PRILOGA 1C

NASLOVNA STRAN NAČRTA

		2. Načrt gradbeništva
PODATKI O GRADNJI		
naziv gradnje		**Prenova in širitev kuhinje - OŠ PT VL**
kratek opis gradnje		**Širitev kohinje v OŠ VL**
VRSTE GRADNJE	☑	**NOVOGRADNJA - NOVOZGRAJEN OBJEKT**
označiti vse ustrezne vrste gradnje	☑	**NOVOGRADNJA - PRIZIDAVA**
	☐	**REKONSTRUKCIJA**
	☐	**SPREMEMBA NAMEMBNOSTI**
	☐	**ODSTRANITEV CELOTNEGA OBJEKTA**
	☐	**LEGALIZACIJA**
	☐	**MANJŠA REKONSTRUKCIJA**
PODATKI O PROJEKTNI DOKUMENTACIJI		
vrsta dokumentacije		**PZI (projekt za izvedbo)**
številka projekta		**04-2019-PZI**
PODATKI O NAČRTU		
strokovno področje načrta		**2. Načrt gradbeništva**
naziv načrta		**Načrt gradbeništva**
številka načrta		**04-2019-PZI-Gk**
datum izdelave		**jun.24**
datum spremembe		
PODATKI O PROJEKTANTU NAČRTA		
projektant načrta (naziv družbe)		**ZASNOVA - gradbeni biro, Lovšin Tone s.p.**
naslov		**Vrvarska pot 1a, 1310 Ribnica**
odgovorna oseba projektanta načrta		**Tone Lovšin d.i.g.**
podpis odgovorne osebe projektanta načrta		ZASNOVA gradbeni biro LOVŠIN TONE s.p. • projektiranje g.o. • gradbeni nadzor • svetovanje Vrvarska pot 1A Ribnica /Dol.
PODATKI O IZDELOVALCU NAČRTA		
ime in priimek pooblaščenega arhitekta, pooblaščenega inženirja		**Tone Lovšin d.i.g.**
identifikacijska številka		**IZS G - 0379**
podpis pooblaščenega arhitekta, pooblaščenega inženirja		TONE LOVŠIN dipl.inž.grad. IZS—G-0379

PRILOGA 2C

IZJAVA PROJEKTANTA NAČRTA IN POOBLAŠČENEGA STOKOVNJAKA, KI JE IZDELAL NAČRT V PZI IN PID

PROJEKTANT NAČRTA	
projektant načrta (naziv družbe)	**ZASNOVA - gradbnei biro, Lovšin Tone s.p.**
naslov	**Vrvarska pot 1a, 1310 Ribnica**
odgovorna oseba projektanta načrta	**Tone Lovšin d.i.g.**

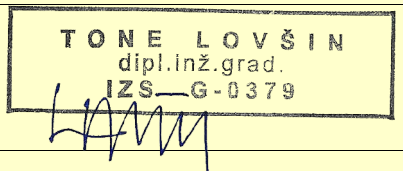
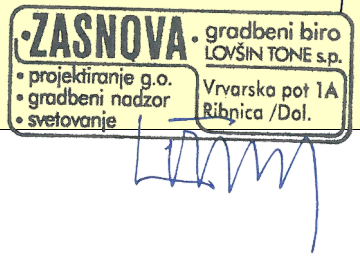
IN POOBLAŠČENI STROKOVNJAK, KI JE IZDELAL NAČRT	
pooblaščeni strokovnjak	**Tone Lovšin d.i.g.**

IZJAVLJAVA:

da načrt

vrsta dokumentacije	**PZI (projekt za izvedbo)**
strokovno področje načrta	**Načrt gradbeništva**
naziv načrta	**2. Načrt gradbeništva**
številka načrta	**04-2019-PZI-Gk**
datum izdelave	**jun.24**

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

pooblaščeni strokovnjak	**Tone Lovšin d.i.g.**
identifikacijska številka	**IZS G - 0379**
podpis pooblaščenega strokovnjaka	
odgovorna oseba projektanta načrta	**Tone Lovšin d.i.g.**
podpis odgovorne osebe projektanta načrta	

2.1. Vsebina

2.2. TEHNIČNO POROČILO....2
2.2.1. OSNOVNI PODATKI....2
2.2.2. OBTEŽBA....3
2.2.3. ELEMENTI GRADBENIH KONSTRUKCIJ....3
2.2.3.1. TEMELJENJE OBJEKTA....3
2.2.3.2. VERTIKALNA NOSILNA KONSTRUKCIJA....4
2.2.3.3. HORIZONTALNA NOSILNA KONSTRUKCIJA....5
2.2.3.4. STREŠNA KONSTRUKCIJA....5
2.2.4. UPORABLJENI MATERIALI....5
2.2.5. KONTROLA PREGLED NOSILNE KONSTRUKCIJE....7
2.3. ANALIZA VPLIVOV....8
2.4. Vpliv potresa in analiza zidovja pritličja/nadstropja....14
2.5. Statični izračun....15
2.5.1. Analiza prizidka šole....15
2.5.1.1. Analiza ostrešja šole....15
2.5.1.2. Analiza spojev ostrešja šole....45
2.5.1.3. Analiza masivne konstrukcije šole – horizontalne konstrukcije POZ-001-400....51
2.5.2. Analiza jeklenega stopnišč POZ-600....52
2.5.2.1. Analiza jeklenega stopnišča....52
2.5.2.2. Analiza spoj jeklenega stopnišča....53
2.5.3. Analiza jeklenega požarnega stopnišč POZ-700....74
2.5.3.1. Analiza jeklenega stopnišča....74
2.5.3.2. Analiza spojev jeklenega stopnišča....75
2.5.4. Analiza prostora za odpadke POZ-800....114
2.5.5. Analiza vmesnega lesenega dela POZ-900....115
2.5.5.1. Analiza strešne konstrukcije špirovec nad nadstropjem POZ-901 dim 16/28cm (GL24) 122
2.5.5.2. Analiza strešne konstrukcije stropa nad nadstropjem POZ-902 CLT 20 L5 (C24) 124
2.5.5.3. Analiza strešne konstrukcije stropa nad nadstropjem – dela nad stopniščem POZ-903 dim 10/20cm (C24)....135

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www.zasnova.si

2.5.5.4. Analiza strešne/stropne konstrukcije stropa nad pritličjem POZ-904 CLT 20 L5 (C24) 137
2.5.5.5. Analiza stene v pritličju POZ-905 CLT 20 L5 (C24) 150
2.5.5.6. Analiza stene v nadstropju POZ-906 CLT 20 L5 (C24) 161
2.5.5.7. Analiza stene v podstrešju POZ-907 CLT 20 L5 (C24) 172
2.5.5.8. Sidranje CLT stene POZ-908 183
2.5.5.9. Dimenzioniranje stebrov dim 20/48 GL24 POZ-910 189
2.5.5.10. Dimenzioniranje stebrov dim 20/24 GL24 POZ-911 204
2.5.5.11. Dimenzioniranje nosilcev dim 20/48 GL24 POZ-912 215
2.5.5.12. Dimenzioniranje nosilcev dim 20/28 GL24 POZ-913 229
2.5.5.13. Dimenzioniranje ostale konstrukcije vmesnega dela POZ-900 241
2.5.6. Analiza nadstreška kolesarnice POZ-1000 242
2.5.7. Analiza nadstreška vhod POZ-1010 244
2.6. NAČRT LESENE KONSTRUKCIJE 245
2.6.1. Načrt glavnega objekta – lesena konstrukcija 245
2.6.2. Načrt vmesnega dela – lesena konstrukcija 246
2.7. NAČRT JEKLENE KONSTRUKCIJE 247
2.7.1. Dispozicija glavnega – požarnega stopnišča 247
2.7.2. Dispozicija pomožnega – požarnega stopnišča 248
2.7.3. Dispozicija jeklene nadstrešnice - kolesarnica 249
2.7.4. Dispozicija jeklene nadstrešnice - vhod 250
2.8. ARMATURNI NAČRT / SPECIFIKACIJA ARMATURE 251
2.8.1. Armatura osnovne stavbe 251
2.8.2. Armatura pomožnih objektov 252

ZASNOVA

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1310 Ribnica, Slovenija
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2.2. TEHNIČNO POROČILO

2.2.1. OSNOVNI PODATKI

LOKACIJA:	Velike Lašče (občina Velike Lašče)
NADMORSKA VIŠINA:	cca 541,60 mNM
TIP GRADNJE:	MASIVNA GRADNJA
POTRESNI POSPEŠEK TAL:	0,225g
TIP TAL:	B
HITROST VETRA:	20 m/s (cona 1)

Načrt št. **04-2019-PZI-Gk** obravnava izvedbo prizidave obstoječe osnovne šole, delno rekonstrukcijo dela obstoječe stavbe, ureditev zunanje ureditve dela okrog osnovne šole. V novem prizidku se v pritličju izvede nova sodobna kuhinja in pomožni prostori. V nadstropju se pridobi nova učilnica in tri-ji kabineti.

RAČUNSKA ANALIZA:

Načrt gradbeništva obsega dokaz nosilnosti in dimenzioniranje posameznih konstrukcijskih elementov. Načrt je izveden skladno z Gradbeni zakon (Uradni list RS, št. 61/17 in 72/17 – popr.).

Nosilne gradbene konstrukcije so dimenzionirane po metodi mejnih stanj. Izračun je izdelan s pomočjo računalniškega programa »Tower 3D model builder - verzija 8.4 (Radimpex)« in po »peš« metodi z uporabo lastnih programov v Excel-u in Word-u.

Izračun nosilnih gradbenih konstrukcij je izdelan po načelih in pravilih Evrokodov skladno s Pravilnikom o mehanski odpornosti in stabilnosti objektov (U.l.RS.št.:101/2005).

Pomiki in deformacije so kontrolirani in ne presegajo predpisanih omejitev v standardu SIST EN 1990.

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2.2.2. OBTEŽBA

Obtežba je določena skladno s veljavnimi standardi. Upoštevani so predpisi Evrokod.

- Lastna obtežba pridobljena skladno s SIST EN 1991-1-1; 2004 in SIST EN1991-1-1/A101: 2005 – Evrokod 1
- Koristna obtežba pridobljena skladno s SIST EN 1991-1-1; 2004 in SIST EN 1991-1-1/A101: 2005 – Evrokod 1
  - RAZRED UPORABE »C1« 3,00 kN/m^2
  - RAZRED UPORABE »A« 3,00 kN/m^2
  - RAZRED UPORABE »H« 0,40 kN/m^2
  -
- Obtežba snega pridobljena skladno s SIST EN 1991-1-3; 2004 – Evrokod 1

- Obtežba vetra pridobljena skladno s SIST EN 1991-1-4; 2004 – Evrokod 1
- Potresna obtežba določena skladno s SIST EN 1998 – Evrokod 8

Obtežba določena v nadaljevanju pod točko 2.2.

2.2.3. ELEMENTI GRADBENIH KONSTRUKCIJ

2.2.3.1. TEMELJENJE OBJEKTA

TEMELJI novega objekta bodo pasovni, izvedeni v armiranem betonu. Temelji bodo dvostopenjski peta temelja bo širine 60cm in višine 65cm, ter temeljni nastavek širine 25cm. Pod dvigalnim jaškom bo izvedena temeljna plošča debeline 30cm. Temelji so zaradi samega nagnjenega terena izvedeno stopničeno.

Kvaliteta uporabljenega betona bo C25/30 izpostavljenosti XC2, D_{max} 16, v/c_{max} =0,6. Armatura robna palice S-500B in mrežna armatura S-500A. Zaščitne plasti betona podane na samem armaturnem načrtu.

Nasip pod temeljno ploščo naj bo dobro zgoščen in zbit. Nasipni material (tampon frakcije 0/32mm) je potrebno vgrajevati po plasteh, ne debelejših od 0,3 m in ga sproti komprimirati. Zbitost nasipa naj se preveri z meritvami z dinamično ploščo (dinamični deformacijski modul (E_{vd}) tal minimalno 40 MPa).

V kolikor je debelina nasutja večja, se lahko spodnje nasutje izvede iz manj kvalitetnega materiala (odstrel, gramoz), frakcij 0/200mm. Na raščena tla naj se položi politlak, ki bo preprečeval mešanje materialov.

Pri izkopu za temelje moramo zagotoviti, da bo **na celotnem tlorisu objekta** enaka sestava materiala, da ne pride do diferenčnih posedkov na objektu. V primeru, da bo prišlo pri izkopu do razlik v sestavi materiala, naj se izvede poglobitev - stopničenje. Izkop naj se nadomesti s peščeno prodnato blazino (tampon).

Predpostavka: Temeljna tla so SREDNJE nosilna. V statičnem izračunu predpostavljena nosilnost temeljnih tal 200kPa modul reakcije temeljnih tal je 20MN/m^3

Geomehanske poročilo ni bilo izvedeno.

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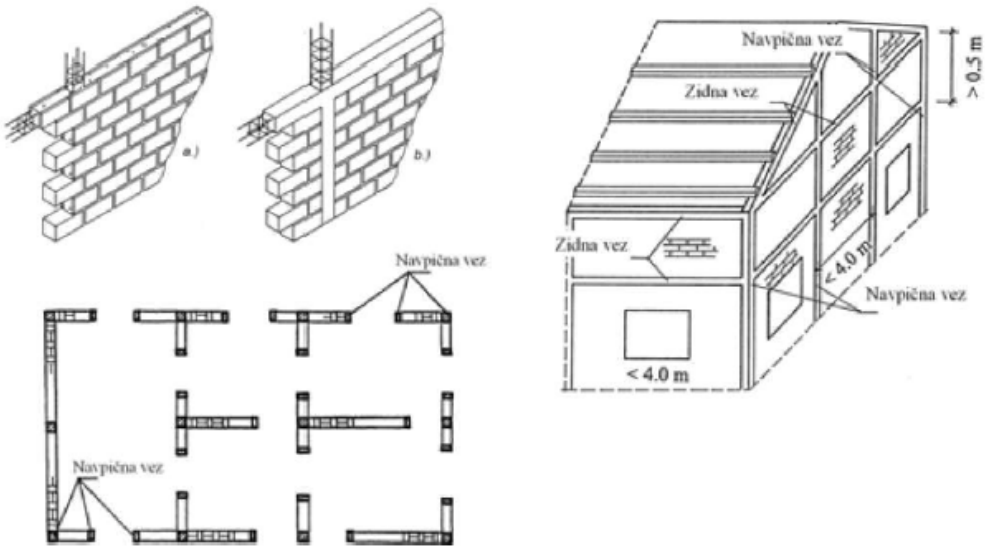
Pred izvedbo potrebno preveriti ustreznost temeljnih tal z PODATKI KI SO BILI UPOŠTEVANI V STATIČNEM IZRAČUNU. V kolikor se le ti razlikujejo potrebno obvestit projektanta.

2.2.3.2. VERTIKALNA NOSILNA KONSTRUKCIJA

Nosilni zidovi bodo pozidani z opečnimi bloki v podaljšani cementni malti 1:2:6, v debelini 25cm. Zidaki uporabljeni za zidanje morajo izpolnjevati zahteve in dosegati lastnosti opisane v standardu SIST EN 771 specifikacije za zidake. Normalizirana tlačna trdnost zidakov, ki se uporabljajo za zidanje na potresnih območjih ne sme biti manjša od fb = 10 MPa, trdnost, merjena vzporedno z naležno površino mora biti vsaj fbl = 2,5 MPa. Uporabljene malte morajo izpolnjevati zahteve SIST EN 998-2 – Specifikacije za malte za zidanje, če so pripravljene tovarniško ali projektirane, sicer morajo izpolnjevati splošne zahteve SIST EN 1996-2 – Projektiranje, izbira materialov in izvedba. Na potresnih območjih po zahtevah Evrokod 6 in 8 se uporablja samo malte tipa M5 in več, katerih tlačna trdnost znaša vsaj fm = 5 MPa. Nosilni zidovi so ojačani s horizontalnimi in vertikalnimi protipotresnimi vezmi. Vertikalne zidne vezi bodo izvedene na vseh vogalih, stikovanjih in križanjih obodnih in notranjih nosilnih zidov, ter medosna razdalja med njima ni večja od 5m. Horizontalne zidne vezi so predvidene po obodu in zaključku zidov, so višine 20 cm in enake širine kot zidov. Kjer so plošče debeline 20cm, je HV že v debelini plošče. Zaradi večje višine zidov se vmes izvede dodatna HV vez višine 20cm. Vertikalne vezi se izvede kot AB v dim. b/h=30/30 cm in 20/20 cm, oz. iz opečnih vogalnikov.

VV so armirani z rebrasto armaturo 4Φ14 in stremeni Φ8 na razdalji cca 20cm, kvaliteta jekla je S-500b. Sidrna armatura bo vgrajena v temeljno ploščo.
HV so armirane z rebrasto armaturo 4ø12 in stremeni ø8 na razdalji cca 20cm, kvaliteta jekla je S-500b.
Uporabljen beton HV in VV je C25/30.



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2.2.3.3. HORIZONTALNA NOSILNA KONSTRUKCIJA

Plošča nad pritličjem in nadstropjem je izvedena iz armiranega betona debeline 20 cm, betonirane na kraju samem, z betonom kvalitete C25/30 XC2 in armirana z mrežno armaturo kvalitete S-500A, ter robno rebrasto armaturo kvalitete S-500B.

Plošča je oprta na spodnje nosilne zidove. Zaščitna plast betona znaša minimalno 2,5cm. Po robu plošče se predhodno namesti dodatno toplotno izolacijo debeline do 5cm (npr. XPS300 Fibran).

Stopnice so eno ravne kovinske

2.2.3.4. STREŠNA KONSTRUKCIJA

Strešna konstrukcija bo izvedena iz rezanega lesa, smreke kvalitete C24. Izvedena bo kot dvokapna z naklonom 30°, po principu nosilnega sistema stojalo. Na obeh strešinah sta izvedeni frčadi v istem naklonu kot osnovna streha. Na vmesnem parkiranem delu in nad avto salonom je izvedena ravna streha po enem izmed sistemov.

Strešina je sestavljena iz vmesnih in kapnih leg, ki so oprte na zunanje in notranje stene. Zavetrovanje je izvedeno s sidranje kapnih leg v vezi in ročicami na stebrih kateri podpirajo srednjo lego.

Posamezne lege so izvedena zaradi večjih razponov iz jeklenih H profilov kvalitete S-235

Masiven žagan les, ki se bo uporabljal v nosilnih gradbenih konstrukcijah, mora ustrezati zahtevam harmoniziranega standarda SIST EN 14081-1.

Kvaliteta lesa mora biti določena skladno s standardom, ki dovoljuje vizualno in strojno razvrščanje lesa.

Izvajalec dela mora pred pričetkom izvedbe pripraviti » Program kontrole zagotavljanja kakovosti izvedenih del«, kjer je moral upoštevati vse zahteve iz projektne dokumentacije.

2.2.4. UPORABLJENI MATERIALI

- Les: **C 24 - smreka, rezan les SIST EN 14081-1**
  $f_{m,k}$ = 2,4 kN/m^2
  $f_{t,0,k}$ = 1,4 kN/m^2
  $f_{c,0,k}$ = 2,1 kN/m^2
  $f_{v,k}$ = 0,25 kN/m^2
  $E_{0,mean}$ = 1100 kN/m^2

  GL 24 – lepljen les

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$f_{m,k}$ = 2,4 kN/m^2
$f_{t,0,k}$ = 1,65 kN/m^2
$f_{c,0,k}$ = 2,4 kN/m^2
$f_{v,k}$ = 0,27 kN/m^2
$E_{0,mean}$ = 1160 kN/m^2

- Jeklo: **S 235-JR** f_{yk} = 23,5 kN/cm^2
  E_s = 21000 kN/cm^2

- Konstrukcijski vijaki: **8'8** SIST EN 14399

- Zvari: EN ISO 3834

- Kemijska sidra: navojna palica 8'8 + kemična masa (kot npr. Hilti HIT-HY 200-A)

- Beton: C 25/30 f_{ck} = 2,50 kN/cm^2
  $f_{ck,cube}$ = 3,0 kN/cm^2
  E_{cm} = 3100 kN/cm^2

  razred izpostavljenosti: glej na grafiki
  zaščitni sloji so sledeči: c_{min} = 3,5 cm priporočljiva 5cm

- Armatura: S 500-A (mrežna armatura)
  f_{yk} = 50,0 kN/cm^2
  E_s = 20000 kN/cm^2

  S 500-B (rebrasta armatura, palice)
  f_{yk} = 50,0 kN/cm^2
  E_s = 20000 kN/cm^2

Kvaliteta vseh osnovnih materialov in veznih sredstev je označena skladno s slovenskimi standardi SIST. Ne glede na način označevanja je izvajalec dolžan preveriti zahtevane kvalitete oz. predvsem zahtevane mehanske lastnosti materialov.
Pri izdelavi projektne dokumentacije PZI za jekleno konstrukcijo morajo biti upoštevana predvsem določila iz standarda SIST EN 1993: Projektiranje jeklenih konstrukcij in SIST EN 1998: Projektiranje potresno odpornih konstrukcij. Specifikacije, lastnosti, proizvodnja in skladnost betona in jekla so določene s standardom. Jeklena konstrukcija je izdelana iz konstrukcijskega jekla S 235 JR. Mehanske lastnosti mehkega konstrukcijskega jekla – meja plastičnosti in natezna trdnost – so določene s standardom SIST EN 10025. Izdelava in montaža nosilne jeklene konstrukcije mora biti v skladu s SIST EN 1090-1.
Pri zvarih mora biti meja plastičnosti, natezna trdnost, relativni porušni raztezek in žilavost dodajnega materiala vsaj enaka ali večja kot pri osnovnem materialu, ki ga varimo. V konstrukciji so predvideni kotni zvari, pri čemer je

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debelina zvara 0,46 (za S235) kratnik debeline najtanjšega materiala, ki se ga vari. Absolutno najmanjša debelina nosilnega zvara je 3,0 mm. Uporabljene so visokotrdnostne vijačne zveze brez prednapetja, ki ustrezajo standardu SIST EN 15048.
Izbrani izvajalec mora izdelati načrt montaže jeklenih konstrukcij glede na uporabljeno opremo in mehanizacijo s katerim mora biti izkazana stabilnost konstrukcij v vseh fazah gradnje.

2.2.5. KONTROLA PREGLED NOSILNE KONSTRUKCIJE

V skladu z veljavnimi predpisi in standardi je po končani gradnji in primopredaji objekta v uporabo, upravljalec objekta dolžan poskrbeti za redne vizualne kontrolne preglede nosilne konstrukcije v časovnih razdobju dveh do treh let. Na konstrukciji je potrebno pregledati in evidentirati pojav eventualnih deformacij, razpok in sledi korozije. V primeru, da je pri vizualnem pregledu ugotovi večje poškodbe, je potrebno opraviti točnejše meritve in ugotoviti dejanske vrednosti poškodb ter označiti njihovo lokacijo. V kolikor dejanska vrednost poškodb, razpok, povesov in diferenčnih posedkov presega s predpisom določene vrednosti, je potrebno o tem obvestiti odgovornega projektanta, ki bo s pomočjo pooblaščene institucije izvedel analizo vzrokov in vplivov poškodb na varnost in uporabnost objekta ter po potrebi izdelal predlog sanacijskih ukrepov. Vzdrževanje objekta mora biti tako, da bo objekt varen in funkcionalen ter s tem odgovarjal namenu, kakor je predvideno v projektu. V primeru novih posegov v nosilno konstrukcijo je upravljalec o tem dolžan obvestiti odgovornega projektanta.

Podatki o nosilnosti temeljnih tal so povzeti iz poročila pri gradnji objekta v preteklosti.

Pri gradnji je potrebno upoštevati vse predpise in standarde s tega področja.

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2.3. ANALIZA VPLIVOV

2.3.1. STALNA TEŽA / LASTNA TEŽA *SIST EN 1991-1-1; 2*

2.3.1.1. OBTEŽBA STREŠNE KONSTRUKCIJE

pozicija	ime sloja	debelina [m]	specifična teža [kN/m^3]		skupaj [kN/m^2]
1.	FOTOVOLATIKA				0,25
2.	KRITINA				0,25
3.	DESKE IN LETVE V RAZMAKU				0,10
6.	NOSILNA LESENA KONSTRUKCIJA				program upošteva sam
			SKUPAJ g_{streha} =		**0,60**

2.3.1.2. OBTEŽBA PLOŠČE NAD NADSTROPJEM

pozicija	ime sloja	debelina [m]	specifična teža [kN/m^3]		skupaj [kN/m^2]
1.	ZAKLJUČNI SLOJ (lesen pod)	0,02	5		0,10
2.	Varianta Fe podkonstrukcije				0,2
3.	LOČILNI SLOJ				
4.	TI+ZI (EPS izolacija)	0,25	0,5		0,125
5.	AB plošča				program upošteva sam
6.	SPUŠČEN STROP				0,20
7.	INŠTALACIJE				0,05
			SKUPAJ g_{streha} =		**0,68**

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2.3.1.3. OBTEŽBA MEDETAŽNE NAD PRITLIČJEM - učilnice

pozicija	ime sloja	debelina [m]	specifična teža [kN/m^3]		skupaj [kN/m^2]
1.	ZAKLJUČNI SLOJ (keramika)	0,02	19		0,38
2.	ESTRIH	0,07	22		1,54
3.	LOČILNI SLOJ				
4.	TI+ZI (EPS izolacija)	0,1	0,5		0,05
5.	AB plošča				program upošteva sam
6.	SPUŠČEN STROP	0,0125	19		0,20
7.	INŠTALACIJE				0,05
			SKUPAJ g_{streha} =		**2,22**

2.3.1.4. OBTEŽBA TALNE KONSTRUKCIJE

pozicija	ime sloja	debelina [m]	specifična teža [kN/m^3]		skupaj [kN/m^2]
1.	ZAKLJUČNI SLOJ (keramika)	0,02	19		0,38
2.	ESTRIH	0,06	24		1,44
3.	LOČILNI SLOJ				0,02
4.	TI+ZI (EPS izolacija)	0,07	0,5		0,035
5.	NOSILNA A.B. PLOŠČA				program upošteva sam
6.	IZOLACIJA	0,24	0,5		0,12
			SKUPAJ g_{streha} =		**2,00**

2.3.1.5. OBTEŽBA RAVNE STREHE

pozicija	ime sloja	debelina [m]	specifična teža [kN/m^3]		skupaj [kN/m^2]
1.	HI FOLIJA				0,05
2.	TI+ZI (EPS izolacija)	0,3	0,5		0,15
3.	NAKLONSKI TI	0,1	0,5		0,05
4.	AB plošča				program upošteva sam
5.	SPUŠČEN STROP	0,04	5		0,20
6.	INŠTALACIJE				0,2
			SKUPAJ g_{streha} =		**0,65**

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2.3.1.6. DODATNA TEŽA NA PLOŠČE

Nad ploščo nad pritličjem se dodatno upošteva obtežba klimatov ocena CCA - 100 kg/m^2

2.3.1.7. OBTEŽBA STREŠNE KONSTRUKCIJE nad prostorom smetnjak

pozicija	ime sloja	debelina [m]	specifična teža [kN/m^3]	skupaj [kN/m^2]
1.	KRITINA + POKONSTRUKCIJA			0,25
2.	NOSILNA KONSTRUKCIJA		program upošteva sam	
			SKUPAJ g_{streha} =	**0,25**

2.3.1.8. OBTEŽBA TALNE KONSTRUKCIJE objekt smetnjak

pozicija	ime sloja	debelina [m]	specifična teža [kN/m^3]	skupaj [kN/m^2]
1.	ZAKLJUČNI TLAK			1,25
2.	NOSILNA KONSTRUKCIJA		program upošteva sam	
			SKUPAJ g_{streha} =	**1,25**

2.3.1.9. OBTEŽBA LAHKOH STREŠNIH KONSTRUKCIJ

pozicija	ime sloja	debelina [m]	specifična teža [kN/m^3]	skupaj [kN/m^2]
1.	TRPEZNA PLOČEVINA			0,15
2.	NOSILNA KONSTRUKCIJA		program upošteva sam	
			SKUPAJ g_{streha} =	**0,15**

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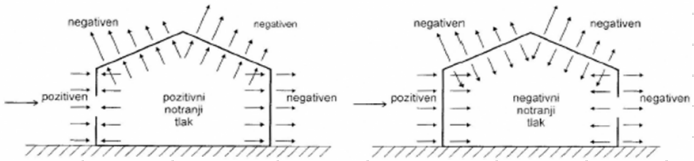
2.3.2.	**KORISTNA OBTEŽBA**						***SIST EN 1991-1-1; 2***
	Kategorije površine:	"C1" - šole		3,00	kN/m^2	kat:	**C**
	Lahke predelne stene			1,00	kN/m^2		
			SKUPAJ q =	**4,00**	**kN/m^2**		
2.3.3.	**OBTEŽBA SNEGA**						***SIST EN 1991-1-3; 2***
►	klimatska cona :		**A2**				
►	nadmorska višina :		**541**	mNM			
►	oblika strehe :		**DVOKAPNICA**				
►	naklon strehe :		**18**	°			
►	snegolovi :		**DA**				
►	Koeficijent izpostvljenosti C_e :		**Običajen**				
►	Toplotni koeficjent C_t :		**1**				
•	obtežba snega na tleh :		**2,01**	kN/m^2			
•	oblikovni koeficijent strehe μ_1:		**0,8**				
•	obtežba snega na strehi :		**1,61**	kN/m^2			
	NA RAVNIH STREHA POVEČANO ZA 50% ZARADI OTEŽENEGA ODTEKANJA						
2.2.4.	**OBTEŽBA VETRA**						***SIST EN 1991-1-4; 2***
	Območje:	**Velike lašče**	Cona:	**2**	proj.hitrost vetra	**20**	m/s
	$v_b = c_{dir} \cdot c_{season} \cdot v_{b,0}$ =			20	m/s		
	c_{dir} =	1			c_{season} =	1	
	$q_b = 1/2 \cdot \rho \cdot v_b^2$ =		0,25				
	dimenzije objekta:			a =	48	m	..daljaš stranica
				b =	24	m	
				h =	10	m	
	$c_e(z)$ =	1,75	..... očitek iz grafa v EC standardu				
	$q_p(z) = c_e(z) \cdot q_b$ =		0,438	kN/m^2			
	koeficjent zunanjega tlaka $c_{pe,10}$						



pozitivne in negativne smeri

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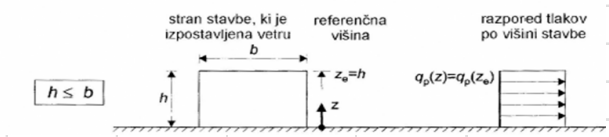
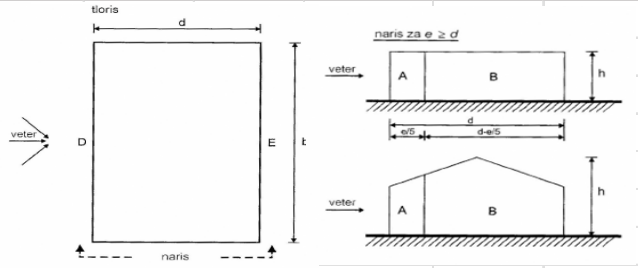
Razporeditev vetra po višini $h \leq b$

RAZPOREDITEV VETRA KOT NA SLIKI



DELOVANJE VETRA NA FASADO



e = min(b ali 2h)

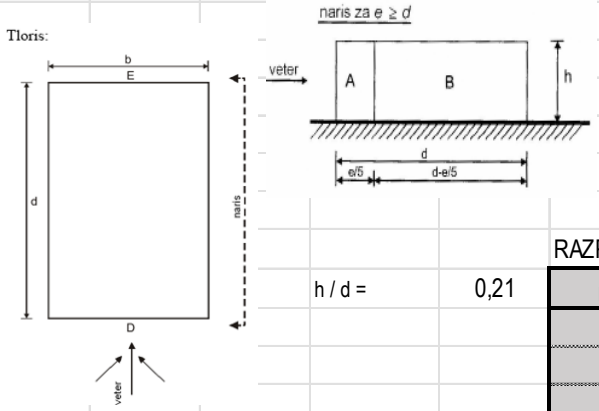
b =	48	m
d =	24	m
h =	10	m
e =	20	m

$e \geq d$

Priporočene vrednosti koeficientov zunanjega tlaka za navpične stene stavbe

h / d = 0,42

področje	$c_{pe,10}$	q_p (z) [kN/m^2]	w_e [kN/m^2]	
A	-1,2	0,438	-0,53	neg. =srk
B	-0,8	0,438	-0,35	poz = pritisk
C	-0,5	0,438	-0,22	
D	0,8	0,438	0,35	
E	-0,5	0,438	-0,22	



e = min(b ali 2h)

b =	24	m
d =	48	m
h =	10	m
e =	20	m

$e \geq d$

RAZPOREDITEV VETRA KOT NA SLIKI

h / d = 0,21

področje	$c_{pe,10}$	q_p (z) [kN/m^2]	w_e [kN
A	-1,2	0,438	-0,5
B	-0,8	0,438	-0,3
C	-0,5	0,438	-0,2
D	0,7	0,438	0,3
E	-0,4	0,438	-0,1

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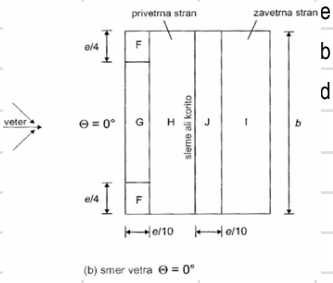
DELOVANJE VETRA NA STREHO



(b) smer vetra Θ = 0°

e = min(b ali 2h)

b = 48 m

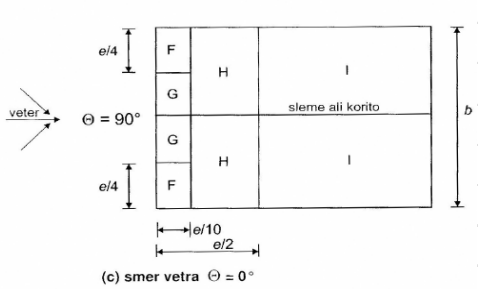
d = 24 m

h = 10 m

e = 20 m

α = 18 °

področje	$c_{pe,10}$	q_p (z) [kN/m^2]	w_e [kN/m^2]
F	-0,9	0,438	-0,39
	0,2	0,438	0,09
G	-0,8	0,438	-0,35
	0,2	0,438	0,09
H	-0,3	0,438	-0,13
	0,2	0,438	0,09
I	-0,3	0,438	-0,13
J	-1	0,438	-0,44



(c) smer vetra Θ = 0°

e = min(b ali 2h)

b = 24 m

d = 48 m

h = 10 m

e = 20 m

α = 18 °

področje	$c_{pe,10}$	q_p (z) [kN/m^2]	w_e [kN/m^2]
F	-1,1	0,438	-0,48
G	-1,4	0,438	-0,61
H	-0,8	0,438	-0,35
I	-0,5	0,438	-0,22

DELOVANJE VETRA NA STREHO

Za notranji vpliv se prevzame najneugodnejši vpliv

Cpi = -0,3 ALI 0,2

področje	$c_{pe,10}$	q_p (z) [kN/m^2]	w_e [kN/m^2]
	-0,3	0,438	-0,13
	0,2	0,438	0,09

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2.4. Vpliv potresa in analiza zidovja pritličja/nadstropja

SIST EN 1998-1; 2005

POTRESNA ANALIZA JE IZVEDENA Z PROGRAMOM AMQUAKE

ANALIZA JE V PRILOGI:

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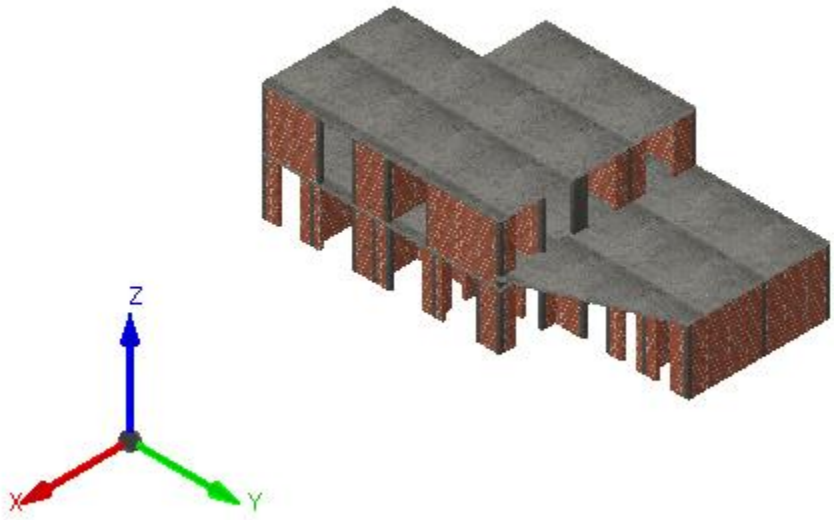
marec 26, 2024

POROČILO ANALIZE PUSHOVER



Država: GBM d.o.o.

Vsebina

1.0 Informacija o projektu 2
2.0 Parametri analize 2
3.0 Uporabljeni materiali 3
3.1 Tabela volumna materiala: 3
3.2 Beton 3
3.3 Armatura 4
3.4 Zidovje 4
3.5 Armirano zidovje 4
3.6 Armirani beton 4
4.0 Potresni parametri 5
5.0 Obtežba stropa 5

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6.0 Rezultati 5

6.1 Analiza X+, exc. pos, tri 5

6.2 Analiza Y+, exc. pos, tri 11

6.3 Analiza Statika 17

1.0 Informacija o projektu

Opis:
Investitor:
Projektant: Sandi Mohar d.i.g.
Država: Velike Lašče - Slovenija
Datum: marec 26, 2024
Verzija programa: AmQuake Version 3.9 Build 16168

Analiza	Mejno stanje	DLS ncilj [mm]	DLS kapaciteta [mm]	ULS cilj x 1,50 [mm]:	ULS kapaciteta [mm]	Varnostni faktor DLS [%]	Varnostni faktor ULS [%]	Faktor dodatne nosilnosti	Max napaka [%]
X+, exc. pos, tri	Pogoji izpolnjeni	2,438	7,804	7,315	7,804	68,753	6,258	2,181	0,595
Y+, exc. pos, tri	Pogoji izpolnjeni	1,157	4,006	3,472	4,006	71,109	13,328	1,475	0,273
Statika	Pogoji izpolnjeni	-	-	-	-	-	-	-	0,00579

2.0 Parametri analize

Standard objekta: Slovenia
Kategorja pomebnosti za stavbe: II

Gamma M	2,200
Gamma C	1,500
Gamma S	1,150
Analza PushoverGamma_Gp	1,000
StatikaGamma_Gs	1,350
Analiza Pushover Phi_L	0,800
Analiza PushoverPsi_2L	0,300
StatikaGamma_QL	1,500
Analiza PushoverPhi_S	1,000
Analiza Pushover Psi_2S	0,000
StatikaGamma_Qs	1,500
StatikaPsi_0,S	0,500

(si9Obojestranski pomik nadstropja:

Material	Pomik zaradi upogiba	Pomik zaradi striga
Zidovje	0,00800	0,00400
Armirano zidovje	0,00800	0,00400
Armirani beton	0,0110	0,0110

Omejitev poškodb:	0,00500
Koeficient razpok:	0,500
Faktor pomembnosti(Gamma_I):	1,000
Uporabiti srednje vrednosti(PushOver)	Da
P_d	1,500
P_F	0,800
Ekscentričnost obtežbe[%]:	5,000

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3.0 Uporabljeni materiali

#	Ime	Projektirana marka betona
9	Porotherm 25 S P+E	Zidaki
10	C25/30	Beton
11	Armatura 8	Armatura
12	Armatura 12	Armatura
13	Armatura 14	Armatura
14	Zidovje	Zidovje
16	Zidovje _16 (Mreža izdelana)	Armirano zidovje
17	Zidovje _17 (Mreža izdelana)	Armirano zidovje
18	Zidovje _18 (Mreža izdelana)	Armirano zidovje
19	Zidovje _19 (Mreža izdelana)	Armirano zidovje
20	Zidovje _20 (Mreža izdelana)	Armirano zidovje
21	Zidovje _21 (Mreža izdelana)	Armirano zidovje
22	Zidovje _22 (Mreža izdelana)	Armirano zidovje
23	Zidovje _23 (Mreža izdelana)	Armirano zidovje
24	Zidovje _24 (Mreža izdelana)	Armirano zidovje
25	Zidovje _25 (Mreža izdelana)	Armirano zidovje
26	Zidovje _26 (Mreža izdelana)	Armirano zidovje
27	Zidovje _27 (Mreža izdelana)	Armirano zidovje
28	Zidovje _28 (Mreža izdelana)	Armirano zidovje
29	Zidovje _29 (Mreža izdelana)	Armirano zidovje
30	Zidovje _30 (Mreža izdelana)	Armirano zidovje
31	Zidovje _31 (Mreža izdelana)	Armirano zidovje
32	Zidovje _32 (Mreža izdelana)	Armirano zidovje
33	Zidovje _33 (Mreža izdelana)	Armirano zidovje
34	Zidovje _34 (Mreža izdelana)	Armirano zidovje
35	Zidovje _35 (Mreža izdelana)	Armirano zidovje
36	Zidovje _36 (Mreža izdelana)	Armirano zidovje
37	Zidovje _37 (Mreža izdelana)	Armirano zidovje
38	Zidovje _38 (Mreža izdelana)	Armirano zidovje
39	Zidovje _39 (Mreža izdelana)	Armirano zidovje
40	Zidovje _40 (Mreža izdelana)	Armirano zidovje
41	Zidovje _41 (Mreža izdelana)	Armirano zidovje
42	Zidovje _42 (Mreža izdelana)	Armirano zidovje
43	Zidovje _43 (Mreža izdelana)	Armirano zidovje
44	Zidovje _44 (Mreža izdelana)	Armirano zidovje
45	Zidovje _45 (Mreža izdelana)	Armirano zidovje
15	VV vezi	Armirani beton

3.1 Tabela volumna materiala:

#	Ime	Volumen [m3]	Teža [kg]
14	Zidovje	116,099	98098,800
15	VV vezi	31,857	79641,875

3.2 Beton

Ime:	# 10: C25/30		
Projektirana marka betona:	C25/30	E [MPa]:	31000,000
fck [MPa]:	25,000	G [MPa]:	12917,000
fcvk [MPa]:	0,450	fcm:	33,000
Gamma C:	1,500	Gostota [kg/m3]:	2500,000
fcvm [MPa]:	0,833	?_cu3:	-0,00350
		?_c3:	-0,00175

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3.3 Armatura

Ime:	# 11: Armatura 8		
Premer [mm]:	8,000	Področje [mm2]:	50,265
Fyk [MPa]:	500,000	Gamma S:	1,150
E [MPa]:	210000,000	fyk / fym:	0,980

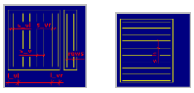
Ime:	# 12: Armatura 12		
Premer [mm]:	12,000	Področje [mm2]:	113,097
Fyk [MPa]:	500,000	Gamma S:	1,150
E [MPa]:	210000,000	fyk / fym:	0,980

Ime:	# 13: Armatura 14		
Premer [mm]:	14,000	Področje [mm2]:	153,938
Fyk [MPa]:	500,000	Gamma S:	1,150
E [MPa]:	210000,000	fyk / fym:	0,980

3.4 Zidovje

Ime:	# 14: Zidovje		
Opeka:	Porotherm 25 S P+E	Malta:	Splošni namen M15
Polnilno zidovje:	Ne		
fk [MPa]:	5,604	fkh [MPa]:	0,824
fvk0 [MPa]:	0,300	E [MPa]:	5604,000
fvlt [MPa]:	0,517	G [MPa]:	2241,600
fxk1 [MPa]:	0,000	Gostota [kg/m3]:	844,960
fxk2 [MPa]:	0,000	Gamma M:	2,200
rho n:	0,750	Razmerje r:	0,500
rho t:	1,000	fk / fmean:	0,833
?_mu:	-0,00200	Phi_fvk:	0,400
?_m:	-0,00100	Phi_fvlt:	0,000

3.5 Armirano zidovje



3.6 Armirani beton

Ime:	# 15: VV vezi				
Beton:	C25/30				
rho n:	0,750			rho t:	1,000
Vertikalno Armatura: Ne					
Absolutno Armatura: Da					
Število armaturnih palic:	4				
b [m]:	0,250			h [m]:	0,250
bar # 1, x [m]:	0,0300	y [m]:	0,0300	Mat:	Armatura 14
bar # 2, x [m]:	0,220	y [m]:	0,0300	Mat:	Armatura 14
bar # 3, x [m]:	0,0300	y [m]:	0,220	Mat:	Armatura 14
bar # 4, x [m]:	0,220	y [m]:	0,220	Mat:	Armatura 14
Stremena: Da					
Stremena:	Armatura 8				
Razmik med stremeni:	0,200			Odcep:	2,000

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4.0 Potresni parametri

Potresna cona:0
Tip tal:: B
Tip spektra: 1
Razmerje viskoznega dušenja konstrukcije: 5,000
Največji pospešek tal: 2,250
Velikost pospeška tal: 1,125
Faktor tal (S):: 1,200
Perioda B: 0,150
Perioda C: 0,500
Perioda D: 2,000
Dinamični amplif. factor beta0: 2,500

5.0 Obtežba stropa

Ime	Stalna obtežba[kN/m2]	Trajnaobtežba [kN/m2]	Analza PushoverGamma_Gp	StatikaGamma_Gs
Etaža 0,000 - 3,700	5,000	2,000	1,000	1,350
Etaža 0,000 - 4,300	5,000	1,000	1,000	1,350
Etaža 3,700 - 7,500	5,000	2,000	1,000	1,350

Ime	Spremenljiva obtežba[kN/m2]	Analiza Pushover Phi_L	Analiza PushoverPsi_2L	StatikaGamma_QL
Etaža 0,000 - 3,700	3,000	0,800	0,300	1,500
Etaža 0,000 - 4,300	0,500	0,800	0,300	1,500
Etaža 3,700 - 7,500	1,000	0,800	0,300	1,500

Ime	Obtežba zaradi snega[kN/m2]	Analiza PushoverPhi_S	Analiza Pushover Psi_2S	StatikaGamma_Qs	StatikaPsi_0,S
Etaža 0,000 - 3,700	0,000	1,000	0,000	1,500	0,500
Etaža 0,000 - 4,300	0,000	1,000	0,000	1,500	0,500
Etaža 3,700 - 7,500	0,000	1,000	0,000	1,500	0,500

6.0 Rezultati

6.1 Analiza X+, exc. pos, tri

Povzetek

DLS cilj [mm]: = dt_dls	2,438
DLS kapaciteta [mm]	7,804
ULS cilj x 1,50 [mm] = dt_uls x 1,50:	7,315
ULS kapaciteta [mm] = d_t	7,804
Varnostni faktor DLS [%]	68,753
Varnostni faktor ULS [%]	6,258
Max napaka [%]	0,344
Nadstropje	3
RShift	0,00162
Dls kriterij	3,200
RShift kriterij	0,323
Uls kriterij	1,067
Dls korak Id	6
Uls korak Id	6
Obdobje T norm.	0,151
Max referenčni pospešek tal [m/s2]	2,400
Duktilnost	1,832
Faktor dodatne nosilnosti	2,181
Elastic displacement [mm] = d_y	5,347

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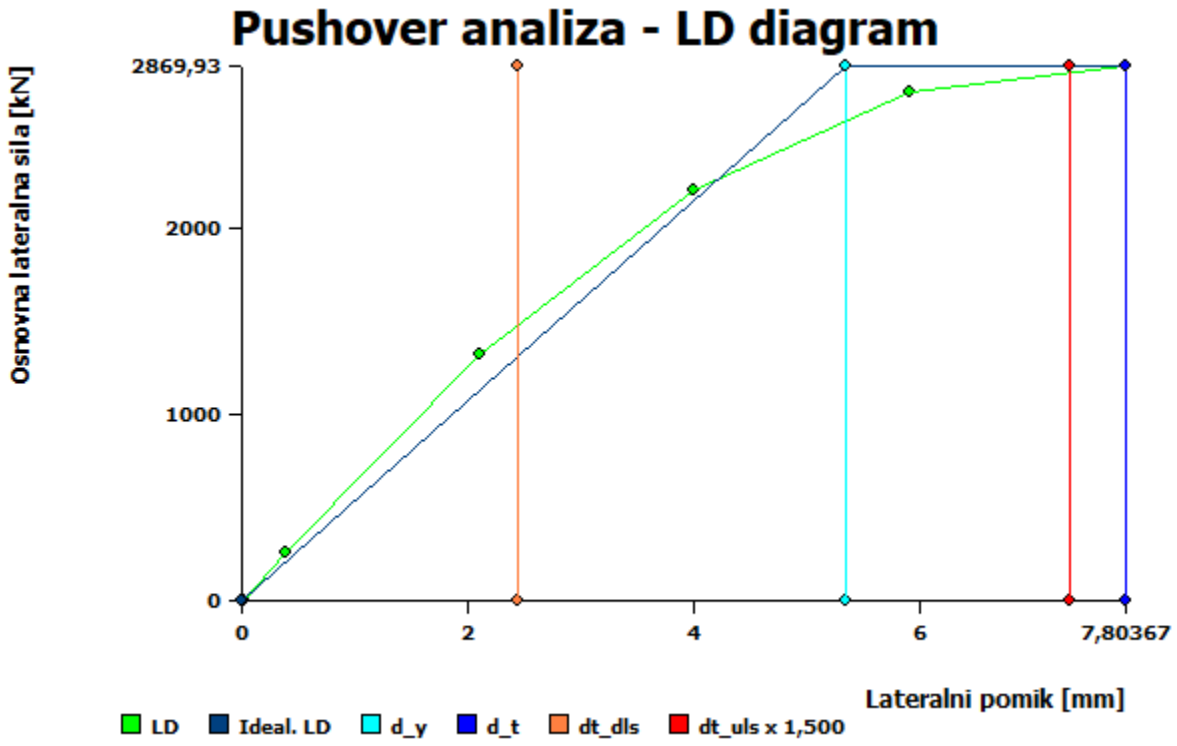

