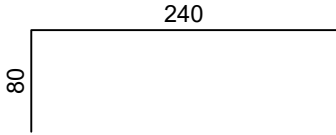
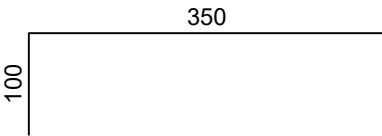

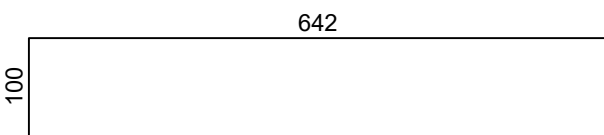
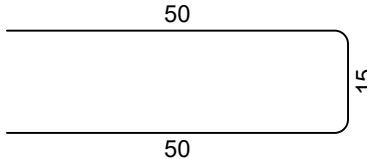
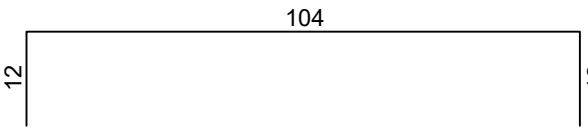
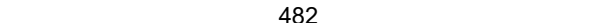
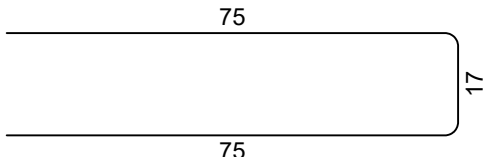
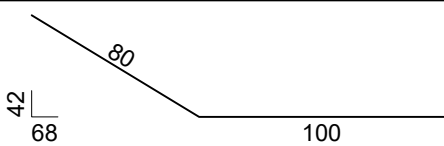
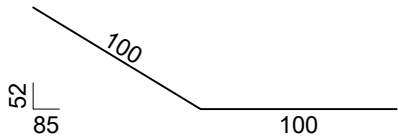
Palice - specifikacija					
ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lg <sub>n</sub> [m]
3		10	1.00	38	38.00
4		10	1.20	150	180.00
5		10	1.29	158	203.82
6		12	1.60	24	38.40
7		12	1.70	4	6.80
8		12	2.20	42	92.40
9		12	2.45	4	9.80
10		12	10.50	6	63.00
POZ.: ABS v oseh - AB STENE (1 kos)					
1		8	0.93	5	4.65
2		8	1.18	12	14.16
3		8	1.24	473	586.52

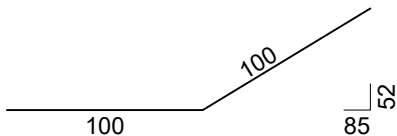
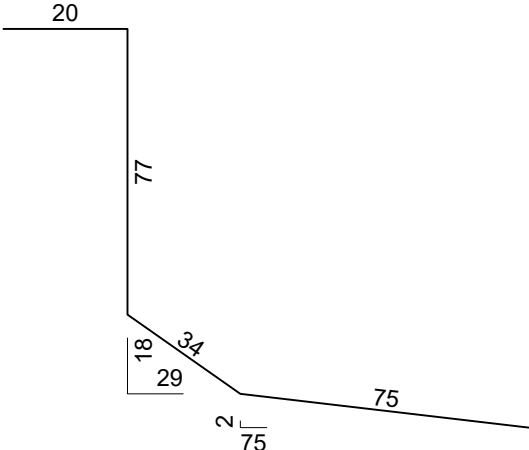
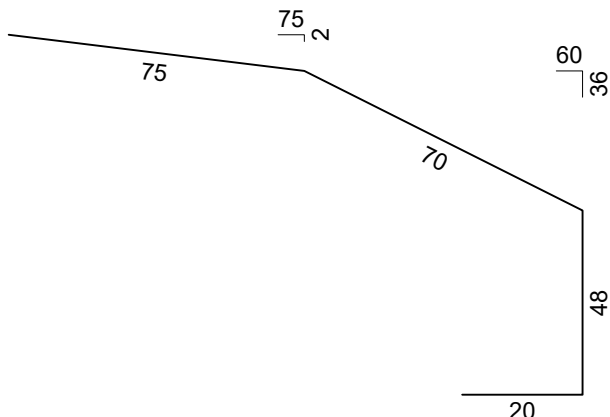
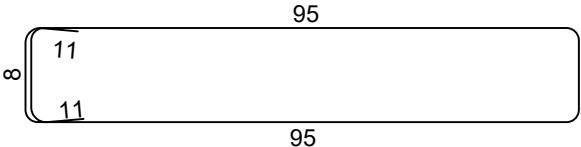
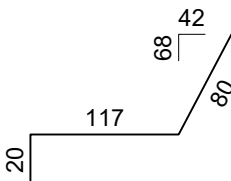
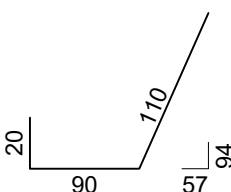
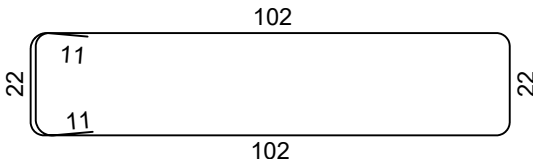


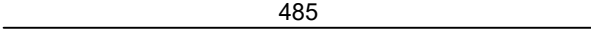
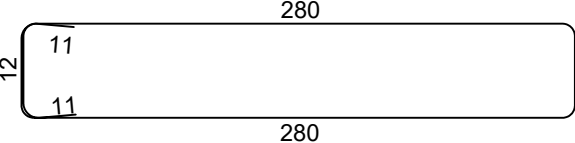