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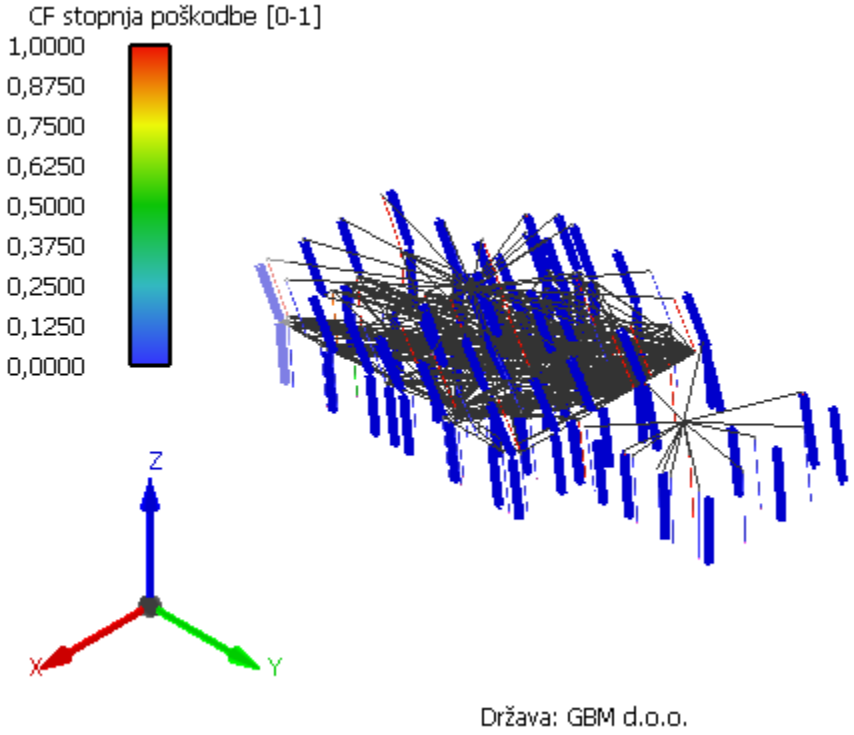

CF poškodba na zadnjem koraku, deformacija

Vertikalna obremenitev / kontrola reakcij:

Material/Obtežba	[m3, m2]	Stalna obtežba [kN/m2(m3)]	Koef.	Fz[kN]
Stropovi				
Etaža 0,000 - 3,700 - Stalna obtežba[kN/m2]	169,728	5,000	1,000	848,64000
Etaža 0,000 - 3,700 - Trajnaobtežba [kN/m2]	169,728	2,000	1,000	339,45600
Etaža 0,000 - 3,700 - Spremenljiva obtežba[kN/m2]	169,728	3,000	0,240	122,20416
Etaža 0,000 - 3,700 - Obtežba zaradi snega[kN/m2]	169,728	0,000	0,000	0,00000
Stena 1	1,146	8,289	1,000	9,50133
Stena 2	0,507	8,289	1,000	4,20670
Stena 3	0,682	8,289	1,000	5,65728
Stena 4	0,954	8,289	1,000	7,90569
Stena 5	0,840	8,289	1,000	6,96281
Stena 6	3,351	8,289	1,000	27,77870
Stena 7	0,656	8,289	1,000	5,43969
Stena 8	0,656	8,289	1,000	5,43969
Stena 9	0,376	8,289	1,000	3,11876
Stena 10	0,516	8,289	1,000	4,27923
Stena 11	0,613	8,289	1,000	5,07705
Stena 12	3,185	8,289	1,000	26,40065
Stena 13	2,161	8,289	1,000	17,91473
Stena 14	3,343	8,289	1,000	27,70618

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Stena 15	3,754	8,289	1,000	31,11505
Stena 16	2,756	8,289	1,000	22,84672
Stena 17	0,376	8,289	1,000	3,11876
Stena 18	0,752	8,289	1,000	6,23752
Stena 19	0,420	8,289	1,000	3,48140
Stena 20	2,818	8,289	1,000	23,35442
Stena 21	3,176	8,289	1,000	26,32812
Stena 22	2,328	8,289	1,000	19,29278
Stena 23	3,343	8,289	1,000	27,70618
Stena 24	2,485	8,289	1,000	20,59831
Stena 25	0,858	8,289	1,000	7,10787
Stena 26	0,350	8,289	1,000	2,90117
Stena 27	0,525	8,289	1,000	4,35176
Stena 28	0,726	8,289	1,000	6,01993
Stena 29	0,639	8,289	1,000	5,29464
Stena 30	1,242	8,289	1,000	10,29915
Stena 31	1,076	8,289	1,000	8,92110
Stena 32	0,534	8,289	1,000	4,42428
Stena 33	1,067	8,289	1,000	8,84857
Stena 34	0,700	8,289	1,000	5,80234
Stena 35	0,420	8,289	1,000	3,48140
Stena 36	2,039	8,289	1,000	16,89932
Stena 37	2,476	8,289	1,000	20,52578
Stena 39	0,787	24,525	1,000	19,31344
Stena 40	0,219	24,525	1,000	5,36484
Stena 41	0,219	24,525	1,000	5,36484
Stena 42	0,219	24,525	1,000	5,36484
Stena 43	0,219	24,525	1,000	5,36484
Stena 44	0,219	24,525	1,000	5,36484
Stena 45	0,219	24,525	1,000	5,36484

Stena 46	0,219	24,525	1,000	5,36484
Stena 47	0,219	24,525	1,000	5,36484
Stena 48	0,219	24,525	1,000	5,36484
Stena 49	0,219	24,525	1,000	5,36484
Stena 50	0,219	24,525	1,000	5,36484
Stena 51	0,219	24,525	1,000	5,36484
Stena 52	0,814	24,525	1,000	19,95722
Stena 53	0,219	24,525	1,000	5,36484
Stena 54	0,219	24,525	1,000	5,36484
Stena 55	0,219	24,525	1,000	5,36484
Stena 56	0,219	24,525	1,000	5,36484
Stena 57	0,586	24,525	1,000	14,37778
Stena 58	0,219	24,525	1,000	5,36484
Stena 59	0,219	24,525	1,000	5,36484
Stena 60	0,219	24,525	1,000	5,36484
Stena 61	0,219	24,525	1,000	5,36484
Stena 62	0,219	24,525	1,000	5,36484
Stena 63	0,219	24,525	1,000	5,36484
Stena 64	0,219	24,525	1,000	5,36484
Stena 65	0,219	24,525	1,000	5,36484
Stena 66	0,263	24,525	1,000	6,43781
Stena 67	0,569	24,525	1,000	13,94859
Stena 68	1,575	24,525	1,000	38,62688
Stena 69	1,881	24,525	1,000	46,13766
Stena 70	1,575	24,525	1,000	38,62688
Stena 71	0,219	24,525	1,000	5,36484
Stena 72	0,787	24,525	1,000	19,31344
Etaža 0,000 - 4,300 - Stalna obtežba[kN/m2]	95,704	5,000	1,000	478,51875
Etaža 0,000 - 4,300 -	95,704	1,000	1,000	95,70375

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Trajnaobtežba [kN/m2]				
Etaža 0,000 - 4,300 - Spremenljiva obtežba[kN/m2]	95,704	0,500	0,240	11,48445
Etaža 0,000 - 4,300 - Obtežba zaradi snega[kN/m2]	95,704	0,000	0,000	0,00000
Stena 73	3,926	8,289	1,000	32,54077
Stena 74	4,582	8,289	1,000	37,97839
Stena 75	2,542	8,289	1,000	21,07078
Stena 76	3,444	8,289	1,000	28,54751
Stena 77	0,933	8,289	1,000	7,73162
Stena 78	0,687	8,289	1,000	5,69251
Stena 79	0,410	8,289	1,000	3,39851
Stena 80	0,820	8,289	1,000	6,79703
Stena 81	1,609	8,289	1,000	13,33917
Stena 83	0,615	24,525	1,000	15,08288
Stena 84	0,256	24,525	1,000	6,28453
Stena 85	0,256	24,525	1,000	6,28453
Stena 86	0,256	24,525	1,000	6,28453
Stena 87	0,256	24,525	1,000	6,28453
Stena 88	0,256	24,525	1,000	6,28453
Stena 89	0,256	24,525	1,000	6,28453
Stena 90	1,025	24,525	1,000	25,13813
Stena 91	0,923	24,525	1,000	22,62431
Stena 92	0,923	24,525	1,000	22,62431

Etaža 3,700 - 7,500 - Stalna obtežba[kN/m2]	169,728	5,000	1,000	848,64000
Etaža 3,700 - 7,500 - Trajnaobtežba [kN/m2]	169,728	2,000	1,000	339,45600
Etaža 3,700 - 7,500 - Spremenljiva obtežba[kN/m2]	169,728	1,000	0,240	40,73472
Etaža 3,700 - 7,500 - Obtežba zaradi snega[kN/m2]	169,728	0,000	0,000	0,00000
Stena 93	1,080	8,289	1,000	8,95218
Stena 94	0,792	8,289	1,000	6,56493
Stena 95	0,792	8,289	1,000	6,56493
Stena 96	3,870	8,289	1,000	32,07865
Stena 97	2,493	8,289	1,000	20,66462
Stena 98	3,870	8,289	1,000	32,07865
Stena 99	2,376	8,289	1,000	19,69480
Stena 100	3,870	8,289	1,000	32,07865
Stena 101	1,296	8,289	1,000	10,74262
Stena 102	0,675	8,289	1,000	5,59511
Stena 103	3,870	8,289	1,000	32,07865
Stena 104	1,602	8,289	1,000	13,27907
Stena 105	2,898	8,289	1,000	24,02169
Stena 106	0,657	8,289	1,000	5,44591
Stena 107	0,720	8,289	1,000	5,96812
Stena 108	2,547	8,289	1,000	21,11223
Stena 109	2,088	8,289	1,000	17,30755
Stena 110	0,432	8,289	1,000	3,58087
Stena 111	1,035	8,289	1,000	8,57917
Stena 112	0,756	8,289	1,000	6,26653
Stena 113	0,495	8,289	1,000	4,10308
Stena 114	2,835	8,289	1,000	23,49948
Stena 115	2,250	8,289	1,000	18,65038
Stena 117	0,225	24,525	1,000	5,51813
Stena 118	0,225	24,525	1,000	5,51813

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Stena 119	0,792	24,525	1,000	19,42380
Stena 120	0,225	24,525	1,000	5,51813
Stena 121	0,225	24,525	1,000	5,51813
Stena 122	0,225	24,525	1,000	5,51813
Stena 123	0,225	24,525	1,000	5,51813
Stena 124	0,225	24,525	1,000	5,51813
Stena 125	0,225	24,525	1,000	5,51813
Stena 126	0,225	24,525	1,000	5,51813
Stena 127	0,225	24,525	1,000	5,51813
Stena 128	0,225	24,525	1,000	5,51813
Stena 129	0,225	24,525	1,000	5,51813
Stena 130	0,225	24,525	1,000	5,51813
Stena 131	0,225	24,525	1,000	5,51813
Stena 132	0,225	24,525	1,000	5,51813
Stena 133	0,225	24,525	1,000	5,51813
Stena 134	0,225	24,525	1,000	5,51813
Stena 135	0,225	24,525	1,000	5,51813
Stena 136	0,225	24,525	1,000	5,51813
Stena 137	0,225	24,525	1,000	5,51813
Stena 138	0,225	24,525	1,000	5,51813
Stena 139	0,171	24,525	1,000	4,19378

Stena 140	0,810	24,525	1,000	19,86525
Stena 141	0,270	24,525	1,000	6,62175
Stena 142	0,585	24,525	1,000	14,34713
Stena 143	1,620	24,525	1,000	39,73050
Stena 144	1,935	24,525	1,000	47,45588
Stena 145	1,620	24,525	1,000	39,73050
Skupna obremenitev = Fz,sum				4868,474

Vozlišče id	Fz[kN]
1	75,325
6	74,928
11	56,737
16	65,469
21	39,299
26	52,893
31	28,706
36	124,027
41	171,179
46	28,918
51	42,289
56	54,269
61	44,541
66	59,150
71	51,211
76	22,706
81	38,446
86	10,327
91	9,650
96	130,940
101	102,735
106	91,757
111	50,184
116	110,495
121	-2,708
126	36,529
131	-34,114
136	-10,174

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141	91,613
146	112,685
151	30,519
156	22,470
161	13,415
166	26,830
171	12,545
176	12,545
181	50,179
186	45,162
191	45,162
306	260,433
311	176,824
316	141,159
321	221,592
326	291,934
331	225,560
336	195,453
341	58,849
346	68,485
351	38,413

356	75,274
361	108,850
366	244,006
371	138,786
376	104,477
381	159,018
386	166,638
391	99,899
396	80,386
Skupne reakcije Fz = Rz,sum	4844,87697

Vertikalno ravnovesje kontrola na ULS cilju:

|Fz,sum - Rz,sum| = 23,6 kN (0,49 %)

6.2 Analiza Y+, exc. pos, tri

Povzetek

DLS cilj [mm]: = dt_dls	1,157
DLS kapaciteta [mm]	4,006
ULS cilj x 1,50 [mm] = dt_uls x 1,50:	3,472
ULS kapaciteta [mm] = d_t	4,006
Varnostni faktor DLS [%]	71,109
Varnostni faktor ULS [%]	13,328
Max napaka [%]	0,120
Nadstropje	2
RShift	0,00481
Dls kriterij	3,461
RShift kriterij	0,962
Uls kriterij	1,154
Dls korak Id	4
Uls korak Id	4
Obdobje T norm.	0,113
Max referenčni pospešek tal [m/s2]	2,596
Duktilnost	1,481
Faktor dodatne nosilnosti	1,475
Elastic displacement [mm] = d_y	3,395

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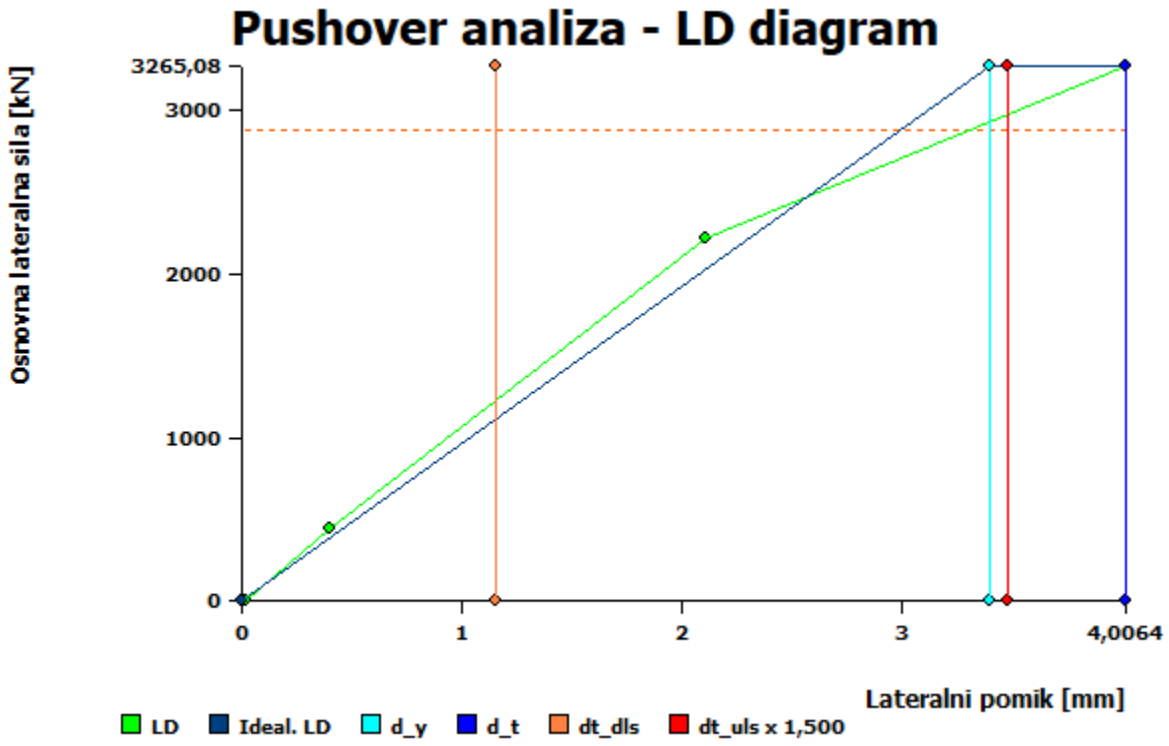

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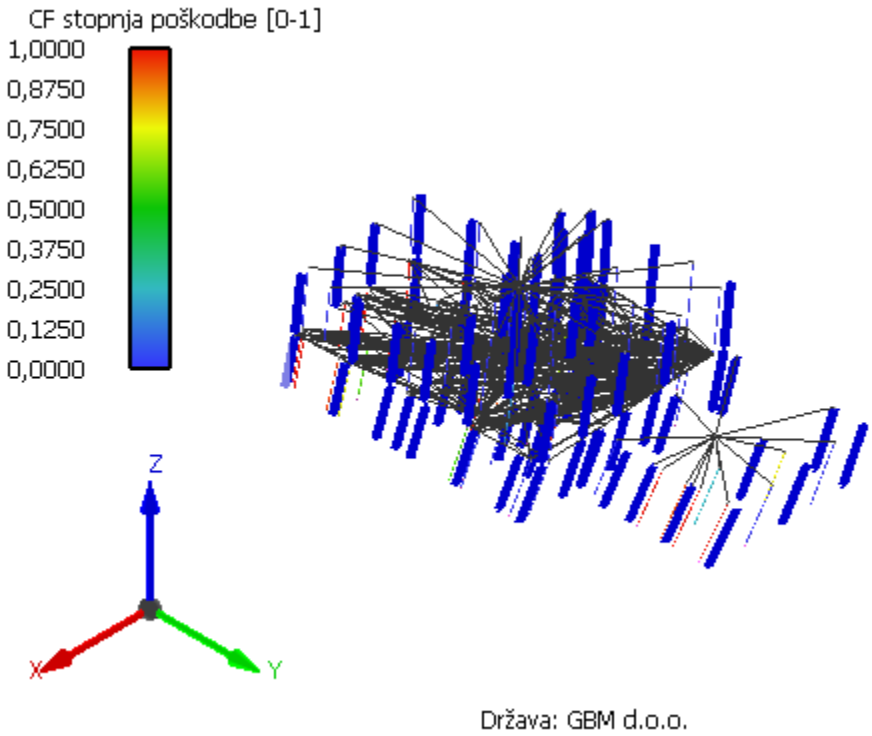

CF poškodba na zadnjem koraku, deformacija

Vertikalna obremenitev / kontrola reakcij:

Material/Obtežba	[m3, m2]	Stalna obtežba [kN/m2(m3)]	Koef.	Fz[kN]
Stropovi				
Etaža 0,000 - 3,700 - Stalna obtežba[kN/m2]	169,728	5,000	1,000	848,64000
Etaža 0,000 - 3,700 - Trajnaobtežba [kN/m2]	169,728	2,000	1,000	339,45600
Etaža 0,000 - 3,700 - Spremenljiva obtežba[kN/m2]	169,728	3,000	0,240	122,20416
Etaža 0,000 - 3,700 - Obtežba zaradi snega[kN/m2]	169,728	0,000	0,000	0,00000
Stena 1	1,146	8,289	1,000	9,50133
Stena 2	0,507	8,289	1,000	4,20670
Stena 3	0,682	8,289	1,000	5,65728
Stena 4	0,954	8,289	1,000	7,90569
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Stena 6	3,351	8,289	1,000	27,77870
Stena 7	0,656	8,289	1,000	5,43969
Stena 8	0,656	8,289	1,000	5,43969
Stena 9	0,376	8,289	1,000	3,11876
Stena 10	0,516	8,289	1,000	4,27923
Stena 11	0,613	8,289	1,000	5,07705
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Stena 13	2,161	8,289	1,000	17,91473
Stena 14	3,343	8,289	1,000	27,70618

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Stena 18	0,752	8,289	1,000	6,23752
Stena 19	0,420	8,289	1,000	3,48140
Stena 20	2,818	8,289	1,000	23,35442
Stena 21	3,176	8,289	1,000	26,32812
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Stena 23	3,343	8,289	1,000	27,70618
Stena 24	2,485	8,289	1,000	20,59831
Stena 25	0,858	8,289	1,000	7,10787
Stena 26	0,350	8,289	1,000	2,90117
Stena 27	0,525	8,289	1,000	4,35176
Stena 28	0,726	8,289	1,000	6,01993
Stena 29	0,639	8,289	1,000	5,29464
Stena 30	1,242	8,289	1,000	10,29915
Stena 31	1,076	8,289	1,000	8,92110
Stena 32	0,534	8,289	1,000	4,42428
Stena 33	1,067	8,289	1,000	8,84857
Stena 34	0,700	8,289	1,000	5,80234
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Stena 37	2,476	8,289	1,000	20,52578
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Stena 41	0,219	24,525	1,000	5,36484
Stena 42	0,219	24,525	1,000	5,36484
Stena 43	0,219	24,525	1,000	5,36484
Stena 44	0,219	24,525	1,000	5,36484
Stena 45	0,219	24,525	1,000	5,36484

Stena 46	0,219	24,525	1,000	5,36484
Stena 47	0,219	24,525	1,000	5,36484
Stena 48	0,219	24,525	1,000	5,36484
Stena 49	0,219	24,525	1,000	5,36484
Stena 50	0,219	24,525	1,000	5,36484
Stena 51	0,219	24,525	1,000	5,36484
Stena 52	0,814	24,525	1,000	19,95722
Stena 53	0,219	24,525	1,000	5,36484
Stena 54	0,219	24,525	1,000	5,36484
Stena 55	0,219	24,525	1,000	5,36484
Stena 56	0,219	24,525	1,000	5,36484
Stena 57	0,586	24,525	1,000	14,37778
Stena 58	0,219	24,525	1,000	5,36484
Stena 59	0,219	24,525	1,000	5,36484
Stena 60	0,219	24,525	1,000	5,36484
Stena 61	0,219	24,525	1,000	5,36484
Stena 62	0,219	24,525	1,000	5,36484
Stena 63	0,219	24,525	1,000	5,36484
Stena 64	0,219	24,525	1,000	5,36484
Stena 65	0,219	24,525	1,000	5,36484
Stena 66	0,263	24,525	1,000	6,43781
Stena 67	0,569	24,525	1,000	13,94859
Stena 68	1,575	24,525	1,000	38,62688
Stena 69	1,881	24,525	1,000	46,13766
Stena 70	1,575	24,525	1,000	38,62688
Stena 71	0,219	24,525	1,000	5,36484
Stena 72	0,787	24,525	1,000	19,31344
Etaža 0,000 - 4,300 - Stalna obtežba[kN/m2]	95,704	5,000	1,000	478,51875
Etaža 0,000 - 4,300 -	95,704	1,000	1,000	95,70375

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Trajnaobtežba [kN/m2]				
Etaža 0,000 - 4,300 - Spremenljiva obtežba[kN/m2]	95,704	0,500	0,240	11,48445
Etaža 0,000 - 4,300 - Obtežba zaradi snega[kN/m2]	95,704	0,000	0,000	0,00000
Stena 73	3,926	8,289	1,000	32,54077
Stena 74	4,582	8,289	1,000	37,97839
Stena 75	2,542	8,289	1,000	21,07078
Stena 76	3,444	8,289	1,000	28,54751
Stena 77	0,933	8,289	1,000	7,73162
Stena 78	0,687	8,289	1,000	5,69251
Stena 79	0,410	8,289	1,000	3,39851
Stena 80	0,820	8,289	1,000	6,79703
Stena 81	1,609	8,289	1,000	13,33917
Stena 83	0,615	24,525	1,000	15,08288
Stena 84	0,256	24,525	1,000	6,28453
Stena 85	0,256	24,525	1,000	6,28453
Stena 86	0,256	24,525	1,000	6,28453
Stena 87	0,256	24,525	1,000	6,28453
Stena 88	0,256	24,525	1,000	6,28453
Stena 89	0,256	24,525	1,000	6,28453
Stena 90	1,025	24,525	1,000	25,13813
Stena 91	0,923	24,525	1,000	22,62431
Stena 92	0,923	24,525	1,000	22,62431

Etaža 3,700 - 7,500 - Stalna obtežba[kN/m2]	169,728	5,000	1,000	848,64000
Etaža 3,700 - 7,500 - Trajnaobtežba [kN/m2]	169,728	2,000	1,000	339,45600
Etaža 3,700 - 7,500 - Spremenljiva obtežba[kN/m2]	169,728	1,000	0,240	40,73472
Etaža 3,700 - 7,500 - Obtežba zaradi snega[kN/m2]	169,728	0,000	0,000	0,00000
Stena 93	1,080	8,289	1,000	8,95218
Stena 94	0,792	8,289	1,000	6,56493
Stena 95	0,792	8,289	1,000	6,56493
Stena 96	3,870	8,289	1,000	32,07865
Stena 97	2,493	8,289	1,000	20,66462
Stena 98	3,870	8,289	1,000	32,07865
Stena 99	2,376	8,289	1,000	19,69480
Stena 100	3,870	8,289	1,000	32,07865
Stena 101	1,296	8,289	1,000	10,74262
Stena 102	0,675	8,289	1,000	5,59511
Stena 103	3,870	8,289	1,000	32,07865
Stena 104	1,602	8,289	1,000	13,27907
Stena 105	2,898	8,289	1,000	24,02169
Stena 106	0,657	8,289	1,000	5,44591
Stena 107	0,720	8,289	1,000	5,96812
Stena 108	2,547	8,289	1,000	21,11223
Stena 109	2,088	8,289	1,000	17,30755
Stena 110	0,432	8,289	1,000	3,58087
Stena 111	1,035	8,289	1,000	8,57917
Stena 112	0,756	8,289	1,000	6,26653
Stena 113	0,495	8,289	1,000	4,10308
Stena 114	2,835	8,289	1,000	23,49948
Stena 115	2,250	8,289	1,000	18,65038
Stena 117	0,225	24,525	1,000	5,51813
Stena 118	0,225	24,525	1,000	5,51813

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Stena 119	0,792	24,525	1,000	19,42380
Stena 120	0,225	24,525	1,000	5,51813
Stena 121	0,225	24,525	1,000	5,51813
Stena 122	0,225	24,525	1,000	5,51813
Stena 123	0,225	24,525	1,000	5,51813
Stena 124	0,225	24,525	1,000	5,51813
Stena 125	0,225	24,525	1,000	5,51813
Stena 126	0,225	24,525	1,000	5,51813
Stena 127	0,225	24,525	1,000	5,51813
Stena 128	0,225	24,525	1,000	5,51813
Stena 129	0,225	24,525	1,000	5,51813
Stena 130	0,225	24,525	1,000	5,51813
Stena 131	0,225	24,525	1,000	5,51813
Stena 132	0,225	24,525	1,000	5,51813
Stena 133	0,225	24,525	1,000	5,51813
Stena 134	0,225	24,525	1,000	5,51813
Stena 135	0,225	24,525	1,000	5,51813
Stena 136	0,225	24,525	1,000	5,51813
Stena 137	0,225	24,525	1,000	5,51813
Stena 138	0,225	24,525	1,000	5,51813
Stena 139	0,171	24,525	1,000	4,19378

Stena 140	0,810	24,525	1,000	19,86525
Stena 141	0,270	24,525	1,000	6,62175
Stena 142	0,585	24,525	1,000	14,34713
Stena 143	1,620	24,525	1,000	39,73050
Stena 144	1,935	24,525	1,000	47,45588
Stena 145	1,620	24,525	1,000	39,73050
Skupna obremenitev = Fz,sum				4868,474

Vozlišče id	Fz[kN]
1	99,173
6	101,436
11	60,155
16	62,802
21	38,015
26	47,354
31	36,197
36	22,607
41	10,251
46	2,098
51	2,166
56	2,996
61	2,635
66	5,126
71	4,440
76	2,202
81	4,404
86	2,888
91	5,329
96	122,272
101	-0,0303
106	-49,003
111	-60,564
116	143,204
121	41,048
126	101,478
131	120,689
136	51,845

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141	157,046
146	112,729
151	30,531
156	22,479
161	13,420
166	26,841
171	12,565
176	12,565
181	50,238
186	45,216
191	45,224
306	430,668
311	220,249
316	474,873
321	114,533
326	249,803
331	125,195
336	165,030
341	390,751
346	220,370
351	74,015

356	113,133
361	168,887
366	233,449
371	-48,138
376	-105,937
381	159,067
386	166,704
391	99,936
396	80,416
Skupne reakcije Fz = Rz,sum	4845,07466

Vertikalno ravnovesje kontrola na ULS cilju:

|Fz,sum - Rz,sum| = 23,4 kN (0,48 %)

6.3 Analiza Statika

Povzetek

Mejno stanje nosilnosti: Pogoji izpolnjeni

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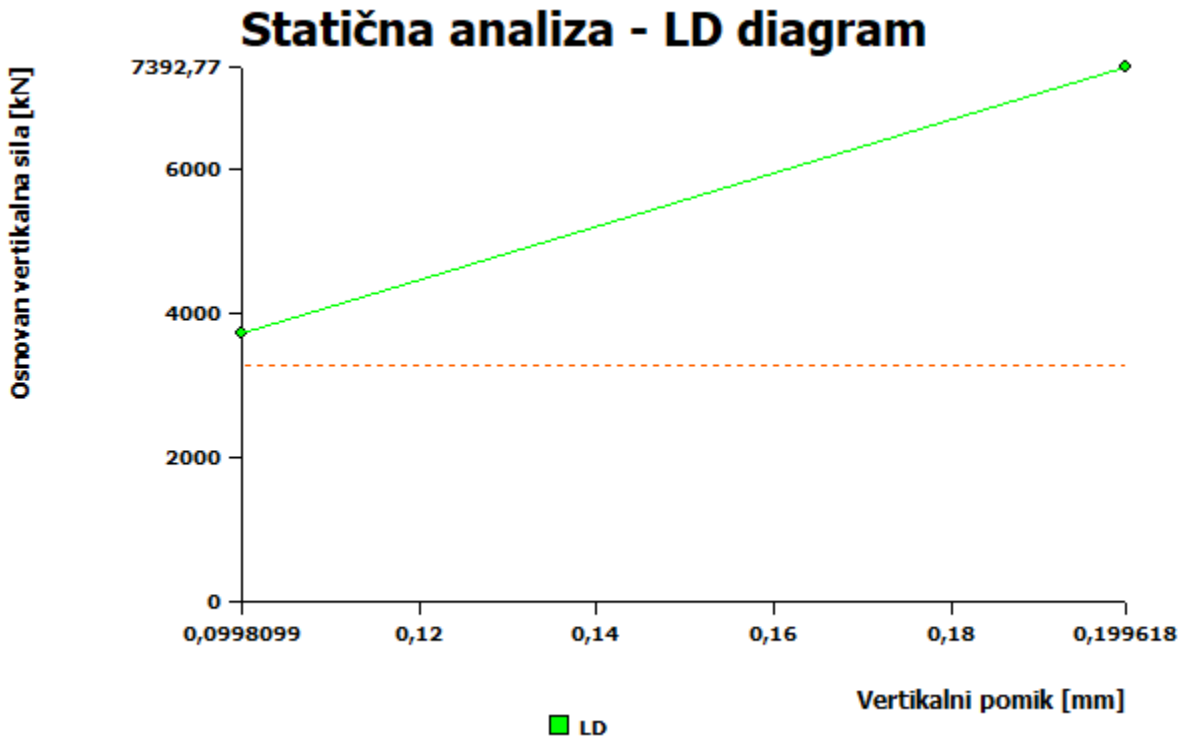

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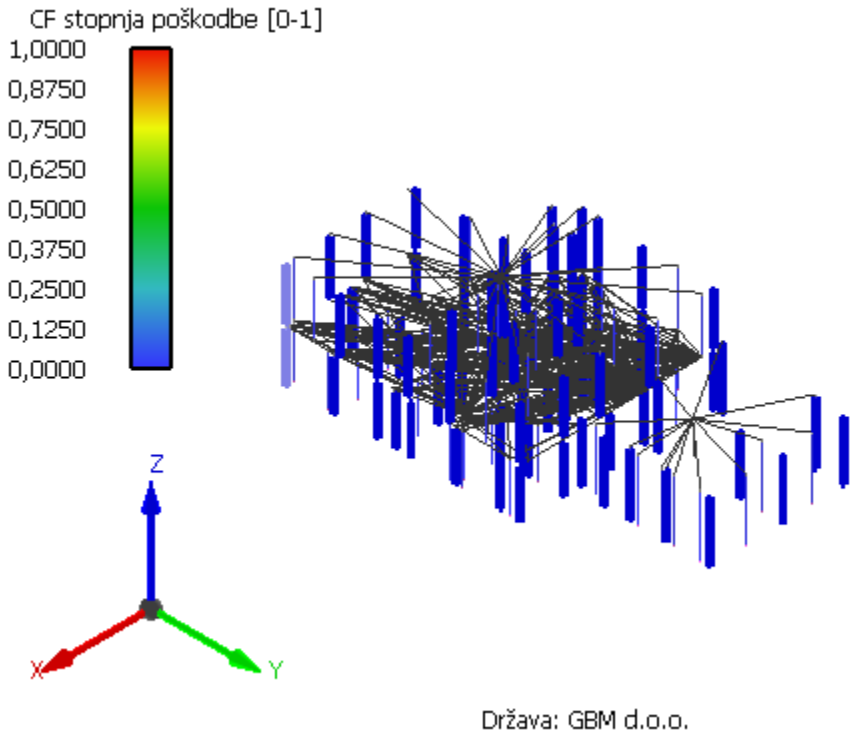

CF poškodba na zadnjem koraku, deformacija

Vertikalna obremenitev / kontrola reakcij:

Material/Obtežba	[m3, m2]	Stalna obtežba [kN/m2(m3)]	Koef.	Fz[kN]
Stropovi				
Etaža 0,000 - 3,700 - Stalna obtežba[kN/m2]	169,728	5,000	1,350	1145,66400
Etaža 0,000 - 3,700 - Trajnaobtežba [kN/m2]	169,728	2,000	1,350	458,26560
Etaža 0,000 - 3,700 - Spremenljiva obtežba[kN/m2]	169,728	3,000	1,500	763,77600
Etaža 0,000 - 3,700 - Obtežba zaradi snega[kN/m2]	169,728	0,000	0,750	0,00000
Stena 1	1,146	8,289	1,350	12,82680
Stena 2	0,507	8,289	1,350	5,67904
Stena 3	0,682	8,289	1,350	7,63733
Stena 4	0,954	8,289	1,350	10,67268
Stena 5	0,840	8,289	1,350	9,39979
Stena 6	3,351	8,289	1,350	37,50125
Stena 7	0,656	8,289	1,350	7,34359
Stena 8	0,656	8,289	1,350	7,34359
Stena 9	0,376	8,289	1,350	4,21032
Stena 10	0,516	8,289	1,350	5,77696
Stena 11	0,613	8,289	1,350	6,85401
Stena 12	3,185	8,289	1,350	35,64088
Stena 13	2,161	8,289	1,350	24,18488
Stena 14	3,343	8,289	1,350	37,40334

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Stena 15	3,754	8,289	1,350	42,00532
Stena 16	2,756	8,289	1,350	30,84307
Stena 17	0,376	8,289	1,350	4,21032
Stena 18	0,752	8,289	1,350	8,42065
Stena 19	0,420	8,289	1,350	4,69990
Stena 20	2,818	8,289	1,350	31,52847
Stena 21	3,176	8,289	1,350	35,54296
Stena 22	2,328	8,289	1,350	26,04526
Stena 23	3,343	8,289	1,350	37,40334
Stena 24	2,485	8,289	1,350	27,80772
Stena 25	0,858	8,289	1,350	9,59562
Stena 26	0,350	8,289	1,350	3,91658
Stena 27	0,525	8,289	1,350	5,87487
Stena 28	0,726	8,289	1,350	8,12690
Stena 29	0,639	8,289	1,350	7,14776
Stena 30	1,242	8,289	1,350	13,90386
Stena 31	1,076	8,289	1,350	12,04348
Stena 32	0,534	8,289	1,350	5,97278
Stena 33	1,067	8,289	1,350	11,94557
Stena 34	0,700	8,289	1,350	7,83316
Stena 35	0,420	8,289	1,350	4,69990
Stena 36	2,039	8,289	1,350	22,81408
Stena 37	2,476	8,289	1,350	27,70980
Stena 39	0,787	24,525	1,350	26,07314
Stena 40	0,219	24,525	1,350	7,24254
Stena 41	0,219	24,525	1,350	7,24254
Stena 42	0,219	24,525	1,350	7,24254
Stena 43	0,219	24,525	1,350	7,24254
Stena 44	0,219	24,525	1,350	7,24254
Stena 45	0,219	24,525	1,350	7,24254

Stena 46	0,219	24,525	1,350	7,24254
Stena 47	0,219	24,525	1,350	7,24254
Stena 48	0,219	24,525	1,350	7,24254
Stena 49	0,219	24,525	1,350	7,24254
Stena 50	0,219	24,525	1,350	7,24254
Stena 51	0,219	24,525	1,350	7,24254
Stena 52	0,814	24,525	1,350	26,94225
Stena 53	0,219	24,525	1,350	7,24254
Stena 54	0,219	24,525	1,350	7,24254
Stena 55	0,219	24,525	1,350	7,24254
Stena 56	0,219	24,525	1,350	7,24254
Stena 57	0,586	24,525	1,350	19,41000
Stena 58	0,219	24,525	1,350	7,24254
Stena 59	0,219	24,525	1,350	7,24254
Stena 60	0,219	24,525	1,350	7,24254
Stena 61	0,219	24,525	1,350	7,24254
Stena 62	0,219	24,525	1,350	7,24254
Stena 63	0,219	24,525	1,350	7,24254
Stena 64	0,219	24,525	1,350	7,24254
Stena 65	0,219	24,525	1,350	7,24254
Stena 66	0,263	24,525	1,350	8,69105
Stena 67	0,569	24,525	1,350	18,83060
Stena 68	1,575	24,525	1,350	52,14628
Stena 69	1,881	24,525	1,350	62,28584
Stena 70	1,575	24,525	1,350	52,14628
Stena 71	0,219	24,525	1,350	7,24254
Stena 72	0,787	24,525	1,350	26,07314
Etaža 0,000 - 4,300 - Stalna obtežba[kN/m2]	95,704	5,000	1,350	646,00031
Etaža 0,000 - 4,300 -	95,704	1,000	1,350	129,20006

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Trajnaobtežba [kN/m2]				
Etaža 0,000 - 4,300 - Spremenljiva obtežba[kN/m2]	95,704	0,500	1,500	71,77781
Etaža 0,000 - 4,300 - Obtežba zaradi snega[kN/m2]	95,704	0,000	0,750	0,00000
Stena 73	3,926	8,289	1,350	43,93004
Stena 74	4,582	8,289	1,350	51,27083
Stena 75	2,542	8,289	1,350	28,44556
Stena 76	3,444	8,289	1,350	38,53914
Stena 77	0,933	8,289	1,350	10,43768
Stena 78	0,687	8,289	1,350	7,68489
Stena 79	0,410	8,289	1,350	4,58799
Stena 80	0,820	8,289	1,350	9,17599
Stena 81	1,609	8,289	1,350	18,00787
Stena 83	0,615	24,525	1,350	20,36188
Stena 84	0,256	24,525	1,350	8,48412
Stena 85	0,256	24,525	1,350	8,48412
Stena 86	0,256	24,525	1,350	8,48412
Stena 87	0,256	24,525	1,350	8,48412
Stena 88	0,256	24,525	1,350	8,48412
Stena 89	0,256	24,525	1,350	8,48412
Stena 90	1,025	24,525	1,350	33,93647
Stena 91	0,923	24,525	1,350	30,54282
Stena 92	0,923	24,525	1,350	30,54282

Etaža 3,700 - 7,500 - Stalna obtežba[kN/m2]	169,728	5,000	1,350	1145,66400
Etaža 3,700 - 7,500 - Trajnaobtežba [kN/m2]	169,728	2,000	1,350	458,26560
Etaža 3,700 - 7,500 - Spremenljiva obtežba[kN/m2]	169,728	1,000	1,500	254,59200
Etaža 3,700 - 7,500 - Obtežba zaradi snega[kN/m2]	169,728	0,000	0,750	0,00000
Stena 93	1,080	8,289	1,350	12,08545
Stena 94	0,792	8,289	1,350	8,86266
Stena 95	0,792	8,289	1,350	8,86266
Stena 96	3,870	8,289	1,350	43,30618
Stena 97	2,493	8,289	1,350	27,89724
Stena 98	3,870	8,289	1,350	43,30618
Stena 99	2,376	8,289	1,350	26,58798
Stena 100	3,870	8,289	1,350	43,30618
Stena 101	1,296	8,289	1,350	14,50254
Stena 102	0,675	8,289	1,350	7,55340
Stena 103	3,870	8,289	1,350	43,30618
Stena 104	1,602	8,289	1,350	17,92674
Stena 105	2,898	8,289	1,350	32,42928
Stena 106	0,657	8,289	1,350	7,35198
Stena 107	0,720	8,289	1,350	8,05696
Stena 108	2,547	8,289	1,350	28,50151
Stena 109	2,088	8,289	1,350	23,36520
Stena 110	0,432	8,289	1,350	4,83418
Stena 111	1,035	8,289	1,350	11,58189
Stena 112	0,756	8,289	1,350	8,45981
Stena 113	0,495	8,289	1,350	5,53916
Stena 114	2,835	8,289	1,350	31,72430
Stena 115	2,250	8,289	1,350	25,17801
Stena 117	0,225	24,525	1,350	7,44947
Stena 118	0,225	24,525	1,350	7,44947

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Stena 119	0,792	24,525	1,350	26,22213
Stena 120	0,225	24,525	1,350	7,44947
Stena 121	0,225	24,525	1,350	7,44947
Stena 122	0,225	24,525	1,350	7,44947
Stena 123	0,225	24,525	1,350	7,44947
Stena 124	0,225	24,525	1,350	7,44947
Stena 125	0,225	24,525	1,350	7,44947
Stena 126	0,225	24,525	1,350	7,44947
Stena 127	0,225	24,525	1,350	7,44947
Stena 128	0,225	24,525	1,350	7,44947
Stena 129	0,225	24,525	1,350	7,44947
Stena 130	0,225	24,525	1,350	7,44947
Stena 131	0,225	24,525	1,350	7,44947
Stena 132	0,225	24,525	1,350	7,44947
Stena 133	0,225	24,525	1,350	7,44947
Stena 134	0,225	24,525	1,350	7,44947
Stena 135	0,225	24,525	1,350	7,44947
Stena 136	0,225	24,525	1,350	7,44947
Stena 137	0,225	24,525	1,350	7,44947
Stena 138	0,225	24,525	1,350	7,44947
Stena 139	0,171	24,525	1,350	5,66160

Stena 140	0,810	24,525	1,350	26,81809
Stena 141	0,270	24,525	1,350	8,93936
Stena 142	0,585	24,525	1,350	19,36862
Stena 143	1,620	24,525	1,350	53,63618
Stena 144	1,935	24,525	1,350	64,06543
Stena 145	1,620	24,525	1,350	53,63618
Skupna obremenitev = Fz,sum				7427,114

Vozlišče id	Fz[kN]
1	72,756
6	78,896
11	57,316
16	60,984
21	36,020
26	48,101
31	33,498
36	138,120
41	156,404
46	24,325
51	35,182
56	43,555
61	36,306
66	58,801
71	56,193
76	24,517
81	45,742
86	23,460
91	20,625
96	118,422
101	84,643
106	71,374
111	53,192
116	115,099
121	63,249
126	154,146
131	338,971
136	398,552

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141	392,994
146	160,209
151	43,390
156	31,946
161	19,072
166	38,145
171	17,537
176	17,537
181	70,148
186	63,133
191	63,133
306	299,811
311	168,552
316	298,957
321	196,204
326	302,599
331	213,018
336	277,944
341	265,789
346	197,014
351	67,992

356	103,235
361	203,997
366	284,929
371	195,627
376	233,741
381	225,533
386	236,517
391	141,632
396	113,982
Skupne reakcije Fz = Rz,sum	7392,76796

Vertikalno ravnovesje kontrola na zadnjem koraku:
|Fz,sum - Rz,sum| = 34,35 kN (0,46 %)

Kontrola prereza
Korak2
Gradbeni element id 3 (Stene/Stebri: 1)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-68,938	0,000215	-0,000906	-0,000191	-0,0541	0,00631	
	Rd	-353,580	25,830	-25,830	-2,564	-0,380	5,225	
								OK
Mid	E	-68,938	0,000215	-0,000906	-0,000191	-0,0557	0,00593	
	Rd	-308,710	25,830	-25,830	-2,564	-0,171	4,142	
								OK
2	E	-68,938	0,000215	-0,000906	-0,000191	-0,0573	0,00556	
	Rd	-353,605	25,830	-25,830	-2,564	-0,402	5,221	
								OK

Gradbeni element id 8 (Stene/Stebri: 2)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-74,197	0,000178	-0,000122	-0,000344	-0,106	-0,00668	
	Rd	-435,486	29,854	-29,854	-4,630	-0,783	-6,001	
								OK
Mid	E	-74,197	0,000178	-0,000122	-0,000344	-0,106	-0,00700	
	Rd	-379,140	29,854	-29,854	-4,630	-0,351	-4,981	
								OK
2	E	-74,197	0,000178	-0,000122	-0,000344	-0,106	-0,00731	
	Rd	-435,489	29,854	-29,854	-4,630	-0,786	-6,000	
								OK

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Gradbeni element id 13 (Stene/Stebri: 3)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-53,644	0,000215	0,0000642	-0,000171	-0,0498	0,00610	
	Rd	-340,040	22,538	22,538	-2,297	-0,384	4,554	
								OK
Mid	E	-53,644	0,000215	0,0000642	-0,000171	-0,0497	0,00573	
	Rd	-296,852	22,538	22,538	-2,297	-0,169	3,730	
								OK
2	E	-53,644	0,000215	0,0000642	-0,000171	-0,0496	0,00535	
	Rd	-340,038	22,538	22,538	-2,297	-0,383	4,554	
								OK

Gradbeni element id 18 (Stene/Stebri: 4)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-57,312	0,000174	-0,000206	-0,000171	-0,0491	0,00599	
	Rd	-340,003	23,204	-23,204	-2,297	-0,368	4,694	
								OK
Mid	E	-57,312	0,000174	-0,000206	-0,000171	-0,0495	0,00568	
	Rd	-296,835	23,204	-23,204	-2,297	-0,163	3,805	
								OK
2	E	-57,312	0,000174	-0,000206	-0,000171	-0,0499	0,00538	
	Rd	-340,010	23,204	-23,204	-2,297	-0,374	4,692	
								OK

Gradbeni element id 23 (Stene/Stebri: 5)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-33,915	-0,0000470	0,000652	-0,0000388	-0,0110	-0,00327	
	Rd	-194,599	-13,496	13,496	-0,521	-0,0829	-2,802	
								OK
Mid	E	-33,915	-0,0000470	0,000652	-0,0000388	-0,00984	-0,00319	
	Rd	-169,948	-13,496	13,496	-0,521	-0,0322	-2,232	
								OK
2	E	-33,915	-0,0000470	0,000652	-0,0000388	-0,00870	-0,00311	
	Rd	-194,625	-13,496	13,496	-0,521	-0,0656	-2,797	
								OK

Gradbeni element id 28 (Stene/Stebri: 6)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-45,212	-0,0000690	0,00154	-0,0000883	-0,0281	-0,00449	
	Rd	-266,922	-18,277	18,277	-1,187	-0,216	-3,811	
								OK
Mid	E	-45,212	-0,0000690	0,00154	-0,0000883	-0,0254	-0,00437	
	Rd	-233,123	-18,277	18,277	-1,187	-0,0843	-3,044	
								OK
2	E	-45,212	-0,0000690	0,00154	-0,0000883	-0,0227	-0,00425	
	Rd	-266,971	-18,277	18,277	-1,187	-0,174	-3,802	
								OK

Gradbeni element id 33 (Stene/Stebri: 7)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-31,148	0,000123	0,0000478	-0,0000512	-0,0131	0,00389	
	Rd	-217,526	13,845	13,845	-0,689	-0,107	2,811	
								OK
Mid	E	-31,148	0,000123	0,0000478	-0,0000512	-0,0130	0,00367	
	Rd	-189,925	13,845	13,845	-0,689	-0,0467	2,330	
								OK
2	E	-31,148	0,000123	0,0000478	-0,0000512	-0,0130	0,00346	
	Rd	-217,524	13,845	13,845	-0,689	-0,106	2,811	
								OK

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Gradbeni element id 38 (Stene/Stebri: 8)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-125,097	-0,000746	0,0401	-0,00692	-2,392	-0,0210	
	Rd	-1270,159	-68,086	68,086	-93,049	-20,768	-12,193	
								OK
Mid	E	-125,097	-0,000746	0,0401	-0,00692	-2,322	-0,0197	
	Rd	-1093,793	-68,086	68,086	-93,049	-9,015	-10,474	
								OK
2	E	-125,097	-0,000746	0,0401	-0,00692	-2,252	-0,0184	
	Rd	-1267,061	-68,086	68,086	-93,049	-19,802	-12,347	
								OK

Gradbeni element id 43 (Stene/Stebri: 9)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-142,500	0,00153	0,0434	-0,00841	-2,800	0,0247	
	Rd	-1358,174	74,318	74,318	-113,124	-23,715	13,518	
								OK
Mid	E	-142,500	0,00153	0,0434	-0,00841	-2,724	0,0221	
	Rd	-1169,874	74,318	74,318	-113,124	-10,526	11,859	
								OK
2	E	-142,500	0,00153	0,0434	-0,00841	-2,648	0,0194	
	Rd	-1354,916	74,318	74,318	-113,124	-22,631	13,610	
								OK

Gradbeni element id 48 (Stene/Stebri: 10)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-22,366	-0,0000773	0,000224	-0,0000324	-0,00814	-0,00307	
	Rd	-181,005	-10,885	10,885	-0,436	-0,0718	-2,214	
								OK
Mid	E	-22,366	-0,0000773	0,000224	-0,0000324	-0,00775	-0,00294	
	Rd	-158,070	-10,885	10,885	-0,436	-0,0297	-1,841	
								OK
2	E	-22,366	-0,0000773	0,000224	-0,0000324	-0,00736	-0,00280	
	Rd	-181,018	-10,885	10,885	-0,436	-0,0649	-2,213	
								OK

Gradbeni element id 53 (Stene/Stebri: 11)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-32,245	-0,000132	0,000729	-0,0000924	-0,0274	-0,00464	
	Rd	-272,077	-16,090	16,090	-1,242	-0,242	-3,193	
								OK
Mid	E	-32,245	-0,000132	0,000729	-0,0000924	-0,0262	-0,00441	
	Rd	-236,981	-16,090	16,090	-1,242	-0,100	-2,644	
								OK
2	E	-32,245	-0,000132	0,000729	-0,0000924	-0,0249	-0,00418	
	Rd	-272,043	-16,090	16,090	-1,242	-0,220	-3,193	
								OK

Gradbeni element id 58 (Stene/Stebri: 12)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-39,492	-0,000262	0,00201	-0,000227	-0,0729	-0,00657	
	Rd	-376,857	-21,328	21,328	-3,056	-0,646	-3,940	
								OK
Mid	E	-39,492	-0,000262	0,00201	-0,000227	-0,0694	-0,00612	
	Rd	-328,736	-21,328	21,328	-3,056	-0,268	-3,288	
								OK
2	E	-39,492	-0,000262	0,00201	-0,000227	-0,0659	-0,00566	
	Rd	-376,751	-21,328	21,328	-3,056	-0,585	-3,941	
								OK

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Gradbeni element id 63 (Stene/Stebri: 13)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-32,732	0,0000697	0,00141	-0,000158	-0,0481	0,00560	
	Rd	-331,300	18,394	18,394	-2,130	-0,428	3,281	
								OK
Mid	E	-32,732	0,0000697	0,00141	-0,000158	-0,0456	0,00548	
	Rd	-289,134	18,394	18,394	-2,130	-0,177	2,736	
								OK
2	E	-32,732	0,0000697	0,00141	-0,000158	-0,0431	0,00535	
	Rd	-331,209	18,394	18,394	-2,130	-0,384	3,279	
								OK

Gradbeni element id 68 (Stene/Stebri: 14)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-51,850	0,000200	0,00986	-0,00108	-0,355	0,0111	
	Rd	-653,375	33,632	33,632	-14,467	-3,189	5,280	
								OK
Mid	E	-51,850	0,000200	0,00986	-0,00108	-0,337	0,0108	
	Rd	-566,028	33,632	33,632	-14,467	-1,325	4,420	
								OK
2	E	-51,850	0,000200	0,00986	-0,00108	-0,320	0,0104	
	Rd	-651,953	33,632	33,632	-14,467	-2,878	5,273	
								OK

Gradbeni element id 73 (Stene/Stebri: 15)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-50,171	-0,000340	0,00472	-0,000706	-0,235	-0,00967	
	Rd	-562,113	-30,088	30,088	-9,496	-2,106	-5,071	
								OK
Mid	E	-50,171	-0,000340	0,00472	-0,000706	-0,227	-0,00907	
	Rd	-488,548	-30,088	30,088	-9,496	-0,884	-4,222	
								OK
2	E	-50,171	-0,000340	0,00472	-0,000706	-0,219	-0,00848	
	Rd	-561,628	-30,088	30,088	-9,496	-1,962	-5,073	
								OK

Gradbeni element id 78 (Stene/Stebri: 16)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-21,530	-0,000194	0,000593	-0,0000966	-0,0287	-0,00483	
	Rd	-276,761	-14,312	14,312	-1,299	-0,257	-2,184	
								OK
Mid	E	-21,530	-0,000194	0,000593	-0,0000966	-0,0276	-0,00449	
	Rd	-240,804	-14,312	14,312	-1,299	-0,108	-1,830	
								OK
2	E	-21,530	-0,000194	0,000593	-0,0000966	-0,0266	-0,00416	
	Rd	-276,724	-14,312	14,312	-1,299	-0,239	-2,185	
								OK

Gradbeni element id 83 (Stene/Stebri: 17)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-39,769	-0,000238	0,00312	-0,000689	-0,217	0,00862	
	Rd	-558,958	-28,026	28,026	-9,272	-1,957	4,074	
								OK
Mid	E	-39,769	-0,000238	0,00312	-0,000689	-0,211	0,00904	
	Rd	-485,476	-28,026	28,026	-9,272	-0,835	3,424	
								OK
2	E	-39,769	-0,000238	0,00312	-0,000689	-0,206	0,00945	
	Rd	-558,395	-28,026	28,026	-9,272	-1,857	4,079	
								OK

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Gradbeni element id 88 (Stene/Stebri: 18)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-19,544	-0,000108	0,00162	-0,000205	-0,0627	0,00580	
	Rd	-364,428	-17,190	17,190	-2,754	-0,575	2,047	
								OK
Mid	E	-19,544	-0,000108	0,00162	-0,000205	-0,0599	0,00599	
	Rd	-317,450	-17,190	17,190	-2,754	-0,241	1,734	
								OK
2	E	-19,544	-0,000108	0,00162	-0,000205	-0,0571	0,00618	
	Rd	-364,136	-17,190	17,190	-2,754	-0,522	2,047	
								OK

Gradbeni element id 93 (Stene/Stebri: 19)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-18,275	-0,00000924	0,000193	-0,0000512	-0,0133	0,00361	
	Rd	-217,645	-11,505	11,505	-0,689	-0,119	1,850	
								OK
Mid	E	-18,275	-0,00000924	0,000193	-0,0000512	-0,0130	0,00363	
	Rd	-189,999	-11,505	11,505	-0,689	-0,0508	1,550	
								OK
2	E	-18,275	-0,00000924	0,000193	-0,0000512	-0,0126	0,00365	
	Rd	-217,629	-11,505	11,505	-0,689	-0,113	1,850	
								OK

Gradbeni element id 98 (Stene/Stebri: 20)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-114,801	-0,000127	0,000838	-0,0000676	-0,0134	-0,0116	
	Rd	-953,727	-122,931	122,931	-0,218	-20,284	-20,258	
								OK
Mid	E	-114,801	-0,000127	0,000838	-0,0000676	-0,0120	-0,0114	
	Rd	-838,277	-122,931	122,931	-0,218	-10,075	-27,176	
								OK
2	E	-114,801	-0,000127	0,000838	-0,0000676	-0,0105	-0,0112	
	Rd	-953,657	-122,931	122,931	-0,218	-20,342	-20,353	
								OK

Gradbeni element id 103 (Stene/Stebri: 21)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-81,022	-0,000246	0,000340	-0,0000676	-0,0123	-0,0117	
	Rd	-953,727	-122,931	122,931	-0,218	-20,129	-20,118	
								OK
Mid	E	-81,022	-0,000246	0,000340	-0,0000676	-0,0117	-0,0113	
	Rd	-838,316	-122,931	122,931	-0,218	-10,241	-27,572	
								OK
2	E	-81,022	-0,000246	0,000340	-0,0000676	-0,0111	-0,0109	
	Rd	-953,727	-122,931	122,931	-0,218	-20,126	-20,122	
								OK

Gradbeni element id 108 (Stene/Stebri: 22)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-67,753	-0,000650	0,000543	-0,0000676	-0,0127	-0,0126	
	Rd	-953,727	-122,931	122,931	-0,218	-20,068	-20,064	
								OK
Mid	E	-67,753	-0,000650	0,000543	-0,0000676	-0,0118	-0,0114	
	Rd	-838,346	-122,931	122,931	-0,218	-10,311	-27,722	
								OK
2	E	-67,753	-0,000650	0,000543	-0,0000676	-0,0108	-0,0103	
	Rd	-953,727	-122,931	122,931	-0,218	-20,072	-20,059	
								OK

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Gradbeni element id 113 (Stene/Stebri: 23)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-49,570	-0,000681	0,000643	-0,0000676	-0,0131	-0,0127	
	Rd	-953,727	-122,931	122,931	-0,218	-19,992	-19,979	
								OK
Mid	E	-49,570	-0,000681	0,000643	-0,0000676	-0,0119	-0,0115	
	Rd	-838,419	-122,931	122,931	-0,218	-10,595	-28,392	
								OK
2	E	-49,570	-0,000681	0,000643	-0,0000676	-0,0108	-0,0103	
	Rd	-953,727	-122,931	122,931	-0,218	-19,994	-19,976	
								OK

Gradbeni element id 118 (Stene/Stebri: 24)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-111,478	0,000267	-0,000192	-0,0000676	-0,0111	-0,0108	
	Rd	-953,727	122,931	-122,931	-0,218	-20,260	-20,255	
								OK
Mid	E	-111,478	0,000267	-0,000192	-0,0000676	-0,0114	-0,0112	
	Rd	-838,272	122,931	-122,931	-0,218	-10,088	-27,218	
								OK
2	E	-111,478	0,000267	-0,000192	-0,0000676	-0,0118	-0,0117	
	Rd	-953,727	122,931	-122,931	-0,218	-20,258	-20,257	
								OK

Gradbeni element id 123 (Stene/Stebri: 25)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-58,903	0,000300	0,000448	-0,0000971	-0,0199	0,0148	
	Rd	-1148,696	147,517	147,517	-0,313	-0,989	36,629	
								OK
Mid	E	-58,903	0,000300	0,000448	-0,0000971	-0,0191	0,0143	
	Rd	-983,807	147,517	147,517	-0,313	-0,354	35,349	
								OK
2	E	-58,903	0,000300	0,000448	-0,0000971	-0,0183	0,0138	
	Rd	-1148,598	147,517	147,517	-0,313	-0,913	36,628	
								OK

Gradbeni element id 128 (Stene/Stebri: 26)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-144,731	0,00187	0,00671	-0,000629	-0,196	0,0348	
	Rd	-2493,279	319,620	319,620	-2,029	-8,801	80,835	
								OK
Mid	E	-144,731	0,00187	0,00671	-0,000629	-0,185	0,0316	
	Rd	-2134,495	319,620	319,620	-2,029	-3,084	77,644	
								OK
2	E	-144,731	0,00187	0,00671	-0,000629	-0,173	0,0283	
	Rd	-2492,406	319,620	319,620	-2,029	-7,776	80,833	
								OK

Gradbeni element id 133 (Stene/Stebri: 27)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-312,898	-0,00496	0,190	-0,0116	-4,470	-0,0924	
	Rd	-7150,341	-885,101	885,101	-37,316	-238,248	-209,459	
								OK
Mid	E	-312,898	-0,00496	0,190	-0,0116	-4,138	-0,0837	
	Rd	-6028,741	-885,101	885,101	-37,316	-85,297	-210,027	
								OK
2	E	-312,898	-0,00496	0,190	-0,0116	-3,805	-0,0751	
	Rd	-7107,401	-885,101	885,101	-37,316	-209,769	-215,870	
								OK

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Gradbeni element id 138 (Stene/Stebri: 28)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-367,409	0,0104	0,203	-0,0196	-7,001	0,125	
	Rd	-8632,610	1057,204	1057,204	-63,149	-368,784	243,902	
								OK
Mid	E	-367,409	0,0104	0,203	-0,0196	-6,646	0,107	
	Rd	-7289,583	1057,204	1057,204	-63,149	-139,105	250,761	
								OK
2	E	-367,409	0,0104	0,203	-0,0196	-6,291	0,0887	
	Rd	-8598,477	1057,204	1057,204	-63,149	-341,501	249,521	
								OK

Gradbeni element id 143 (Stene/Stebri: 29)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-366,920	-0,00648	0,291	-0,0116	-4,732	-0,0959	
	Rd	-7124,341	-885,101	885,101	-37,316	-221,607	-214,714	
								OK
Mid	E	-366,920	-0,00648	0,291	-0,0116	-4,223	-0,0846	
	Rd	-6004,745	-885,101	885,101	-37,316	-76,016	-213,218	
								OK
2	E	-366,920	-0,00648	0,291	-0,0116	-3,714	-0,0732	
	Rd	-7064,023	-885,101	885,101	-37,316	-178,908	-219,887	
								OK

Gradbeni element id 148 (Stene/Stebri: 30)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-140,939	0,000	0,000	0,000	0,000	0,000	
	Rd	-1521,571	82,898	82,898	186,923	0,00120	14,130	
								OK
Mid	E	-140,939	0,000	0,000	0,000	0,000	0,000	
	Rd	-1247,499	82,898	82,898	186,923	0,00120	10,647	
								OK
2	E	-140,939	0,000	0,000	0,000	0,000	0,000	
	Rd	-1521,571	82,898	82,898	186,923	0,00120	14,130	
								OK

Gradbeni element id 153 (Stene/Stebri: 31)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-38,171	0,000	0,000	0,000	0,000	0,000	
	Rd	-412,092	22,452	22,452	3,972	0,0000879	3,827	
								OK
Mid	E	-38,171	0,000	0,000	0,000	0,000	0,000	
	Rd	-337,864	22,452	22,452	3,972	0,0000879	2,883	
								OK
2	E	-38,171	0,000	0,000	0,000	0,000	0,000	
	Rd	-412,092	22,452	22,452	3,972	0,0000879	3,827	
								OK

Gradbeni element id 158 (Stene/Stebri: 32)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-28,104	0,000	0,000	0,000	0,000	0,000	
	Rd	-303,408	16,530	16,530	1,679	0,0000476	2,818	
								OK
Mid	E	-28,104	0,000	0,000	0,000	0,000	0,000	
	Rd	-248,757	16,530	16,530	1,679	0,0000476	2,123	
								OK
2	E	-28,104	0,000	0,000	0,000	0,000	0,000	
	Rd	-303,408	16,530	16,530	1,679	0,0000476	2,818	
								OK

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Gradbeni element id 163 (Stene/Stebri: 33)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-16,778	0,000	0,000	0,000	0,000	0,000	
	Rd	-181,139	9,869	9,869	0,436	0,0000170	1,682	
								OK
Mid	E	-16,778	0,000	0,000	0,000	0,000	0,000	
	Rd	-148,512	9,869	9,869	0,436	0,0000170	1,267	
								OK
2	E	-16,778	0,000	0,000	0,000	0,000	0,000	
	Rd	-181,139	9,869	9,869	0,436	0,0000170	1,682	
								OK

Gradbeni element id 168 (Stene/Stebri: 34)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-33,557	0,000	0,000	0,000	0,000	0,000	
	Rd	-362,279	19,738	19,738	2,754	0,0000679	3,364	
								OK
Mid	E	-33,557	0,000	0,000	0,000	0,000	0,000	
	Rd	-297,024	19,738	19,738	2,754	0,0000679	2,535	
								OK
2	E	-33,557	0,000	0,000	0,000	0,000	0,000	
	Rd	-362,279	19,738	19,738	2,754	0,0000679	3,364	
								OK

Gradbeni element id 173 (Stene/Stebri: 35)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-13,295	0,000	0,000	0,000	0,000	0,000	
	Rd	-953,727	122,931	122,931	0,218	19,827	19,827	
								OK
Mid	E	-13,295	0,000	0,000	0,000	0,000	0,000	
	Rd	-801,742	122,931	122,931	0,218	8,293	27,141	
								OK
2	E	-13,295	0,000	0,000	0,000	0,000	0,000	
	Rd	-953,727	122,931	122,931	0,218	19,827	19,827	
								OK

Gradbeni element id 178 (Stene/Stebri: 36)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-13,295	0,000	0,000	0,000	0,000	0,000	
	Rd	-953,727	122,931	122,931	0,218	19,827	19,827	
								OK
Mid	E	-13,295	0,000	0,000	0,000	0,000	0,000	
	Rd	-801,742	122,931	122,931	0,218	8,293	27,141	
								OK
2	E	-13,295	0,000	0,000	0,000	0,000	0,000	
	Rd	-953,727	122,931	122,931	0,218	19,827	19,827	
								OK

Gradbeni element id 183 (Stene/Stebri: 37)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-53,179	0,000	0,000	0,000	0,000	0,000	
	Rd	-3824,773	491,723	491,723	6,731	0,000699	110,579	
								OK
Mid	E	-53,179	0,000	0,000	0,000	0,000	0,000	
	Rd	-3130,373	491,723	491,723	6,731	0,000699	109,068	
								OK
2	E	-53,179	0,000	0,000	0,000	0,000	0,000	
	Rd	-3824,773	491,723	491,723	6,731	0,000699	110,579	
								OK

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Gradbeni element id 188 (Stene/Stebri: 38)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-47,861	0,000	0,000	0,000	0,000	0,000	
	Rd	-3442,296	442,551	442,551	4,989	0,000568	99,521	
								OK
Mid	E	-47,861	0,000	0,000	0,000	0,000	0,000	
	Rd	-2817,336	442,551	442,551	4,989	0,000568	98,161	
								OK
2	E	-47,861	0,000	0,000	0,000	0,000	0,000	
	Rd	-3442,296	442,551	442,551	4,989	0,000568	99,521	
								OK

Gradbeni element id 193 (Stene/Stebri: 39)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-47,861	0,000	0,000	0,000	0,000	0,000	
	Rd	-3442,296	442,551	442,551	4,989	0,000568	99,521	
								OK
Mid	E	-47,861	0,000	0,000	0,000	0,000	0,000	
	Rd	-2817,336	442,551	442,551	4,989	0,000568	98,161	
								OK
2	E	-47,861	0,000	0,000	0,000	0,000	0,000	
	Rd	-3442,296	442,551	442,551	4,989	0,000568	99,521	
								OK

Gradbeni element id 198 (Stene/Stebri: 40)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-41,997	-0,00000350	0,00565	-0,0000784	0,000594	-0,0000303	
	Rd	-543,309	-28,090	28,090	-8,836	0,00541	-4,257	
								OK
Mid	E	-41,997	-0,00000350	0,00565	-0,0000784	0,0108	-0,0000240	
	Rd	-469,526	-28,090	28,090	-8,836	0,0406	-3,518	
								OK
2	E	-41,997	-0,00000350	0,00565	-0,0000784	0,0209	-0,0000178	
	Rd	-543,646	-28,090	28,090	-8,836	0,191	-4,270	
								OK

Gradbeni element id 205 (Stene/Stebri: 41)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-30,798	-0,0000114	0,00235	-0,0000320	0,000256	-0,0000214	
	Rd	-398,438	-20,600	20,600	-3,609	0,00233	-3,120	
								OK
Mid	E	-30,798	-0,0000114	0,00235	-0,0000320	0,00448	-7,588E-07	
	Rd	-344,309	-20,600	20,600	-3,609	0,0169	-2,577	
								OK
2	E	-30,798	-0,0000114	0,00235	-0,0000320	0,00870	0,0000198	
	Rd	-398,641	-20,600	20,600	-3,609	0,0795	3,134	
								OK

Gradbeni element id 212 (Stene/Stebri: 42)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-30,798	-0,0000160	0,00235	-0,0000320	0,000256	-0,0000209	
	Rd	-398,438	-20,600	20,600	-3,609	0,00233	-3,120	
								OK
Mid	E	-30,798	-0,0000160	0,00235	-0,0000320	0,00448	0,00000786	
	Rd	-344,431	-20,600	20,600	-3,609	0,0170	2,588	
								OK
2	E	-30,798	-0,0000160	0,00235	-0,0000320	0,00870	0,0000366	
	Rd	-398,641	-20,600	20,600	-3,609	0,0795	3,134	
								OK

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Gradbeni element id 219 (Stene/Stebri: 43)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-96,942	0,000586	0,0506	-0,000930	0,00513	-0,000129	
	Rd	-1253,968	64,842	64,842	-105,005	0,0468	-9,834	
								OK
Mid	E	-96,942	0,000586	0,0506	-0,000930	0,0963	-0,00118	
	Rd	-1084,120	64,842	64,842	-105,005	0,364	-8,140	
								OK
2	E	-96,942	0,000586	0,0506	-0,000930	0,187	-0,00224	
	Rd	-1256,708	64,842	64,842	-105,005	1,710	-9,865	
								OK

Gradbeni element id 226 (Stene/Stebri: 44)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-50,396	-0,0000496	0,0101	-0,000134	0,00105	-0,0000318	
	Rd	-651,959	-33,708	33,708	-15,074	0,00952	-5,107	
								OK
Mid	E	-50,396	-0,0000496	0,0101	-0,000134	0,0193	0,0000574	
	Rd	-563,680	-33,708	33,708	-15,074	0,0729	4,236	
								OK
2	E	-50,396	-0,0000496	0,0101	-0,000134	0,0375	0,000147	
	Rd	-652,515	-33,708	33,708	-15,074	0,342	5,128	
								OK

Gradbeni element id 233 (Stene/Stebri: 45)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-26,248	-0,0000120	0,00118	-0,0000204	0,000136	-0,0000180	
	Rd	-339,552	-17,556	17,556	-2,297	0,00124	-2,661	
								OK
Mid	E	-26,248	-0,0000120	0,00118	-0,0000204	0,00226	0,00000355	
	Rd	-293,531	-17,556	17,556	-2,297	0,00855	2,206	
								OK
2	E	-26,248	-0,0000120	0,00118	-0,0000204	0,00438	0,0000251	
	Rd	-339,703	-17,556	17,556	-2,297	0,0400	2,671	
								OK

Gradbeni element id 240 (Stene/Stebri: 46)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-25,548	-0,0000697	0,00109	-0,0000189	0,000126	-0,0000117	
	Rd	-330,546	-17,088	17,088	-2,130	0,00115	-2,589	
								OK
Mid	E	-25,548	-0,0000697	0,00109	-0,0000189	0,00208	0,000114	
	Rd	-285,705	-17,088	17,088	-2,130	0,00789	2,147	
								OK
2	E	-25,548	-0,0000697	0,00109	-0,0000189	0,00404	0,000239	
	Rd	-330,652	-17,088	17,088	-2,130	0,0369	2,599	
								OK

Gradbeni element id 245 (Stene/Stebri: 47)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-27,998	-0,0000917	0,00133	-0,0000244	0,000152	-0,0000113	
	Rd	-362,182	-18,727	18,727	-2,754	0,00139	-2,842	
								OK
Mid	E	-27,998	-0,0000917	0,00133	-0,0000244	0,00255	0,000154	
	Rd	-313,100	-18,727	18,727	-2,754	0,00965	2,353	
								OK
2	E	-27,998	-0,0000917	0,00133	-0,0000244	0,00495	0,000319	
	Rd	-362,353	-18,727	18,727	-2,754	0,0452	2,849	
								OK

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Gradbeni element id 250 (Stene/Stebri: 48)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-16,799	-0,0000257	0,000317	-0,00000611	0,0000431	-0,00000971	
	Rd	-217,318	-11,236	11,236	-0,689	0,000393	-1,704	
								OK
Mid	E	-16,799	-0,0000257	0,000317	-0,00000611	0,000613	0,0000365	
	Rd	-187,853	-11,236	11,236	-0,689	0,00232	1,412	
								OK
2	E	-16,799	-0,0000257	0,000317	-0,00000611	0,00118	0,0000828	
	Rd	-217,394	-11,236	11,236	-0,689	0,0108	1,709	
								OK

Gradbeni element id 255 (Stene/Stebri: 49)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-29,398	-0,000228	-0,00131	-0,0000280	-0,000111	0,00000133	
	Rd	-380,394	-19,663	-19,663	-3,162	-0,00102	2,990	
								OK
Mid	E	-29,398	-0,000228	-0,00131	-0,0000280	-0,00248	0,000412	
	Rd	-328,749	-19,663	-19,663	-3,162	-0,00937	2,470	
								OK
2	E	-29,398	-0,000228	-0,00131	-0,0000280	-0,00484	0,000823	
	Rd	-380,462	-19,663	-19,663	-3,162	-0,0442	2,991	
								OK

Gradbeni element id 262 (Stene/Stebri: 50)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-39,477	-0,00174	-0,00818	-0,000173	-0,000792	0,000145	
	Rd	-3365,911	-432,716	-432,716	-4,682	-0,156	96,729	
								OK
Mid	E	-39,477	-0,00174	-0,00818	-0,000173	-0,0155	0,00328	
	Rd	-2863,448	-432,716	-432,716	-4,682	-1,088	95,856	
								OK
2	E	-39,477	-0,00174	-0,00818	-0,000173	-0,0303	0,00642	
	Rd	-3370,041	-432,716	-432,716	-4,682	-5,884	96,731	
								OK

Gradbeni element id 269 (Stene/Stebri: 51)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-8,524	-0,000168	-0,0000399	-0,00000497	0,00000223	0,0000226	
	Rd	-734,126	-122,931	-122,931	-0,134	0,000543	19,638	
								OK
Mid	E	-8,524	-0,000168	-0,0000399	-0,00000497	-0,0000697	0,000325	
	Rd	-584,124	-122,931	-122,931	-0,134	-0,00434	19,402	
								OK
2	E	-8,524	-0,000168	-0,0000399	-0,00000497	-0,000142	0,000627	
	Rd	-734,173	-122,931	-122,931	-0,134	-0,0342	19,635	
								OK

Gradbeni element id 276 (Stene/Stebri: 52)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-40,374	-0,000916	0,00779	-0,000185	0,000806	0,0000621	
	Rd	-3442,402	-442,551	442,551	-4,989	0,159	98,928	
								OK
Mid	E	-40,374	-0,000916	0,00779	-0,000185	0,0148	0,00171	
	Rd	-2928,395	-442,551	442,551	-4,989	1,040	98,033	
								OK
2	E	-40,374	-0,000916	0,00779	-0,000185	0,0288	0,00336	
	Rd	-3446,120	-442,551	442,551	-4,989	5,643	98,922	
								OK

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Gradbeni element id 283 (Stene/Stebri: 53)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-13,458	0,000142	0,000598	-0,0000116	0,0000690	-0,0000240	
	Rd	-1147,525	147,517	147,517	-0,313	0,0136	-32,874	
								OK
Mid	E	-13,458	0,000142	0,000598	-0,0000116	0,00115	-0,000279	
	Rd	-976,025	147,517	147,517	-0,313	0,0803	-32,576	
								OK
2	E	-13,458	0,000142	0,000598	-0,0000116	0,00222	-0,000534	
	Rd	-1148,116	147,517	147,517	-0,313	0,436	-32,904	
								OK

Gradbeni element id 288 (Stene/Stebri: 54)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-29,159	0,000769	0,00695	-0,0000750	0,000715	-0,0000982	
	Rd	-2485,989	319,620	319,620	-2,029	0,140	-71,252	
								OK
Mid	E	-29,159	0,000769	0,00695	-0,0000750	0,0132	-0,00148	
	Rd	-2115,228	319,620	319,620	-2,029	0,926	-70,649	
								OK
2	E	-29,159	0,000769	0,00695	-0,0000750	0,0257	-0,00287	
	Rd	-2490,340	319,620	319,620	-2,029	5,021	-71,328	
								OK

Gradbeni element id 293 (Stene/Stebri: 55)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-80,749	-0,00377	0,133	-0,00138	0,0133	0,000432	
	Rd	-6885,667	-885,101	885,101	-37,316	2,624	197,896	
								OK
Mid	E	-80,749	-0,00377	0,133	-0,00138	0,252	0,00722	
	Rd	-5870,374	-885,101	885,101	-37,316	17,668	196,059	
								OK
2	E	-80,749	-0,00377	0,133	-0,00138	0,491	0,0140	
	Rd	-6975,040	-885,101	885,101	-37,316	95,332	197,765	
								OK

Gradbeni element id 298 (Stene/Stebri: 56)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-96,450	0,00452	0,251	-0,00233	0,0252	-0,000522	
	Rd	-8223,695	1057,204	1057,204	-63,149	4,956	-235,978	
								OK
Mid	E	-96,450	0,00452	0,251	-0,00233	0,478	-0,00865	
	Rd	-7024,344	1057,204	1057,204	-63,149	33,457	-233,996	
								OK
2	E	-96,450	0,00452	0,251	-0,00233	0,930	-0,0168	
	Rd	-8421,035	1057,204	1057,204	-63,149	179,923	-235,245	
								OK

Gradbeni element id 303 (Stene/Stebri: 57)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-80,749	-0,00444	0,190	-0,00138	0,0191	0,000499	
	Rd	-6886,132	-885,101	885,101	-37,316	3,761	197,907	
								OK
Mid	E	-80,749	-0,00444	0,190	-0,00138	0,362	0,00849	
	Rd	-5880,651	-885,101	885,101	-37,316	25,342	196,046	
								OK
2	E	-80,749	-0,00444	0,190	-0,00138	0,704	0,0165	
	Rd	-7034,067	-885,101	885,101	-37,316	136,252	197,424	
								OK

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Gradbeni element id 308 (Stene/Stebri: 58)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-276,797	-0,00200	-0,0862	-0,0150	-4,514	0,0237	
	Rd	-1981,758	-106,406	-106,406	-201,528	-108,458	80,245	
								OK
Mid	E	-276,797	-0,00200	-0,0862	-0,0150	-4,665	0,0272	
	Rd	-1817,912	-106,406	-106,406	-201,528	-50,219	78,241	
								OK
2	E	-276,797	-0,00200	-0,0862	-0,0150	-4,816	0,0307	
	Rd	-1985,205	-106,406	-106,406	-201,528	-114,928	79,849	
								OK

Gradbeni element id 313 (Stene/Stebri: 59)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-155,973	0,000223	0,00526	-0,00188	-0,613	-0,0136	
	Rd	-1013,496	55,461	55,461	-25,218	-16,724	-51,638	
								OK
Mid	E	-155,973	0,000223	0,00526	-0,00188	-0,603	-0,0140	
	Rd	-944,174	55,461	55,461	-25,218	-7,284	-49,956	
								OK
2	E	-155,973	0,000223	0,00526	-0,00188	-0,594	-0,0144	
	Rd	-1013,349	55,461	55,461	-25,218	-16,237	-51,713	
								OK

Gradbeni element id 318 (Stene/Stebri: 60)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-269,745	-0,00171	-0,0371	-0,0330	-10,530	0,0323	
	Rd	-2479,550	-122,851	-122,851	-444,575	-131,773	39,225	
								OK
Mid	E	-269,745	-0,00171	-0,0371	-0,0330	-10,595	0,0353	
	Rd	-2371,517	-122,851	-122,851	-444,575	-60,576	36,897	
								OK
2	E	-269,745	-0,00171	-0,0371	-0,0330	-10,660	0,0383	
	Rd	-2479,688	-122,851	-122,851	-444,575	-133,218	39,242	
								OK

Gradbeni element id 323 (Stene/Stebri: 61)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-178,926	-0,000427	0,0340	-0,00627	-2,136	-0,0222	
	Rd	-1561,258	-73,953	73,953	-84,360	-70,871	-72,699	
								OK
Mid	E	-178,926	-0,000427	0,0340	-0,00627	-2,077	-0,0215	
	Rd	-1444,574	-73,953	73,953	-84,360	-31,182	-72,636	
								OK
2	E	-178,926	-0,000427	0,0340	-0,00627	-2,017	-0,0207	
	Rd	-1559,696	-73,953	73,953	-84,360	-67,074	-72,817	
								OK

Gradbeni element id 328 (Stene/Stebri: 62)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-279,347	0,00174	-0,103	-0,0290	-8,997	-0,0286	
	Rd	-2297,913	121,359	-121,359	-390,159	-171,719	-63,698	
								OK
Mid	E	-279,347	0,00174	-0,103	-0,0290	-9,177	-0,0317	
	Rd	-2097,432	121,359	-121,359	-390,159	-80,383	-62,783	
								OK
2	E	-279,347	0,00174	-0,103	-0,0290	-9,357	-0,0347	
	Rd	-2300,940	121,359	-121,359	-390,159	-181,000	-64,728	
								OK

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Gradbeni element id 333 (Stene/Stebri: 63)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-197,305	0,00161	0,0387	-0,0111	-3,679	0,0283	
	Rd	-1701,042	86,499	86,499	-149,569	-89,364	58,133	
								OK
Mid	E	-197,305	0,00161	0,0387	-0,0111	-3,611	0,0255	
	Rd	-1543,463	86,499	86,499	-149,569	-39,375	56,634	
								OK
2	E	-197,305	0,00161	0,0387	-0,0111	-3,543	0,0226	
	Rd	-1699,323	86,499	86,499	-149,569	-86,427	58,246	
								OK

Gradbeni element id 338 (Stene/Stebri: 64)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-250,697	-0,00245	-0,102	-0,0495	-15,239	0,0345	
	Rd	-2758,063	-130,808	-130,808	-667,391	-321,997	63,808	
								OK
Mid	E	-250,697	-0,00245	-0,102	-0,0495	-15,418	0,0388	
	Rd	-2579,809	-130,808	-130,808	-667,391	-150,221	63,595	
								OK
2	E	-250,697	-0,00245	-0,102	-0,0495	-15,596	0,0430	
	Rd	-2759,207	-130,808	-130,808	-667,391	-329,145	63,909	
								OK

Gradbeni element id 343 (Stene/Stebri: 65)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-241,165	0,00127	-0,0794	-0,0442	-14,356	-0,0348	
	Rd	-2652,374	125,496	-125,496	-596,060	-313,964	-63,673	
								OK
Mid	E	-241,165	0,00127	-0,0794	-0,0442	-14,495	-0,0370	
	Rd	-2481,473	125,496	-125,496	-596,060	-144,877	-62,933	
								OK
2	E	-241,165	0,00127	-0,0794	-0,0442	-14,634	-0,0392	
	Rd	-2653,162	125,496	-125,496	-596,060	-318,065	-63,359	
								OK

Gradbeni element id 348 (Stene/Stebri: 66)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-178,575	-0,000161	-0,0178	-0,0201	-6,393	0,0298	
	Rd	-2064,290	-94,684	-94,684	-270,986	-172,173	58,686	
								OK
Mid	E	-178,575	-0,000161	-0,0178	-0,0201	-6,424	0,0301	
	Rd	-1896,418	-94,684	-94,684	-270,986	-78,574	58,213	
								OK
2	E	-178,575	-0,000161	-0,0178	-0,0201	-6,455	0,0304	
	Rd	-2064,743	-94,684	-94,684	-270,986	-173,666	58,638	
								OK

Gradbeni element id 353 (Stene/Stebri: 67)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-59,024	0,000140	0,000498	-0,000424	-0,128	0,0105	
	Rd	-572,747	26,584	26,584	-5,707	-6,346	36,286	
								OK
Mid	E	-59,024	0,000140	0,000498	-0,000424	-0,127	0,0103	
	Rd	-517,096	26,584	26,584	-5,707	-2,686	34,417	
								OK
2	E	-59,024	0,000140	0,000498	-0,000424	-0,127	0,0100	
	Rd	-572,717	26,584	26,584	-5,707	-6,260	36,263	
								OK

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Gradbeni element id 358 (Stene/Stebri: 68)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-91,782	0,000654	0,00366	-0,00121	-0,389	0,0142	
	Rd	-906,844	39,869	39,869	-16,314	-16,490	48,121	
								OK
Mid	E	-91,782	0,000654	0,00366	-0,00121	-0,382	0,0130	
	Rd	-849,313	39,869	39,869	-16,314	-7,224	47,614	
								OK
2	E	-91,782	0,000654	0,00366	-0,00121	-0,376	0,0119	
	Rd	-906,668	39,869	39,869	-16,314	-15,994	48,166	
								OK

Gradbeni element id 363 (Stene/Stebri: 69)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-183,953	-0,000224	0,0322	-0,0213	-7,188	-0,0309	
	Rd	-1966,221	-96,855	96,855	-286,230	-199,881	-62,503	
								OK
Mid	E	-183,953	-0,000224	0,0322	-0,0213	-7,131	-0,0306	
	Rd	-1774,439	-96,855	96,855	-286,230	-93,763	-64,852	
								OK
2	E	-183,953	-0,000224	0,0322	-0,0213	-7,075	-0,0302	
	Rd	-1963,450	-96,855	96,855	-286,230	-191,046	-60,605	
								OK

Gradbeni element id 368 (Stene/Stebri: 70)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-261,726	0,00223	-0,142	-0,0288	-8,774	-0,0274	
	Rd	-2296,272	117,984	-117,984	-387,642	-179,201	-64,109	
								OK
Mid	E	-261,726	0,00223	-0,142	-0,0288	-9,022	-0,0313	
	Rd	-2098,932	117,984	-117,984	-387,642	-82,696	-61,919	
								OK
2	E	-261,726	0,00223	-0,142	-0,0288	-9,271	-0,0352	
	Rd	-2299,345	117,984	-117,984	-387,642	-186,799	-63,357	
								OK

Gradbeni element id 373 (Stene/Stebri: 71)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-171,493	-0,00212	-0,0963	-0,0328	-9,899	0,0301	
	Rd	-2417,438	-104,817	-104,817	-441,565	-278,680	59,050	
								OK
Mid	E	-171,493	-0,00212	-0,0963	-0,0328	-10,068	0,0338	
	Rd	-2263,575	-104,817	-104,817	-441,565	-130,966	59,841	
								OK
2	E	-171,493	-0,00212	-0,0963	-0,0328	-10,236	0,0375	
	Rd	-2418,704	-104,817	-104,817	-441,565	-285,032	58,592	
								OK

Gradbeni element id 378 (Stene/Stebri: 72)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-199,426	0,00180	-0,310	-0,0815	-24,850	-0,0420	
	Rd	-3376,208	136,998	-136,998	-1100,676	-757,645	-74,790	
								OK
Mid	E	-199,426	0,00180	-0,310	-0,0815	-25,393	-0,0452	
	Rd	-3263,464	136,998	-136,998	-1100,676	-368,682	-78,428	
								OK
2	E	-199,426	0,00180	-0,310	-0,0815	-25,936	-0,0483	
	Rd	-3377,350	136,998	-136,998	-1100,676	-774,140	-73,356	
								OK

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Gradbeni element id 383 (Stene/Stebri: 73)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-194,483	0,000	0,000	0,000	0,000	0,000	
	Rd	-2385,153	109,167	109,167	444,550	0,00222	42,594	
								OK
Mid	E	-194,483	0,000	0,000	0,000	0,000	0,000	
	Rd	-2145,302	109,167	109,167	444,550	0,00222	37,788	
								OK
2	E	-194,483	0,000	0,000	0,000	0,000	0,000	
	Rd	-2385,153	109,167	109,167	444,550	0,00222	42,594	
								OK

Gradbeni element id 388 (Stene/Stebri: 74)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-205,226	0,000	0,000	0,000	0,000	0,000	
	Rd	-2557,077	122,030	122,030	663,789	0,00289	69,648	
								OK
Mid	E	-205,226	0,000	0,000	0,000	0,000	0,000	
	Rd	-2194,039	122,030	122,030	663,789	0,00289	64,576	
								OK
2	E	-205,226	0,000	0,000	0,000	0,000	0,000	
	Rd	-2557,077	122,030	122,030	663,789	0,00289	69,648	
								OK

Gradbeni element id 393 (Stene/Stebri: 75)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-121,753	0,000	0,000	0,000	0,000	0,000	
	Rd	-1649,144	72,932	72,932	151,021	0,00109	58,453	
								OK
Mid	E	-121,753	0,000	0,000	0,000	0,000	0,000	
	Rd	-1444,021	72,932	72,932	151,021	0,00109	55,443	
								OK
2	E	-121,753	0,000	0,000	0,000	0,000	0,000	
	Rd	-1649,144	72,932	72,932	151,021	0,00109	58,453	
								OK

Gradbeni element id 398 (Stene/Stebri: 76)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-98,091	0,000	0,000	0,000	0,000	0,000	
	Rd	-1088,264	53,119	53,119	53,322	0,000550	56,816	
								OK
Mid	E	-98,091	0,000	0,000	0,000	0,000	0,000	
	Rd	-929,632	53,119	53,119	53,322	0,000550	54,391	
								OK
2	E	-98,091	0,000	0,000	0,000	0,000	0,000	
	Rd	-1088,264	53,119	53,119	53,322	0,000550	56,816	
								OK

Gradbeni element id 403 (Stene/Stebri: 77)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-172,919	-0,00579	0,288	-0,00531	0,0289	0,000696	
	Rd	-2479,801	-113,258	113,258	-599,813	0,935	67,693	
								OK
Mid	E	-172,919	-0,00579	0,288	-0,00531	0,548	0,0111	
	Rd	-2222,105	-113,258	113,258	-599,813	7,299	64,484	
								OK
2	E	-172,919	-0,00579	0,288	-0,00531	1,067	0,0215	
	Rd	-2502,510	-113,258	113,258	-599,813	33,792	67,006	
								OK

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Gradbeni element id 410 (Stene/Stebri: 78)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-172,919	-0,000490	-0,0856	-0,00529	-0,00843	0,000167	
	Rd	-2479,715	-113,258	-113,258	-599,813	-0,272	67,696	
								OK
Mid	E	-172,919	-0,000490	-0,0856	-0,00529	-0,162	0,00105	
	Rd	-2219,792	-113,258	-113,258	-599,813	-2,173	64,611	
								OK
2	E	-172,919	-0,000490	-0,0856	-0,00529	-0,316	0,00193	
	Rd	-2482,426	-113,258	-113,258	-599,813	-10,187	67,480	
								OK

Gradbeni element id 415 (Stene/Stebri: 79)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-114,823	0,00131	-0,239	-0,00155	-0,0239	-0,000215	
	Rd	-1722,245	74,400	-74,400	-175,541	-1,002	-58,857	
								OK
Mid	E	-114,823	0,00131	-0,239	-0,00155	-0,455	-0,00257	
	Rd	-1563,702	74,400	-74,400	-175,541	-7,859	-56,500	
								OK
2	E	-114,823	0,00131	-0,239	-0,00155	-0,885	-0,00492	
	Rd	-1742,807	74,400	-74,400	-175,541	-36,279	-57,584	
								OK

Gradbeni element id 422 (Stene/Stebri: 80)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-172,919	-0,000720	-0,149	-0,00529	-0,0148	0,000190	
	Rd	-2479,741	-113,258	-113,258	-599,813	-0,478	67,696	
								OK
Mid	E	-172,919	-0,000720	-0,149	-0,00529	-0,283	0,00149	
	Rd	-2220,236	-113,258	-113,258	-599,813	-3,788	64,555	
								OK
2	E	-172,919	-0,000720	-0,149	-0,00529	-0,552	0,00278	
	Rd	-2487,026	-113,258	-113,258	-599,813	-17,730	67,354	
								OK

Gradbeni element id 429 (Stene/Stebri: 81)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-172,919	-0,00109	0,0476	-0,00529	0,00489	0,000227	
	Rd	-2479,700	-113,258	113,258	-599,813	0,158	67,696	
								OK
Mid	E	-172,919	-0,00109	0,0476	-0,00529	0,0907	0,00219	
	Rd	-2219,542	-113,258	113,258	-599,813	1,213	64,631	
								OK
2	E	-172,919	-0,00109	0,0476	-0,00529	0,176	0,00415	
	Rd	-2480,731	-113,258	113,258	-599,813	5,683	67,597	
								OK

Gradbeni element id 436 (Stene/Stebri: 82)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-79,118	-0,000662	0,00122	-0,000622	0,000180	0,000120	
	Rd	-1328,134	-53,249	53,249	-70,161	0,00998	53,872	
								OK
Mid	E	-79,118	-0,000662	0,00122	-0,000622	0,00238	0,00131	
	Rd	-1216,603	-53,249	53,249	-70,161	0,0546	52,471	
								OK
2	E	-79,118	-0,000662	0,00122	-0,000622	0,00458	0,00250	
	Rd	-1328,159	-53,249	53,249	-70,161	0,253	53,865	
								OK

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Gradbeni element id 443 (Stene/Stebri: 83)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-135,121	-0,000788	-0,00532	-0,00253	-0,000434	0,000171	
	Rd	-1987,357	-87,977	-87,977	-286,288	-0,0163	61,989	
								OK
Mid	E	-135,121	-0,000788	-0,00532	-0,00253	-0,0100	0,00159	
	Rd	-1791,554	-87,977	-87,977	-286,288	-0,156	59,599	
								OK
2	E	-135,121	-0,000788	-0,00532	-0,00253	-0,0196	0,00301	
	Rd	-1987,448	-87,977	-87,977	-286,288	-0,737	61,983	
								OK

Gradbeni element id 450 (Stene/Stebri: 84)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-265,343	0,00431	-0,433	-0,0180	-0,0431	-0,000250	
	Rd	-3911,498	172,676	-172,676	-2069,523	-1,606	-120,276	
								OK
Mid	E	-265,343	0,00431	-0,433	-0,0180	-0,823	-0,00801	
	Rd	-3542,030	172,676	-172,676	-2069,523	-12,633	-115,106	
								OK
2	E	-265,343	0,00431	-0,433	-0,0180	-1,602	-0,0158	
	Rd	-3938,860	172,676	-172,676	-2069,523	-58,887	-119,171	
								OK

Gradbeni element id 457 (Stene/Stebri: 85)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-36,071	-0,0000871	-0,00472	-0,0000703	-0,000446	0,0000333	
	Rd	-758,989	-24,456	-24,456	-7,927	-0,0463	46,431	
								OK
Mid	E	-36,071	-0,0000871	-0,00472	-0,0000703	-0,00894	0,000190	
	Rd	-715,015	-24,456	-24,456	-7,927	-0,385	45,748	
								OK
2	E	-36,071	-0,0000871	-0,00472	-0,0000703	-0,0174	0,000347	
	Rd	-759,149	-24,456	-24,456	-7,927	-1,802	46,167	
								OK

Gradbeni element id 464 (Stene/Stebri: 86)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-121,457	-0,00271	-0,122	-0,00240	-0,0121	0,000182	
	Rd	-1955,459	-84,299	-84,299	-270,986	-0,501	61,176	
								OK
Mid	E	-121,457	-0,00271	-0,122	-0,00240	-0,232	0,00506	
	Rd	-1764,786	-84,299	-84,299	-270,986	-3,955	58,931	
								OK
2	E	-121,457	-0,00271	-0,122	-0,00240	-0,452	0,00994	
	Rd	-1962,644	-84,299	-84,299	-270,986	-18,382	60,658	
								OK

Gradbeni element id 471 (Stene/Stebri: 87)

Loc.	F	Nx [kN]	Vy [kN]	Vz [kN]	T [kNm]	My [kNm]	Mz [kNm]	Ne izpolnjuje pogojev
1	E	-98,708	-0,000441	-0,000218	-0,00136	0,0000454	-0,0000280	
	Rd	-1657,985	-69,083	-69,083	-153,954	0,00216	-57,509	
								OK
Mid	E	-98,708	-0,000441	-0,000218	-0,00136	-0,000348	0,000766	
	Rd	-1504,989	-69,083	-69,083	-153,954	-0,00687	55,926	
								OK
2	E	-98,708	-0,000441	-0,000218	-0,00136	-0,000741	0,00156	
	Rd	-1658,302	-69,083	-69,083	-153,954	-0,0353	57,671	
								OK

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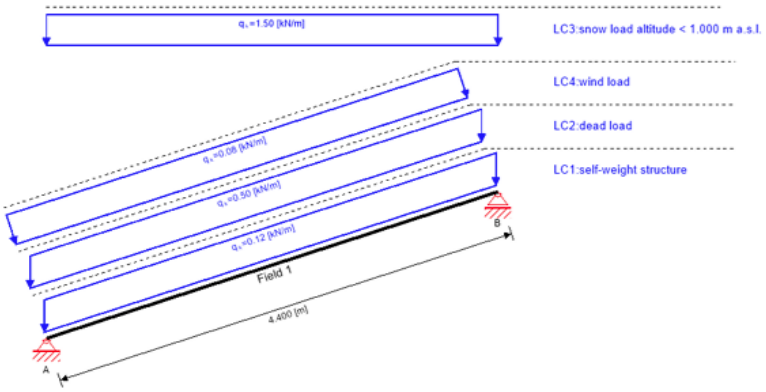
2.5. Statični izračun

2.5.1. Analiza prizidka šole

2.5.1.1. Analiza ostrešja šole

- *Analiza osnovnega špirovca POZ-501 dim 12/20cm (C24)*

System

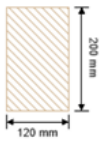


Global utilization ratio 75 %

ULS	53 %	ULS Fire	0 %	SLS	75 %	Vibration	0 %	Support	-1 %	Void	-1 %

Product data

Section: Wooden beam 12/20



Section width	Section height	Area	Iy	Iz
[cm]	[cm]	[mm²]	[mm⁴]	[mm⁴]
12	20	24,000	80,000,010	28,800,000

Material values

Material	$f_{m,k}$	$f_{t,0,k}$	$f_{t,90,k}$	$f_{c,0,k}$	$f_{c,90,k}$	$f_{v,k}$	$f_{r,k\,min}$	$E_{0,mean}$	G_{mean}	$E_{0,5}$
	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
C24 spruce	24.00	14.00	0.40	21.00	2.50	2.30	0.80	11,000.00	690.00	7,400.00

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Load

Load case groups

	Load case category	Type	Duration	Kmod	γ_{inf}	γ_{sup}	Ψ_0	Ψ_1	Ψ_2
LC1	self-weight structure	G	permanent	0.6	1	1.35	1	1	1
LC2	dead load	G	permanent	0.6	1	1.35	1	1	1
LC3	snow load altitude < 1.000 m a.s.l.	Q	short term	0.9	0	1.5	0.5	0.2	0
LC4	wind load	Q	short term	0.9	0	1.5	0.6	0.2	0

LC1:self-weight structure

continuous load

Field	Load at start [kN/m]
1	0.12

LC2:dead load

continuous load

Field	Load at start [kN/m]
1	0.50

LC3:snow load altitude < 1.000 m a.s.l.

continuous load

Field	Load at start [kN/m]
1	1.50

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LC4:wind load

continuous load

Field	Load at start [kN/m]
1	0.08

ULS Combinations

	Combination rule
LCO1	1.35/1.00 * LC1 + 1.35/1.00 * LC2
LCO2	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC3
LCO3	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC3 + 1.50/0.00 * 0.60 * LC4
LCO4	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC4
LCO5	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC4 + 1.50/0.00 * 0.50 * LC3

SLS Characteristic Combination

	Combination rule
LCO6	1.00/1.00 * LC1 + 1.00/1.00 * LC2
LCO7	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * LC3 + 1.00/0.00 * 0.60 * LC4
LCO8	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * LC4 + 1.00/0.00 * 0.50 * LC3

SLS Quasi-permanent Combination

	Combination rule
LCO9	1.00/1.00 * LC1 + 1.00/1.00 * LC2
LCO10	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.00 * LC3 + 1.00/0.00 * 0.00 * LC4
LCO11	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.00 * LC4 + 1.00/0.00 * 0.00 * LC3