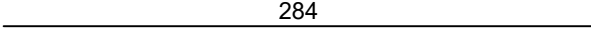
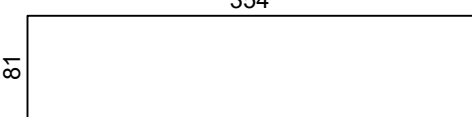
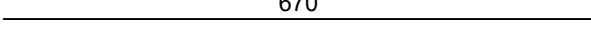
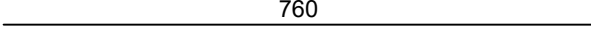
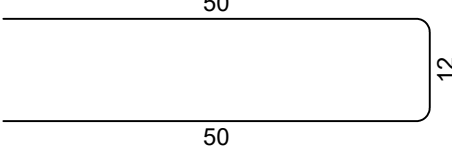
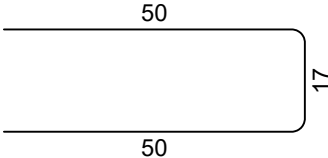
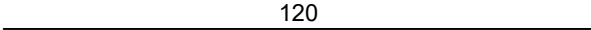
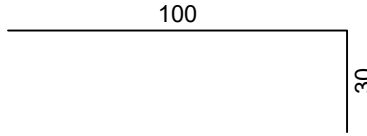
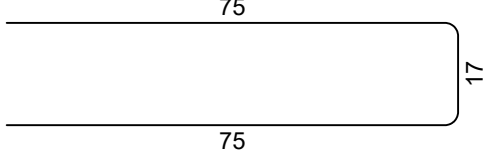
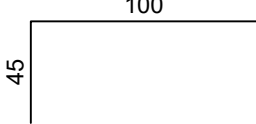
Palice - specifikacija					
ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lg <sub>n</sub> [m]
4		8	1.58	22	34.76
5		8	1.64	26	42.64
6		8	1.50	36	54.00
7		8	1.50	201	301.50
8		8	1.74	773	1345.02
9		8	1.84	17	31.28
10		8	2.44	17	41.48
11		8	2.74	64	175.36
12		10	1.59	12	19.08
13		10	1.60	236	377.60
14		10	1.75	154	269.50

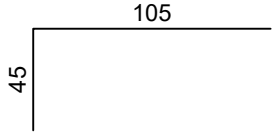
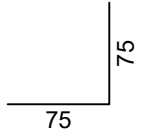
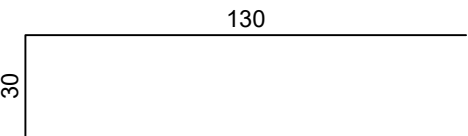
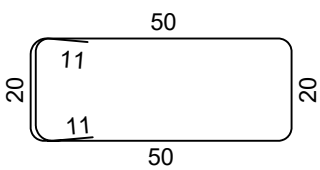

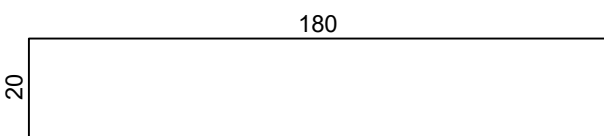
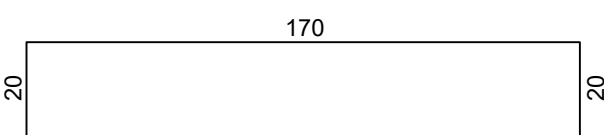
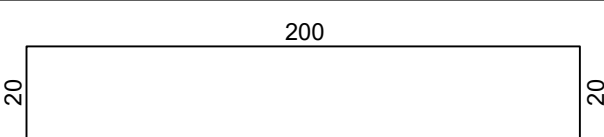
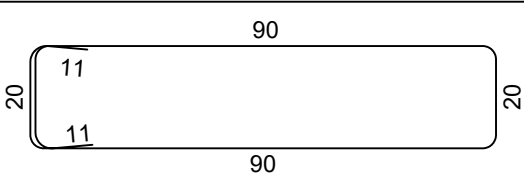
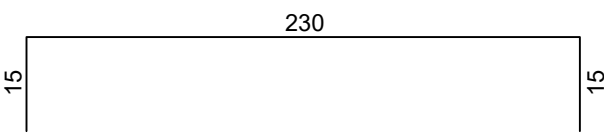
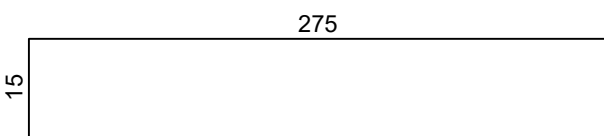
Palice - specifikacija					
ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lg <sub>n</sub> [m]
15		10	2.00	192	384.00
16		10	2.10	7	14.70
17		10	2.23	15	33.45
18		10	2.24	40	89.60
19		10	2.65	8	21.20
20		12	1.60	12	19.20
21		12	1.70	18	30.60
22		12	2.00	193	386.00
23		12	2.00	62	124.00
24		12	2.00	10	20.00
25		12	2.10	16	33.60
26		12	2.20	4	8.80

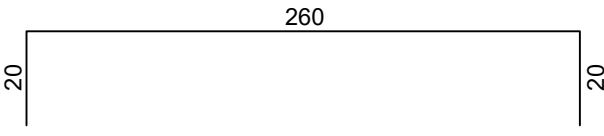
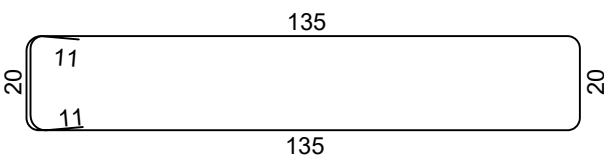
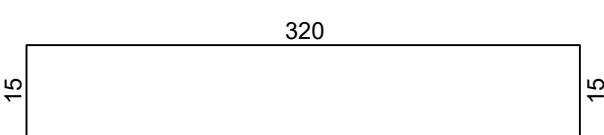
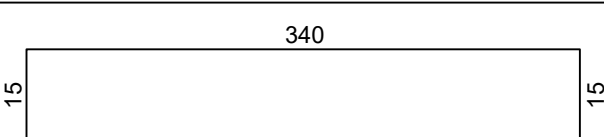
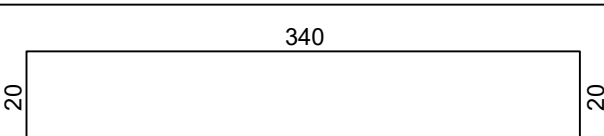
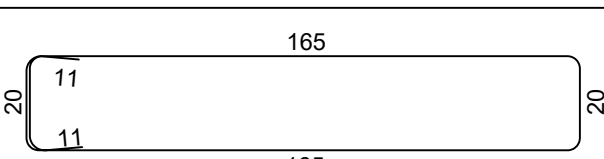
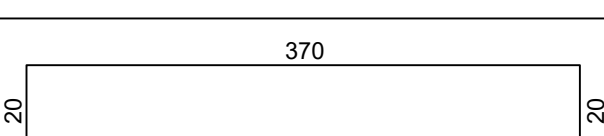
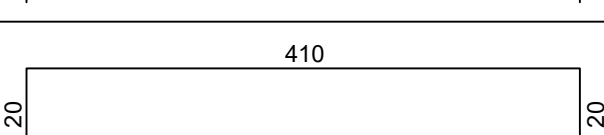
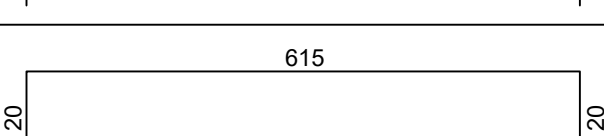
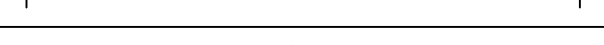
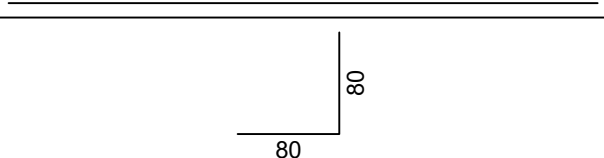
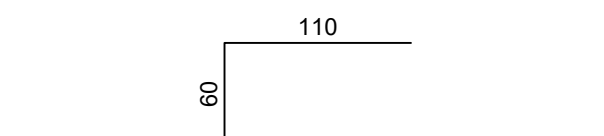
Palice - specifikacija					
ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]
27		12	2.50	85	212.50
28		12	2.50	28	70.00
29		12	3.34	7	23.38
30		12	3.70	4	14.80
31		12	3.80	16	60.80
32		12	3.90	18	70.20
33		12	4.00	2	8.00
34		12	4.25	2	8.50
35		12	6.44	29	186.76
36		12	10.54	26	274.04
37		14	2.00	16	32.00
38		14	2.10	18	37.80
39		14	2.40	92	220.80
40		14	2.50	34	85.00
41		14	3.30	4	13.20
42		14	4.25	2	8.50
43		14	4.70	54	253.80
44		14	4.80	16	76.80
45		14	6.00	32	192.00
46		14	6.44	27	173.88

Palice - specifikacija					
ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lg <sub>n</sub> [m]
47		14	6.50	20	130.00
48		16	2.24	14	31.36
49		16	3.20	6	19.20
50		16	4.50	12	54.00
51		16	6.44	15	96.60
52		16	7.42	9	66.78
POZ.: ST -stopnice, drame=20cm + Podesti +30a (1 kos)					
1		8	1.15	165	189.75
2		8	1.28	47	60.16
3		8	4.82	7	33.74
4		10	1.67	11	18.37
5		10	1.80	11	19.80
6		10	2.00	11	22.00

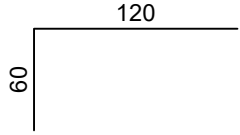
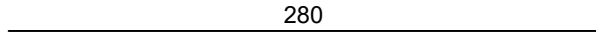
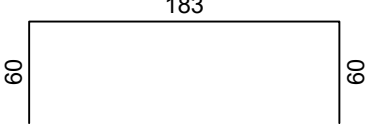
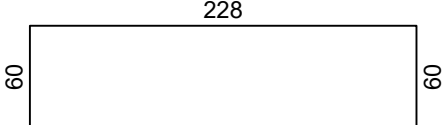
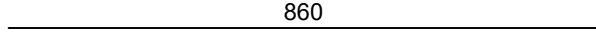
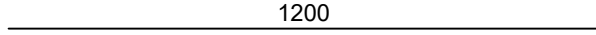
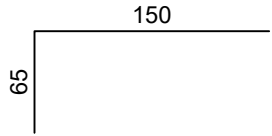
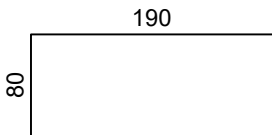
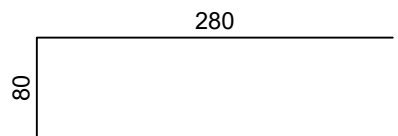
Palice - specifikacija					
ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lg <sub>n</sub> [m]
7		10	2.00	11	22.00
8		10	2.06	11	22.66
9		10	2.13	11	23.43
10		10	2.36	16	37.76
11		10	2.17	11	23.87
12		10	2.20	11	24.20
13		10	2.92	28	81.76

Palice - specifikacija					
ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lg <sub>n</sub> [m]
14		10	4.85	11	53.35
15		10	6.18	7	43.26
16		12	1.60	12	19.20
17		12	2.84	8	22.72
18		12	4.35	8	34.80
19		12	6.70	4	26.80
20		12	7.60	4	30.40
POZ.: ABS/OZ v oseh - oporni zidovi (1 kos)					
1		8	1.12	199	222.88
2		8	1.17	76	88.92
3		8	1.20	28	33.60
4		8	1.30	98	127.40
5		8	1.67	48	80.16
6		10	1.45	86	124.70

Palice - specifikacija					
ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lg <sub>n</sub> [m]
7		10	1.50	152	228.00
8		10	1.50	22	33.00
9		10	1.60	16	25.60
10		10	1.82	139	252.98
11		10	2.02	20	40.40
12		10	2.00	18	36.00
13		10	2.10	18	37.80
14		10	2.40	20	48.00
15		10	2.62	58	151.96
16		10	2.60	8	20.80
17		10	2.90	8	23.20

Palice - specifikacija					
ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lg <sub>n</sub> [m]
18		10	3.00	20	60.00
19		10	3.52	12	42.24
20		10	3.50	12	42.00
21		10	3.70	20	74.00
22		10	3.80	8	30.40
23		10	4.12	41	168.92
24		10	4.10	20	82.00
25		10	4.50	12	54.00
26		10	6.55	8	52.40
27		12	1.50	16	24.00
28		12	1.60	24	38.40
29		12	1.70	4	6.80