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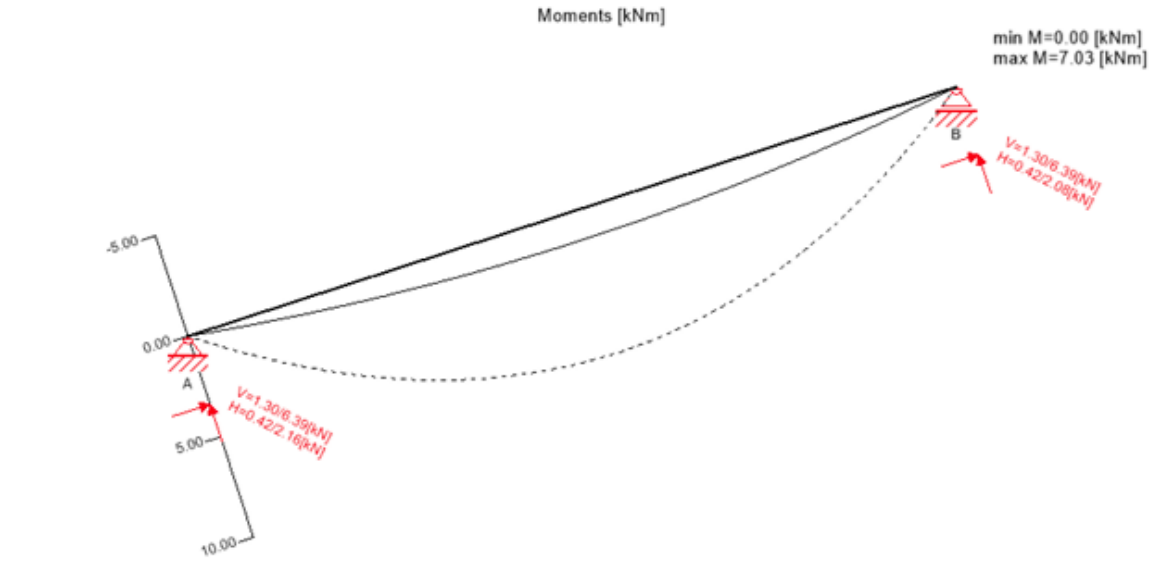
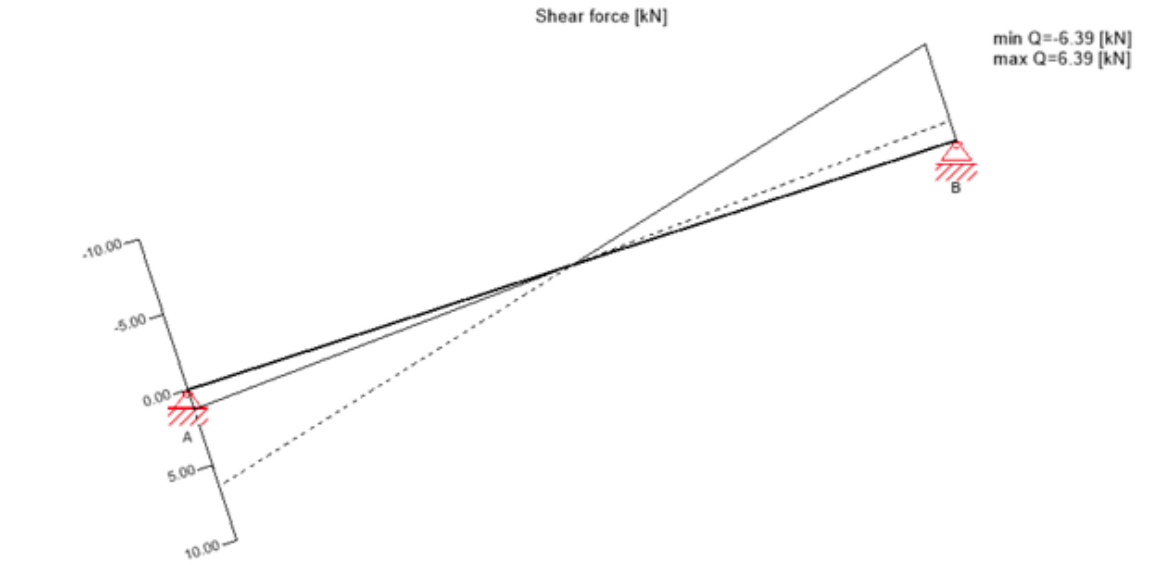
Ultimate limit state (ULS) - design results





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ULS Flexural design

Field	Dist.	$f_{m,k}$	$f_{c,0,k}$	$f_{t,0,k}$	γ_m	k_{mod}	$k_{sys,z}$	$k_{h,m,y}$	$k_{h,m,z}$	k_l	$f_{m,y,d}$	$f_{m,z,d}$	$f_{t,0,d}$	$f_{c,0,d}$
	[m]	[N/mm²]	[N/mm²]	[N/mm²]	[-]	[-]	[-]	[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
1	2.2	24.00	21.00	14.00	1.30	0.90	1.00	1.00	1.05	1.00	16.62	17.37	9.69	14.54

Field	$M_{y,d}$	$M_{z,d}$	$N_{c,d}$	$N_{t,d}$	$\sigma_{m,y,d}$	$\sigma_{m,z,d}$	$\sigma_{c,d}$	$\sigma_{t,d}$	Ratio	
	[kNm]	[kNm]	[kN]	[kN]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]		
1	7.03	0.00	0.00	0.05	8.78	0.00	0.00	0.00	53%	LCO3

ULS Shear analysis

Field	Dist.	$f_{v,k}$	γ_m	k_{mod}	$k_{h,v}$	$f_{v,d}$	V_d	$\tau_{v,d}$	Ratio	
	[m]	[N/mm²]	[-]	[-]	[-]	[N/mm²]	[kN]	[N/mm²]		
1	4.2	2.30	1.30	0.90	1.00	1.59	5.81	0.36	23%	LCO3

ULS Buckling design

Field	$M_{y,d}$	$M_{z,d}$	$N_{c,d}$	$\sigma_{m,y,d}$	$\sigma_{m,z,d}$	$\sigma_{c,d}$	Ratio	
	[kNm]	[kNm]	[kN]	[N/mm²]	[N/mm²]	[N/mm²]		
1	7.03	0.00	0.00	8.78	0.00	0.00	53%	LCO3

ULS Lateral torsional buckling design

Field	$M_{y,d}$	$M_{z,d}$	$N_{c,d}$	$\sigma_{m,y,d}$	$\sigma_{m,z,d}$	$\sigma_{c,d}$	Ratio	
	[kNm]	[kNm]	[kN]	[N/mm²]	[N/mm²]	[N/mm²]		
1	7.03	0.00	0.00	8.78	0.00	0.00	53%	LCO3

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Flexural stress analysis							
$M_{y,d}$ =	7.03	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm		$f_{m,k,z}$ =	24.00	N/mm²	
$N_{t,d}$ =	0.05	kN		γ_m =	1.30	-	
				k_{mod} =	0.90	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{h,m,y}$ =	1.00	-	
				$k_{h,m,z}$ =	1.05	-	
				k_l =	1.00	-	
$\sigma_{t,d}$ =	0.00	N/mm²		$f_{t,0,d}$ =	9.69	N/mm²	
$\sigma_{m,y,d}$ =	8.78	N/mm²		$f_{m,y,d}$ =	16.62	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	17.37	N/mm²	✓
Utilization ratio							53%

Shear stress analysis							
V_d =	5.81	kN		$f_{v,k}$ =	2.30	N/mm²	
				γ_m =	1.30	-	
				k_{mod} =	0.90	-	
				$k_{h,v}$ =	1.00	-	
$\tau_{v,d}$ =	0.36	N/mm²	<	$f_{v,d}$ =	1.59	N/mm²	✓
Utilization ratio							23%

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Buckling analysis							
$M_{y,d}$ =	7.03	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm					
$N_{c,d}$ =	0.00	kN		γ_m =	1.30	-	
				k_{mod} =	0.90	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{sys,z}$ =	1.00	-	
				$k_{h,m,y}$ =	1.00	-	
				$k_{h,m,z}$ =	1.05	-	
$\sigma_{c,d}$ =	0.00	N/mm²		$f_{c,0,d}$ =	14.54	N/mm²	
$\sigma_{m,y,d}$ =	8.78	N/mm²		$f_{m,y,d}$ =	16.62	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	17.37	N/mm²	✓
Utilization ratio							53%

Lateral torsional buckling analysis							
$M_{y,d}$ =	7.03	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm					
$N_{c,d}$ =	0.00	kN		γ_m =	1.30	-	
				k_{mod} =	0.90	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{h,m,y}$ =	1.00	-	
				$k_{h,m,z}$ =	1.05	-	
				k_l =	1.00	-	
$\sigma_{c,d}$ =	0.00	N/mm²		$f_{c,0,d}$ =	14.54	N/mm²	
$\sigma_{m,y,d}$ =	8.78	N/mm²		$f_{m,y,d}$ =	16.62	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	17.37	N/mm²	✓
Utilization ratio							53%

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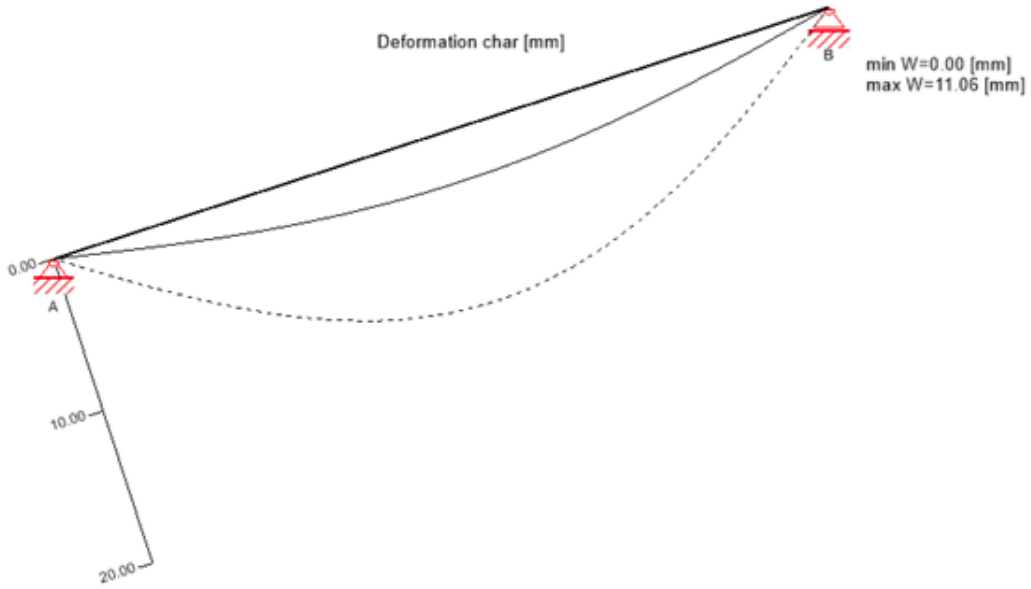
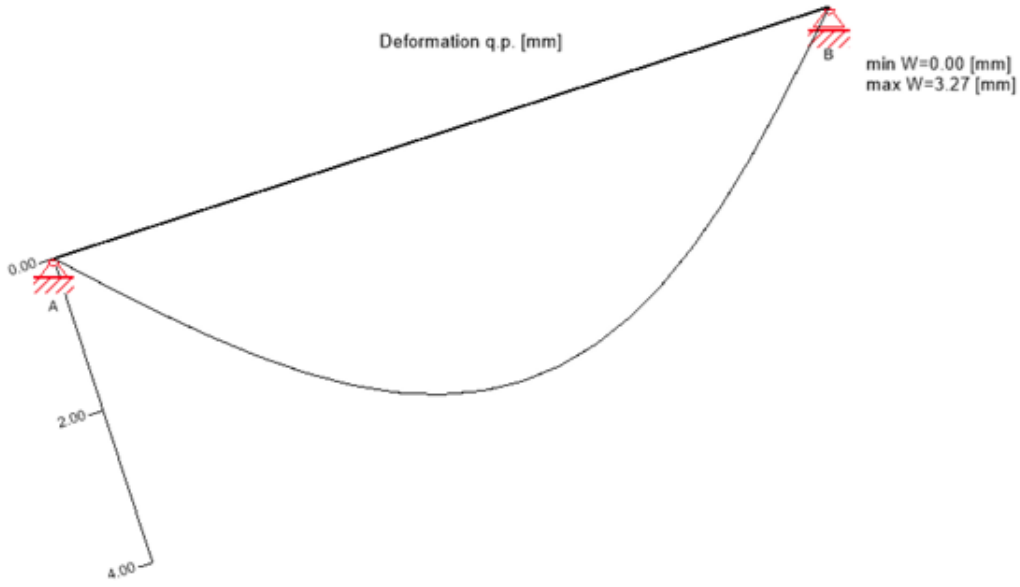
Service limit state design (SLS) - design results





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w_{inst} = w[char]					
Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.6	L/300	14.7	11.1	75%

w_{fin} = w[char] + w[q.p.]*kdef					
Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.6	L/250	17.6	13.0	74%

$w_{net,fin}$ = w[q.p.] + w[q.p.]*kdef					
Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.6	L/300	14.7	5.2	36%

Support reaction					
Load case category	k_{mod}	A_V	A_H	B_V	B_H
			[kN]		
self-weight structure	0.6	0.26	0.00	0.26	0.00
		0.26	0.00	0.26	0.00
dead load	0.6	1.10	0.00	1.10	0.00
		1.10	0.00	1.10	0.00
snow load altitude < 1.000 m a.s.l.	0.9	3.14	0.00	3.14	0.00
		0.00	0.00	0.00	0.00
wind load	0.9	0.15	0.11	0.19	0.00
		0.00	0.00	0.00	0.00

Reference documents for this analysis	
English title	Description
EN 338	EN 338 - Structural timber ? Strength classes
EN 1995-1-1	EN 1995-1-1 - Eurocode 5: Design of timber structures - Part 1-1: General - Common rules and rules for buildings

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Reference documents for this analysis	
English title	Description
EN 1995-1-2	EN 1995-1-2 - Eurocode 5 — Design of timber structures — Part 1-2: General — Structural fire design
EN 14080	EN 14080 - Timber Structures - Glued laminated timber and glued solid timber - Requirements
EN 1990	EN 1990 - Eurocode ? Basis of structural design
ÖNorm B 1995-1-1 NA	ÖNORM EN 1995-1-1 - Austria - National Annex – Nationally determined parameters – Eurocode 5: Design of timber structures – Part 1-1: General-Common rules and rules for buildings
ÖNorm B 1995-1-2 NA	ÖNORM EN 1995-1-2 - Austria - National Annex - Eurocode 5: Design of timber structures ? Part 1-2: General ? Structural fire design ? National specifications concerning ÖNORM EN 1995-1-2, national comments and national supplements
ÖNORM EN 1995-1-1_NA, chapter 7.3	ÖNORM EN 1995-1-1 - Austria - National Annex – Nationally determined parameters – Eurocode 5: Design of timber structures – Part 1-1: General-Common rules and rules for buildings; chapter 7.3
CERTIFICATE NO. EUFI29-20000564-C	Product certificate
LVL G by Stora Enso_Structural design manual column&beam_ V01	Design manual
ETA 20_0291 LVL G by Stora Enso	Stora Enso - LVL G by Stora Enso

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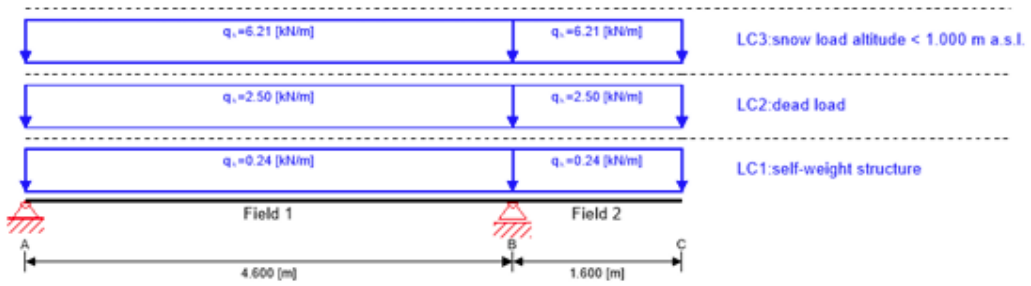
➢ *Analiza vmesnih leg POZ-502 dim 20/24cm (C24)*

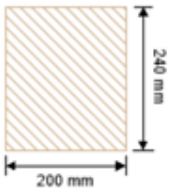
System



Global utilization ratio												95 %
ULS	83 %	ULS Fire	0 %	SLS	95 %	Vibration	0 %	Support	-1 %	Void	-1 %	

Product data

Section: Wooden beam 20/24



Section width	Section height	Area	Iy	Iz
[cm]	[cm]	[mm²]	[mm⁴]	[mm⁴]
20	24	48,000	230,400,000	160,000,000

Material values

Material	$f_{m,k}$	$f_{t,0,k}$	$f_{t,90,k}$	$f_{c,0,k}$	$f_{c,90,k}$	$f_{v,k}$	$f_{r,k\,min}$	$E_{0,mean}$	G_{mean}	$E_{0,5}$
	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
C24 spruce	24.00	14.00	0.40	21.00	2.50	2.30	0.80	11,000.00	690.00	7,400.00

Load

Load case groups

	Load case category	Type	Duration	Kmod	γ_{inf}	γ_{sup}	Ψ_0	Ψ_1	Ψ_2
LC1	self-weight structure	G	permanent	0.6	1	1.35	1	1	1
LC2	dead load	G	permanent	0.6	1	1.35	1	1	1

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Load case groups

	Load case category	Type	Duration	Kmod	γ_{inf}	γ_{sup}	Ψ_0	Ψ_1	Ψ_2
LC3	snow load altitude < 1.000 m a.s.l.	Q	short term	0.9	0	1.5	0.5	0.2	0

LC1:self-weight structure

continuous load

Field	Load at start [kN/m]
1	0.24
2	0.24

LC2:dead load

continuous load

Field	Load at start [kN/m]
1	2.50
2	2.50

LC3:snow load altitude < 1.000 m a.s.l.

continuous load

Field	Load at start [kN/m]
1	6.21
2	6.21

ULS Combinations

	Combination rule
LCO1	1.35/1.00 * LC1 + 1.35/1.00 * LC2

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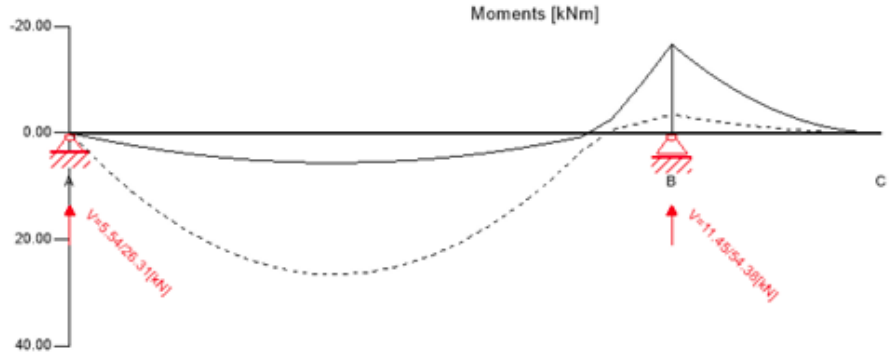
ULS Combinations	
	Combination rule
LCO2	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC3

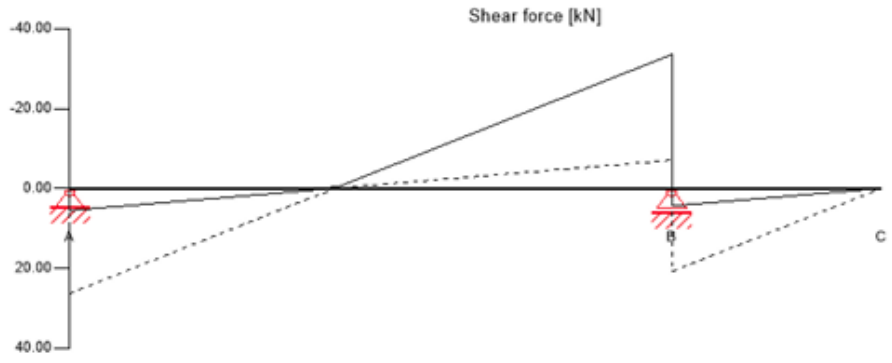
SLS Characteristic Combination	
	Combination rule
LCO3	1.00/1.00 * LC1 + 1.00/1.00 * LC2
LCO4	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * LC3

SLS Quasi-permanent Combination	
	Combination rule
LCO5	1.00/1.00 * LC1 + 1.00/1.00 * LC2
LCO6	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.00 * LC3

Ultimate limit state (ULS) - design results



min M=-16.66 [kNm]
max M=26.58 [kNm]



min Q=-33.55 [kN]
max Q=26.31 [kN]

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ULS Flexural design

Field	Dist.	$f_{m,k}$	$f_{c,0,k}$	$f_{t,0,k}$	γ_m	k_{mod}	$k_{sys,z}$	$k_{h,m,y}$	$k_{h,m,z}$	k_l	$f_{m,y,d}$	$f_{m,z,d}$	$f_{t,0,d}$	$f_{c,0,d}$
	[m]	[N/mm²]	[N/mm²]	[N/mm²]	[-]	[-]	[-]	[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
1	2.07	24.00	21.00	14.00	1.30	0.90	1.00	1.00	1.00	1.00	16.62	16.62	9.69	14.54
2	0.0	24.00	21.00	14.00	1.30	0.90	1.00	1.00	1.00	1.00	16.62	16.62	9.69	14.54

Field	$M_{y,d}$	$M_{z,d}$	$N_{c,d}$	$N_{t,d}$	$\sigma_{m,y,d}$	$\sigma_{m,z,d}$	$\sigma_{c,d}$	$\sigma_{t,d}$	Ratio	
	[kNm]	[kNm]	[kN]	[kN]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]		
1	26.58	0.00	0.00	0.00	13.84	0.00	0.00	0.00	83%	LCO2
2	-16.66	0.00	0.00	0.00	8.68	0.00	0.00	0.00	52%	LCO2

ULS Shear analysis

Field	Dist.	$f_{v,k}$	γ_m	k_{mod}	$k_{h,v}$	$f_{v,d}$	V_d	$\tau_{v,d}$	Ratio	
	[m]	[N/mm²]	[-]	[-]	[-]	[N/mm²]	[kN]	[N/mm²]		
1	4.36	2.30	1.30	0.90	1.00	1.59	30.43	0.95	60%	LCO2
2	0.24	2.30	1.30	0.90	1.00	1.59	17.70	0.55	35%	LCO2

ULS Buckling design

Field	$M_{y,d}$	$M_{z,d}$	$N_{c,d}$	$\sigma_{m,y,d}$	$\sigma_{m,z,d}$	$\sigma_{c,d}$	Ratio	
	[kNm]	[kNm]	[kN]	[N/mm²]	[N/mm²]	[N/mm²]		
1	26.58	0.00	0.00	13.84	0.00	0.00	83%	LCO2
2	-16.66	0.00	0.00	8.68	0.00	0.00	52%	LCO2

ULS Lateral torsional buckling design

Field	$M_{y,d}$	$M_{z,d}$	$N_{c,d}$	$\sigma_{m,y,d}$	$\sigma_{m,z,d}$	$\sigma_{c,d}$	Ratio	
	[kNm]	[kNm]	[kN]	[N/mm²]	[N/mm²]	[N/mm²]		
1	26.58	0.00	0.00	13.84	0.00	0.00	83%	LCO2
2	-16.66	0.00	0.00	8.68	0.00	0.00	52%	LCO2

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Flexural stress analysis							
$M_{y,d}$ =	26.58	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm		$f_{m,k,z}$ =	24.00	N/mm²	
$N_{t,d}$ =	0.00	kN		γ_m =	1.30	-	
				k_{mod} =	0.90	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{h,m,y}$ =	1.00	-	
				$k_{h,m,z}$ =	1.00	-	
				k_i =	1.00	-	
$\sigma_{t,d}$ =	0.00	N/mm²		$f_{t,0,d}$ =	9.69	N/mm²	
$\sigma_{m,y,d}$ =	13.84	N/mm²		$f_{m,y,d}$ =	16.62	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	16.62	N/mm²	✓
Utilization ratio							83%

Shear stress analysis							
V_d =	30.43	kN		$f_{v,k}$ =	2.30	N/mm²	
				γ_m =	1.30	-	
				k_{mod} =	0.90	-	
				$k_{h,v}$ =	1.00	-	
$\tau_{v,d}$ =	0.95	N/mm²	<	$f_{v,d}$ =	1.59	N/mm²	✓
Utilization ratio							60%

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Buckling analysis							
$M_{y,d}$ =	26.58	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm					
$N_{c,d}$ =	0.00	kN		γ_m =	1.30	-	
				k_{mod} =	0.90	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{sys,z}$ =	1.00	-	
				$k_{h,m,y}$ =	1.00	-	
				$k_{h,m,z}$ =	1.00	-	
$\sigma_{c,d}$ =	0.00	N/mm²		$f_{c,0,d}$ =	14.54	N/mm²	
$\sigma_{m,y,d}$ =	13.84	N/mm²		$f_{m,y,d}$ =	16.62	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	16.62	N/mm²	✓
Utilization ratio							83%

Lateral torsional buckling analysis							
$M_{y,d}$ =	26.58	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm					
$N_{c,d}$ =	0.00	kN		γ_m =	1.30	-	
				k_{mod} =	0.90	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{h,m,y}$ =	1.00	-	
				$k_{h,m,z}$ =	1.00	-	
				k_l =	1.00	-	
$\sigma_{c,d}$ =	0.00	N/mm²		$f_{c,0,d}$ =	14.54	N/mm²	
$\sigma_{m,y,d}$ =	13.84	N/mm²		$f_{m,y,d}$ =	16.62	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	16.62	N/mm²	✓
Utilization ratio							83%

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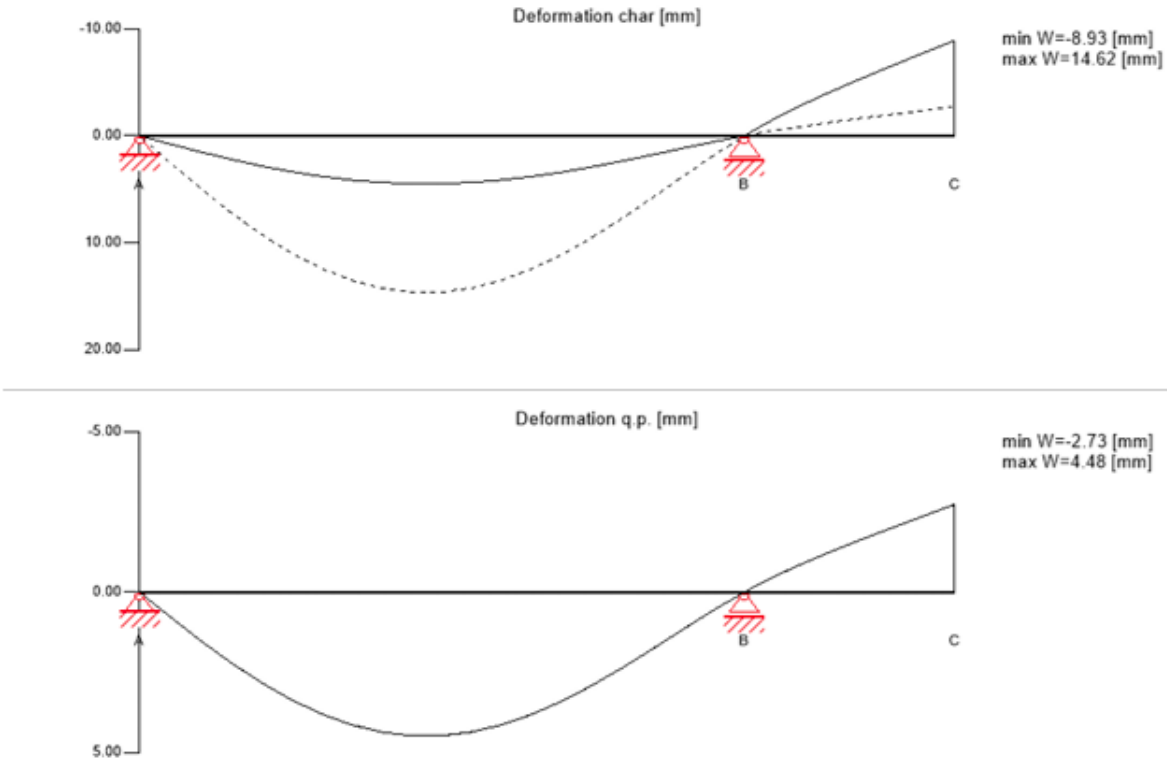
Service limit state design (SLS) - design results



w_{inst} = w[char]

Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.6	L/300	15.3	14.6	95%
2	0.6	L/300	10.7	0.0	0%

w_{fin} = w[char] + w[q.p.]*kdef

Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.6	L/250	18.4	17.3	94%
2	0.6	L/250	12.8	0.0	0%

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$w_{net,fin}$ = w[q.p.] + w[q.p.]*kdef					
Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.6	L/300	15.3	7.2	47%
2	0.6	L/300	10.7	0.0	0%

Support reaction				
Load case category		k_{mod}	A_V	B_V
			[kN]	
self-weight structure		0.6	0.49	1.00
			0.49	1.00
dead load		0.6	5.05	10.45
			5.05	10.45
snow load altitude < 1.000 m a.s.l.		0.9	12.56	25.95
			0.00	0.00

Reference documents for this analysis	
English title	Description
EN 338	EN 338 - Structural timber ? Strength classes
EN 1995-1-1	EN 1995-1-1 - Eurocode 5: Design of timber structures - Part 1-1: General - Common rules and rules for buildings
EN 1995-1-2	EN 1995-1-2 - Eurocode 5 — Design of timber structures — Part 1-2: General — Structural fire design
EN 14080	EN 14080 - Timber Structures - Glued laminated timber and glued solid timber - Requirements
EN 1990	EN 1990 - Eurocode ? Basis of structural design
ÖNorm B 1995-1-1 NA	ÖNORM EN 1995-1-1 - Austria - National Annex – Nationally determined parameters – Eurocode 5: Design of timber structures – Part 1-1: General- Common rules and rules for buildings
ÖNorm B 1995-1-2 NA	ÖNORM EN 1995-1-2 - Austria - National Annex - Eurocode 5: Design of timber structures ? Part 1-2: General ? Structural fire design ? National specifications concerning ÖNORM EN 1995-1-2, national comments and national supplements
ÖNORM EN 1995-1-1_NA, chapter 7.3	ÖNORM EN 1995-1-1 - Austria - National Annex – Nationally determined parameters – Eurocode 5: Design of timber structures – Part 1-1: General- Common rules and rules for buildings; chapter 7.3
CERTIFICATE NO. EUFI29-20000564-C	Product certificate

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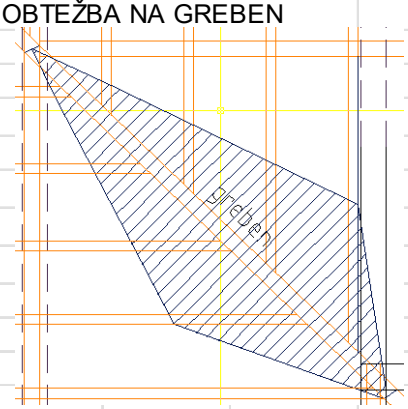
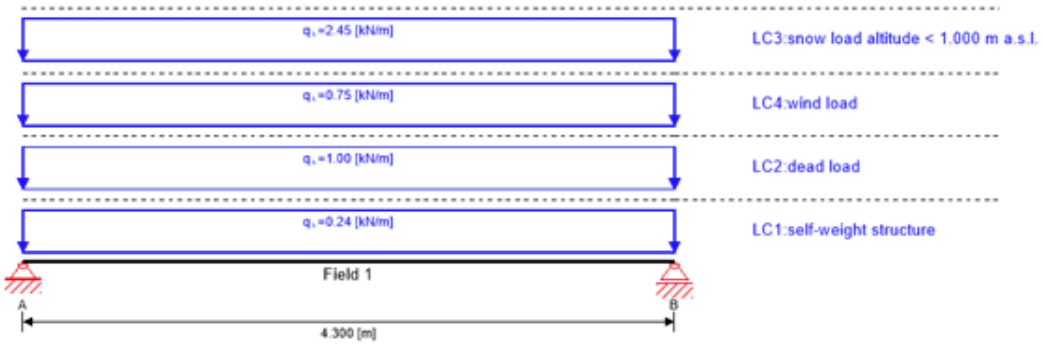
➢ *Analiza žlotne lege POZ-503 dim 20/24cm (C24)*

POZ - 503:	greben na novem prizidku				
I. OBTEŽBA NA GREBEN					
		OBTEŽBA:			
		g1 =	0,6	kN/m^2	
		w1 =	0,4	kN/m^2	
		w2 =	0,38	kN/m^2	
		s =	1,62	kN/m^2	
		PODATKI:			
		L =	4,3	m	dolžina grebena
II. PREREZ		IZBRANI PREREZ	20	24	
		KATEGORIJA LES:	C24		
III. DIMENZIONIRANJE					
Greben je dimenzioniran po mejnih stanjih. Preverjena je nosilnost prereza, ter dovoljen pomik.					
Dimenzioniranje je izvedeno z računalniškim programom Tower 6					
REZULTATE GLEJ V NADALJEVANJU					
IV. DOVOLJEN POMIK					
L/200 =	0,029 m				
izpis iz programa=	0,007 m				
POMIK USTREZA					

System

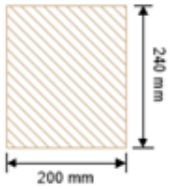


Global utilization ratio 51 %

ULS	44 %	ULS Fire	0 %	SLS	51 %	Vibration	0 %	Support	-1 %	Void	-1 %

Product data

Section: Wooden beam 20/24



Section width	Section height	Area	Iy	Iz
[cm]	[cm]	[mm²]	[mm⁴]	[mm⁴]
20	24	48,000	230,400,000	160,000,000

Material values

Material	$f_{m,k}$	$f_{t,0,k}$	$f_{t,90,k}$	$f_{c,0,k}$	$f_{c,90,k}$	$f_{v,k}$	$f_{r,k\,min}$	$E_{0,mean}$	G_{mean}	$E_{0,5}$
	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
C24 spruce	24.00	14.00	0.40	21.00	2.50	2.30	0.80	11,000.00	690.00	7,400.00

Load

Load case groups

	Load case category	Type	Duration	Kmod	γ_{inf}	γ_{sup}	Ψ_0	Ψ_1	Ψ_2
LC1	self-weight structure	G	permanent	0.6	1	1.35	1	1	1

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Load case groups

	Load case category	Type	Duration	Kmod	γ_{inf}	γ_{sup}	Ψ_0	Ψ_1	Ψ_2
LC2	dead load	G	permanent	0.6	1	1.35	1	1	1
LC3	snow load altitude < 1.000 m a.s.l.	Q	short term	0.9	0	1.5	0.5	0.2	0
LC4	wind load	Q	short term	0.9	0	1.5	0.6	0.2	0

LC1:self-weight structure

continuous load

Field	Load at start [kN/m]
1	0.24

LC2:dead load

continuous load

Field	Load at start [kN/m]
1	1.00

LC3:snow load altitude < 1.000 m a.s.l.

continuous load

Field	Load at start [kN/m]
1	2.45

LC4:wind load

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continuous load	
Field	Load at start [kN/m]
1	0.75

ULS Combinations	
	Combination rule
LCO1	1.35/1.00 * LC1 + 1.35/1.00 * LC2
LCO2	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC3
LCO3	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC3 + 1.50/0.00 * 0.60 * LC4
LCO4	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC4
LCO5	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC4 + 1.50/0.00 * 0.50 * LC3

SLS Characteristic Combination	
	Combination rule
LCO6	1.00/1.00 * LC1 + 1.00/1.00 * LC2
LCO7	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * LC3 + 1.00/0.00 * 0.60 * LC4
LCO8	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * LC4 + 1.00/0.00 * 0.50 * LC3

SLS Quasi-permanent Combination	
	Combination rule
LCO9	1.00/1.00 * LC1 + 1.00/1.00 * LC2
LCO10	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.00 * LC3 + 1.00/0.00 * 0.00 * LC4
LCO11	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.00 * LC4 + 1.00/0.00 * 0.00 * LC3

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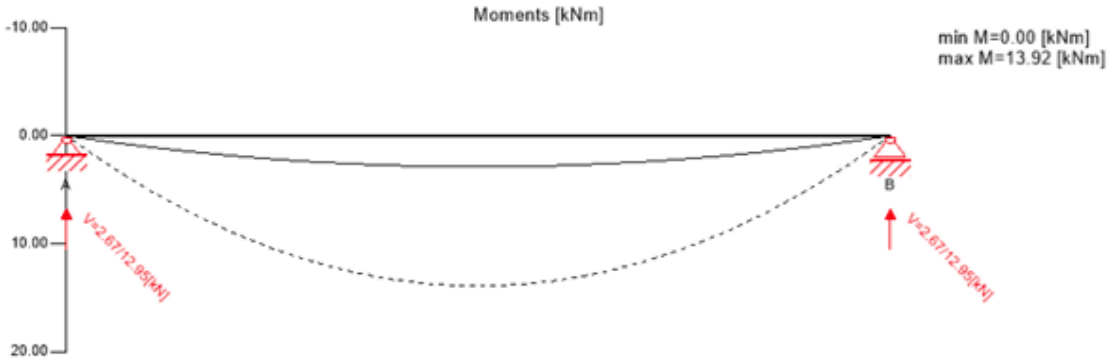
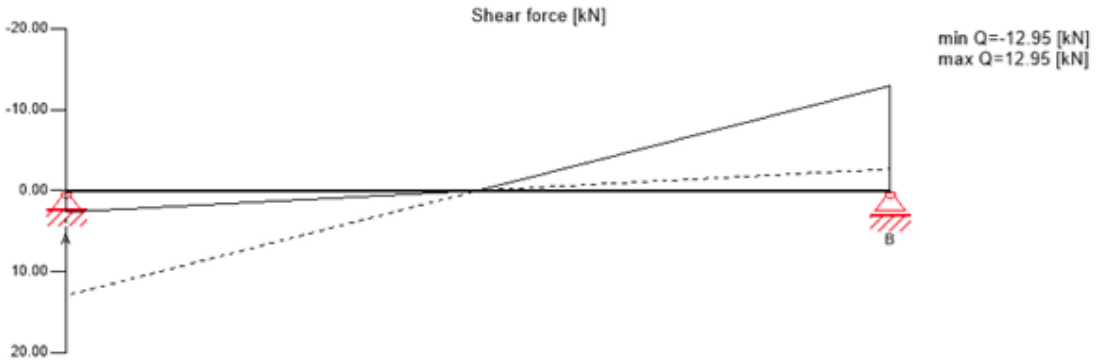
Ultimate limit state (ULS) - design results





ULS Flexural design

Field	Dist.	$f_{m,k}$	$f_{c,0,k}$	$f_{t,0,k}$	γ_m	k_{mod}	$k_{sys,z}$	$k_{h,m,y}$	$k_{h,m,z}$	k_l	$f_{m,y,d}$	$f_{m,z,d}$	$f_{t,0,d}$	$f_{c,0,d}$
	[m]	[N/mm²]	[N/mm²]	[N/mm²]	[-]	[-]	[-]	[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
1	2.15	24.00	21.00	14.00	1.30	0.90	1.00	1.00	1.00	1.00	16.62	16.62	9.69	14.54

Field	$M_{y,d}$	$M_{z,d}$	$N_{c,d}$	$N_{t,d}$	$\sigma_{m,y,d}$	$\sigma_{m,z,d}$	$\sigma_{c,d}$	$\sigma_{t,d}$	Ratio	
	[kNm]	[kNm]	[kN]	[kN]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]		
1	13.92	0.00	0.00	0.00	7.25	0.00	0.00	0.00	44%	LC03

ULS Shear analysis

Field	Dist.	$f_{v,k}$	γ_m	k_{mod}	$k_{h,v}$	$f_{v,d}$	V_d	$\tau_{v,d}$	Ratio	
	[m]	[N/mm²]	[-]	[-]	[-]	[N/mm²]	[kN]	[N/mm²]		
1	0.24	2.30	1.30	0.90	1.00	1.59	11.51	0.36	23%	LC03

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ULS Buckling design								
Field	$M_{y,d}$ [kNm]	$M_{z,d}$ [kNm]	$N_{c,d}$ [kN]	$\sigma_{m,y,d}$ [N/mm²]	$\sigma_{m,z,d}$ [N/mm²]	$\sigma_{c,d}$ [N/mm²]	Ratio	
1	13.92	0.00	0.00	7.25	0.00	0.00	44%	LCO3

ULS Lateral torsional buckling design								
Field	$M_{y,d}$ [kNm]	$M_{z,d}$ [kNm]	$N_{c,d}$ [kN]	$\sigma_{m,y,d}$ [N/mm²]	$\sigma_{m,z,d}$ [N/mm²]	$\sigma_{c,d}$ [N/mm²]	Ratio	
1	13.92	0.00	0.00	7.25	0.00	0.00	44%	LCO3

Flexural stress analysis							
$M_{y,d}$ =	13.92	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm		$f_{m,k,z}$ =	24.00	N/mm²	
$N_{t,d}$ =	0.00	kN		γ_m =	1.30	-	
				k_{mod} =	0.90	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{h,m,y}$ =	1.00	-	
				$k_{h,m,z}$ =	1.00	-	
				k_l =	1.00	-	
$\sigma_{t,d}$ =	0.00	N/mm²		$f_{t,0,d}$ =	9.69	N/mm²	
$\sigma_{m,y,d}$ =	7.25	N/mm²		$f_{m,y,d}$ =	16.62	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	16.62	N/mm²	✓
Utilization ratio							44%

Shear stress analysis							
V_d =	11.51	kN		$f_{v,k}$ =	2.30	N/mm²	
				γ_m =	1.30	-	
				k_{mod} =	0.90	-	
				$k_{h,v}$ =	1.00	-	
$\tau_{v,d}$ =	0.36	N/mm²	<	$f_{v,d}$ =	1.59	N/mm²	✓
Utilization ratio							23%

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Buckling analysis							
$M_{y,d}$ =	13.92	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm					
$N_{c,d}$ =	0.00	kN		γ_m =	1.30	-	
				k_{mod} =	0.90	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{sys,z}$ =	1.00	-	
				$k_{h,m,y}$ =	1.00	-	
				$k_{h,m,z}$ =	1.00	-	
$\sigma_{c,d}$ =	0.00	N/mm²		$f_{c,0,d}$ =	14.54	N/mm²	
$\sigma_{m,y,d}$ =	7.25	N/mm²		$f_{m,y,d}$ =	16.62	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	16.62	N/mm²	✓
Utilization ratio							44%

Lateral torsional buckling analysis							
$M_{y,d}$ =	13.92	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm					
$N_{c,d}$ =	0.00	kN		γ_m =	1.30	-	
				k_{mod} =	0.90	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{h,m,y}$ =	1.00	-	
				$k_{h,m,z}$ =	1.00	-	
				k_l =	1.00	-	
$\sigma_{c,d}$ =	0.00	N/mm²		$f_{c,0,d}$ =	14.54	N/mm²	
$\sigma_{m,y,d}$ =	7.25	N/mm²		$f_{m,y,d}$ =	16.62	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	16.62	N/mm²	✓
Utilization ratio							44%

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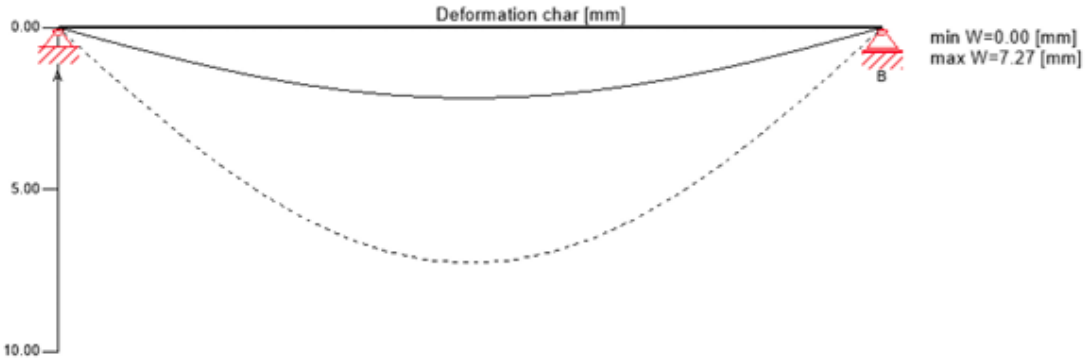
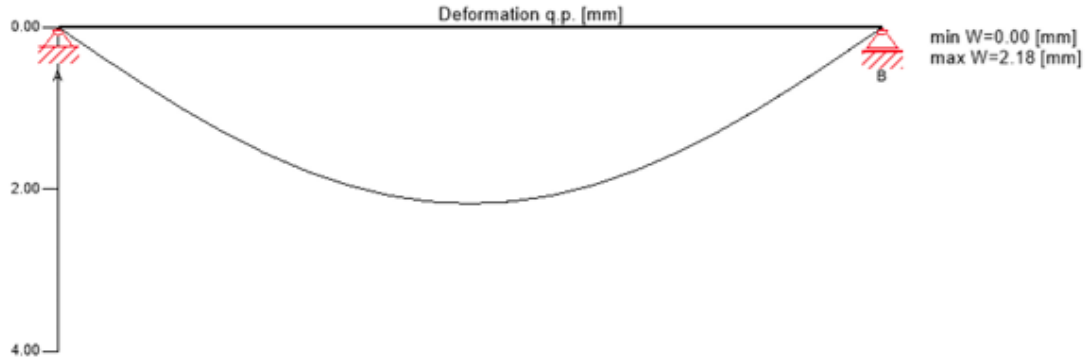
Service limit state design (SLS) - design results





w_{inst} = w[char]

Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.6	L/300	14.3	7.3	51%

w_{fin} = w[char] + w[q.p.]*kdef

Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.6	L/250	17.2	8.6	50%

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$w_{net,fin}$ = w[q.p.] + w[q.p.]*kdef					
Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.6	L/300	14.3	3.5	24%

Support reaction			
Load case category	k_{mod}	A_V	B_V
		[kN]	
self-weight structure	0.6	0.52	0.52
		0.52	0.52
dead load	0.6	2.15	2.15
		2.15	2.15
snow load altitude < 1.000 m a.s.l.	0.9	5.27	5.27
		0.00	0.00
wind load	0.9	1.61	1.61
		0.00	0.00

Reference documents for this analysis	
English title	Description
EN 338	EN 338 - Structural timber ? Strength classes
EN 1995-1-1	EN 1995-1-1 - Eurocode 5: Design of timber structures - Part 1-1: General - Common rules and rules for buildings
EN 1995-1-2	EN 1995-1-2 - Eurocode 5 — Design of timber structures — Part 1-2: General — Structural fire design
EN 14080	EN 14080 - Timber Structures - Glued laminated timber and glued solid timber - Requirements
EN 1990	EN 1990 - Eurocode ? Basis of structural design
ÖNorm B 1995-1-1 NA	ÖNORM EN 1995-1-1 - Austria - National Annex – Nationally determined parameters – Eurocode 5: Design of timber structures – Part 1-1: General-Common rules and rules for buildings
ÖNorm B 1995-1-2 NA	ÖNORM EN 1995-1-2 - Austria - National Annex - Eurocode 5: Design of timber structures ? Part 1-2: General ? Structural fire design ? National specifications concerning ÖNORM EN 1995-1-2, national comments and national supplements
ÖNORM EN 1995-1-1_NA, chapter 7.3	ÖNORM EN 1995-1-1 - Austria - National Annex – Nationally determined parameters – Eurocode 5: Design of timber structures – Part 1-1: General-Common rules and rules for buildings; chapter 7.3

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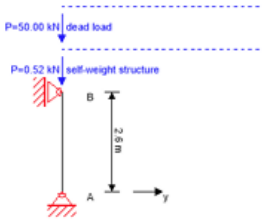
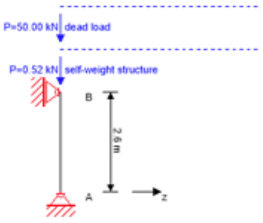
➢ *Analiza sohe POZ-504 dim 20/20cm (C24)*

System

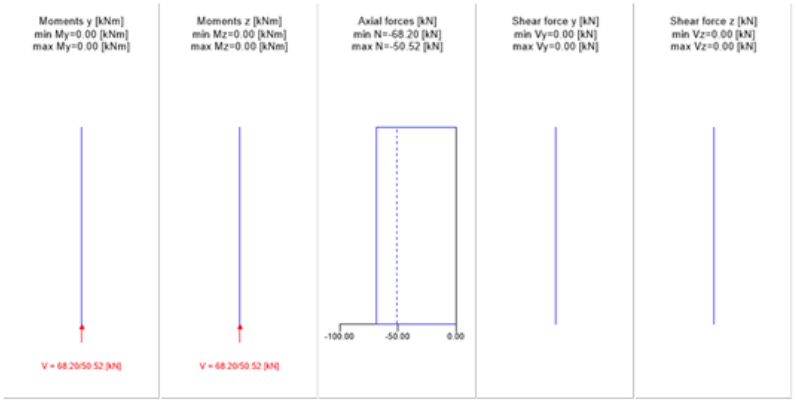






Section: Wooden beam 20/20; **Material**: C24 spruce; **Service class**: service class 1; **Fire resistance class**: R 0

Utilization 21 %



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Flexural stress analysis						18%
$M_{y,d}$ =	0.00	kNm	$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm	$f_{m,k,z}$ =	24.00	N/mm²	
$N_{c,d}$ =	-68.20	kN	$f_{c,0,k}$ =	21.00	N/mm²	
$\sigma_{c,d}$ =	1.71	N/mm²	$f_{c,0,d}$ =	9.69	N/mm²	
$\sigma_{m,y,d}$ =	0.00	N/mm²	$f_{m,y,d}$ =	11.08	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm² <	$f_{m,z,d}$ =	11.08	N/mm²	✓

Shear stress analysis Y						0%
V_d =	0.00	kN	$f_{v,k}$ =	2.30	N/mm²	
$\tau_{v,d}$ =	0.00	N/mm² <	$f_{v,d}$ =	1.06	N/mm²	✓

Shear stress analysis Z						0%
V_d =	0.00	kN	$f_{v,k}$ =	2.30	N/mm²	
$\tau_{v,d}$ =	0.00	N/mm² <	$f_{v,d}$ =	1.06	N/mm²	✓

Shear stress analysis Combined						0%
$V_{y,d}$ =	0.00	kN	$V_{z,d}$ =	0.00	kN	
$\tau_{v,y,d}$ =	0.00	N/mm²	$\tau_{v,z,d}$ =	0.00	N/mm²	
			Ratio =	0%		✓

Lateral torsional buckling analysis						0%
$M_{y,d}$ =	0.00	kNm	$f_{m,k}$ =	0.00	N/mm²	
$M_{z,d}$ =	0.00	kNm				
$N_{c,d}$ =	0.00	kN	$f_{c,0,k}$ =	0.00	N/mm²	
$\sigma_{c,d}$ =	0.00	N/mm²	$f_{c,0,d}$ =	0.00	N/mm²	
$\sigma_{m,y,d}$ =	0.00	N/mm²	$f_{m,y,d}$ =	0.00	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm² <	$f_{m,z,d}$ =	0.00	N/mm²	✓