Palice - specifikacija					
ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lg <sub>n</sub> [m]
30		12	1.80	4	7.20
31		12	2.80	2	5.60
32		12	3.03	2	6.06
33		12	3.48	2	6.96
34		12	8.60	2	17.20
35		12	12.00	2	24.00
36		14	2.15	74	159.10
37		14	2.70	16	43.20
38		14	3.60	8	28.80

Palice - izvleček			
Ø [mm]	lgn [m]	Teža enote [kg/m']	Teža [kg]
B500B			
8	4500.14	0.41	1840.56
10	5385.77	0.65	3495.36
12	2552.52	0.92	2348.32
14	1454.88	1.25	1821.51
16	331.94	1.64	543.72
Skupaj (B500B)			10049.47
Skupaj			10049.47

Mreže - specifikacija						
Pozicija	Oznaka mreže	B [cm]	L [cm]	n	Teža enote [kg/m2]	Skupna teža [kg]
POZ.: TP -temeljna plošča, dpl=35cm; (1 kos)						
I	Q-503	215	600	12	7.90	1222.92
I-1	Q-503	215	305	6	7.90	310.83
I-2	Q-503	145	305	2	7.90	69.88
I-3	Q-503	215	90	12	7.90	183.44
Skupaj						1787.06
POZ.: 30 -plošča nad kletjo, dpl=15-30cm; (1 kos)						
I-1	Q-335	169	270	4	5.33	97.21
II	Q-424	215	600	3	6.73	260.45
II-1	Q-424	215	600	7	6.73	607.72
II-2	Q-424	215	94	10	6.73	136.01
II-3	Q-424	127	600	1	6.73	51.28
II-4	Q-424	127	94	1	6.73	8.03
II-5	Q-424	64	600	1	6.73	25.84
II-6	Q-424	64	94	1	6.73	4.05
II-7	Q-424	215	320	3	6.73	138.91
II-8	Q-424	149	320	1	6.73	32.09
Skupaj						1361.59
POZ.: 10-20 -strešna plošča + napušč (1 kos)						
I-1	Q-221	189	600	1	3.48	39.46
I-2	Q-221	189	504	1	3.48	33.15
II	Q-335	215	600	4	5.33	275.03
II-1	Q-335	215	94	6	5.33	64.63
II-2	Q-335	215	600	2	5.33	137.51
II-3	Q-335	64	600	1	5.33	20.47
II-4	Q-335	64	94	1	5.33	3.21
II-5	Q-335	215	270	4	5.33	123.76
II-6	Q-335	215	200	10	5.33	229.19
II-7	Q-335	180	200	2	5.33	38.27
II-8	Q-335	100	200	2	5.33	21.21
III-1	Q-424	215	189	6	6.73	164.08
III-2	Q-424	64	189	1	6.73	8.14
Skupaj						1158.12
POZ.: ABS v oseh - AB STENE (1 kos)						
I-1	Q-335	215	471	32	5.33	1727.18
I-2	Q-335	64	471	4	5.33	64.27
I-3	Q-335	149	471	2	5.33	74.81
II	Q-424	215	600	8	6.73	694.54
II-1	Q-424	215	481	4	6.73	278.39
II-2	Q-424	215	575	20	6.73	1663.99

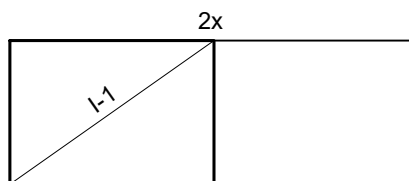
Mreže - specifikacija						
Pozicija	Oznaka mreže	B [cm]	L [cm]	n	Teža enote [kg/m2]	Skupna teža [kg]
II-3	Q-424	215	75	8	6.73	86.82
II-4	Q-424	170	600	4	6.73	274.58
II-5	Q-424	170	75	2	6.73	17.16
II-6	Q-424	215	600	2	6.73	173.63
II-7	Q-424	71	75	2	6.73	7.17
II-8	Q-424	139	75	2	6.73	14.03
II-9	Q-424	215	522	6	6.73	453.50
II-10	Q-424	149	481	2	6.73	96.47
II-11	Q-424	149	600	2	6.73	120.33
II-12	Q-424	149	75	2	6.73	15.04
II-13	Q-424	215	471	6	6.73	408.91
II-14	Q-424	149	259	2	6.73	51.94
III-1	Q-503	215	401	4	7.90	272.43
III-2	Q-503	149	401	2	7.90	94.40
Skupaj						6589.59
POZ.: ST -stopnice, drame=20cm + Podesti +30a (1 kos)						
I-1	Q-335	215	284	6	5.33	195.27
I-2	Q-335	177	284	2	5.33	53.59
I-3	Q-335	104	280	2	5.33	31.04
Skupaj						279.90
POZ.: ABS/OZ v oseh - oporni zidovi (1 kos)						
I-1	Q-257	95	232	2	4.11	18.12
I-2	Q-257	187	165	2	4.11	25.36
I-3	Q-257	161	282	2	4.11	37.32
I-4	Q-257	176	600	2	4.11	86.99
I-5	Q-257	158	600	2	4.11	77.83
I-6	Q-257	109	600	2	4.11	53.88
I-7	Q-257	85	327	2	4.11	22.85
II-1	Q-335	215	254	2	5.33	58.21
II-2	Q-335	116	254	2	5.33	31.54
II-3	Q-335	215	255	2	5.33	58.44
II-4	Q-335	215	255	2	5.33	58.44
II-5	Q-335	215	225	2	5.33	51.57
II-6	Q-335	177	195	2	5.33	36.79
Skupaj						617.36

Mreže - izvleček					
Oznaka mreže	B [cm]	L [cm]	n	Teža enote [kg/m <sup>2</sup> ]	Skupna teža [kg]
Q-221	215	600	2	3.48	89.78
Q-257	215	600	9	4.11	477.17
Q-335	215	600	62	5.33	4262.93
Q-424	215	600	74	6.73	6424.46
Q-503	215	600	26	7.90	2649.66
Skupaj					13904.01

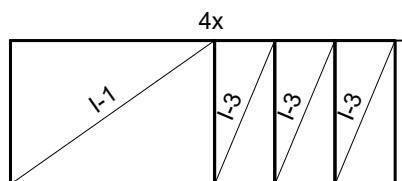
Mreže - načrt razreza

POZ.: TP - temeljna plošča, dpl=35cm;