Buckling analysis						21%
$M_{y,d}$ =	0.00	kNm	$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm				
$N_{c,d}$ =	-68.20	kN	$f_{c,0,k}$ =	21.00	N/mm²	
$\sigma_{c,d}$ =	1.71	N/mm²	$f_{c,0,d}$ =	9.69	N/mm²	
$\sigma_{m,y,d}$ =	0.00	N/mm²	$f_{m,y,d}$ =	11.08	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm² <	$f_{m,z,d}$ =	11.08	N/mm²	✓

Support reaction

Load case category	k_{mod}	A_y [kN]	A_z [kN]	B_x [kN]	B_y [kN]	B_z [kN]
self-weight structure	0.6	0.00	0.00	0.52	0.00	0.00
		0.00	0.00	0.52	0.00	0.00
dead load	0.6	0.00	0.00	50.00	0.00	0.00
		0.00	0.00	50.00	0.00	0.00

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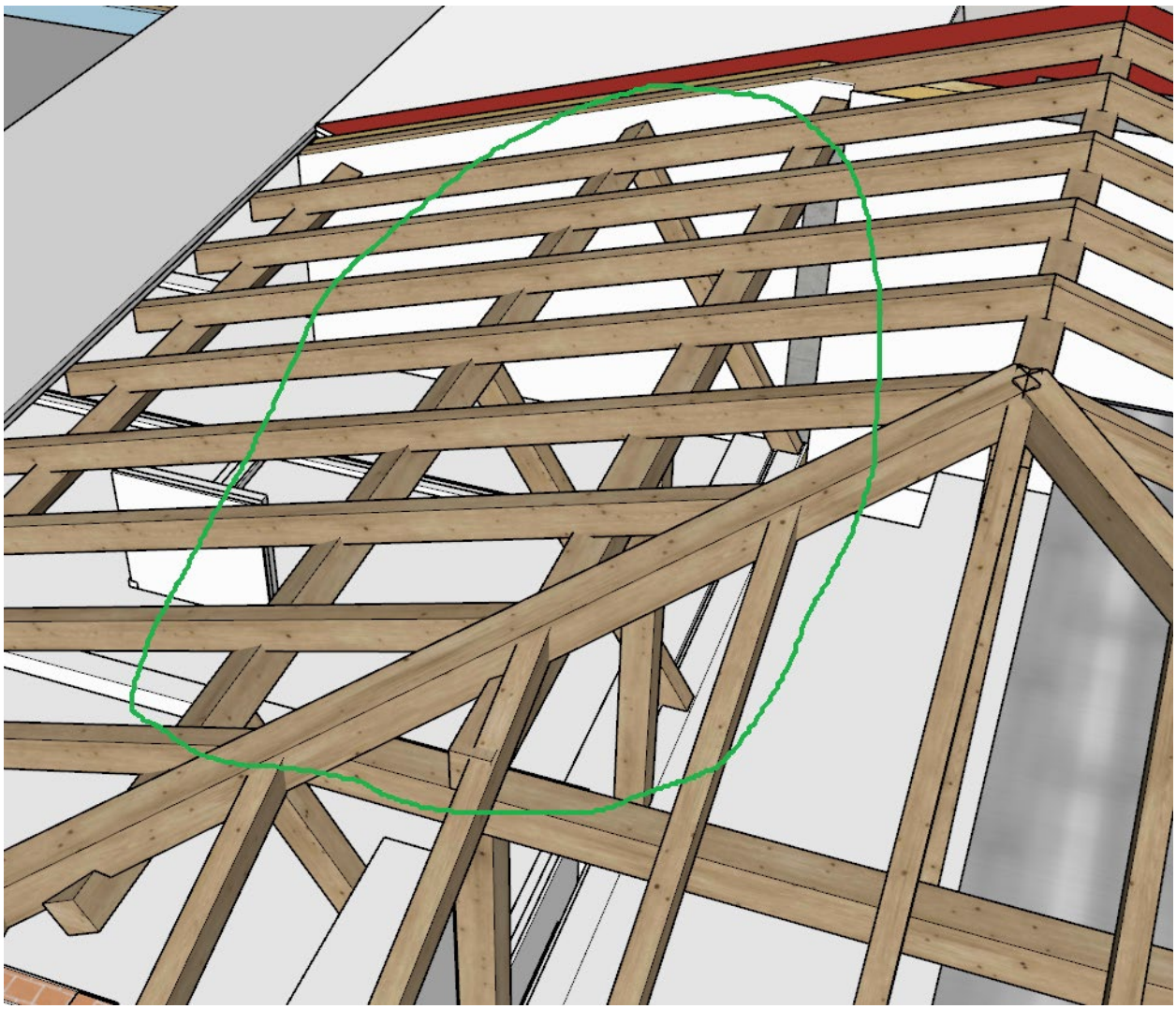
- *Analiza poševnega opiranja samega dela strehe nad obstoječo streho POZ-506 dim 16/20cm (C24)*



SILA KI JE V POŠEVNIH OPIRAČAH F = 32 kN

PREREZ USTREZA

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2.5.1.2. Analiza spojev ostrešja šole

- *Sidranje kapne lege v ab venec / ploščo*

SIDRANJE KAPNE LEGE

Design Specifications

Anchor

Anchor system	fischer Injection system FIS VL
Injection resin	FIS VL 410 C
Fixing element	Threaded rod FIS A M 16 x 300 8.8, zinc plated steel, Property Class 8.8
Calculated anchorage depth	80 mm
Design Data	Anchor design in Concrete according European Technical Assessment ETA-10/0352, Option 1, Issued 13/05/2020



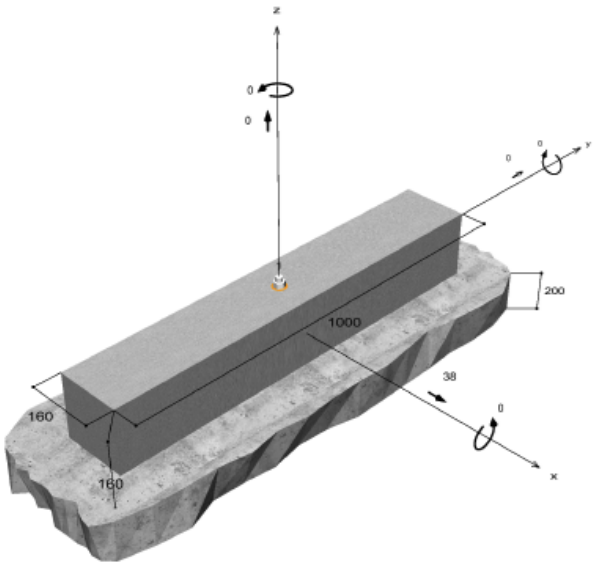
Geometry / Loads / Scale units

mm, kN, kNm

Value of design actions (including

partial safety factor for the load)





Not drawn to scale

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Input data

Design method	EN1992-4:2018 bonded fastener
Base material	C25/30, EN 206
Concrete condition	Non-cracked, dry hole
Temperature range	24 °C long term temperature, 40 °C short term temperature
Reinforcement	Normal or no reinforcement. No edge reinforcement
Drilling method	Hammer drilling
Installation type	Push-through installation
Annular gap	Annular gap filled
Type of loading	Permanent-Transient/Static
Base plate location	Base plate flush installed on base material
Base plate geometry	160 mm x 1,000 mm x 160 mm
Profile type	None

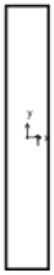
Design actions *)

#	N_{Ed} kN	$V_{Ed,x}$ kN	$V_{Ed,y}$ kN	$M_{Ed,x}$ kNm	$M_{Ed,y}$ kNm	$M_{T,Ed}$ kNm	Type of loading
1	0.00	38.00	0.00	0.00	0.00	0.00	Permanent-Transient/Static

*) The required partial safety factors for actions are included

Resulting anchor forces

Anchor no.	Tensile action kN	Shear Action kN	Shear Action x kN	Shear Action y kN
1	0.00	38.00	38.00	0.00



max. concrete compressive strain : ‰
max. concrete compressive stress : N/mm²
Resulting tensile actions : kN , X/Y position (/)
Resulting compression actions : kN , X/Y position (/)

Resistance to shear loads

Proof	Action kN	Capacity kN	Utilisation β_V %
Steel failure without lever arm *	38.00	50.40	75.4
Concrete pry-out failure	38.00	43.73	**86.9**

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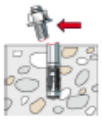
Steel failure without lever arm

$$V_{Ed} \leq \frac{V_{Rk,s}}{\gamma_{Ms}} \quad (V_{Rd,s})$$



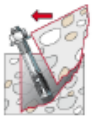
$$V_{Rk,s} = k_7 \cdot V^0_{Rk,s} = 1.00 \cdot 63.00kN = 63.00kN$$ Eq. (7.35)/ (7.36)

$V_{Rk,s}$ kN	γ_{Ms}	$V_{Rd,s}$ kN	V_{Ed} kN	β_{Vs} %
63.00	1.25	50.40	38.00	75.4

Anchor no.	β_{Vs} %	Group N°	Decisive Beta
1	75.4	1	$\beta_{Vs;1}$

Concrete pry-out failure

$$V_{Ed} \leq \frac{V_{Rk,cp}}{\gamma_{Mc}} \quad (V_{Rd,cp})$$



$$V_{Rk,cp} = k_8 \cdot N_{Rk,c} = 2 \cdot 39.35kN = 78.71kN$$ Eq. (7.39c)

$$N_{Rk,c} = N^0_{Rk,c} \cdot \frac{A_{c,N}}{A^0_{c,N}} \cdot \Psi_{s,N} \cdot \Psi_{re,N} \cdot \Psi_{ec,N} \cdot \Psi_{M,N}$$ Eq. (7.1)

$$N_{Rk,c} = 39.35kN \cdot \frac{57{,}600mm^2}{57{,}600mm^2} \cdot 1.000 \cdot 1.000 \cdot 1.000 \cdot 1.000 = 39.35kN$$

$$N^0_{Rk,c} = k_1 \cdot \sqrt{f_{ck}} \cdot h_{ef}^{1.5} = 11 \cdot \sqrt{25.0N/mm^2} \cdot \left(80mm\right)^{1.5} = 39.35kN$$ Eq. (7.2)

$$\Psi_{s,N} = min\left(1;\ 0.7 + 0.3 \cdot \frac{c}{c_{cr,N}}\right) = min\left(1;\ 0.7 + 0.3 \cdot \frac{\infty}{120mm}\right) = 1.000 \leq 1$$ Eq. (7.4)

$$\Psi_{re,N} = 1.000$$ Eq. (7.5)

$$\Psi_{ec,N} = \frac{1}{1 + \frac{2e_n}{s_{cr,N}}} \Rightarrow \Psi_{ec,Nx} \cdot \Psi_{ec,Ny} = 1.000 \cdot 1.000 = 1.000 \leq 1$$ Eq. (7.6)

$$\Psi_{M,N} = 1.00 \geq 1$$ Eq. (7.7)

$V_{Rk,cp}$ kN	γ_{Mcp}	$V_{Rd,cp}$ kN	V_{Ed} kN	$\beta_{V,cp}$ %
78.71	1.80	43.73	38.00	86.9

Anchor no.	$\beta_{V,cp}$ %	Group N°	Decisive Beta
1	86.9	1	$\beta_{V,cp;1}$

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Resistance to combined tensile and shear loads

$\beta_V = \beta_{V,cp;1} = 0.87 \leq 1$  **Proof successful**

Information concerning the anchor plate

Base plate details

Plate thickness specified by user without proof	t = 160 mm
Profile type	None

Technical remarks

The transmission of the anchor loads to the supports of the concrete member shall be shown for the ultimate limit state and the serviceability limit state; for this purpose, the normal verifications shall be carried out under due consideration of the actions introduced by the anchors. For these verifications the additional provisions given in the current design method shall be taken into account.
As a pre-condition the anchor plate is assumed to be flat when subjected to the actions. Therefore, the plate (if present) must be sufficiently stiff. The C-Fix anchor plate design is based on a proof of stresses and does not allow a statement about the stiffness of the plate. The proof of the necessary stiffness is not carried out by C-Fix.

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Installation data

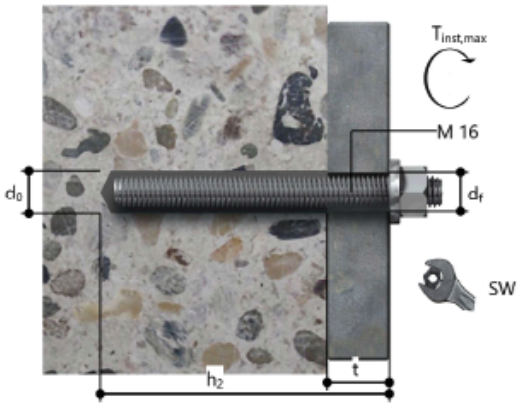
Anchor

Anchor system	**fischer Injection system FIS VL**	
Injection resin	FIS VL 410 C (other cartridge sizes available)	Art.-No. 539463
Fixing element	Threaded rod FIS A M 16 x 300 8.8, zinc plated steel, Property Class 8.8	Art.-No. 519402
Accessories	FIS MR Plus	Art.-No. 545853
	FIS Extension tube 9mm	Art.-No. 48983
	Dispenser FIS AC	Art.-No. 96497
	Compressed-air cleaning tool	Art.-No. 93286
	compressed air (oil-free), min. 6 bar	By job site.
	BSD 18	Art.-No. 1493
	SDS Chuck with internal thread M8	Art.-No. 530332
	SDS Plus-V II 18/250/300	Art.-No. 531837
Alternative cartdriges	FIS VL 300 T The shown cartdriges are alternative to the highlighted one above with the same approval number.	Art.-No. 539461



Installation details

Thread diameter	M 16
Drill hole diameter	d_0 = 18 mm
Drill hole depth	h_2 = 240 mm
Calculated anchorage depth	h_{ef} = 80 mm
Drilling method	Hammer drilling
Drill hole cleaning	4 times blowing, 4 times brushing, 4 times blowing required activities according the given instruction in the approval
Installation type	Push-through installation
Annular gap	Annular gap filled
Maximum torque	$T_{inst,max}$ = 60.0 Nm
Socket size	24 mm
Base plate thickness	t = 160 mm
Total fixing thickness Tfix,max	t_{fix} = 160 mm
Volume of resin per drill hole	28 ml/14 scale divisions



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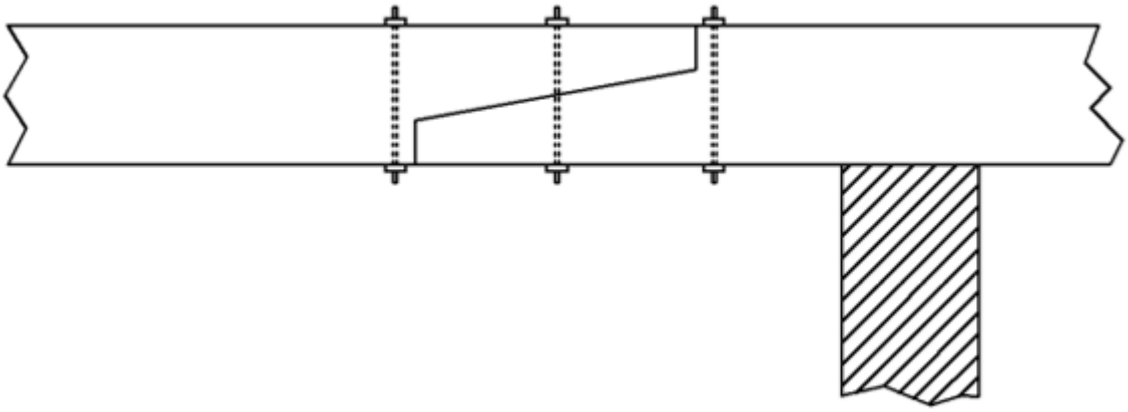
- *Analiza spojev vmesne lege*



SPOJ SE IZVEDE Z PREKLOPOM IN SE ZVIJAČI – GLEJ NAČRT

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2.5.1.3. Analiza masivne konstrukcije šole – horizontalne konstrukcije POZ-001-400

Glej prilogo:

Vhodni podatki - Konstrukcija

Shema nivojev

Naziv	z [m]	h [m]
Nivo (streha jaška)	8.80	0.40
Nivo (podstreha)	8.40	3.00
Nivo (ravna streha)	5.40	0.60

Naziv	z [m]	h [m]
Nivo (1.nadstropje)	4.80	4.00
Nivo (Pritličje)	0.80	0.80
Nivo (dno dvigalnega jaška)	0.00	

Tabele materialov

No	Naziv materiala	E[kN/m2]	μ	γ[kN/m3]	αt[1/C]	Em[kN/m2]	μm
1	C 25/30	3.100e+7	0.20	25.00	1.000e-5	3.100e+7	0.20
2	Opeka - v dobrem stanju	7.580e+4	0.20	14.00	1.000e-5	3.410e+6	0.20
3	Opeka - v dobrem stanju	7.580e+4	0.20	0.00	1.000e-5	3.410e+6	0.20
4	Les-Iglavci-Masiven les	1.000e+7	0.20	5.00	1.000e-5	1.000e+7	0.20
5	Jeklo	2.100e+8	0.30	78.50	1.000e-5	2.100e+8	0.30

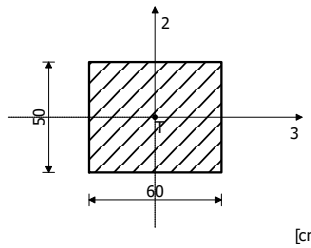
Seti plošč

No	d[m]	e[m]	Material	Tip preračuna	Ortotropija	E2[kN/m2]	G[kN/m2]	α
<1>	0.250	0.125	1	Tanka plošča	Izotropna			
<2>	0.250	0.125	1	Tanka plošča	Izotropna			
<3>	0.200	0.100	1	Tanka plošča	Izotropna			
<4>	0.200	0.100	1	Tanka plošča	Izotropna			
<5>	0.250	0.125	2	Opeka/Bloki	Izotropna			

Seti gred

Set: 1 Prerez: b/d=60/50, Fiktivna ekscentričnost

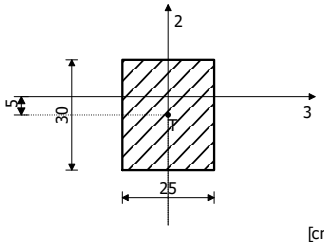
Mat.	A1	A2	A3	I1	I2	I3
1 - C 25/30	3.000e-1	2.500e-1	2.500e-1	1.240e-2	9.000e-3	6.250e-3



[cm]

Set: 2 Prerez: b/d=25/30, Fiktivna ekscentričnost

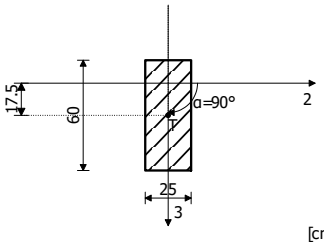
Mat.	A1	A2	A3	I1	I2	I3
1 - C 25/30	7.500e-2	6.250e-2	6.250e-2	7.752e-4	3.906e-4	5.625e-4



[cm]

Set: 4 Prerez: b/d=25/60, Fiktivna ekscentričnost

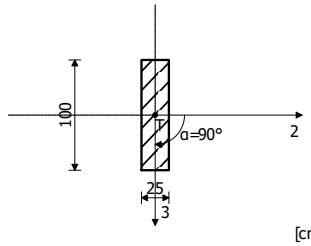
Mat.	A1	A2	A3	I1	I2	I3
1 - C 25/30	1.500e-1	1.250e-1	1.250e-1	2.307e-3	4.500e-3	7.812e-4



[cm]

Set: 5 Prerez: b/d=25/100, Fiktivna ekscentričnost

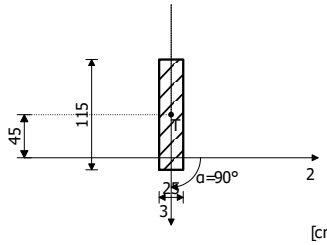
Mat.	A1	A2	A3	I1	I2	I3
1 - C 25/30	2.500e-1	2.083e-1	2.083e-1	4.388e-3	2.083e-2	1.302e-3



[cm]

Set: 6 Prerez: b/d=25/115, Fiktivna ekscentričnost

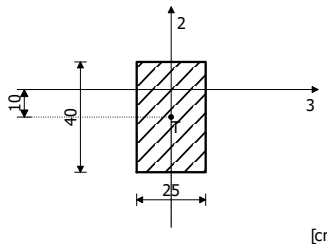
Mat.	A1	A2	A3	I1	I2	I3
1 - C 25/30	2.875e-1	2.396e-1	2.396e-1	5.169e-3	3.168e-2	1.497e-3



[cm]

Set: 7 Prerez: b/d=25/40, Fiktivna ekscentričnost

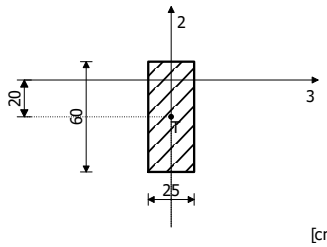
Mat.	A1	A2	A3	I1	I2	I3
1 - C 25/30	1.000e-1	8.333e-2	8.333e-2	1.273e-3	5.208e-4	1.333e-3



[cm]

Set: 8 Prerez: b/d=25/60, Fiktivna ekscentričnost

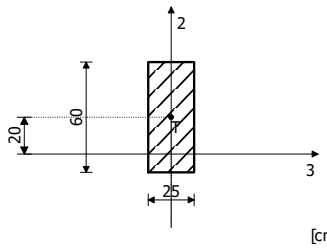
Mat.	A1	A2	A3	I1	I2	I3
1 - C 25/30	1.500e-1	1.250e-1	1.250e-1	2.307e-3	7.812e-4	4.500e-3



[cm]

Set: 9 Prerez: b/d=25/60, Fiktivna ekscentričnost

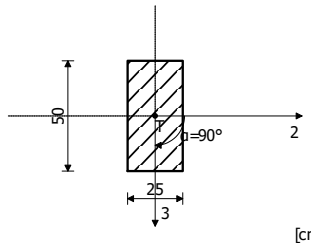
Mat.	A1	A2	A3	I1	I2	I3
1 - C 25/30	1.500e-1	1.250e-1	1.250e-1	2.307e-3	7.812e-4	4.500e-3



[cm]

Set: 10 Prerez: b/d=25/50, Fiktivna ekscentričnost

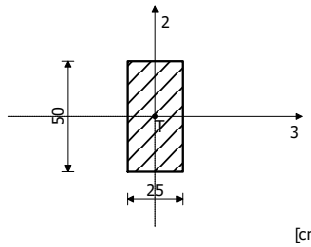
Mat.	A1	A2	A3	I1	I2	I3
3 - Opeka - v dob...	1.250e-1	1.042e-1	1.042e-1	1.788e-3	2.604e-3	6.510e-4



[cm]

Set: 11 Prerez: b/d=25/50, Fiktivna ekscentričnost

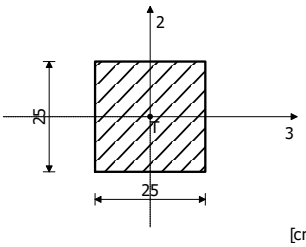
Mat.	A1	A2	A3	I1	I2	I3
3 - Opeka - v dob...	1.250e-1	1.042e-1	1.042e-1	1.788e-3	6.510e-4	2.604e-3



[cm]

Set: 12 Prerez: b/d=25/25, Fiktivna ekscentričnost

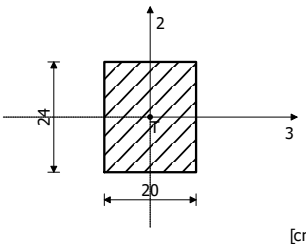
Mat.	A1	A2	A3	I1	I2	I3
1 - C 25/30	6.250e-2	5.208e-2	5.208e-2	5.501e-4	3.255e-4	3.255e-4



[cm]

Set: 14 Prerez: b/d=20/24, Fiktivna ekscentričnost

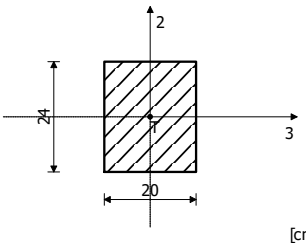
Mat.	A1	A2	A3	I1	I2	I3
4 - Les-Iglavci-M...	4.800e-2	4.000e-2	4.000e-2	3.175e-4	1.600e-4	2.304e-4



[cm]

Set: 15 Prerez: b/d=20/24, Fiktivna ekscentričnost

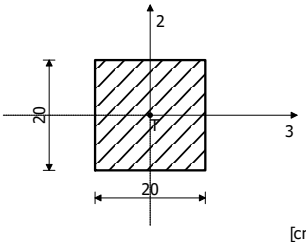
Mat.	A1	A2	A3	I1	I2	I3
4 - Les-Iglavci-M...	4.800e-2	4.000e-2	4.000e-2	3.175e-4	1.600e-4	2.304e-4



[cm]

Set: 16 Prerez: b/d=20/20, Fiktivna ekscentričnost

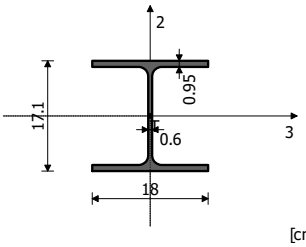
Mat.	A1	A2	A3	I1	I2	I3
4 - Les-Iglavci-M...	4.000e-2	3.333e-2	3.333e-2	2.253e-4	1.333e-4	1.333e-4



[cm]

Set: 17 Prerez: IPBl 180, Fiktivna ekscentričnost

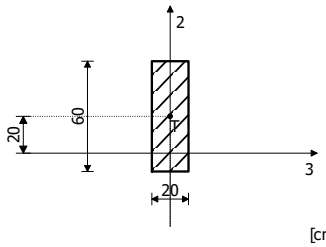
Mat.	A1	A2	A3	I1	I2	I3
5 - Jeklo	4.525e-3	1.447e-3	3.420e-3	1.127e-7	9.238e-6	2.509e-5



[cm]

Set: 18 Prerez: b/d=20/60, Fiktivna ekscentričnost

Mat.	A1	A2	A3	I1	I2	I3
1 - C 25/30	1.200e-1	1.000e-1	1.000e-1	1.264e-3	4.000e-4	3.600e-3



[cm]

Seti površinskih podpor

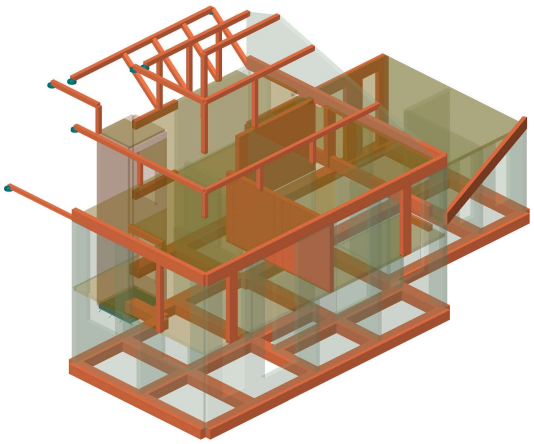
Set	K,R1	K,R2	K,R3
1	2.000e+4	2.000e+4	2.000e+4

Seti linijskih podpor

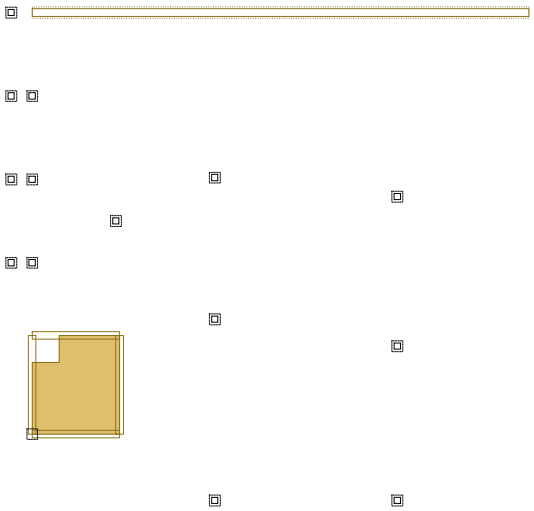
Set	K,R1	K,R2	K,R3	K,M1	Tla [m]
1	2.000e+4	2.000e+4	2.000e+4		0.500

Seti točkovnih podpor

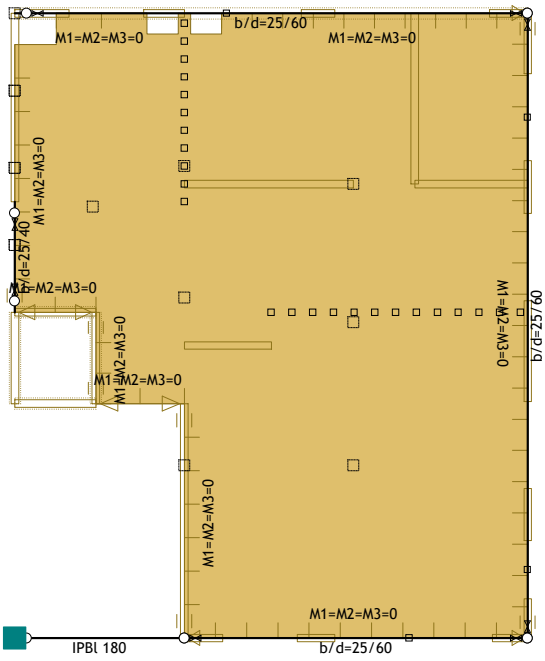
Set	K,R1	K,R2	K,R3	K,M1	K,M2	K,M3
1	1.000e+10	1.000e+10	1.000e+10			



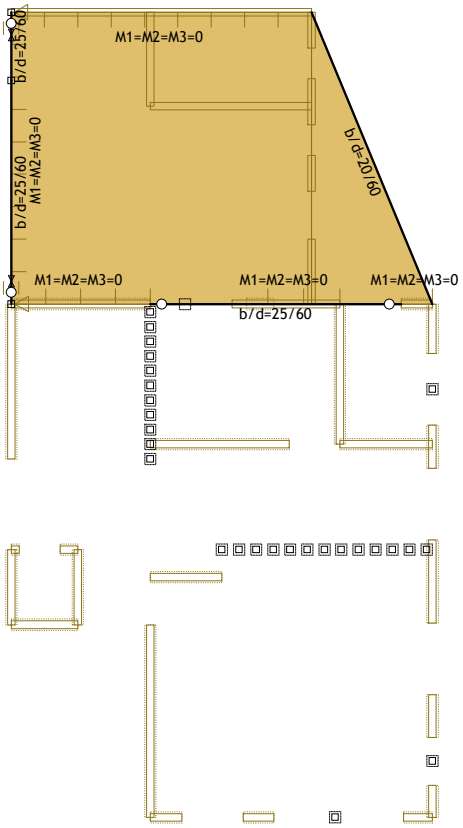
Izometrija



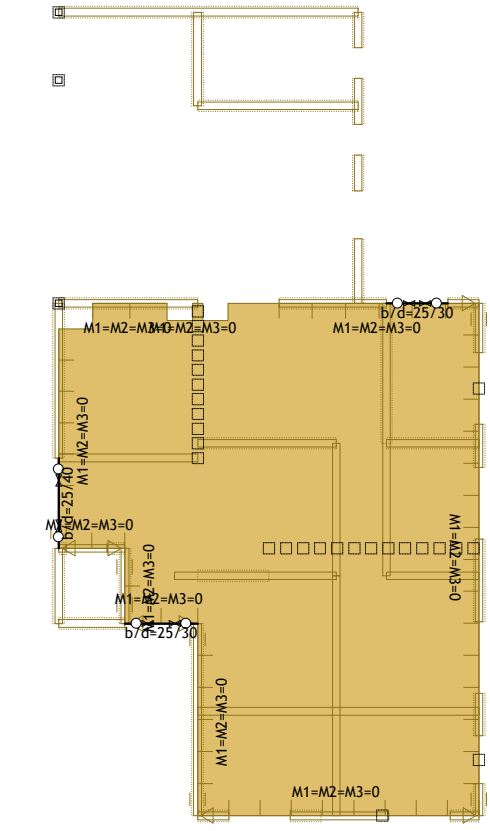
Nivo: Nivo (streha jaška) [8.80 m]



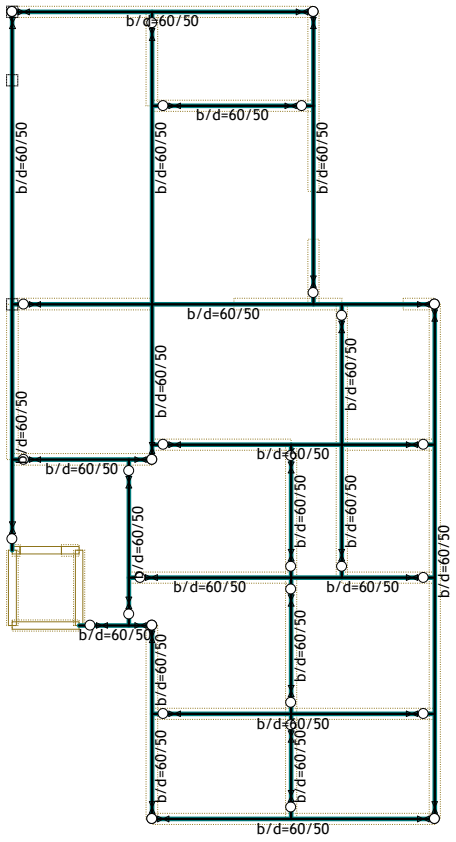
Nivo: Nivo (podstreha) [8.40 m]



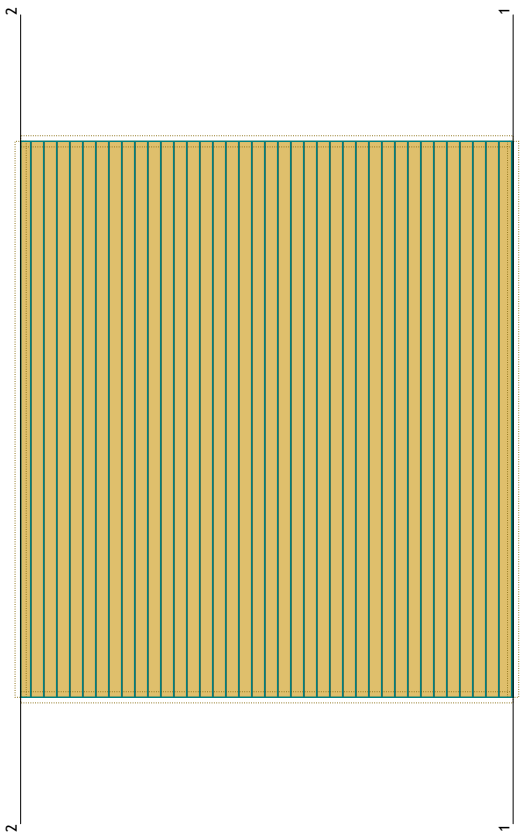
Nivo: Nivo (ravna streha) [5.40 m]



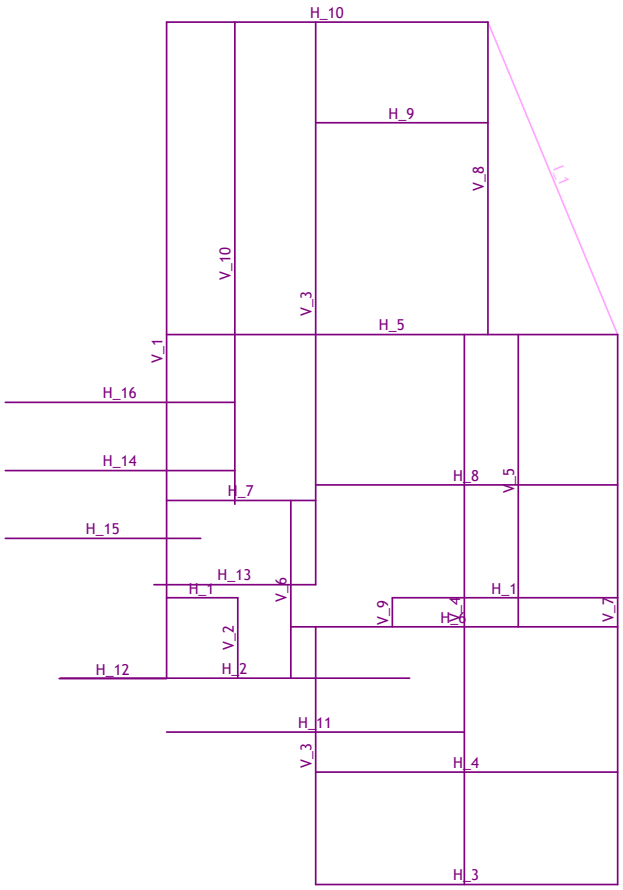
Nivo: Nivo (1.nadstropje) [4.80 m]



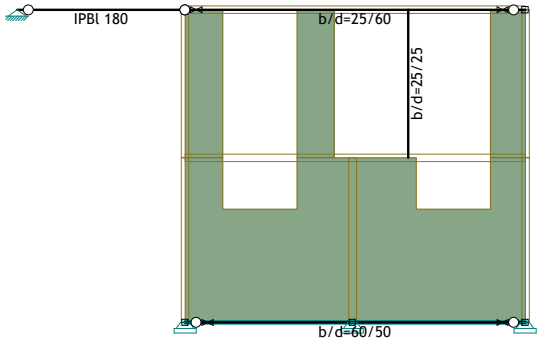
Nivo: Nivo (Pritličje) [0.80 m]



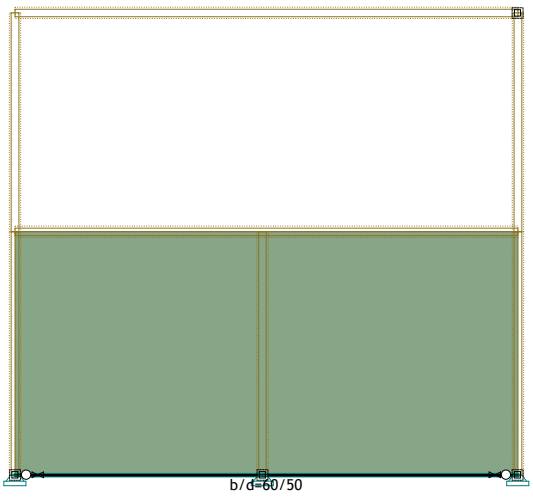
Nivo: Nivo (dno dvigalnega jaška) [0.00 m]



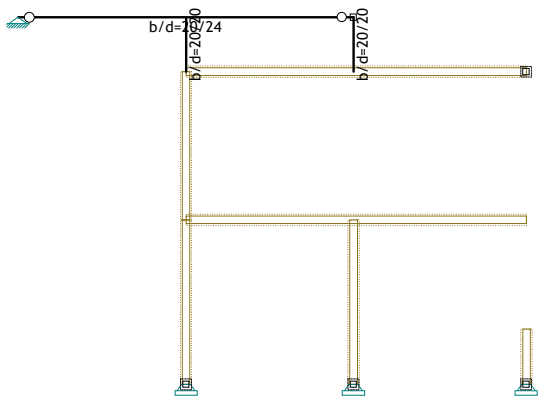
Dispozicija okvirjev



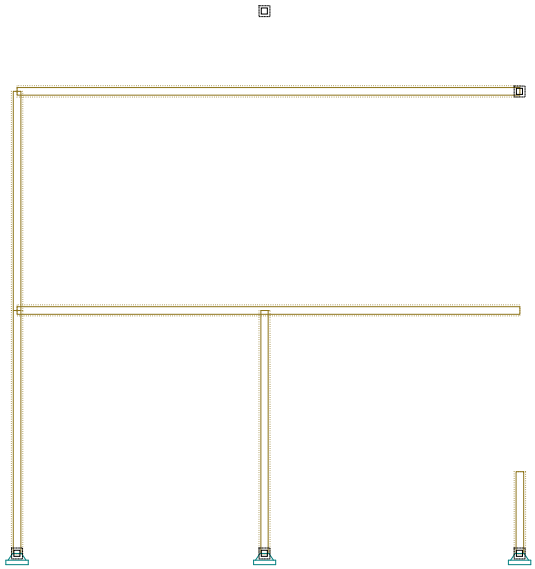
Okvir: H_3



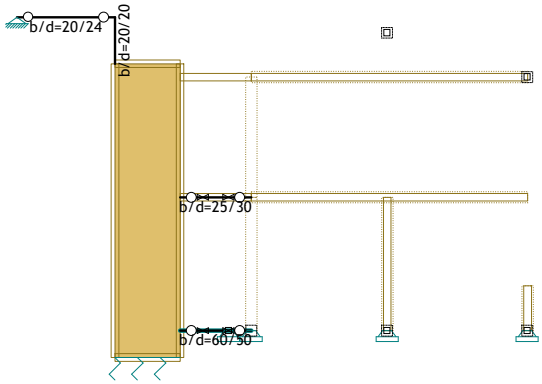
Okvir: H_4



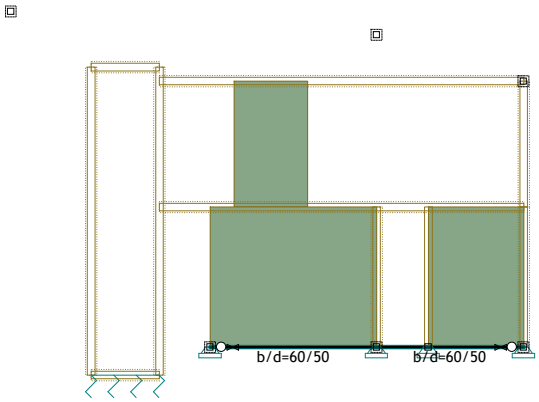
Okvir: H_11



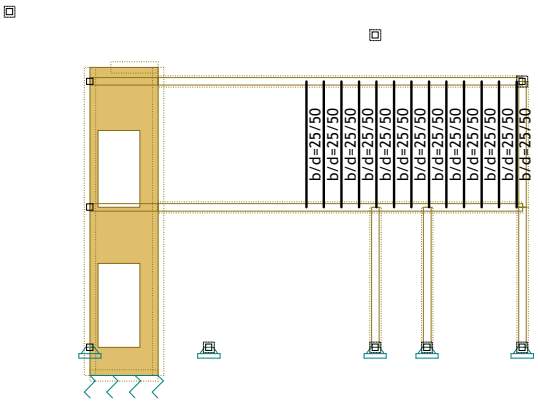
Okvir: H_12



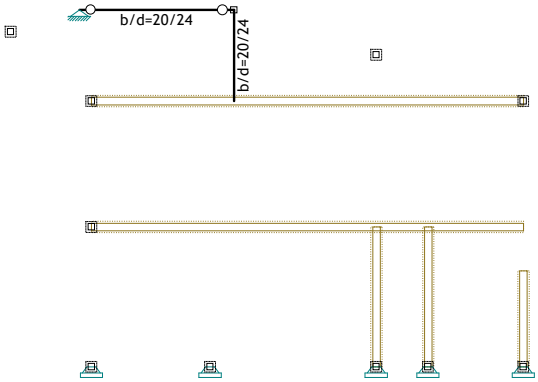
Okvir: H_2



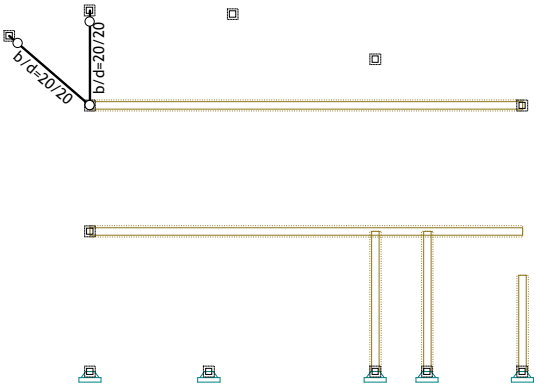
Okvir: H_6



Okvir: H_1



Okvir: H_13



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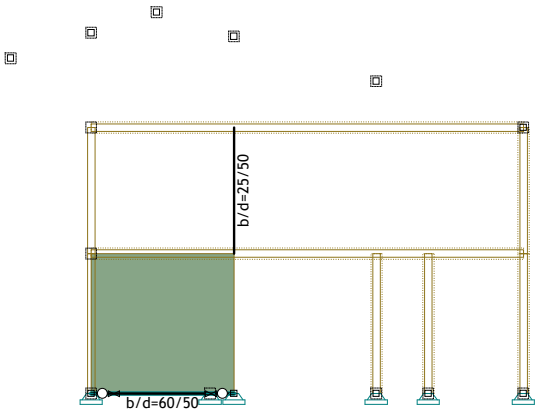
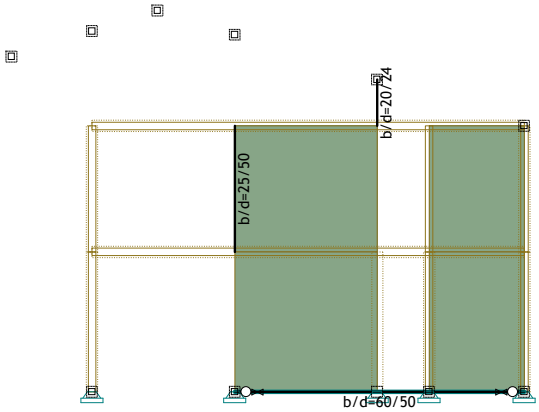


Okvir: H_7



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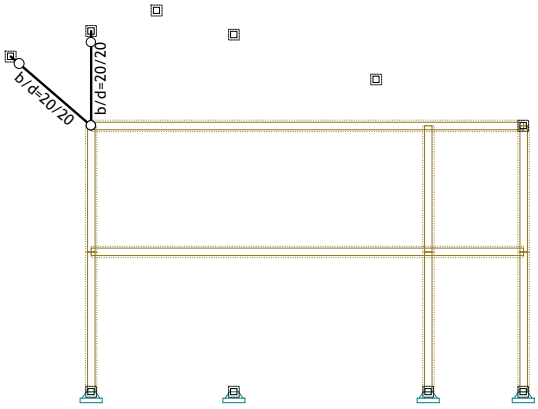

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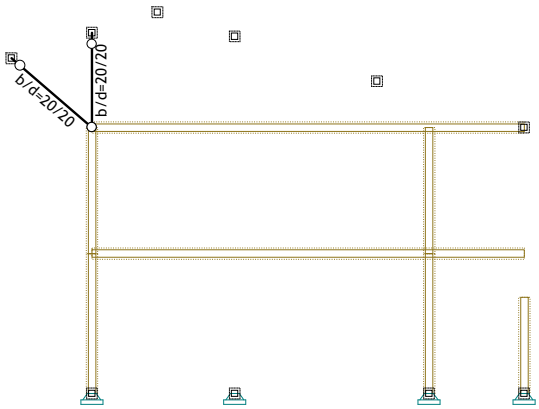

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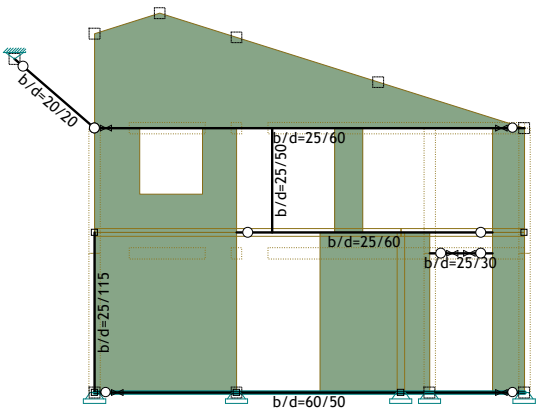

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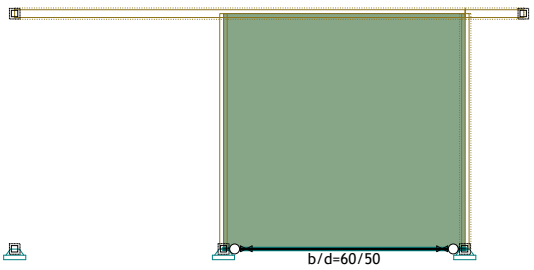

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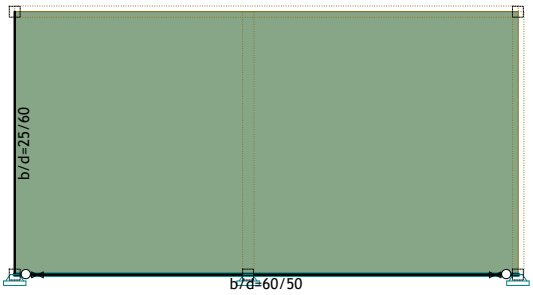

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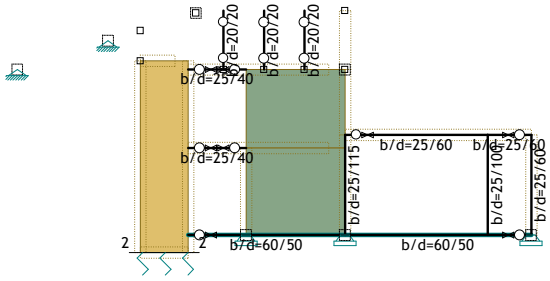
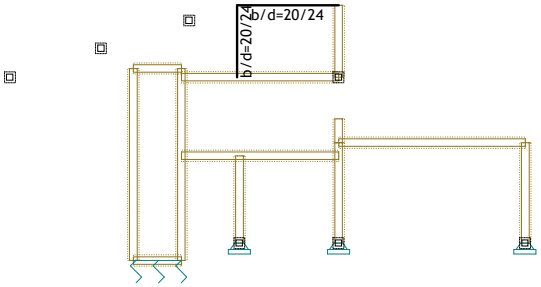
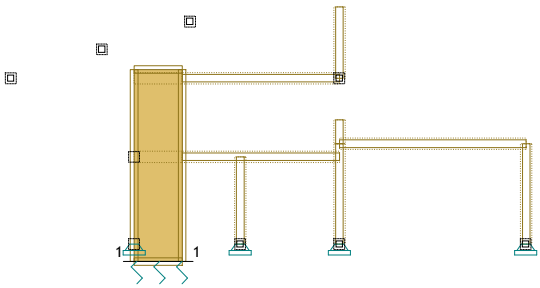