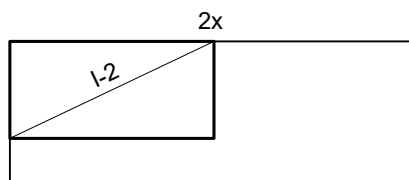
Q-503 (600 cm x 215 cm)



I-1 305 x 215



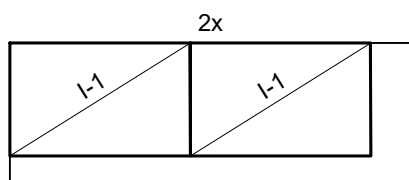
I-1 305 x 215  
I-3 90 x 215  
I-3 90 x 215  
I-3 90 x 215



I-2 305 x 145

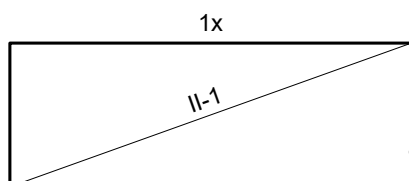
POZ.: 30 -plošča nad kletjo, dpl=15-30cm;

Q-335 (600 cm x 215 cm)

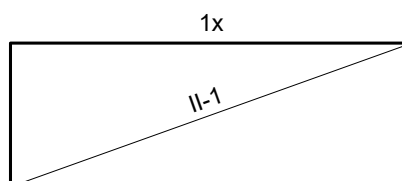


I-1 270 x 169  
I-1 270 x 169

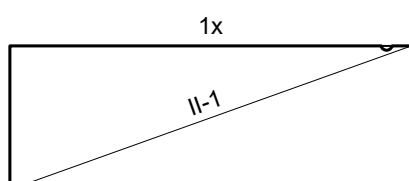
Q-424 (600 cm x 215 cm)



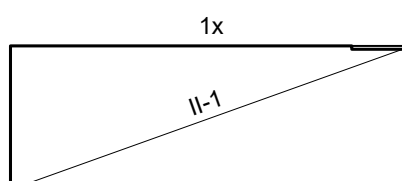
II-1 600 x 215



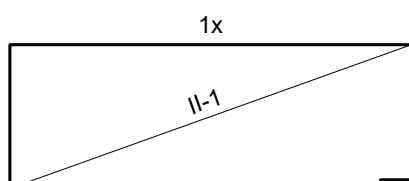
II-1 600 x 215



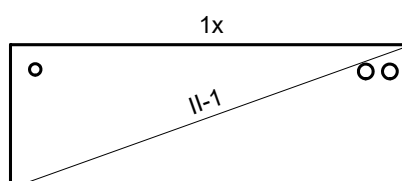
II-1 600 x 215



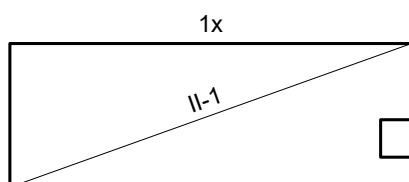
II-1 600 x 215



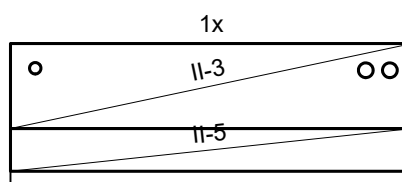
II-1 600 x 215



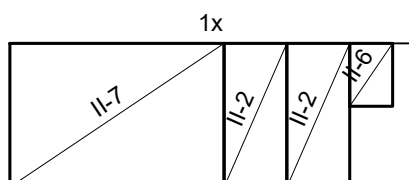
II-1 600 x 215



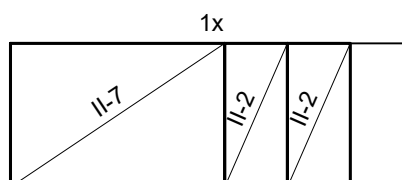
II-1 600 x 215



II-3 600 x 127  
II-5 600 x 64

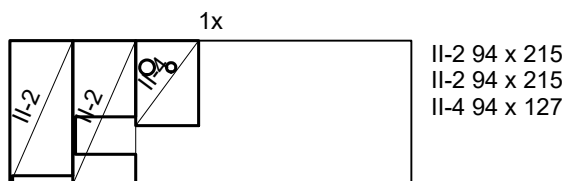
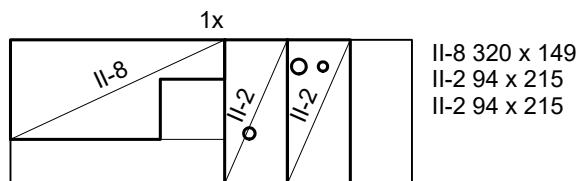
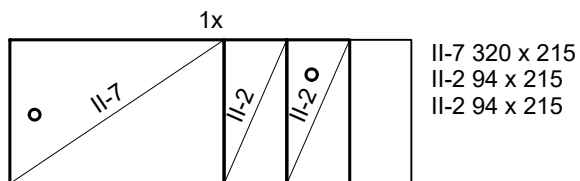


II-7 320 x 215  
II-2 94 x 215  
II-2 94 x 215  
II-6 94 x 64



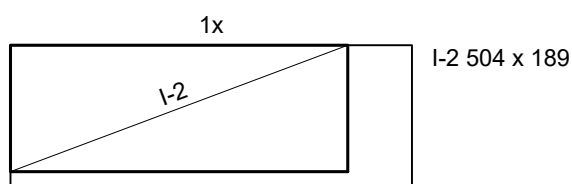
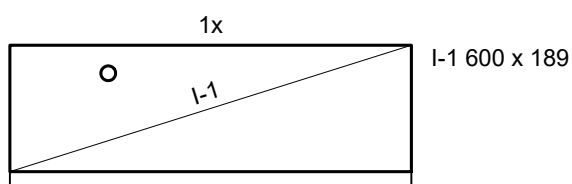
II-7 320 x 215  
II-2 94 x 215  
II-2 94 x 215