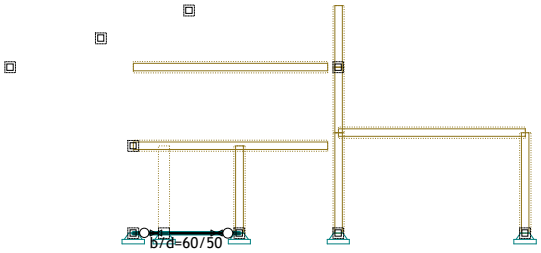
Okvir: V_1



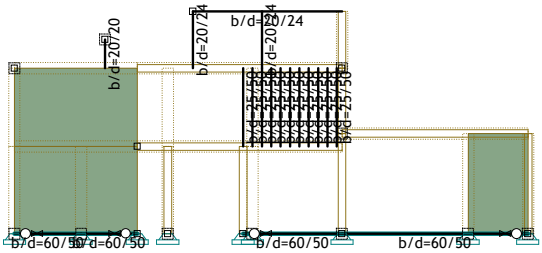
Okvir: V_10



Okvir: V_2



Okvir: V_6



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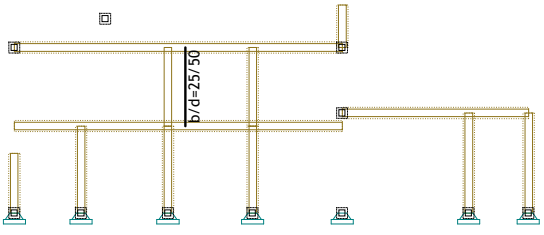
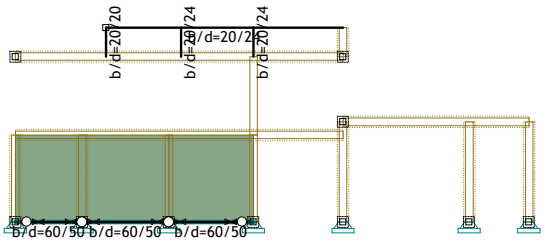


Okvir: V_9



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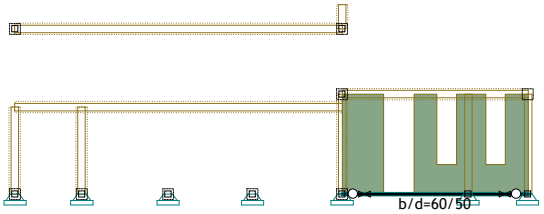
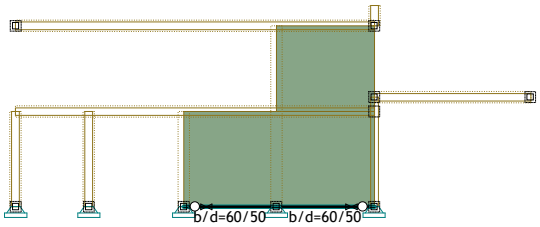
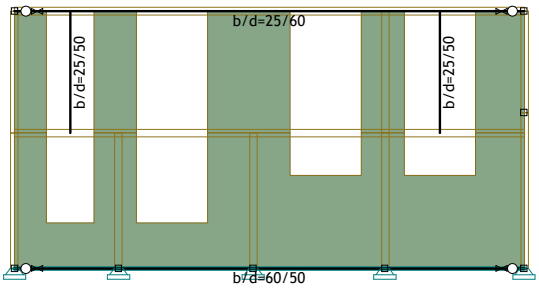


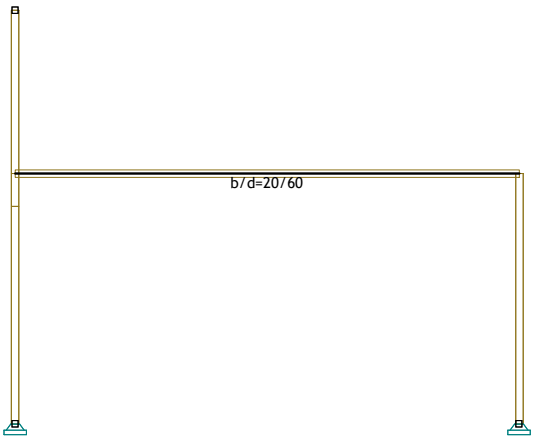
Okvir: V_8



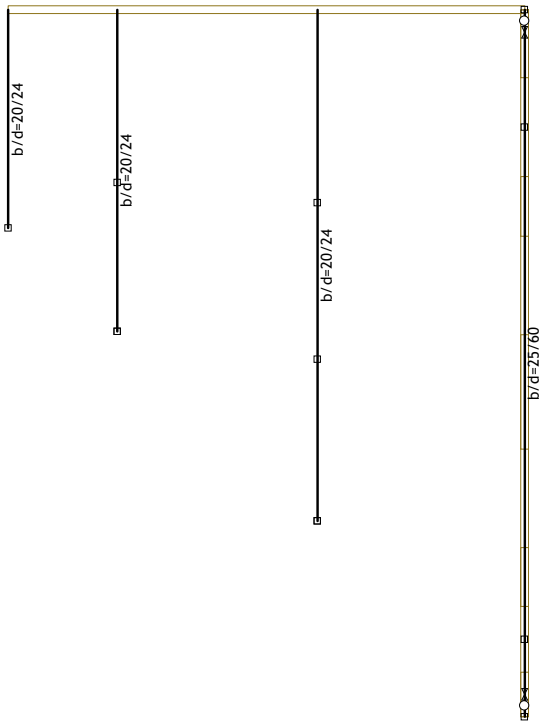
Okvir: V_5



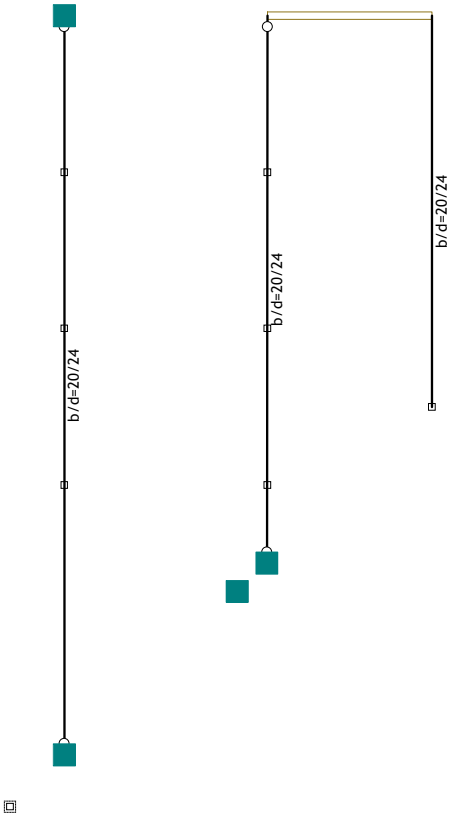
Okvir: V_7



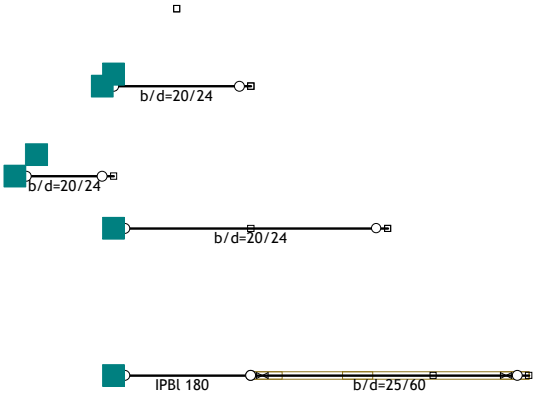
Okvir: I_1



Pogled: Strešina_1



Pogled: Strešina_2



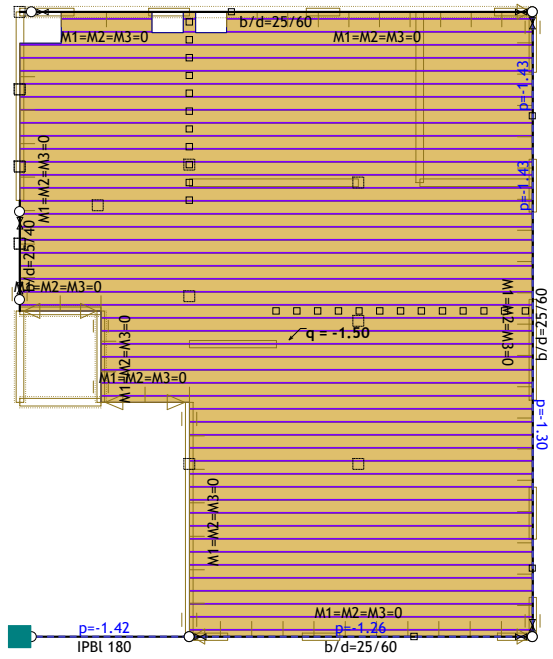
Pogled: Strešina_3

Vhodni podatki - Obtežba

Lista obtežnih primerov

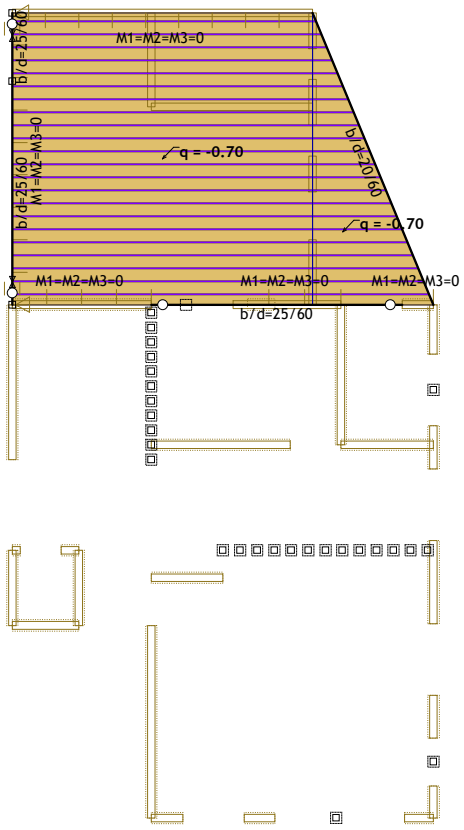
LC	Naziv
1	Lastna teža (g)
2	Koristna teža (cela)
3	Koristna teža (šah_1)
4	Koristna teža (šah_2)
5	Sneg
6	Komb.: 1.35xI+1.05xIII+1.05xIV+1.5xV
7	Komb.: 1.35xI+1.05xIII+1.5xIV+0.75xV
8	Komb.: 1.35xI+1.5xIII+1.05xIV+0.75xV
9	Komb.: I+1.05xIII+1.05xIV+1.5xV
10	Komb.: I+1.05xIII+1.5xIV+0.75xV
11	Komb.: I+1.5xIII+1.05xIV+0.75xV
12	Komb.: 1.35xI+1.05xIV+1.5xV
13	Komb.: 1.35xI+1.05xIII+1.5xV
14	Komb.: 1.35xI+1.05xIII+1.5xIV
15	Komb.: 1.35xI+1.5xIII+1.05xIV
16	Komb.: 1.35xI+1.05xII+1.5xV
17	Komb.: 1.35xI+1.5xIV+0.75xV
18	Komb.: 1.35xI+1.5xIII+0.75xV
19	Komb.: 1.35xI+1.5xII+0.75xV
20	Komb.: I+1.05xIV+1.5xV
21	Komb.: I+1.05xIII+1.5xV
22	Komb.: I+1.05xIII+1.5xIV
23	Komb.: I+1.5xIII+1.05xIV
24	Komb.: I+1.05xII+1.5xV
25	Komb.: I+1.5xIV+0.75xV
26	Komb.: I+1.5xIII+0.75xV
27	Komb.: I+1.5xII+0.75xV
28	Komb.: 1.35xI+1.5xV
29	Komb.: 1.35xI+1.5xIV
30	Komb.: 1.35xI+1.5xIII
31	Komb.: 1.35xI+1.5xII
32	Komb.: I+1.5xV
33	Komb.: I+1.5xIV
34	Komb.: I+1.5xIII
35	Komb.: I+1.5xII
36	Komb.: 1.35xI
37	Komb.: I

Obt. 1: Lastna teža (g)



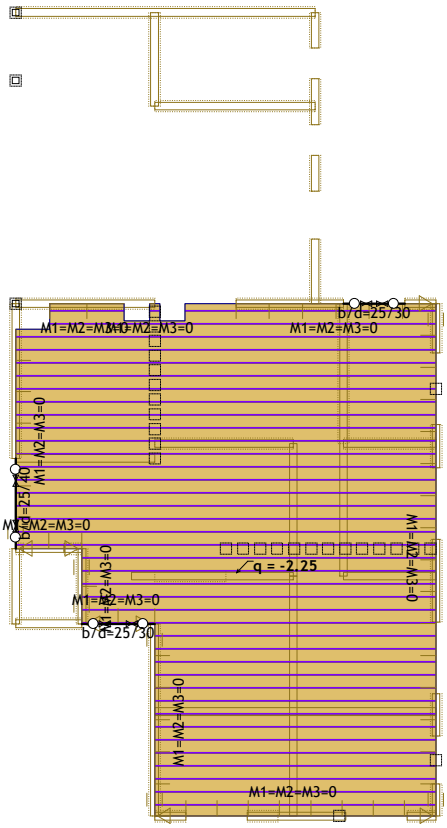
Nivo: Nivo (podstreha) [8.40 m]

Obt. 1: Lastna teža (g)



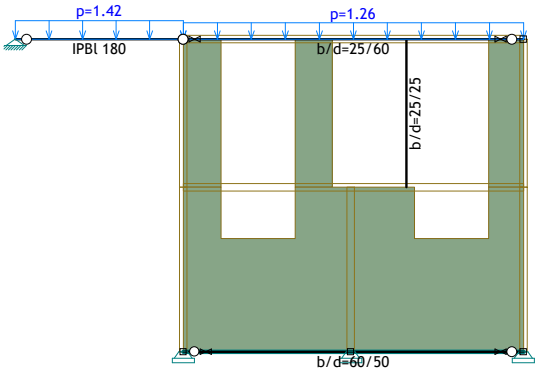
Nivo: Nivo (ravna streha) [5.40 m]

Obt. 1: Lastna teža (g)



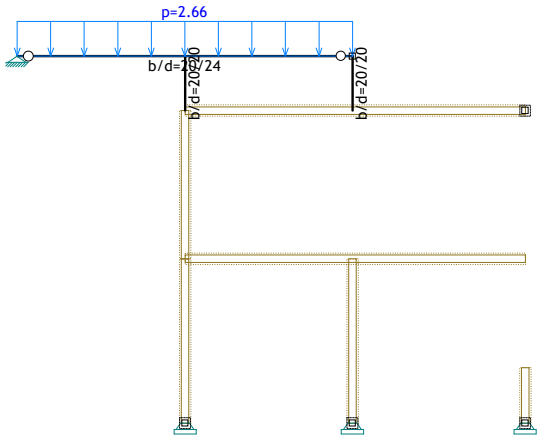
Nivo: Nivo (1.nadstropje) [4.80 m]

Obt. 1: Lastna teža (g)



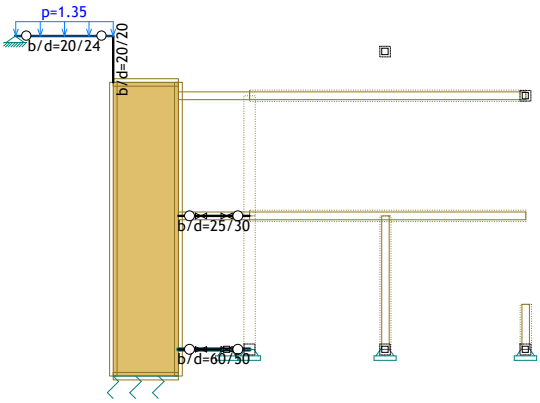
Okvir: H_3

Obt. 1: Lastna teža (g)



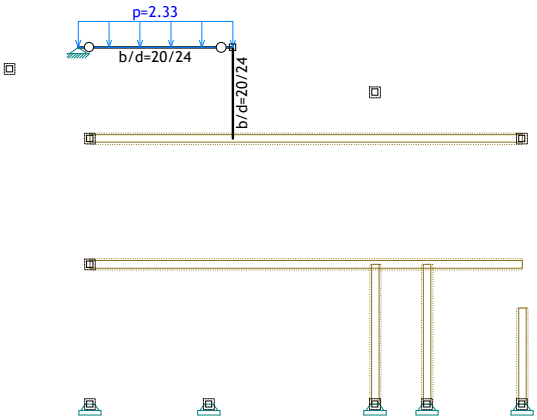
Okvir: H_11

Obt. 1: Lastna teža (g)



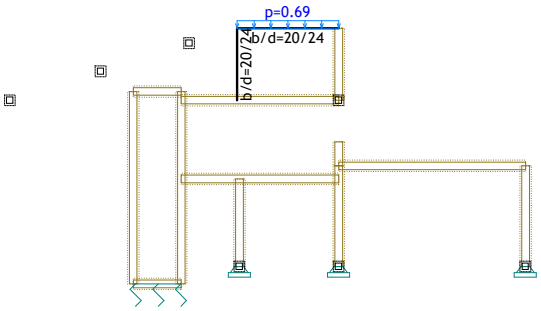
Okvir: H_2

Obt. 1: Lastna teža (g)



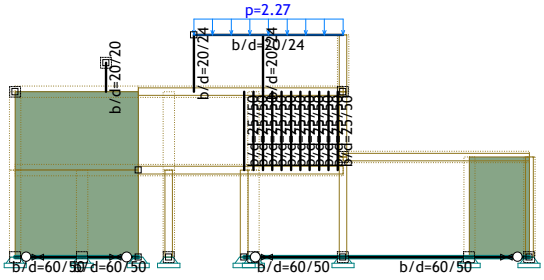
Okvir: H_13

Obt. 1: Lastna teža (g)



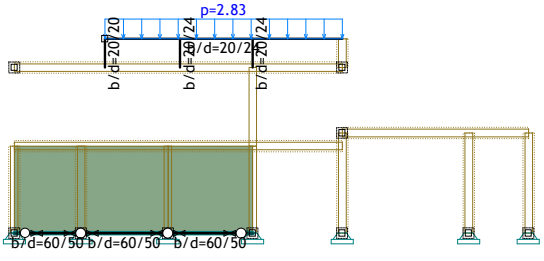
Okvir: V_10

Obt. 1: Lastna teža (g)



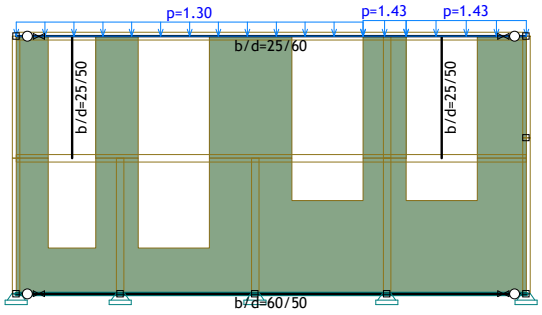
Okvir: V_3

Obt. 1: Lastna teža (g)



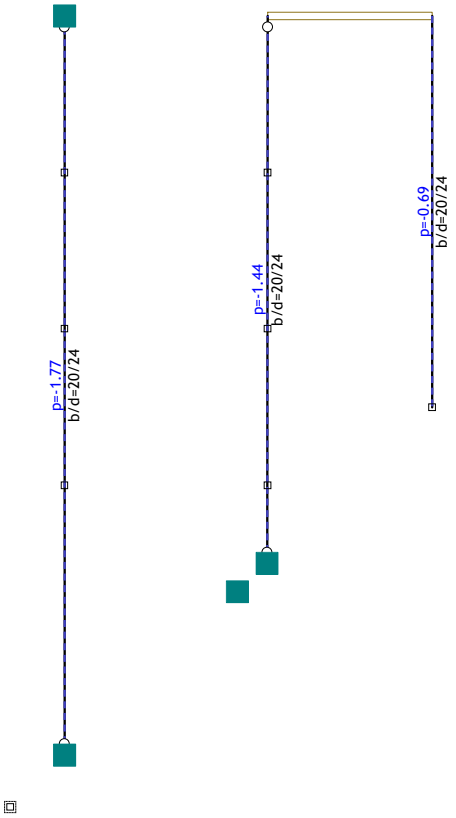
Okvir: V_4

Obt. 1: Lastna teža (g)



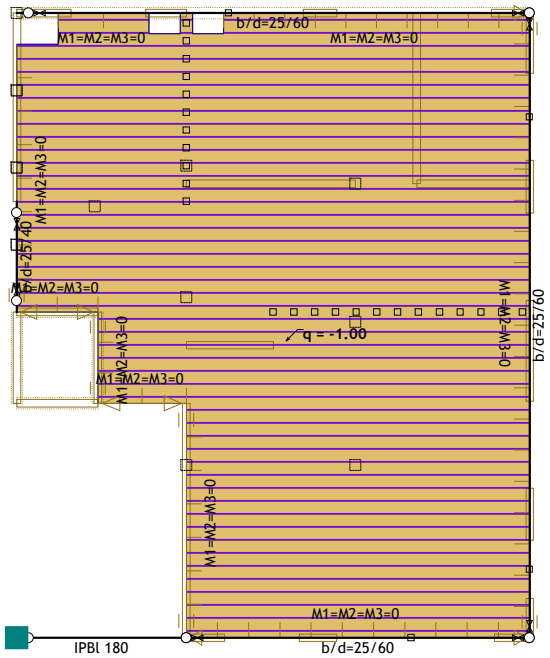
Okvir: V_7

Obt. 1: Lastna teža (g)



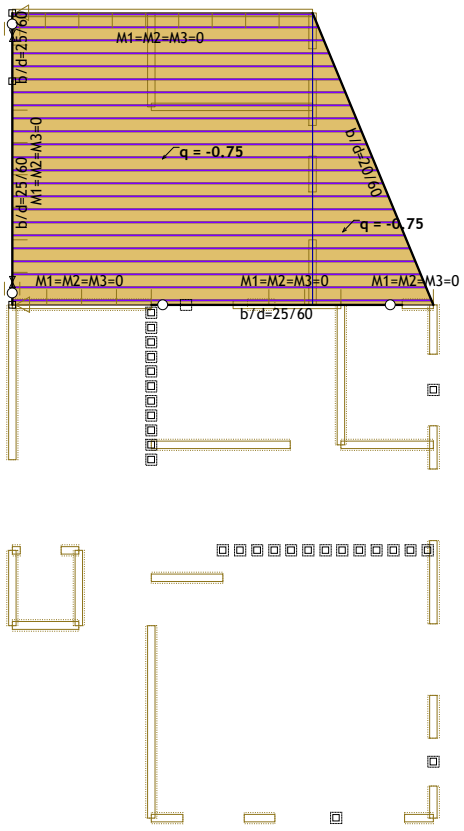
Pogled: Strešina_2

Obt. 2: Koristna teža (cela)



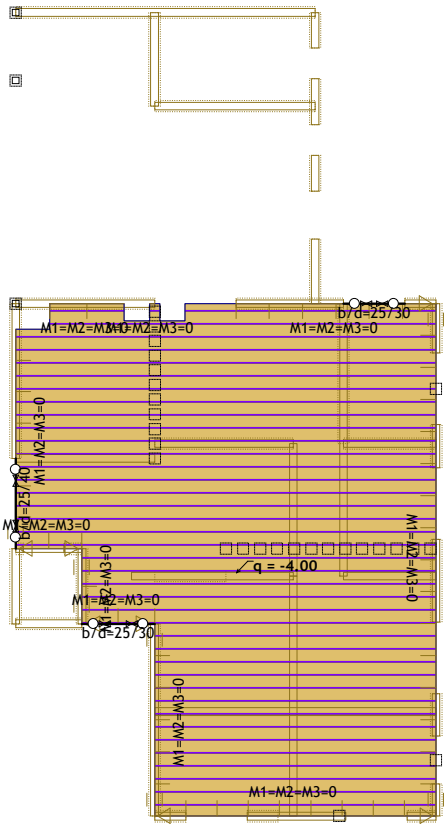
Nivo: Nivo (podstreha) [8.40 m]

Obt. 2: Koristna teža (cela)



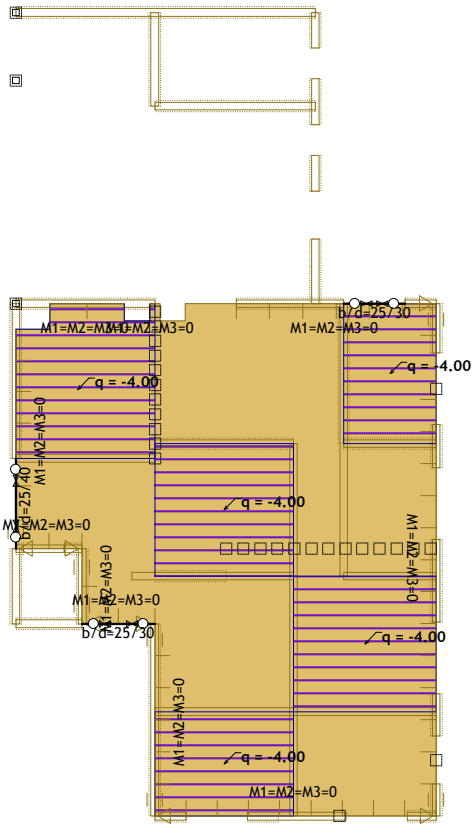
Nivo: Nivo (ravna streha) [5.40 m]

Obt. 2: Koristna teža (cela)



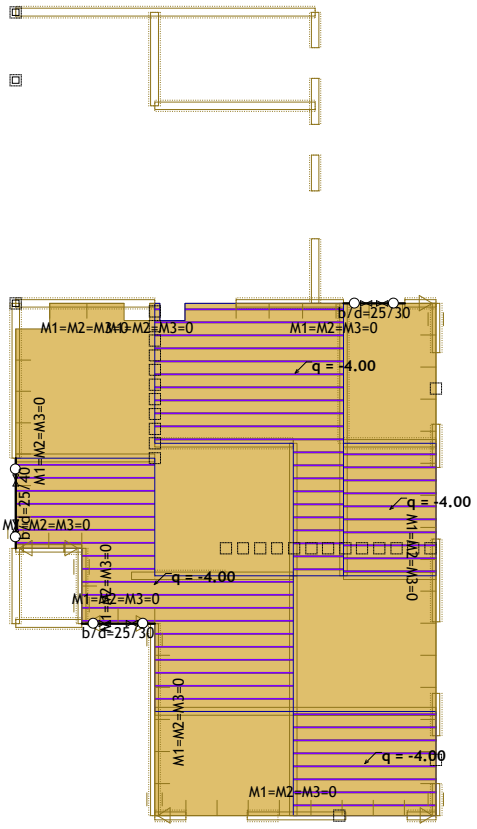
Nivo: Nivo (1.nadstropje) [4.80 m]

Obt. 3: Koristna teža (šah_1)



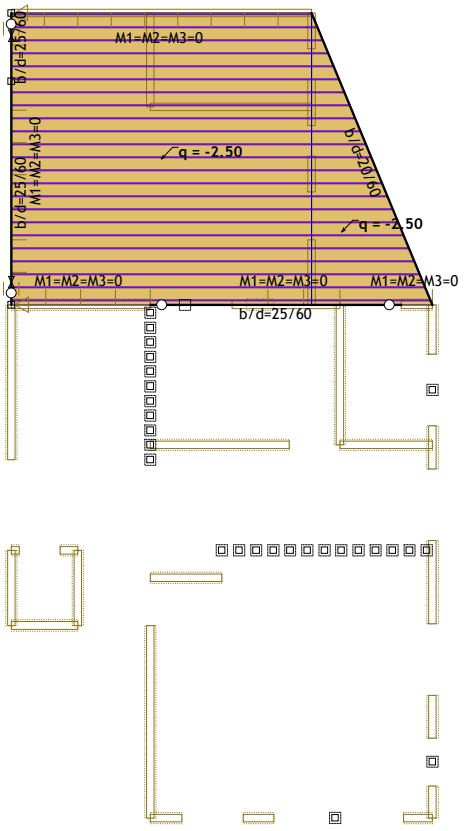
Nivo: Nivo (1.nadstropje) [4.80 m]

Obt. 4: Koristna teža (šah_2)



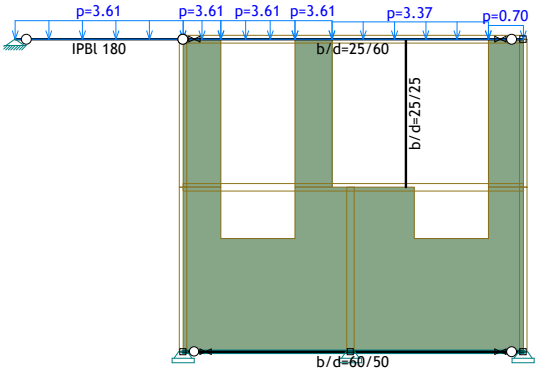
Nivo: Nivo (1.nadstropje) [4.80 m]

Obt. 5: Sneg



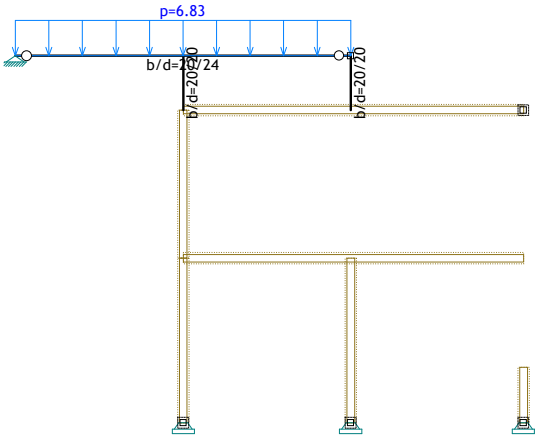
Nivo: Nivo (ravna streha) [5.40 m]

Obt. 5: Sneg



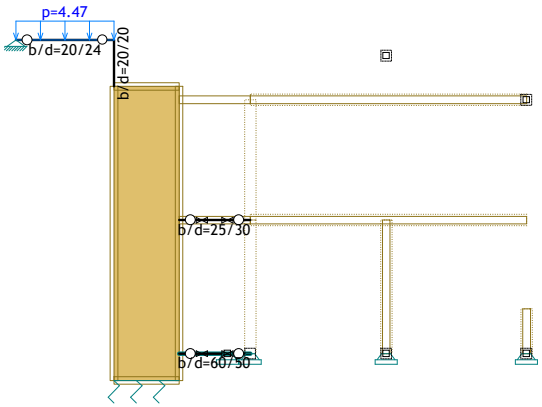
Okvir: H_3

Obt. 5: Sneg



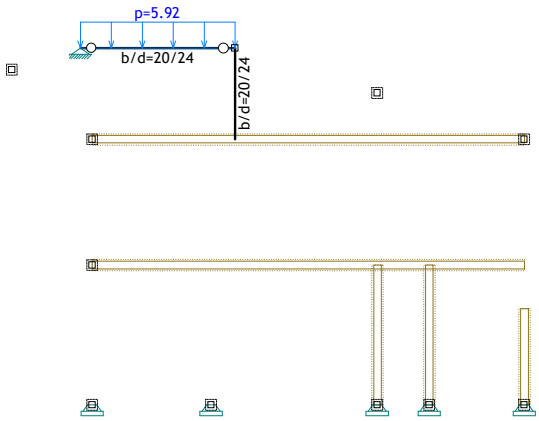
Okvir: H_11

Obt. 5: Sneg



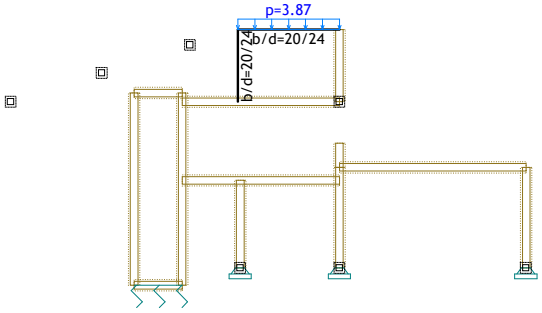
Okvir: H_2

Obt. 5: Sneg



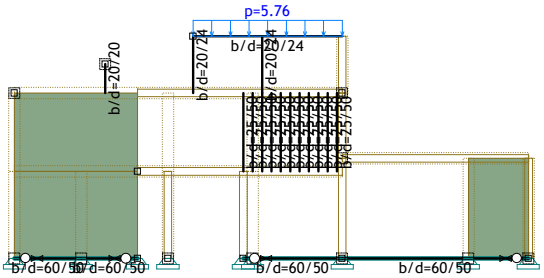
Okvir: H_13

Obt. 5: Sneg



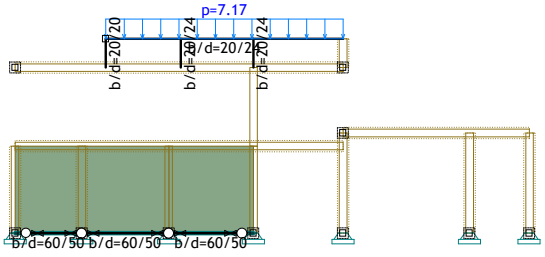
Okvir: V_10

Obt. 5: Sneg



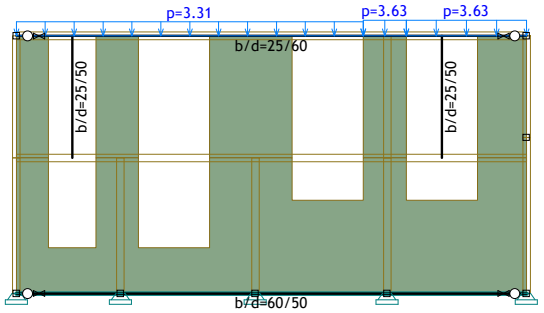
Okvir: V_3

Obt. 5: Sneg



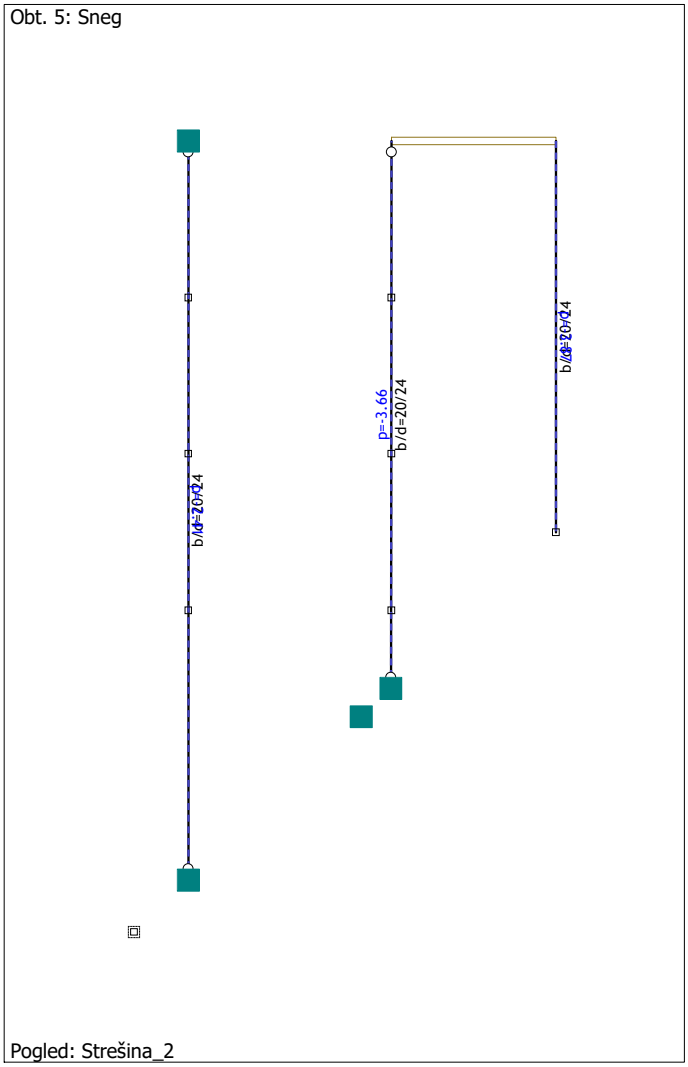
Okvir: V_4

Obt. 5: Sneg



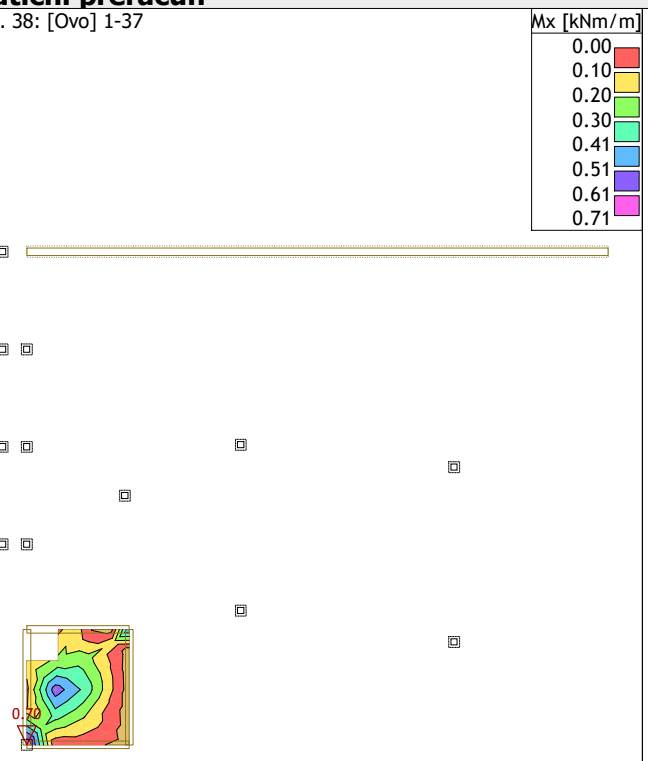
Okvir: V_7

Obt. 5: Sneg



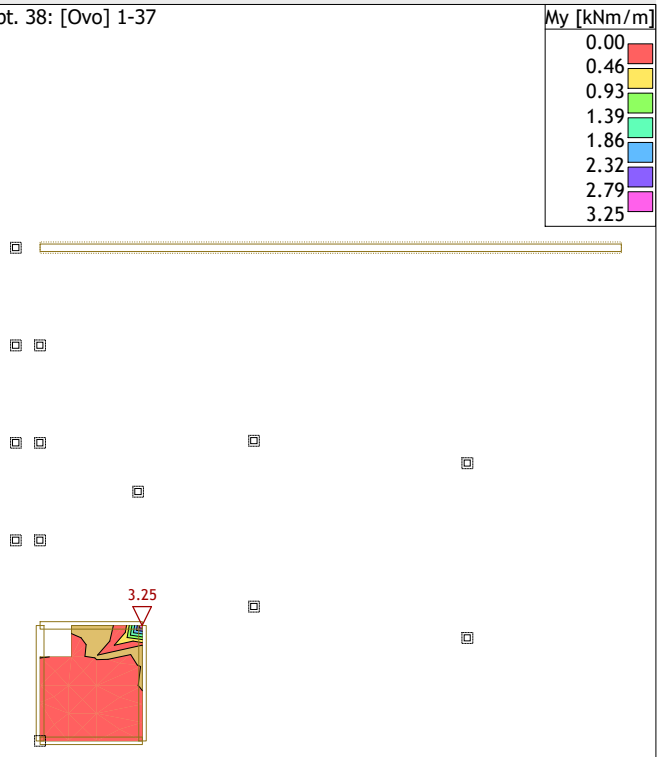
Pogled: Strešina_2

Obt. 38: [Ovo] 1-37



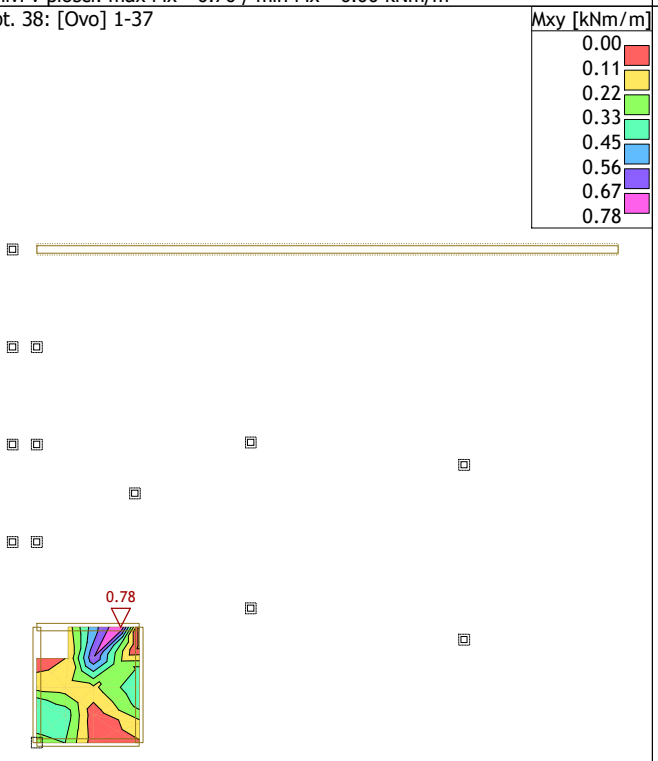
Nivo: Nivo (streha jaška) [8.80 m]
Vplivi v plošči: max Mx= 0.70 / min Mx= 0.00 kNm/m

Obt. 38: [Ovo] 1-37



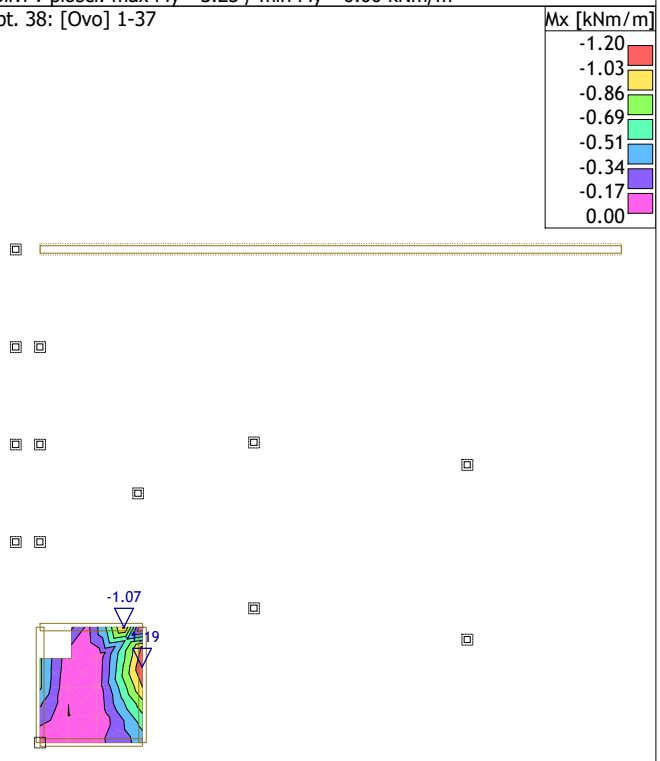
Nivo: Nivo (streha jaška) [8.80 m]
Vplivi v plošči: max My= 3.25 / min My= 0.00 kNm/m

Obt. 38: [Ovo] 1-37



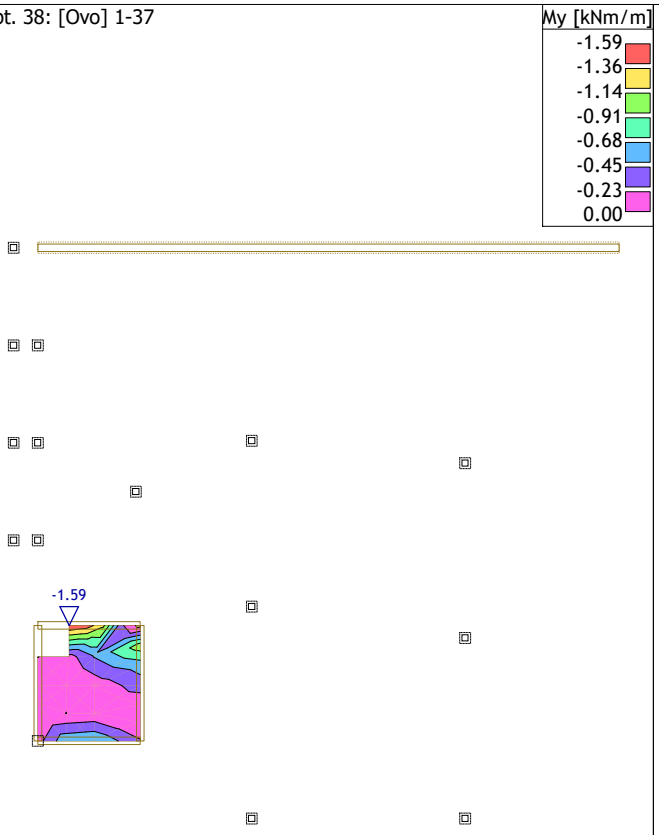
Nivo: Nivo (streha jaška) [8.80 m]
Vplivi v plošči: max Mxy= 0.78 / min Mxy= 0.00 kNm/m

Obt. 38: [Ovo] 1-37



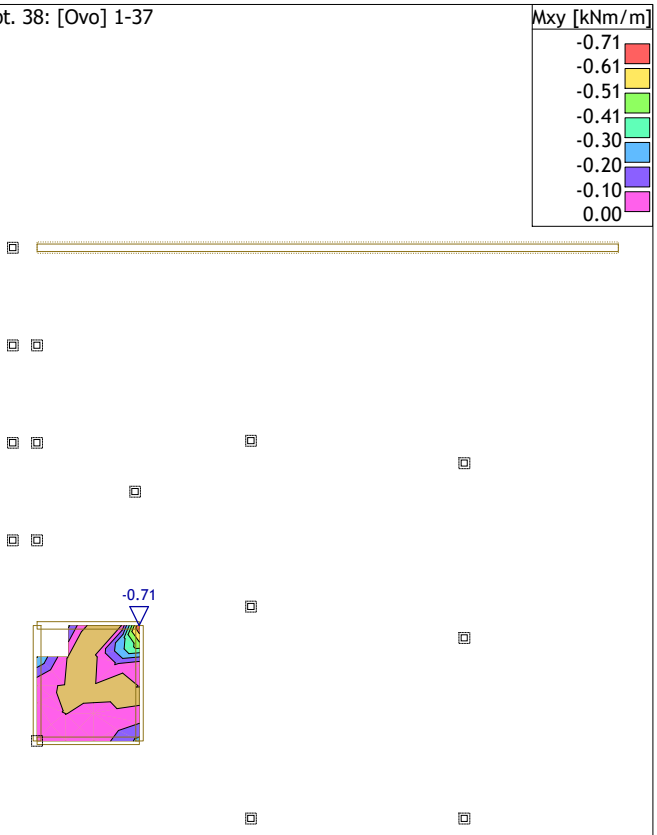
Nivo: Nivo (streha jaška) [8.80 m]
Vplivi v plošči: max Mx= 0.00 / min Mx= -1.19 kNm/m

Obt. 38: [Ovo] 1-37



Nivo: Nivo (streha jaška) [8.80 m]
Vplivi v plošči: max My= 0.00 / min My= -1.59 kNm/m

Obt. 38: [Ovo] 1-37



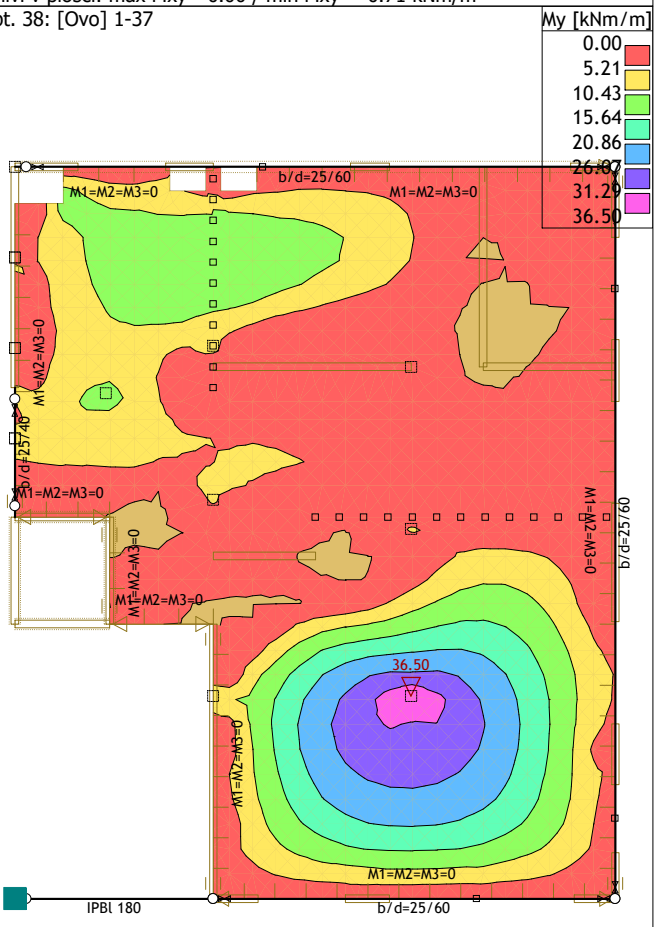
Nivo: Nivo (streha jaška) [8.80 m]
Vplivi v plošči: max Mxy= 0.00 / min Mxy= -0.71 kNm/m

Obt. 38: [Ovo] 1-37



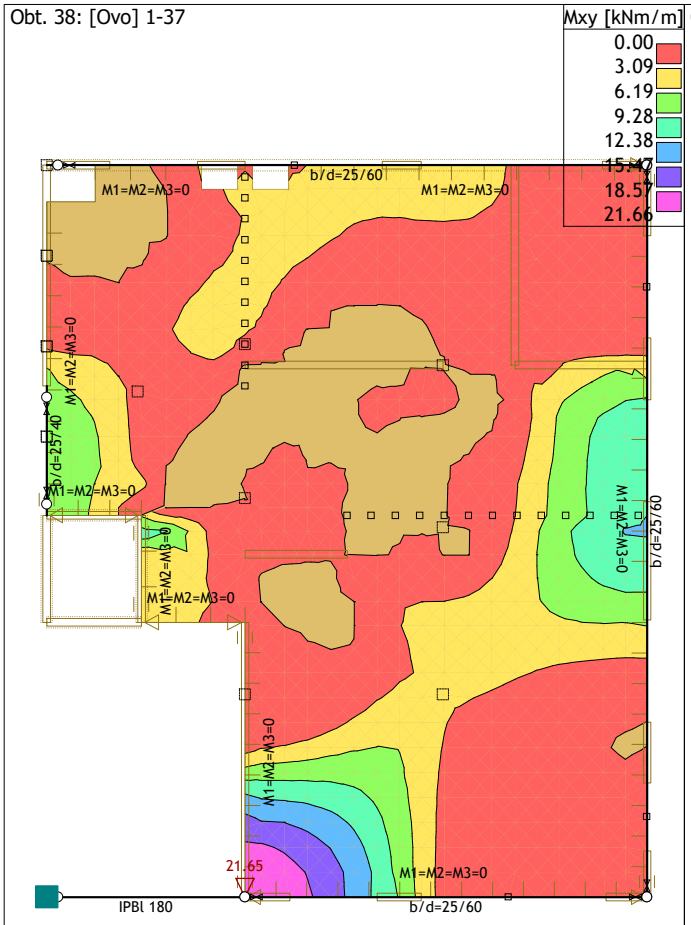
Nivo: Nivo (podstreha) [8.40 m]
Vplivi v plošči: max Mx= 39.67 / min Mx= 0.00 kNm/m

Obt. 38: [Ovo] 1-37



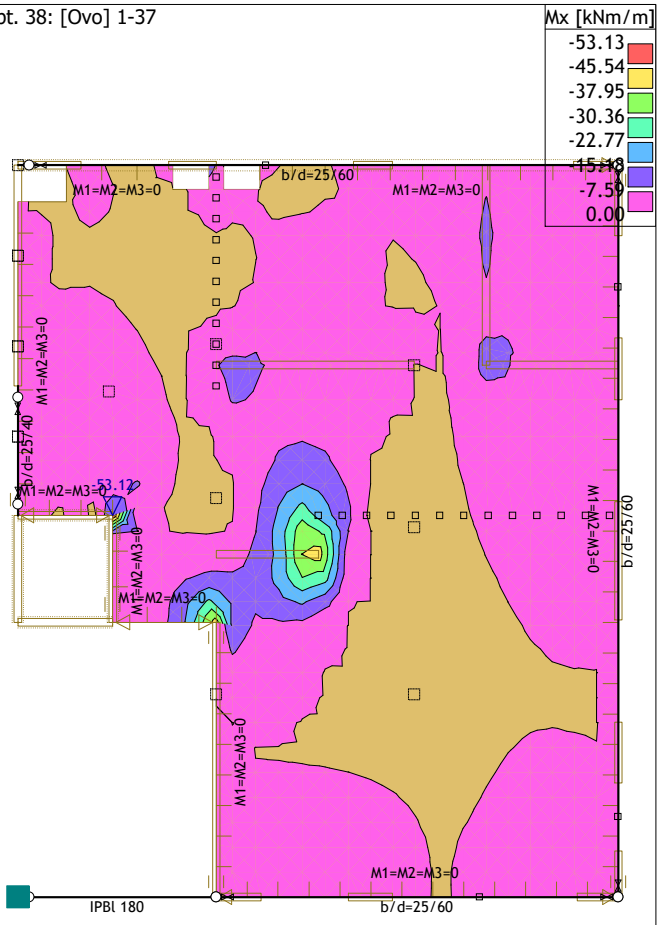
Nivo: Nivo (podstreha) [8.40 m]
Vplivi v plošči: max My= 36.50 / min My= 0.00 kNm/m

Obt. 38: [Ovo] 1-37



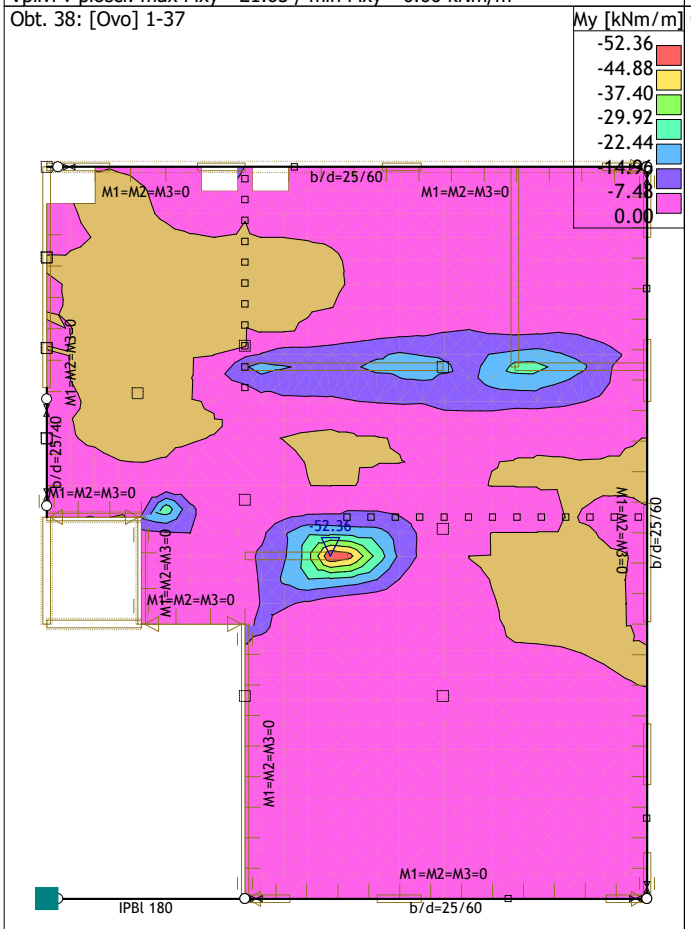
Nivo: Nivo (podstreha) [8.40 m]
Vplivi v plošči: max Mxy= 21.65 / min Mxy= 0.00 kNm/m

Obt. 38: [Ovo] 1-37



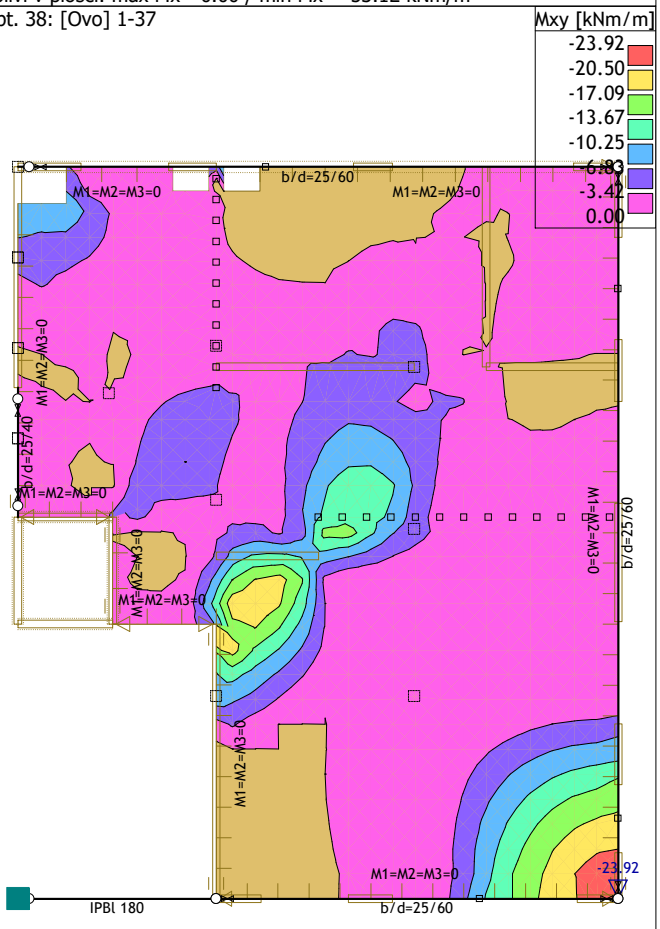
Nivo: Nivo (podstreha) [8.40 m]
Vplivi v plošči: max Mx= 0.00 / min Mx= -53.12 kNm/m

Obt. 38: [Ovo] 1-37



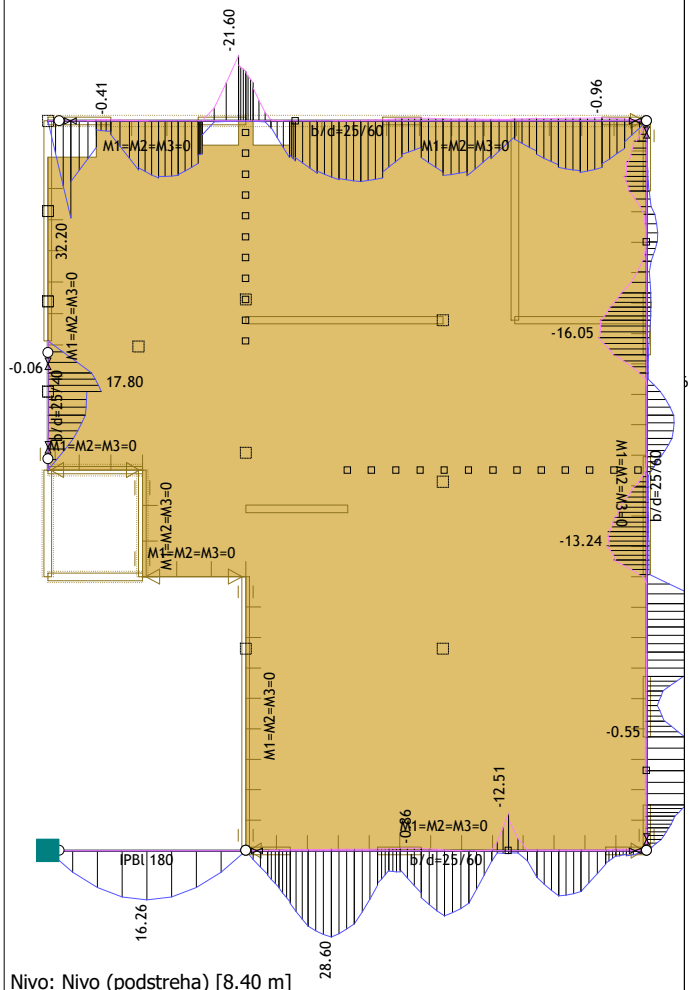
Nivo: Nivo (podstreha) [8.40 m]
Vplivi v plošči: max My= 0.00 / min My= -52.36 kNm/m

Obt. 38: [Ovo] 1-37



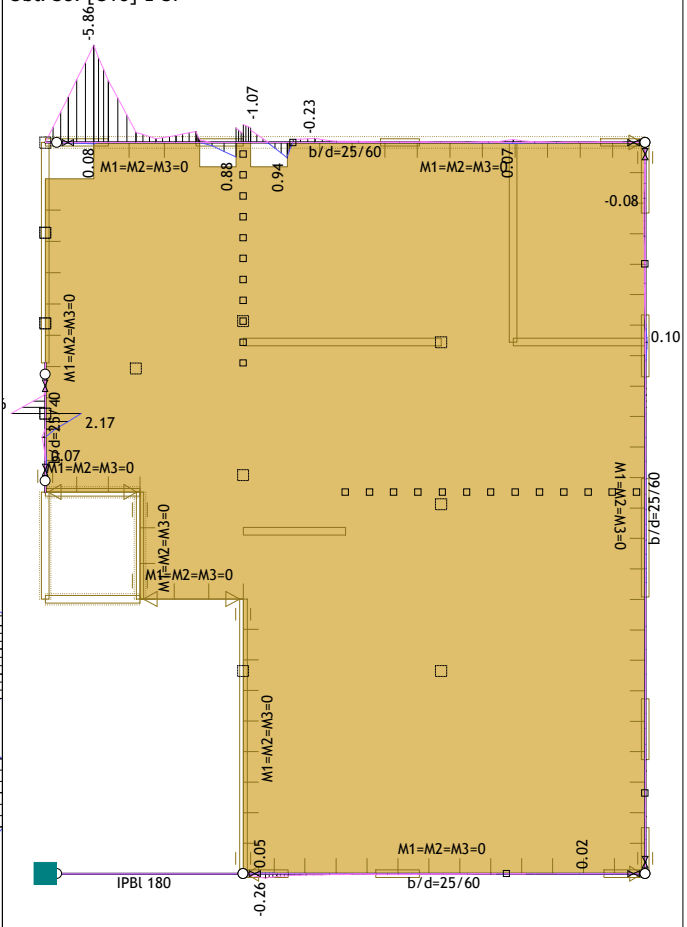
Nivo: Nivo (podstreha) [8.40 m]
Vplivi v plošči: max Mxy= 0.00 / min Mxy= -23.92 kNm/m

Obt. 38: [Ovo] 1-37



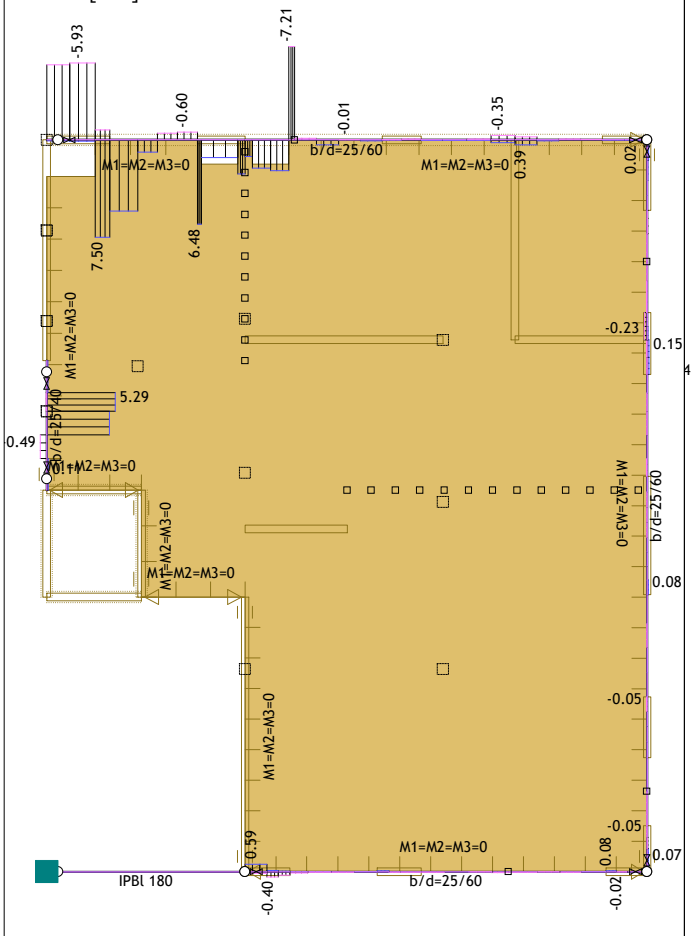
Nivo: Nivo (podstreha) [8.40 m]
Vplivi v gredi: max M3= 32.20 / min M3= -21.60 kNm

Obt. 38: [Ovo] 1-37



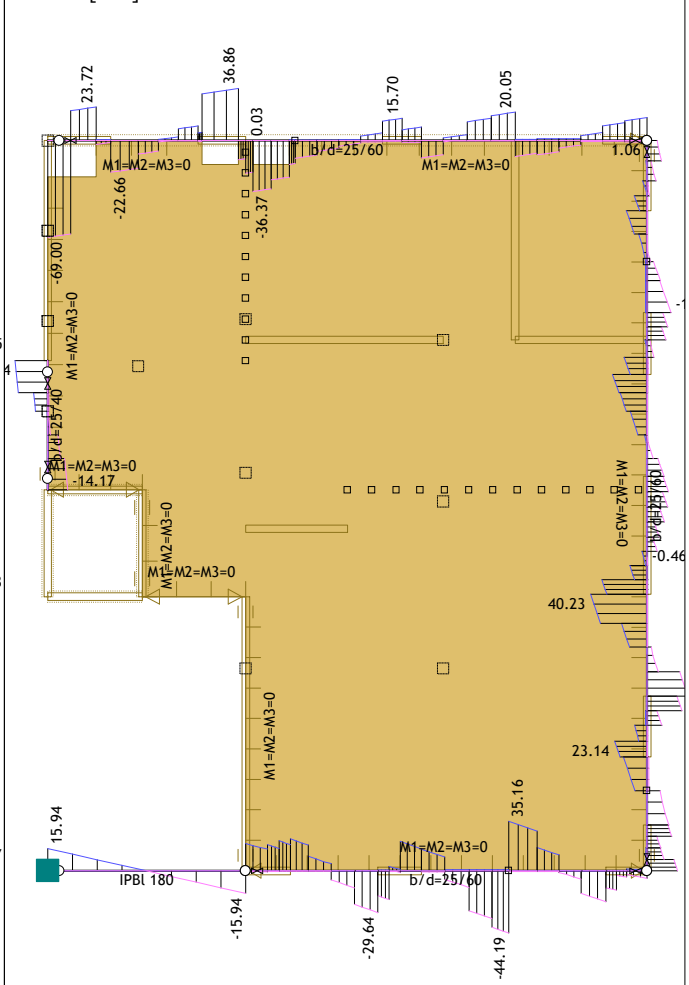
Nivo: Nivo (podstreha) [8.40 m]
Vplivi v gredi: max M2= 2.17 / min M2= -5.86 kNm

Obt. 38: [Ovo] 1-37



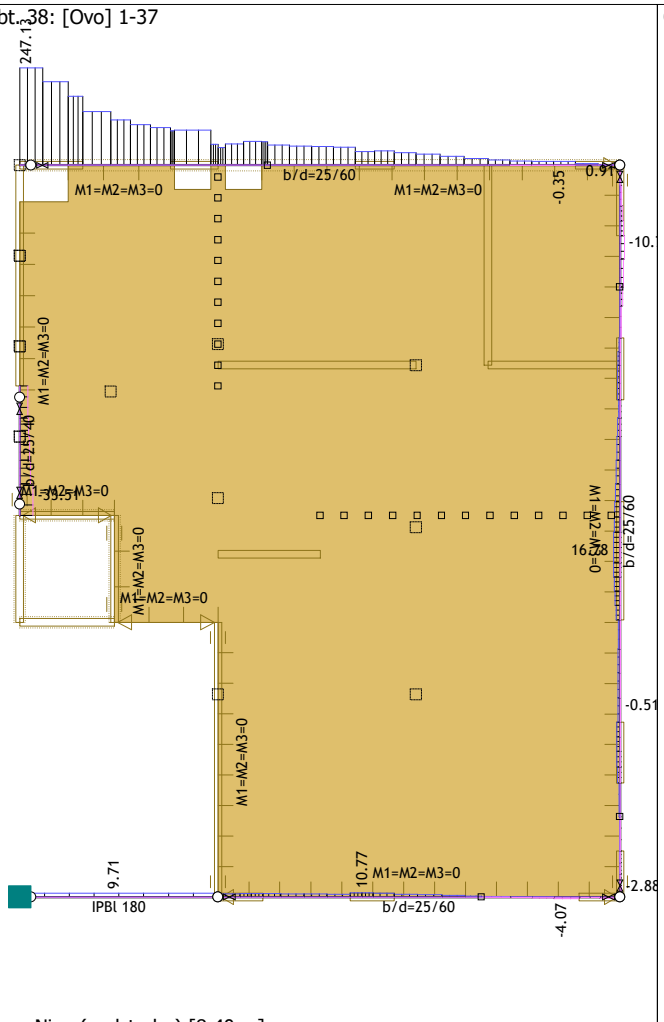
Nivo: Nivo (podstreha) [8.40 m]
Vplivi v gredi: max T3= 7.50 / min T3= -7.21 kN

Obt. 38: [Ovo] 1-37



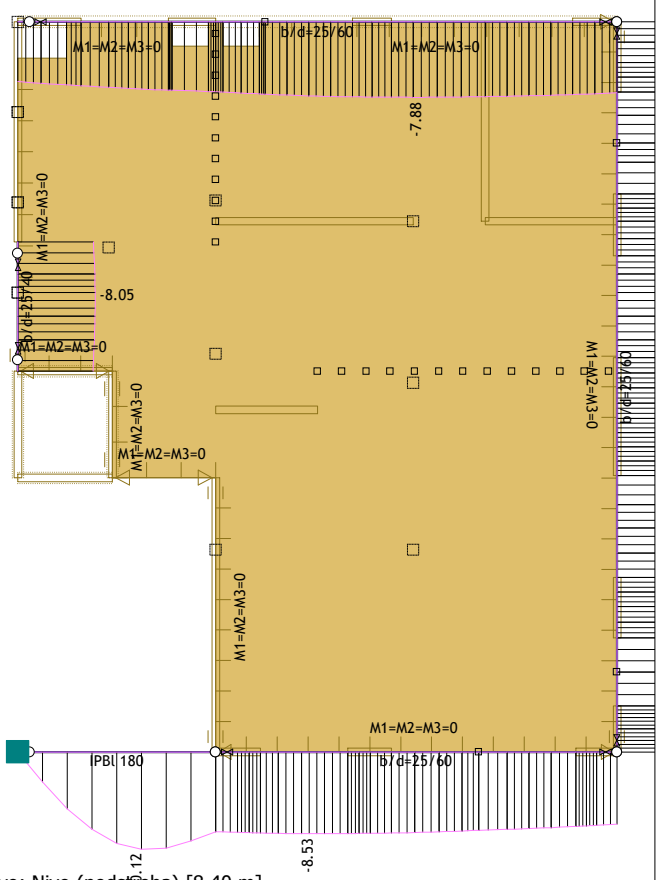
Nivo: Nivo (podstreha) [8.40 m]
Vplivi v gredi: max T2= 40.23 / min T2= -69.00 kN

Obt. 38: [Ovo] 1-37



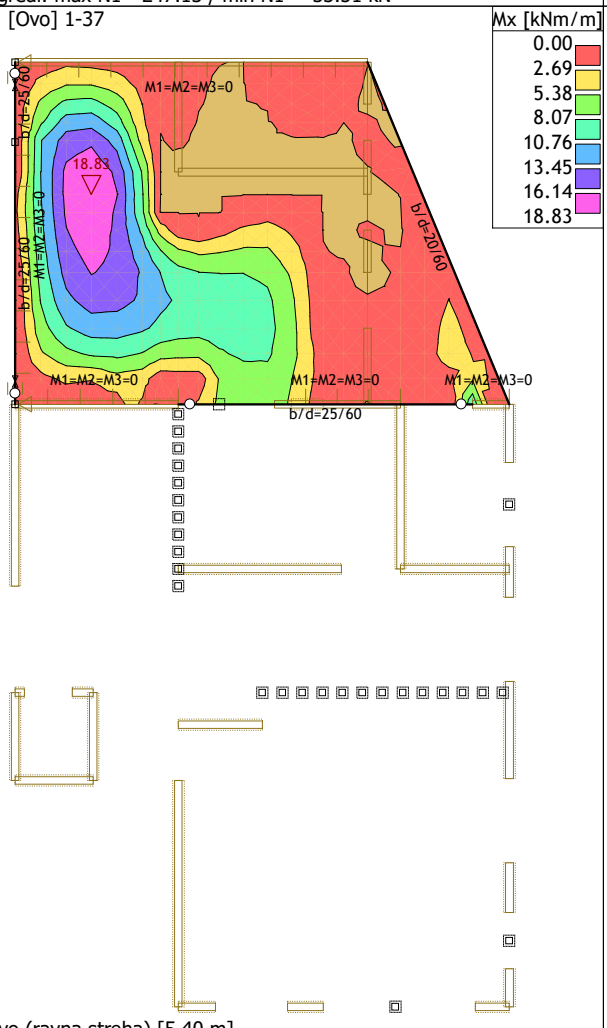
Nivo: Nivo (podstreha) [8.40 m]
Vplivi v gredi: max N1= 247.13 / min N1= -33.51 kN

Obt. 38: [Ovo] 1-37



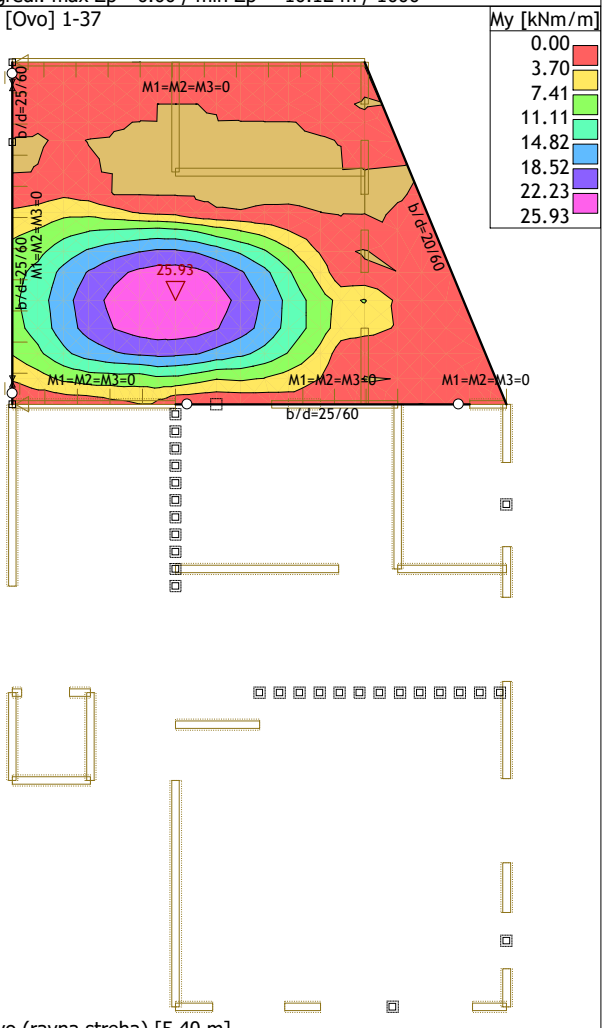
Nivo: Nivo (podstreha) [8.40 m]
Vplivi v gredi: max Zp= 0.00 / min Zp= -10.12 m / 1000

Obt. 38: [Ovo] 1-37



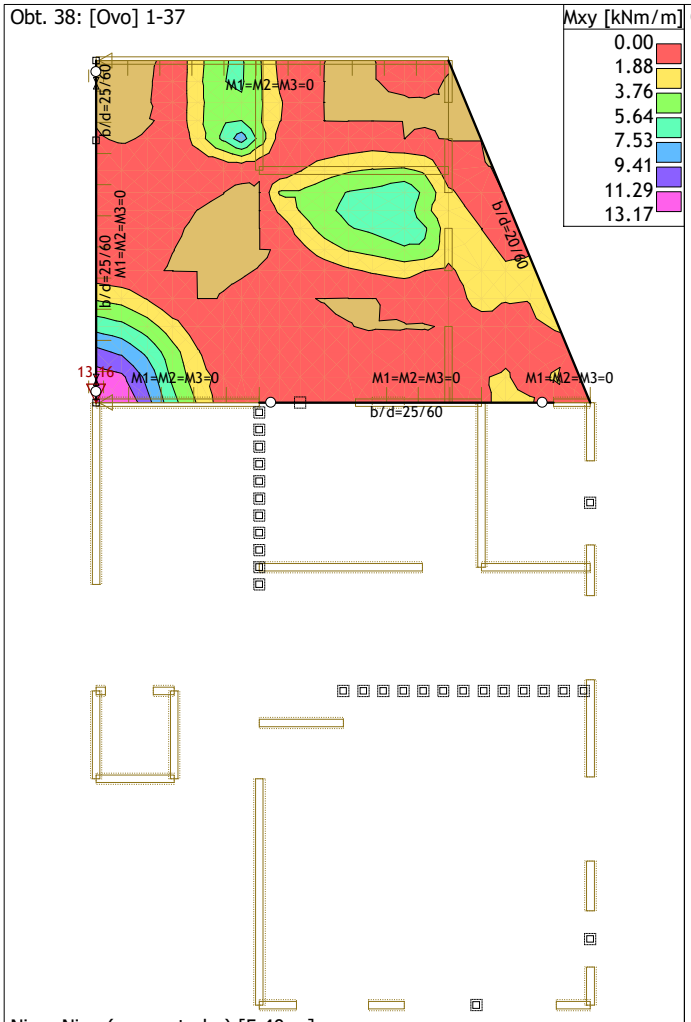
Nivo: Nivo (ravna streha) [5.40 m]
Vplivi v plošči: max Mx= 18.83 / min Mx= 0.00 kNm/m

Obt. 38: [Ovo] 1-37



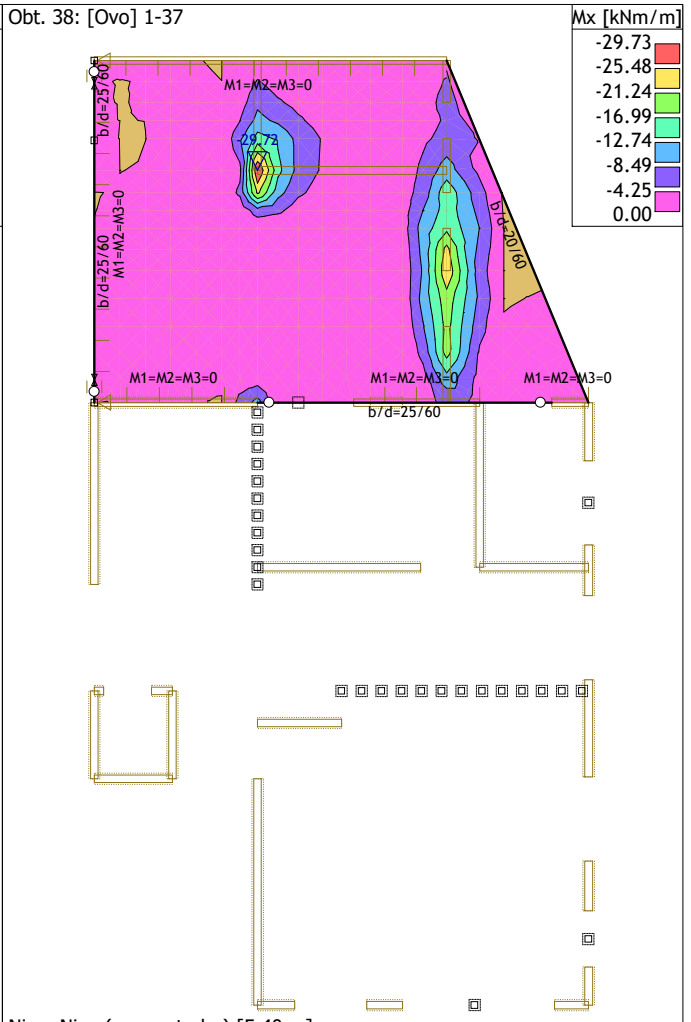
Nivo: Nivo (ravna streha) [5.40 m]
Vplivi v plošči: max My= 25.93 / min My= 0.00 kNm/m

Obt. 38: [Ovo] 1-37



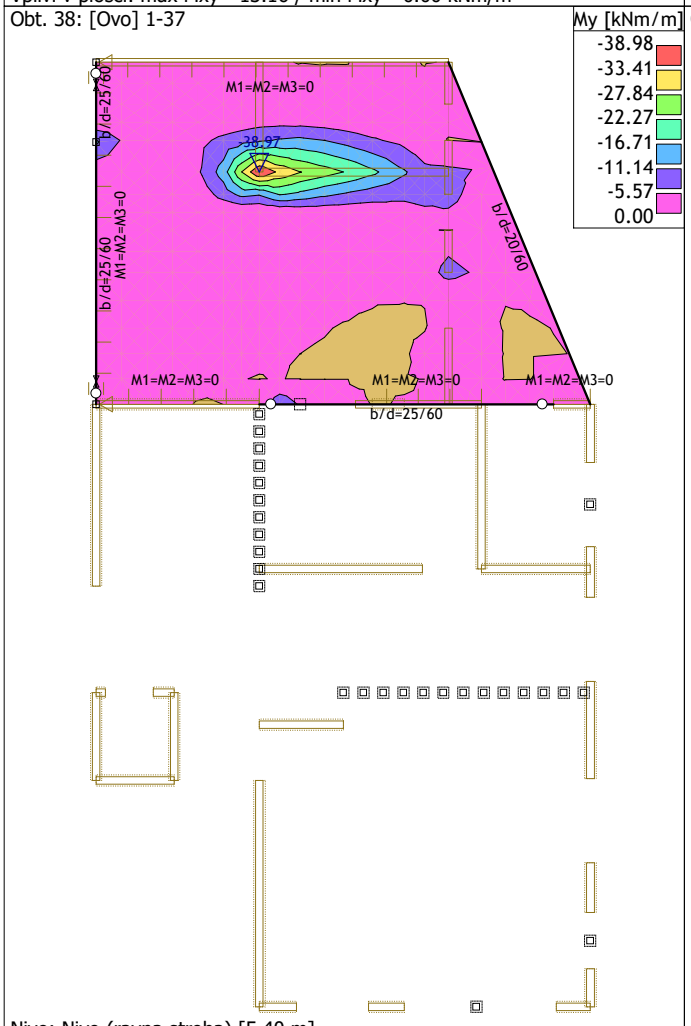
Nivo: Nivo (ravna streha) [5.40 m]
Vplivi v plošči: max Mxy= 13.16 / min Mxy= 0.00 kNm/m

Obt. 38: [Ovo] 1-37



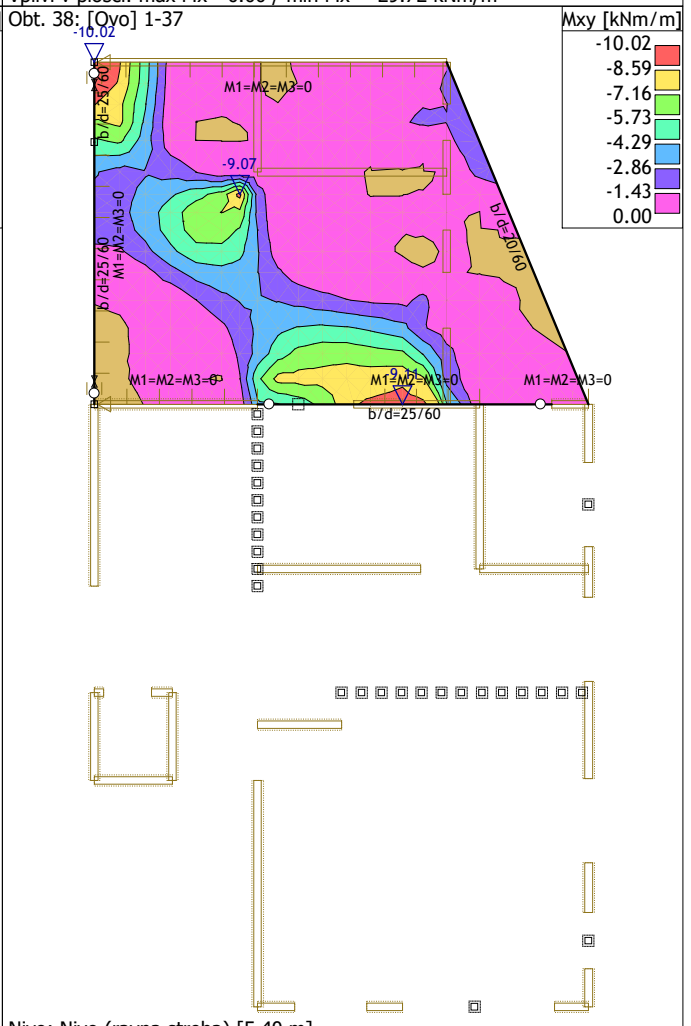
Nivo: Nivo (ravna streha) [5.40 m]
Vplivi v plošči: max Mx= 0.00 / min Mx= -29.72 kNm/m

Obt. 38: [Ovo] 1-37



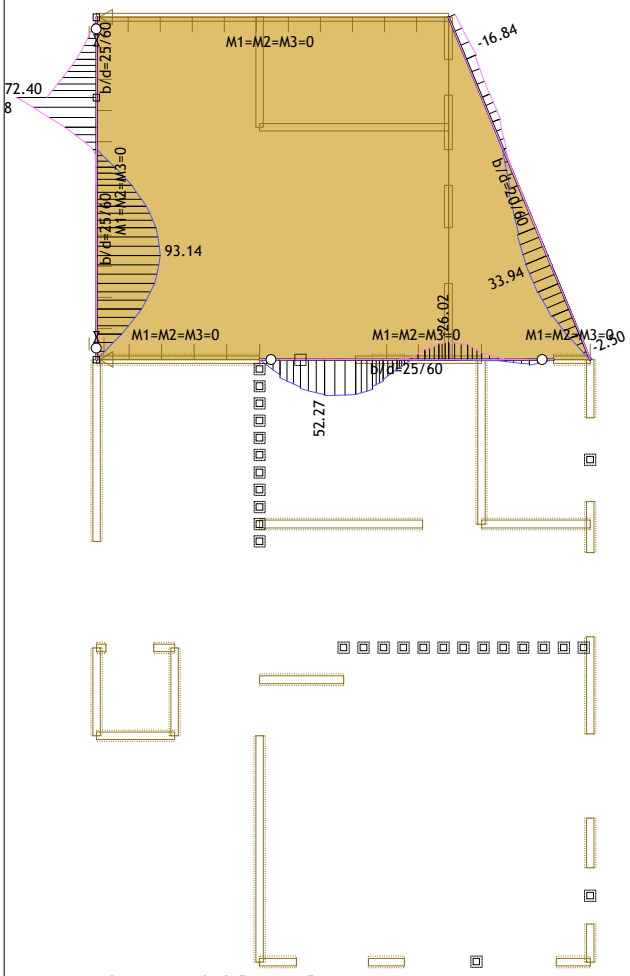
Nivo: Nivo (ravna streha) [5.40 m]
Vplivi v plošči: max My= 0.00 / min My= -38.97 kNm/m

Obt. 38: [Ovo] 1-37



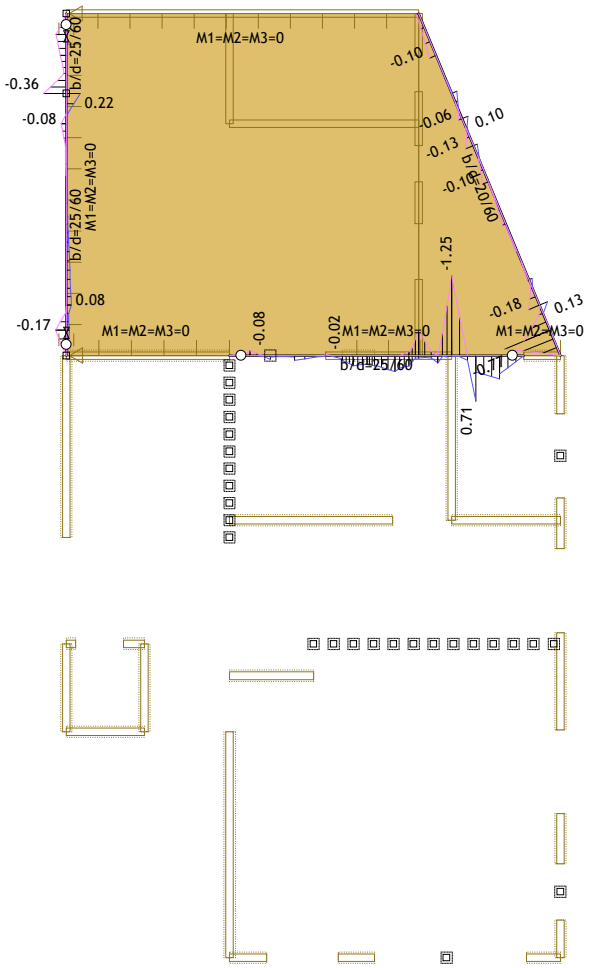
Nivo: Nivo (ravna streha) [5.40 m]
Vplivi v plošči: max Mxy= 0.00 / min Mxy= -10.02 kNm/m

Obt. 38: [Ovo] 1-37



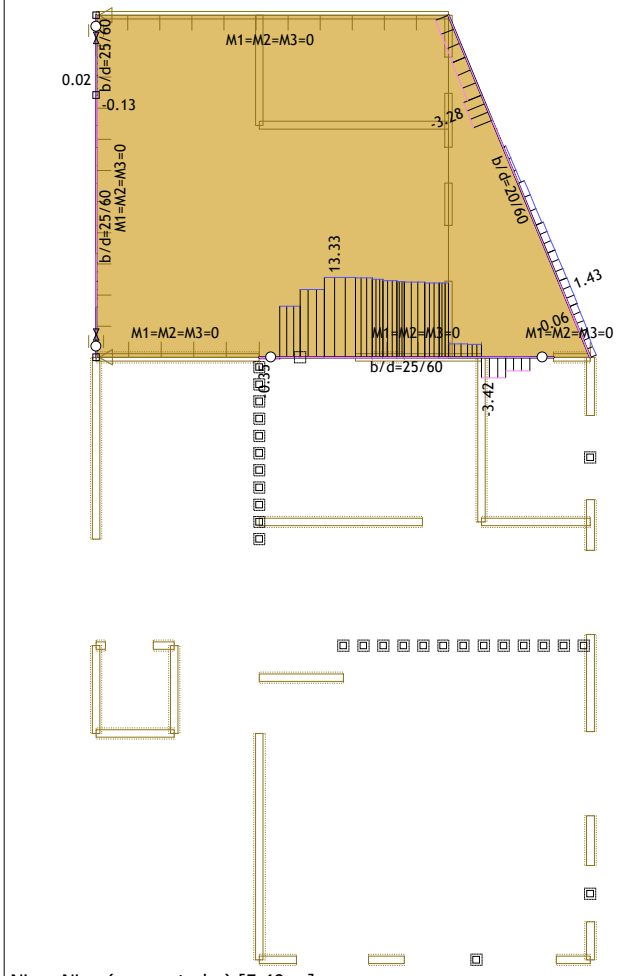
Nivo: Nivo (ravna streha) [5.40 m]
Vplivi v gredi: max M3= 93.14 / min M3= -116.58 kNm

Obt. 38: [Ovo] 1-37



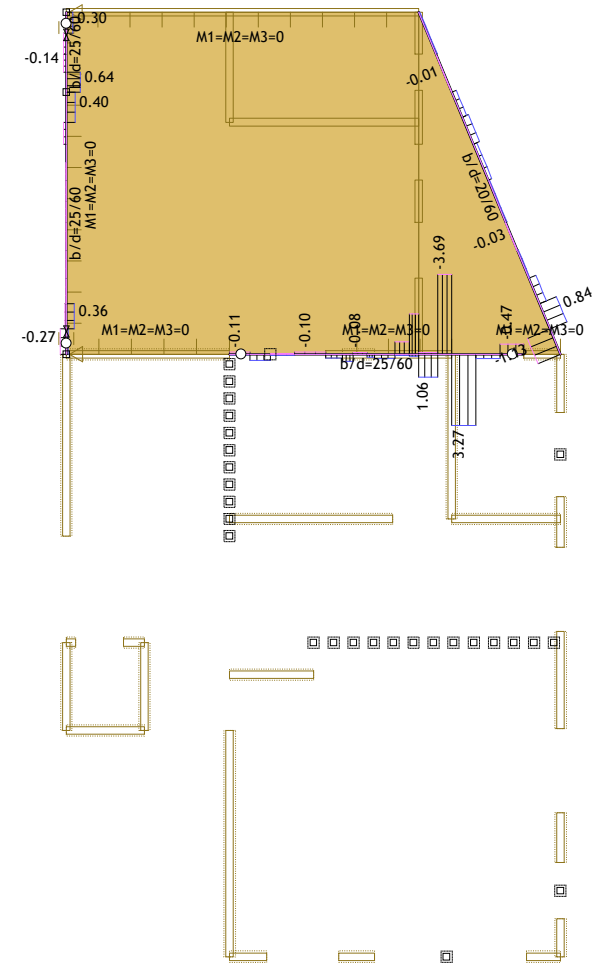
Nivo: Nivo (ravna streha) [5.40 m]
Vplivi v gredi: max M2= 0.71 / min M2= -1.25 kNm

Obt. 38: [Ovo] 1-37



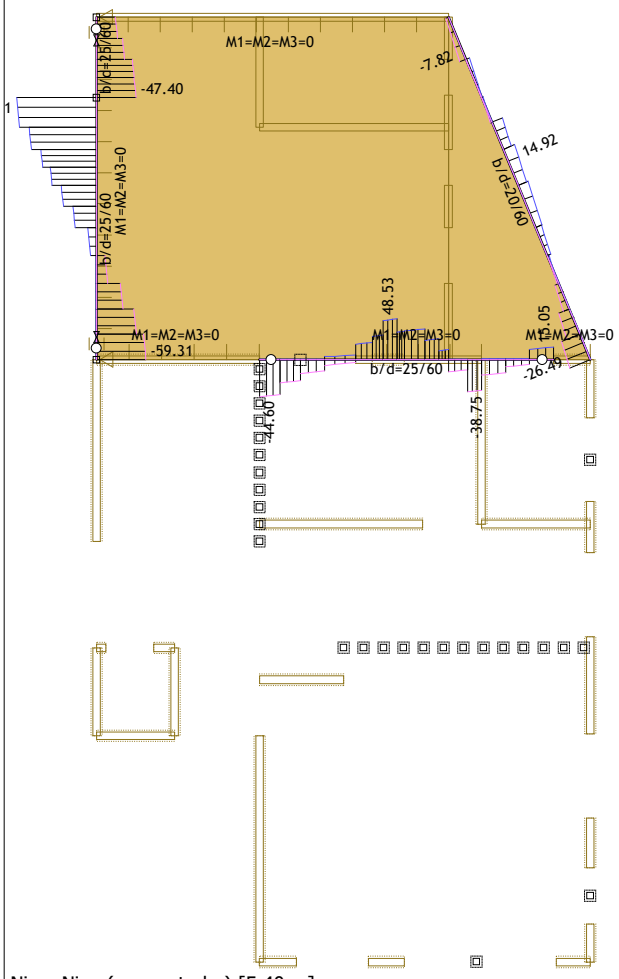
Nivo: Nivo (ravna streha) [5.40 m]
Vplivi v gredi: max M1= 13.33 / min M1= -3.42 kNm

Obt. 38: [Ovo] 1-37



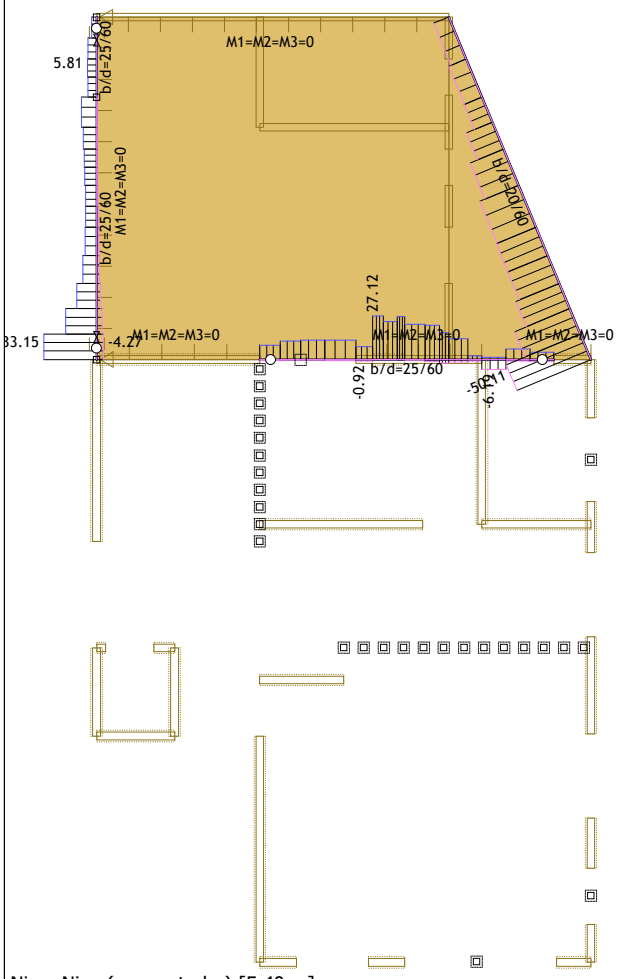
Nivo: Nivo (ravna streha) [5.40 m]
Vplivi v gredi: max T3= 3.27 / min T3= -3.69 kN

Obt. 38: [Ovo] 1-37



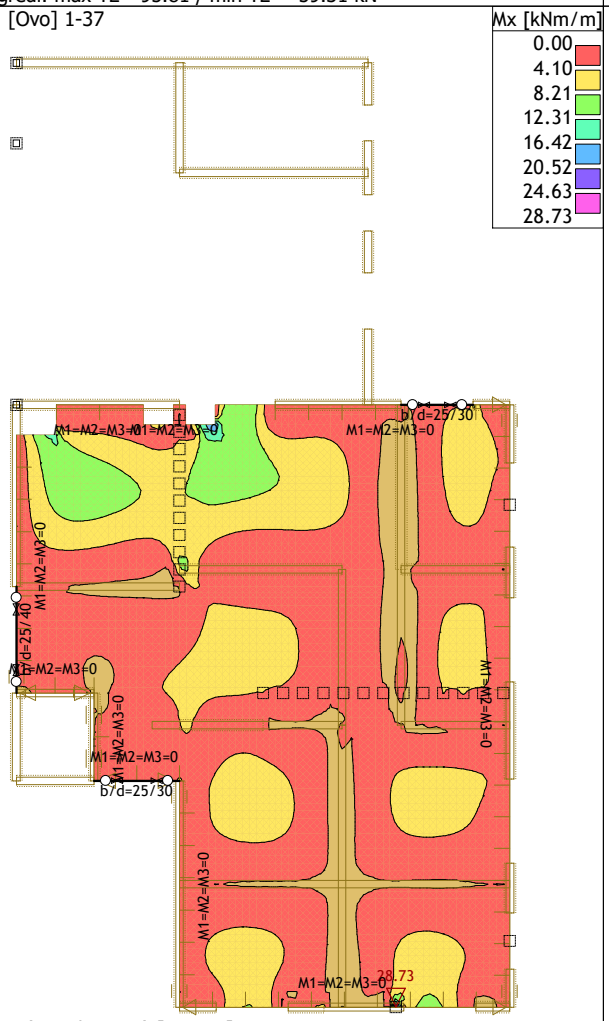
Nivo: Nivo (ravna streha) [5.40 m]
Vplivi v gredi: max T2= 95.81 / min T2= -59.31 kN