## Mreže - načrt razreza

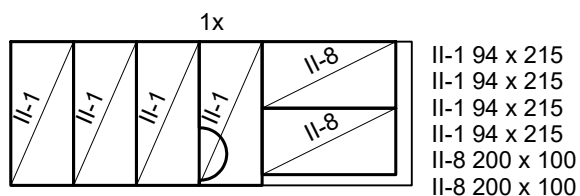
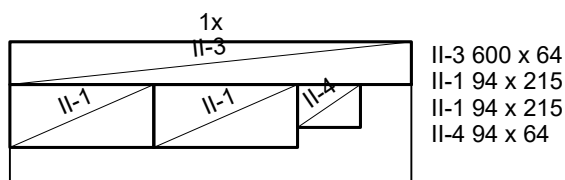
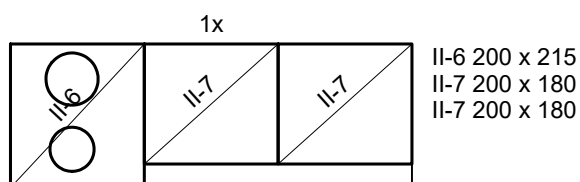
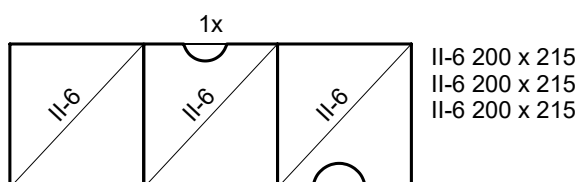
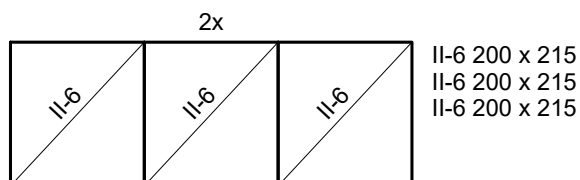
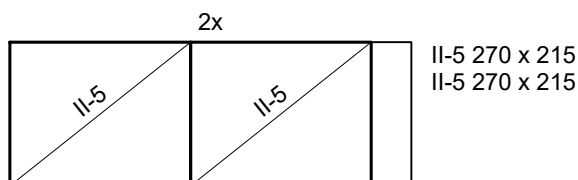
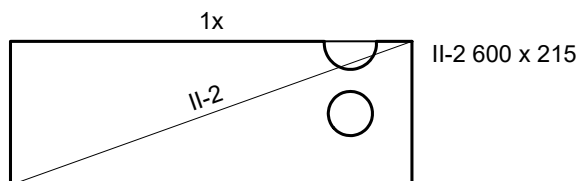
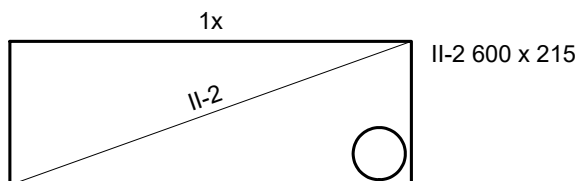


POZ.: 10-20 -strešna plošča + napušč

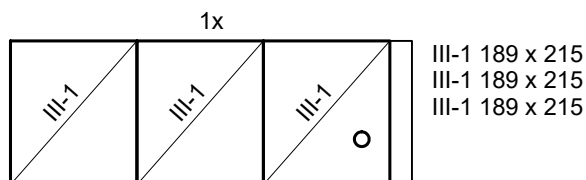
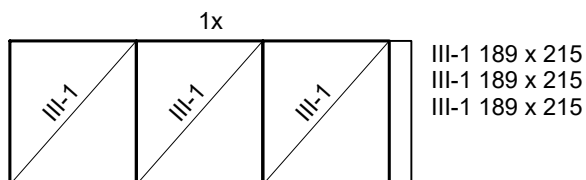
Q-221 (600 cm x 215 cm)



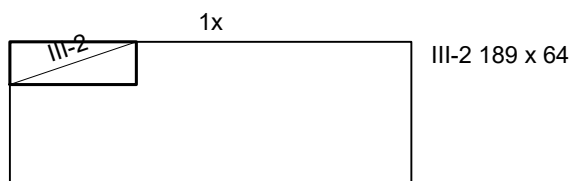
Q-335 (600 cm x 215 cm)



Q-424 (600 cm x 215 cm)

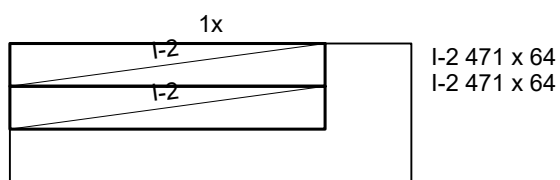
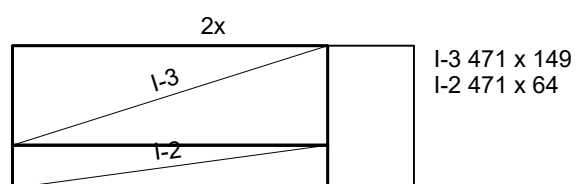
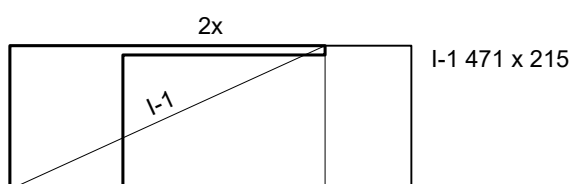
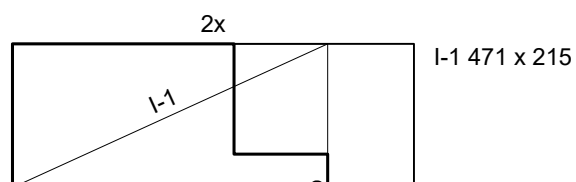
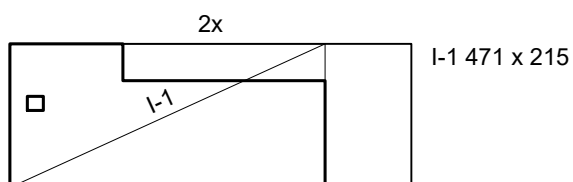
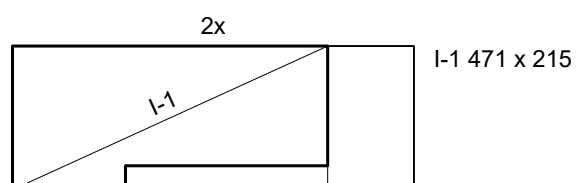
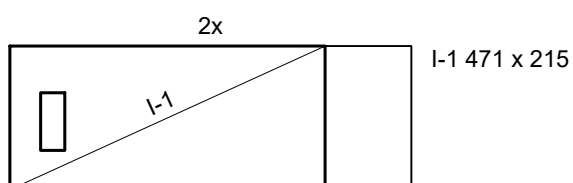
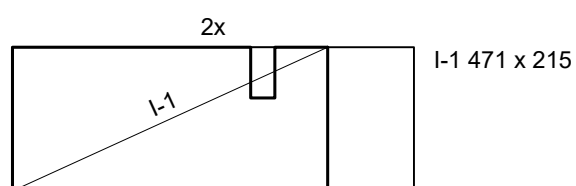
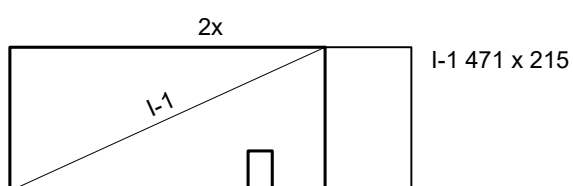
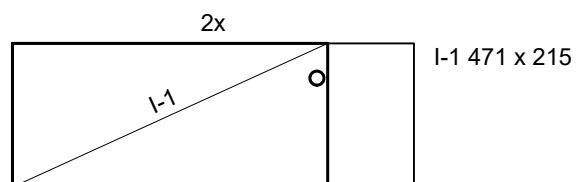
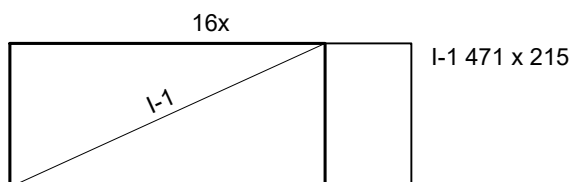


Mreže - načrt razreza

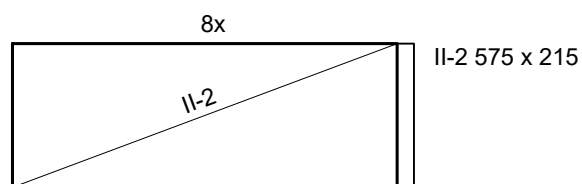
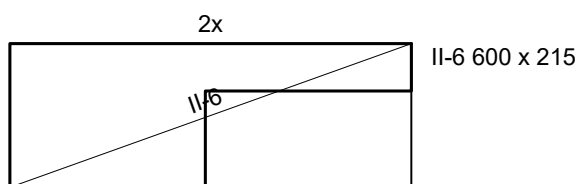


POZ.: ABS v oseh - AB STENE

Q-335 (600 cm x 215 cm)

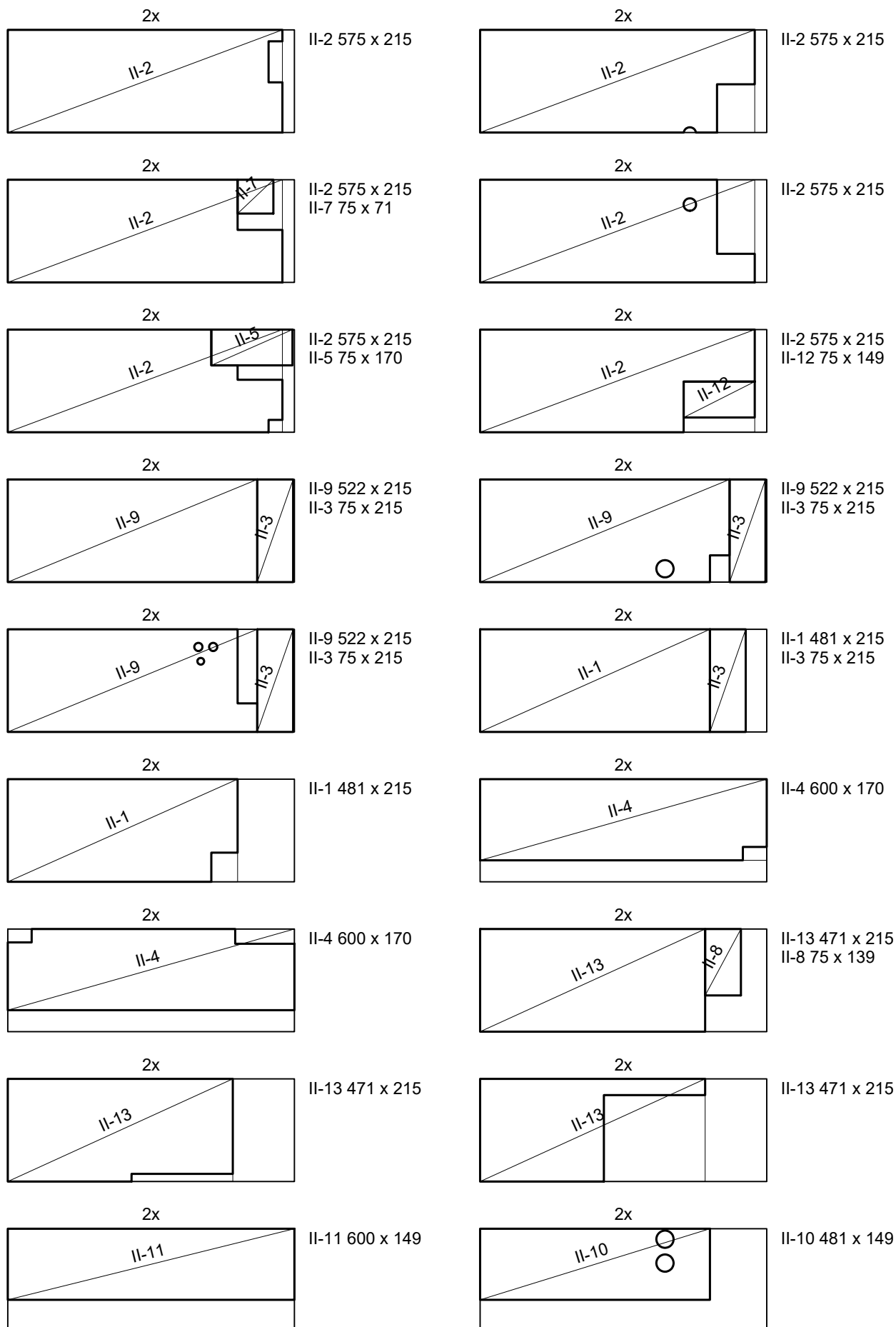


Q-424 (600 cm x 215 cm)

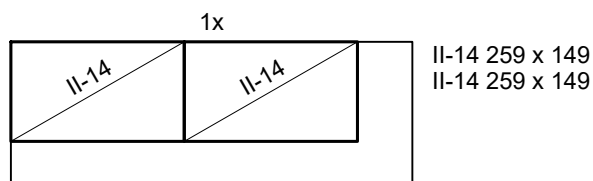




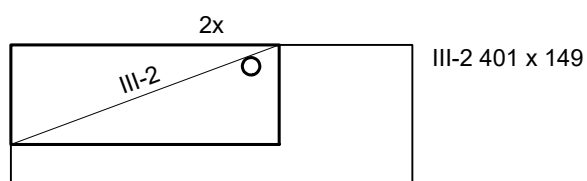
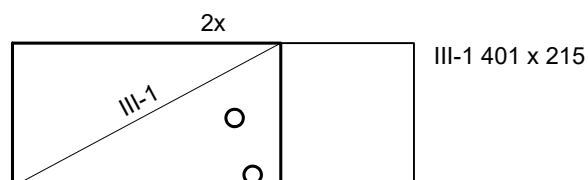
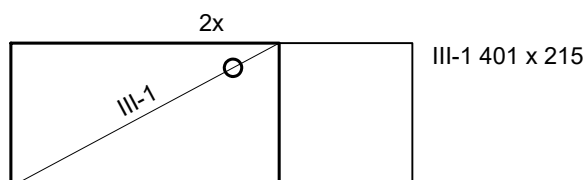
## Mreže - načrt razreza



## Mreže - načrt razreza

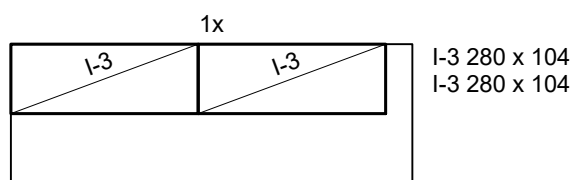
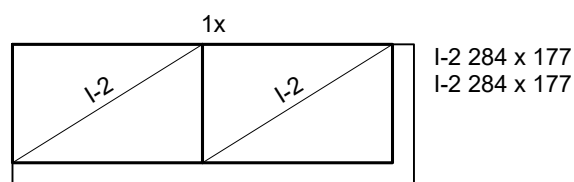
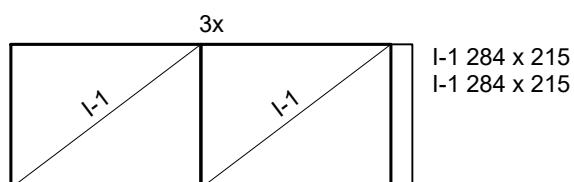


Q-503 (600 cm x 215 cm)



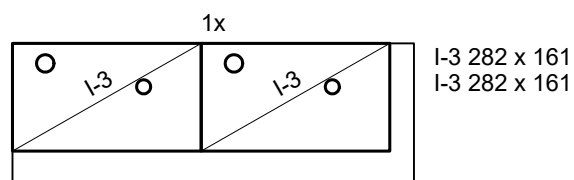
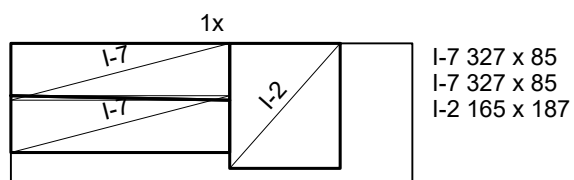
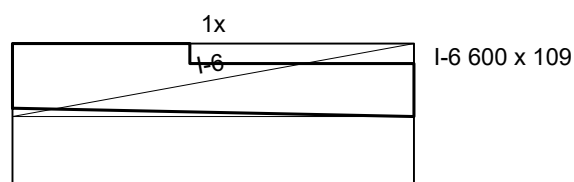
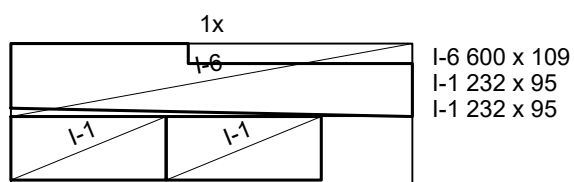
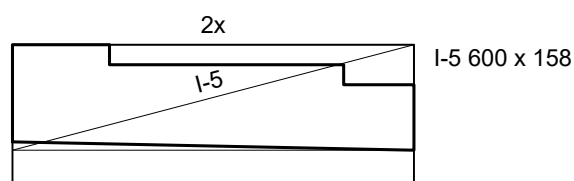
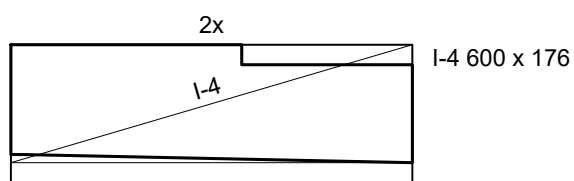
POZ.: ST -stopnice, drame=20cm + Podesti +30a

Q-335 (600 cm x 215 cm)

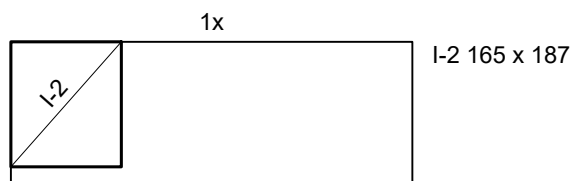


POZ.: ABS/OZ v oseh - oporni zidovi

Q-257 (600 cm x 215 cm)



Mreže - načrt razreza



Q-335 (600 cm x 215 cm)