Obt. 38: [Ovo] 1-37



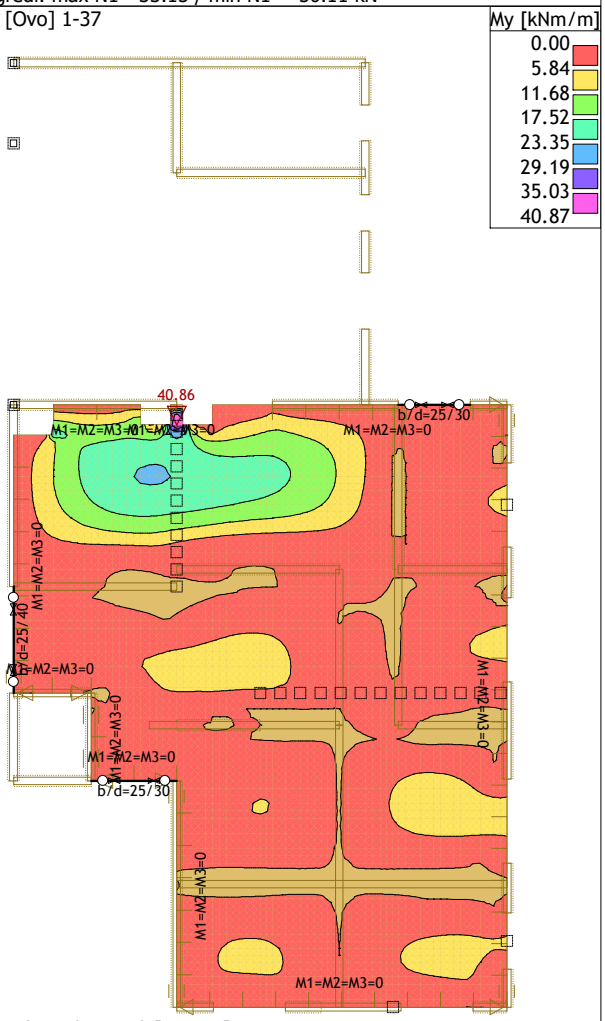
Nivo: Nivo (ravna streha) [5.40 m]
Vplivi v gredi: max N1= 33.15 / min N1= -50.11 kN

Obt. 38: [Ovo] 1-37



Nivo: Nivo (1.nadstropje) [4.80 m]
Vplivi v plošči: max Mx= 28.73 / min Mx= 0.00 kNm/m

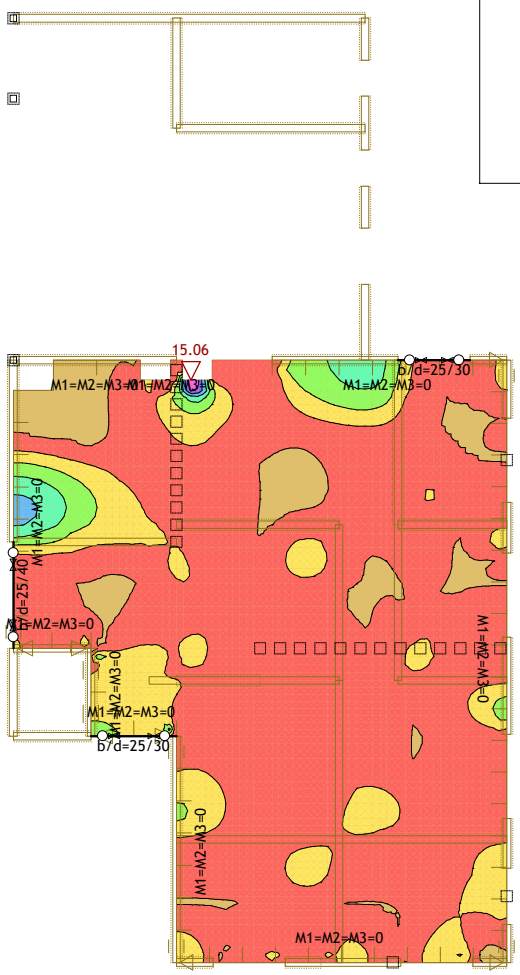
Obt. 38: [Ovo] 1-37



Nivo: Nivo (1.nadstropje) [4.80 m]
Vplivi v plošči: max My= 40.86 / min My= 0.00 kNm/m

Obt. 38: [Ovo] 1-37

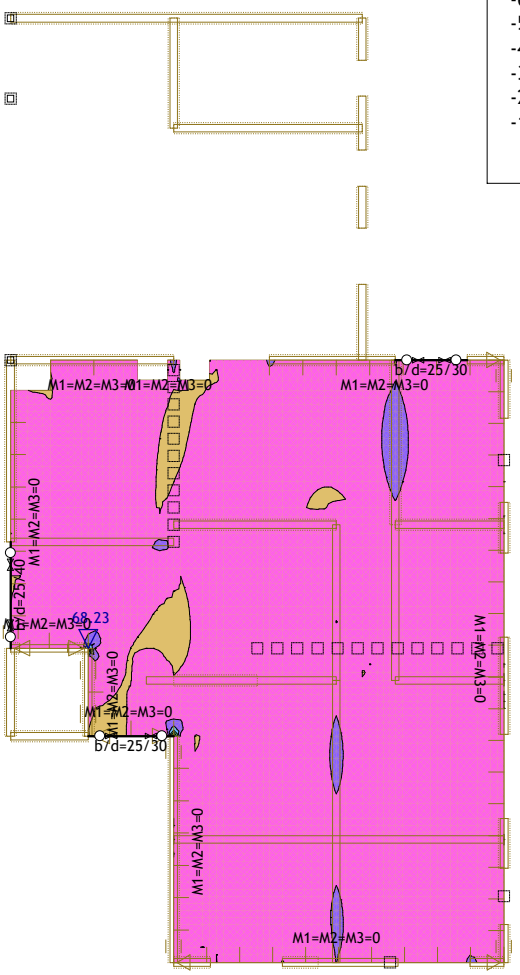
Mxy [kNm/m]
0.00
2.15
4.31
6.46
8.61
10.76
12.92
15.07



Nivo: Nivo (1.nadstropje) [4.80 m]
Vplivi v plošči: max Mxy= 15.06 / min Mxy= 0.00 kNm/m

Obt. 38: [Ovo] 1-37

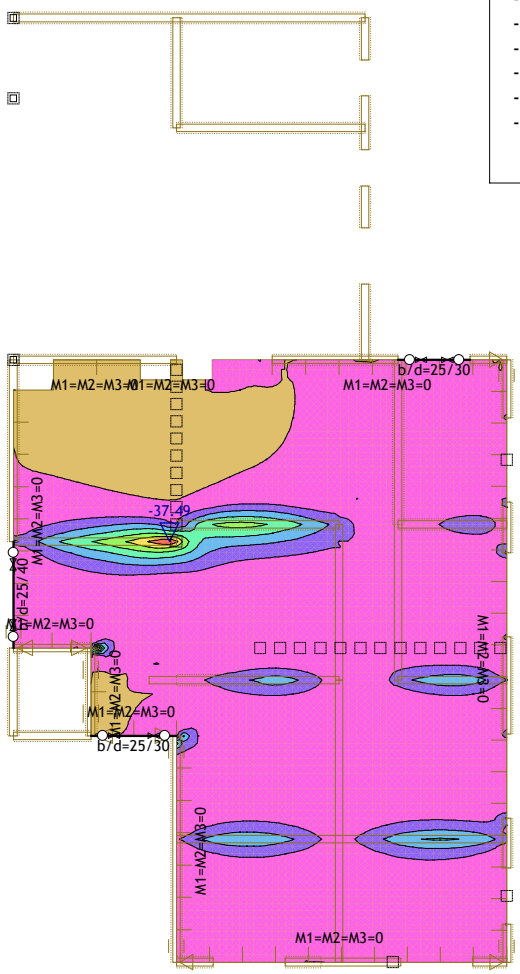
Mx [kNm/m]
-68.23
-58.48
-48.74
-38.99
-29.24
-19.49
-9.75
0.00



Nivo: Nivo (1.nadstropje) [4.80 m]
Vplivi v plošči: max Mx= 0.00 / min Mx= -68.23 kNm/m

Obt. 38: [Ovo] 1-37

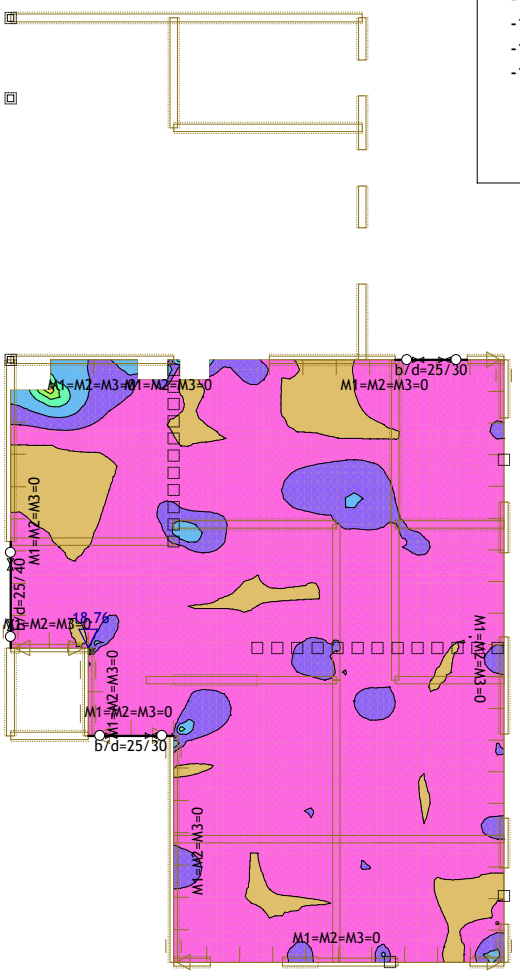
My [kNm/m]
-37.50
-32.14
-26.79
-21.43
-16.07
-10.71
-5.36
0.00



Nivo: Nivo (1.nadstropje) [4.80 m]
Vplivi v plošči: max My= 0.00 / min My= -37.49 kNm/m

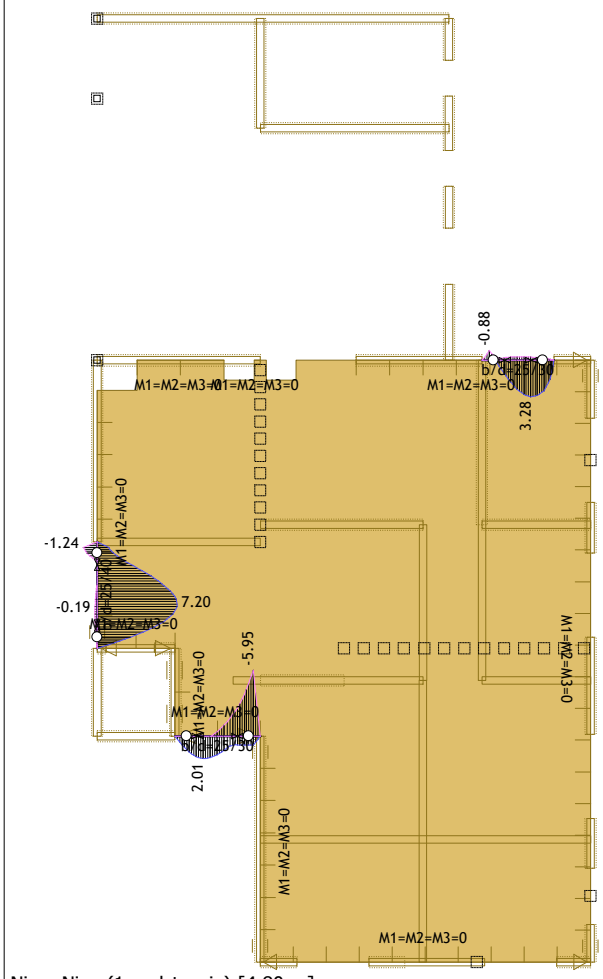
Obt. 38: [Ovo] 1-37

Mxy [kNm/m]
-18.76
-16.08
-13.40
-10.72
-8.04
-5.36
-2.68
0.00



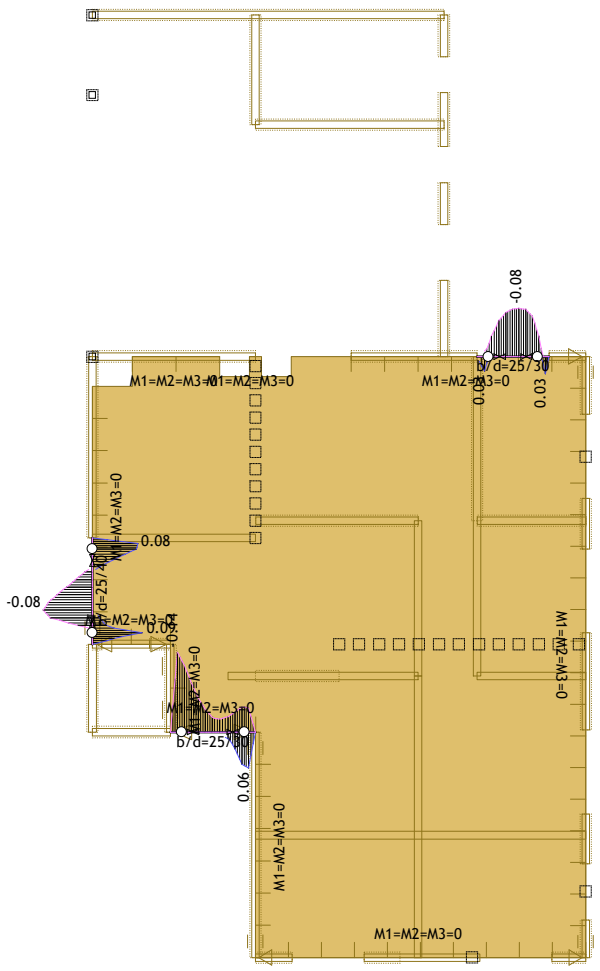
Nivo: Nivo (1.nadstropje) [4.80 m]
Vplivi v plošči: max Mxy= 0.00 / min Mxy= -18.76 kNm/m

Obt. 38: [Ovo] 1-37



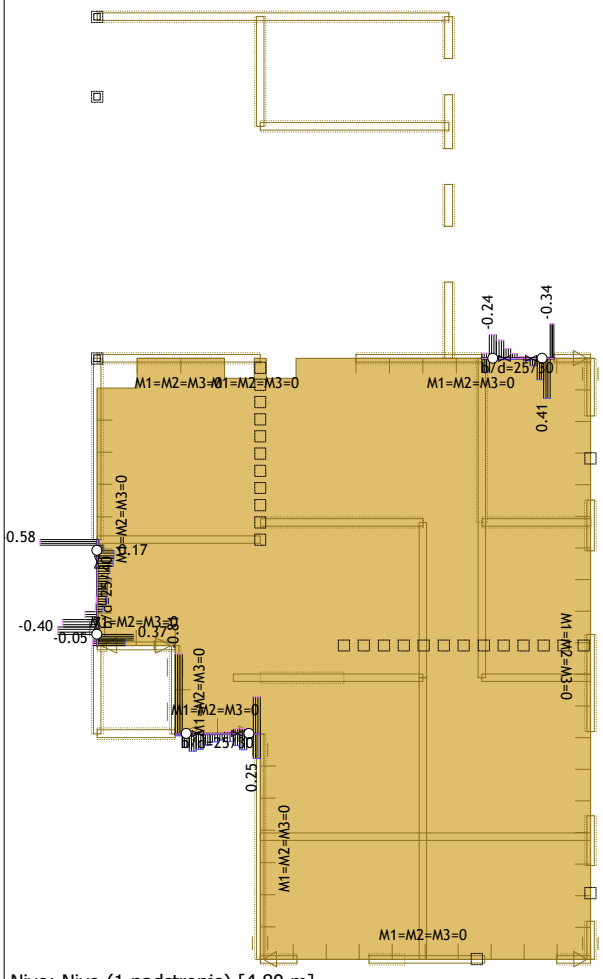
Nivo: Nivo (1.nadstropje) [4.80 m]
Vplivi v gredi: max M3= 7.20 / min M3= -5.95 kNm

Obt. 38: [Ovo] 1-37



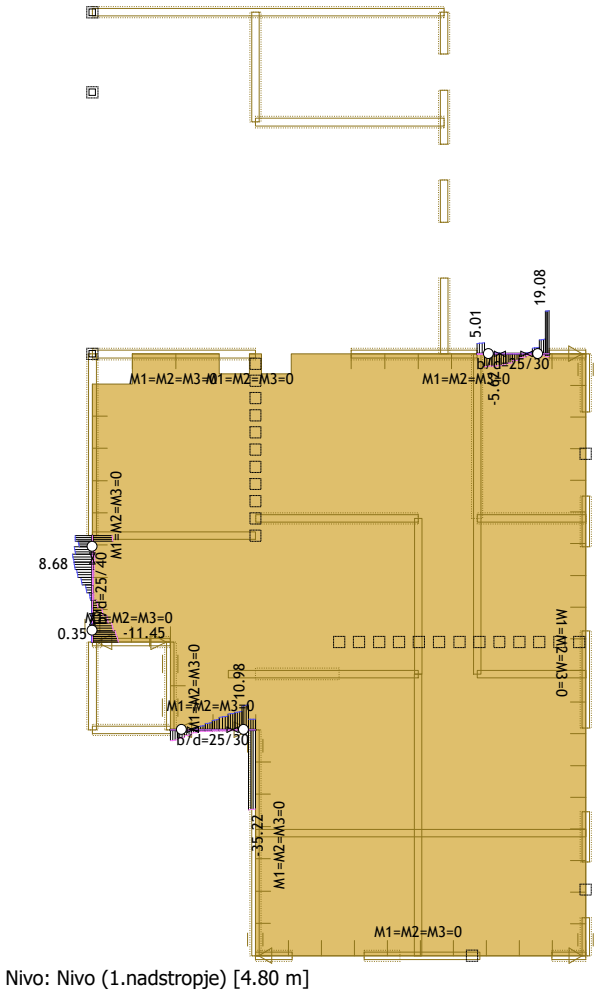
Nivo: Nivo (1.nadstropje) [4.80 m]
Vplivi v gredi: max M2= 0.09 / min M2= -0.14 kNm

Obt. 38: [Ovo] 1-37



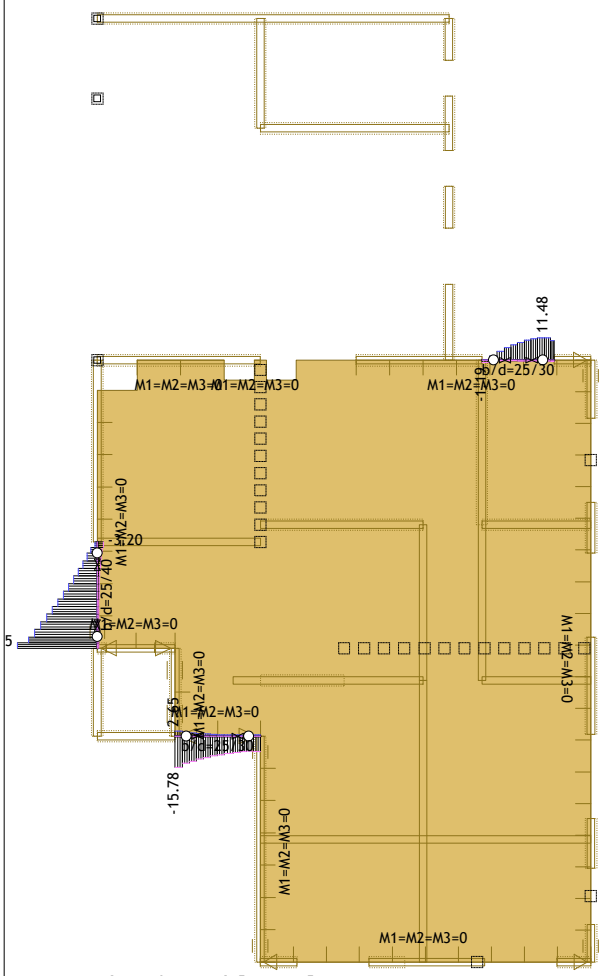
Nivo: Nivo (1.nadstropje) [4.80 m]
Vplivi v gredi: max T3= 0.41 / min T3= -0.81 kN

Obt. 38: [Ovo] 1-37



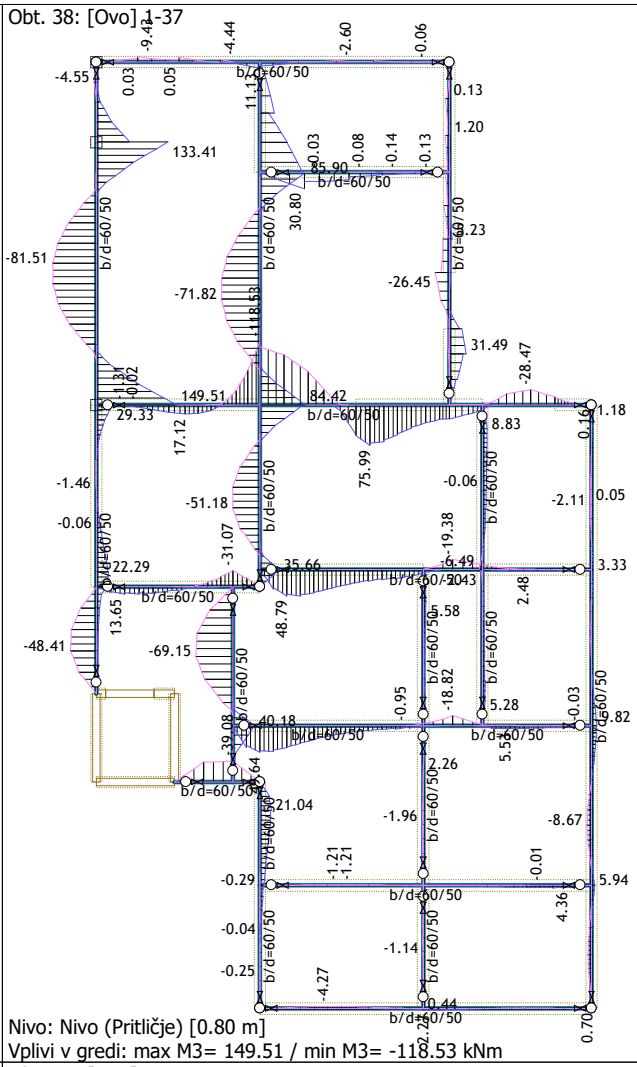
Nivo: Nivo (1.nadstropje) [4.80 m]
Vplivi v gredi: max T2= 19.08 / min T2= -35.22 kN

Obt. 38: [Ovo] 1-37



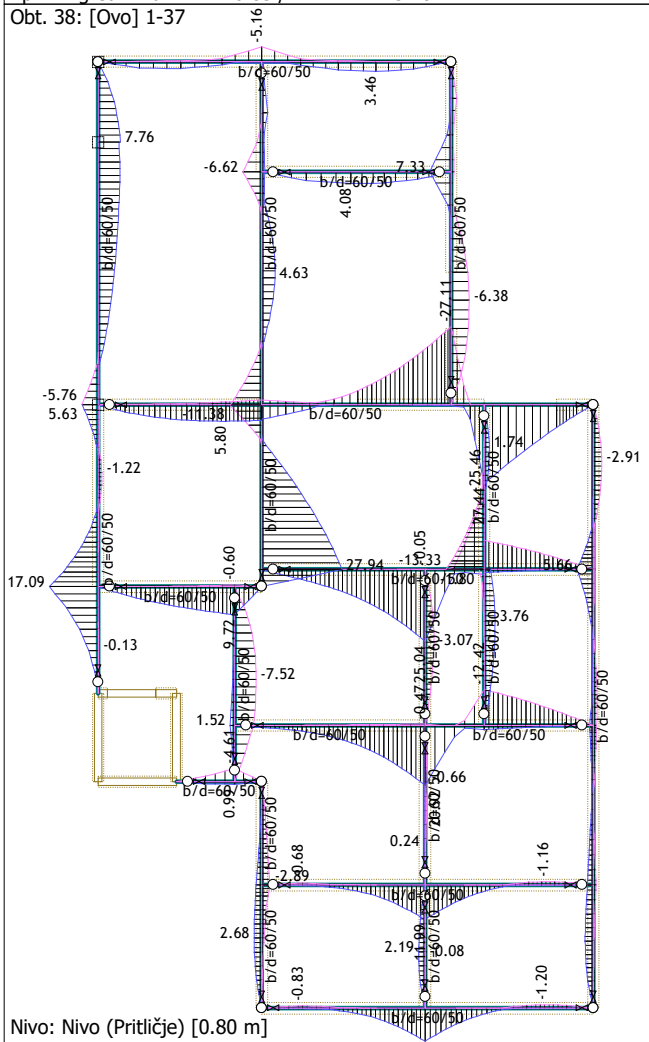
Nivo: Nivo (1.nadstropje) [4.80 m]
Vplivi v gredi: max N1= 40.85 / min N1= -15.78 kN

Obt. 38: [Ovo] 1-37



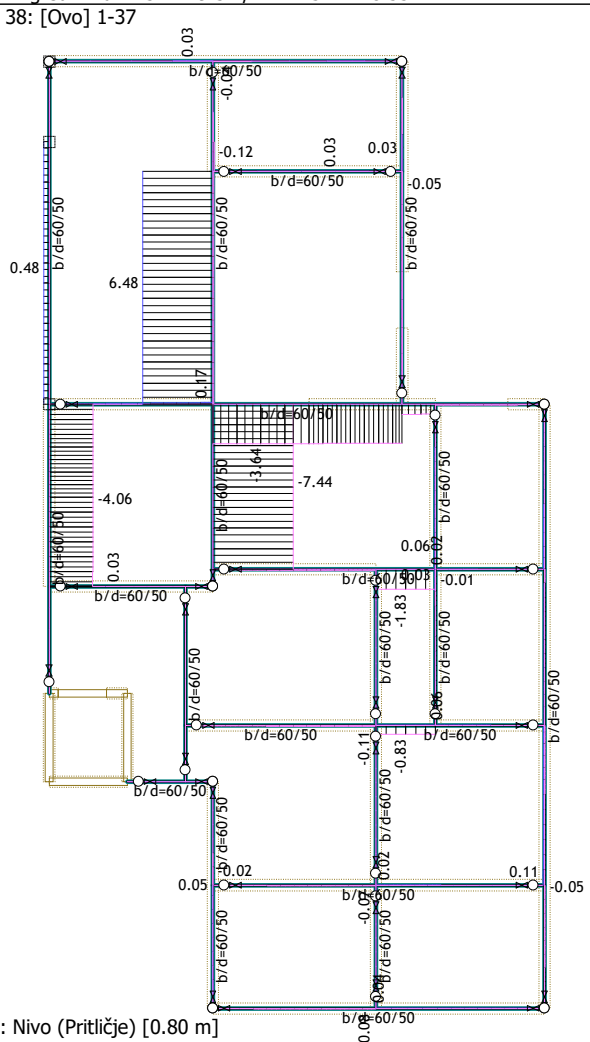
Nivo: Nivo (Pritličje) [0.80 m]
Vplivi v gredi: max M3= 149.51 / min M3= -118.53 kNm

Obt. 38: [Ovo] 1-37



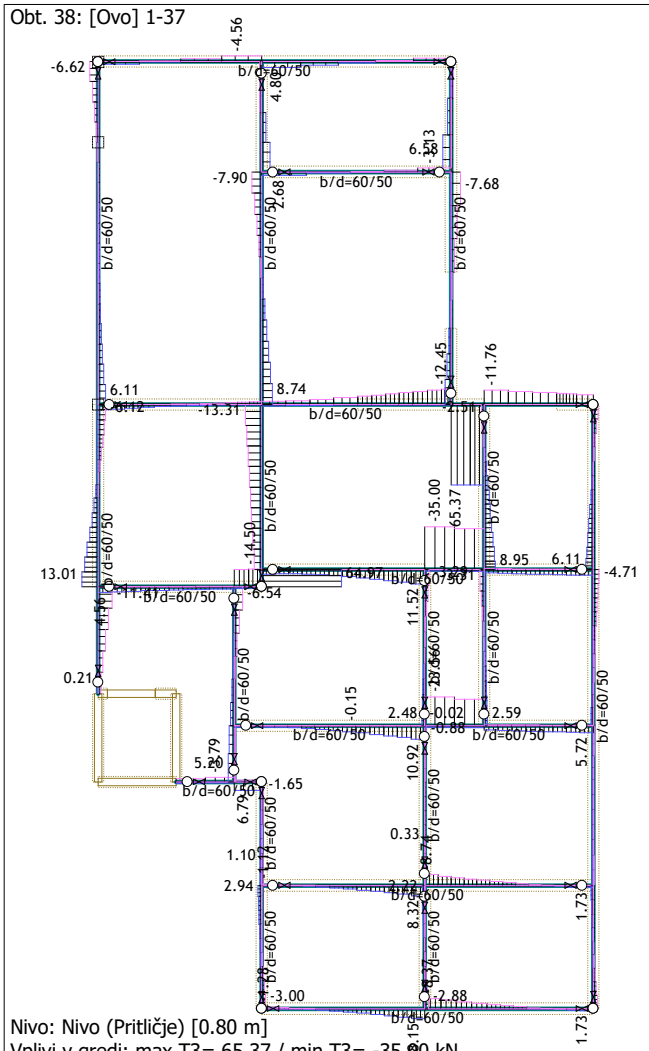
Nivo: Nivo (Pritličje) [0.80 m]
Vplivi v gredi: max M2= 27.94 / min M2= -27.31 kNm

Obt. 38: [Ovo] 1-37



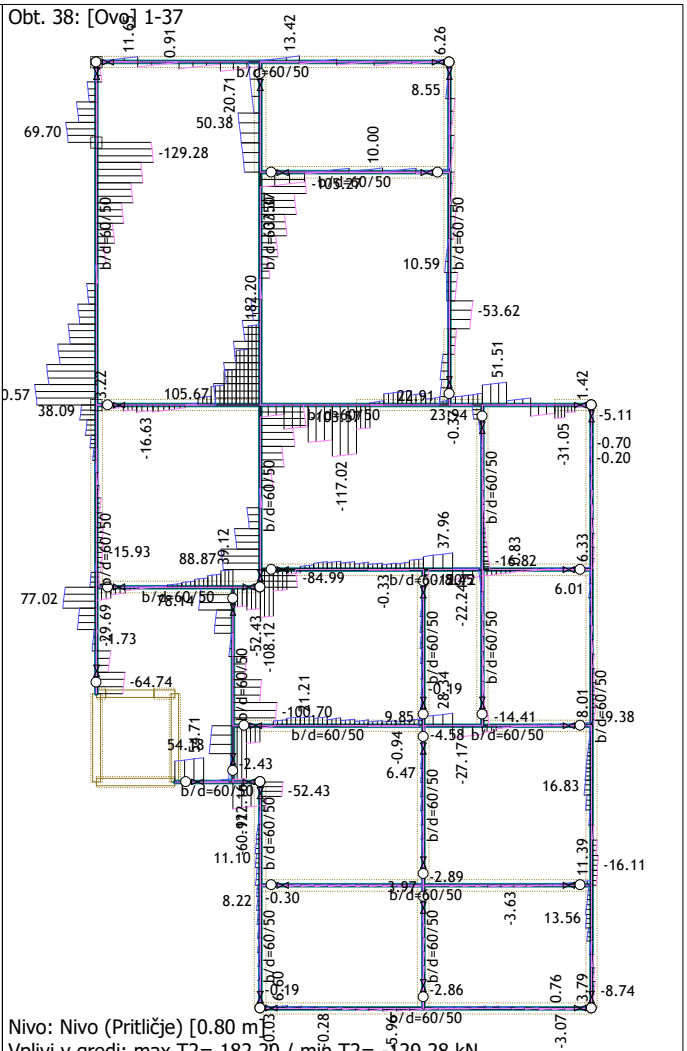
Nivo: Nivo (Pritličje) [0.80 m]
Vplivi v gredi: max M1= 6.48 / min M1= -7.44 kNm

Obt. 38: [Ovo] 1-37



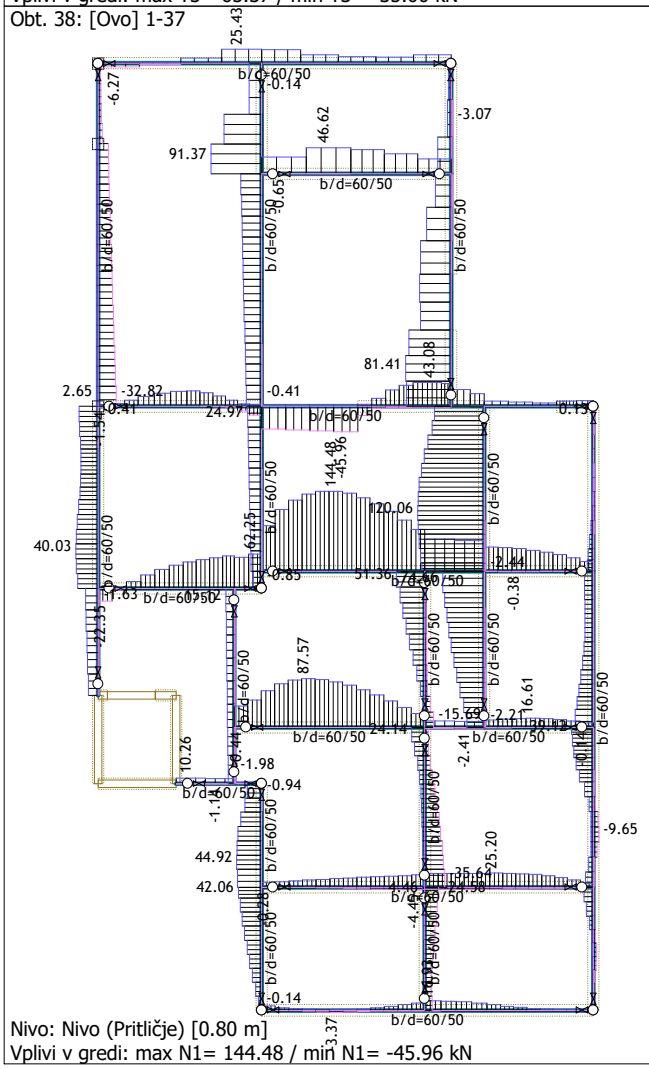
Nivo: Nivo (Pritličje) [0.80 m]
Vplivi v gredi: max T3= 65.37 / min T3= -35.00 kN

Obt. 38: [Ovo] 1-37



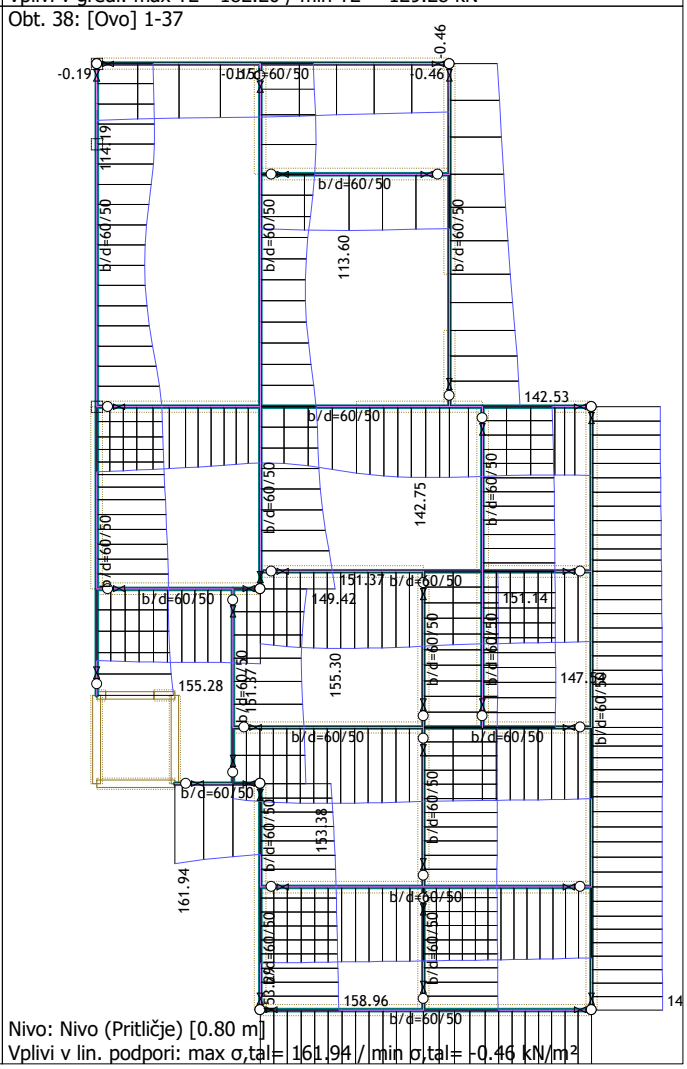
Nivo: Nivo (Pritličje) [0.80 m]
Vplivi v gredi: max T2= 182.20 / min T2= -129.28 kN

Obt. 38: [Ovo] 1-37



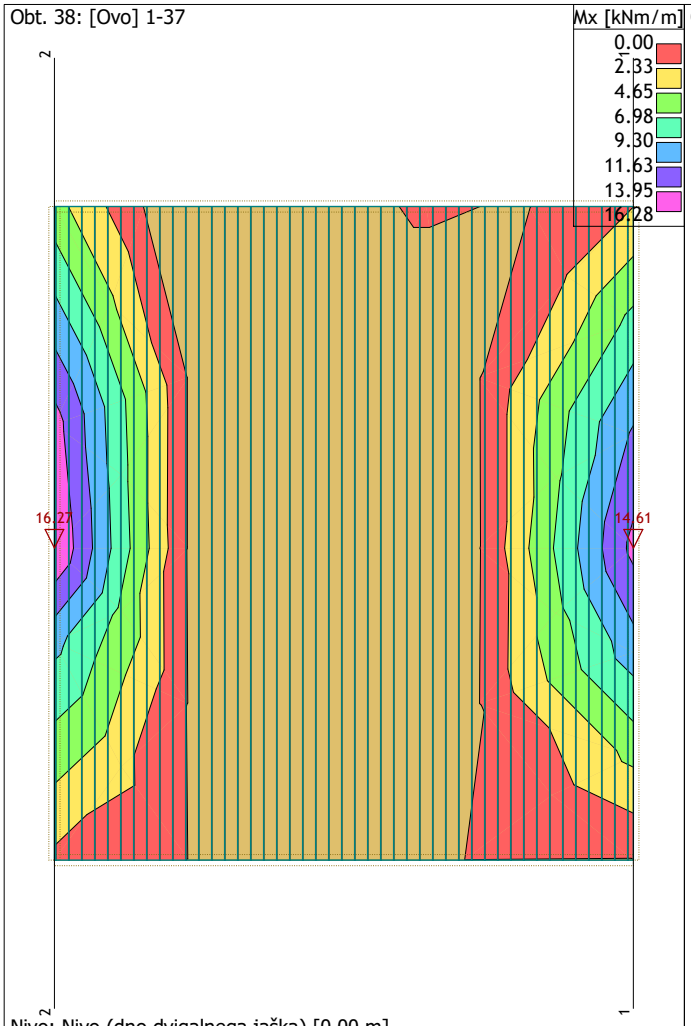
Nivo: Nivo (Pritličje) [0.80 m]
Vplivi v gredi: max N1= 144.48 / min N1= -45.96 kN

Obt. 38: [Ovo] 1-37



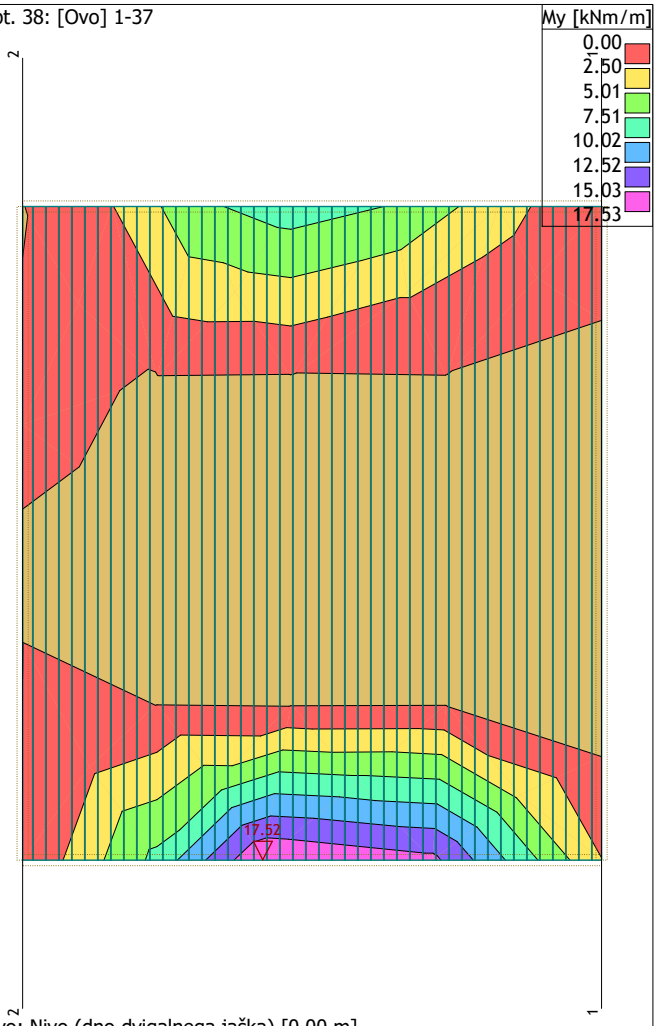
Nivo: Nivo (Pritličje) [0.80 m]
Vplivi v lin. podpori: max σ,tal= 161.94 / min σ,tal= -0.46 kN/m²

Obt. 38: [Ovo] 1-37



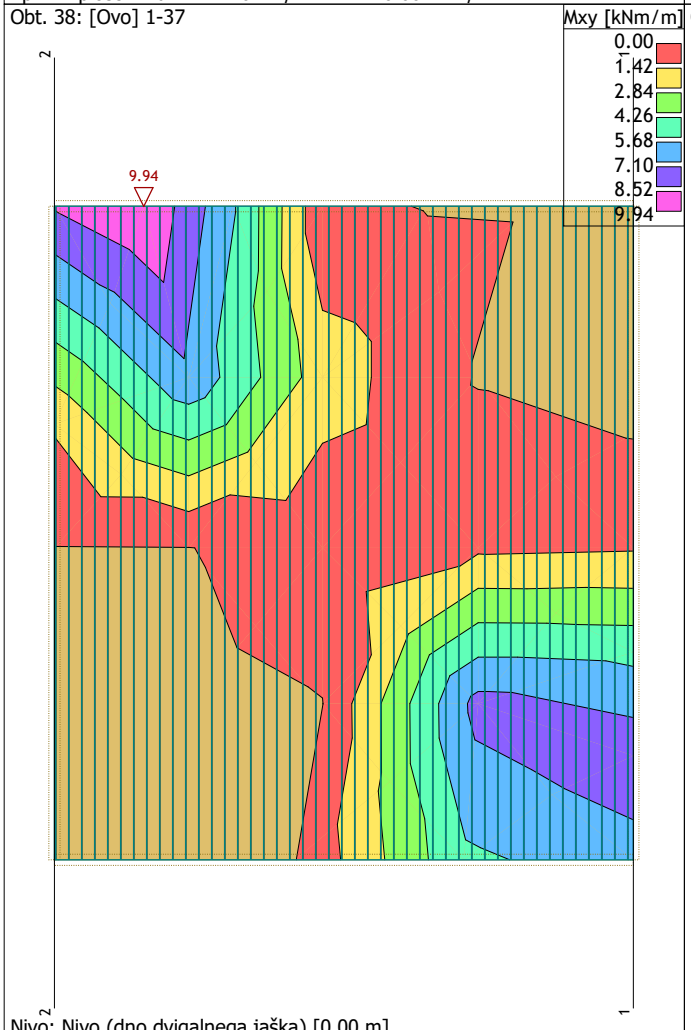
Nivo: Nivo (dno dvigalnega jaška) [0.00 m]
Vplivi v plošči: max Mx= 16.27 / min Mx= 0.00 kNm/m

Obt. 38: [Ovo] 1-37



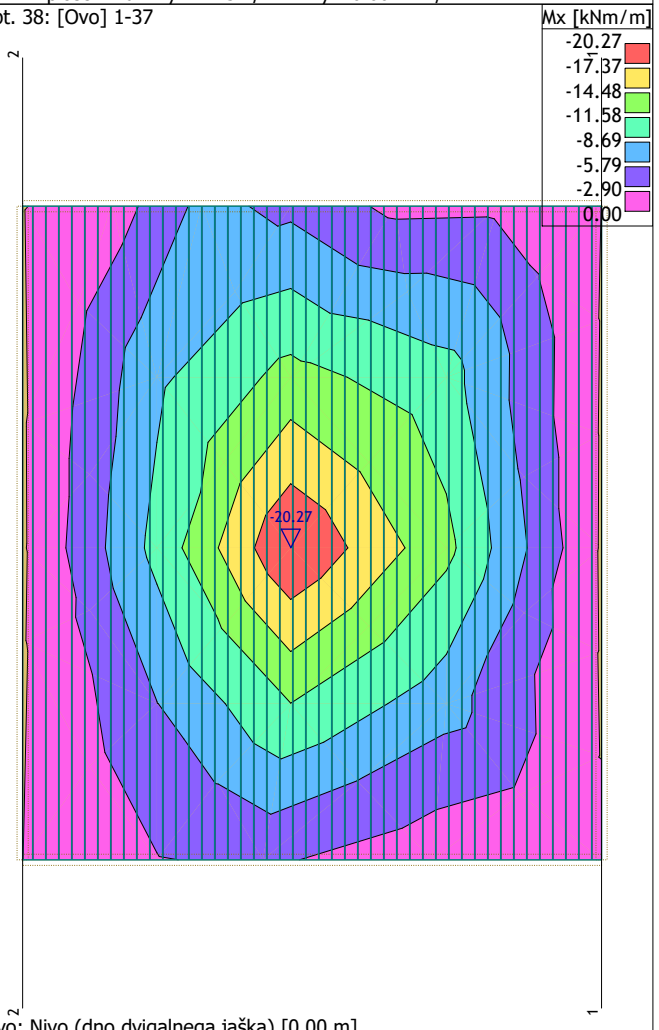
Nivo: Nivo (dno dvigalnega jaška) [0.00 m]
Vplivi v plošči: max My= 17.52 / min My= 0.00 kNm/m

Obt. 38: [Ovo] 1-37

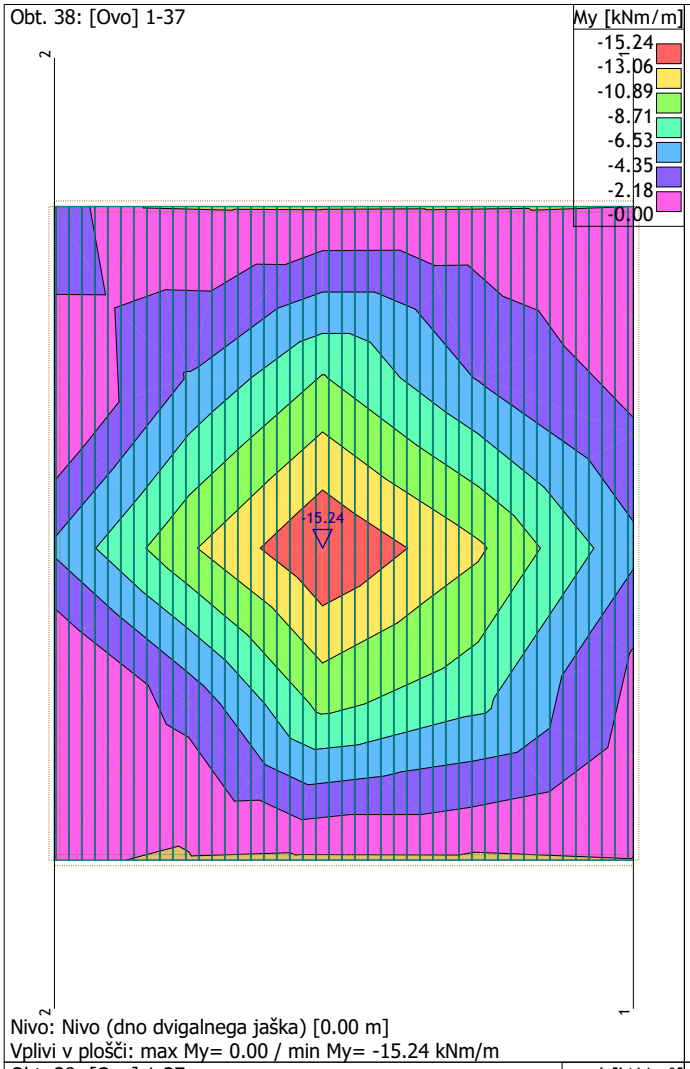


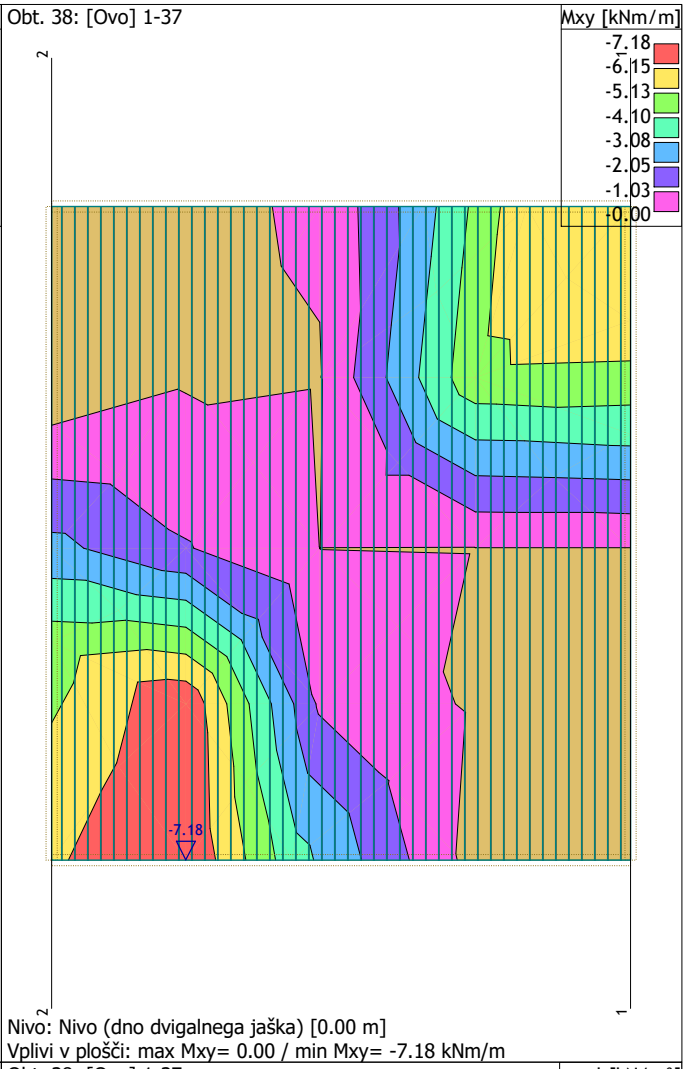
Nivo: Nivo (dno dvigalnega jaška) [0.00 m]
Vplivi v plošči: max Mxy= 9.94 / min Mxy= 0.00 kNm/m

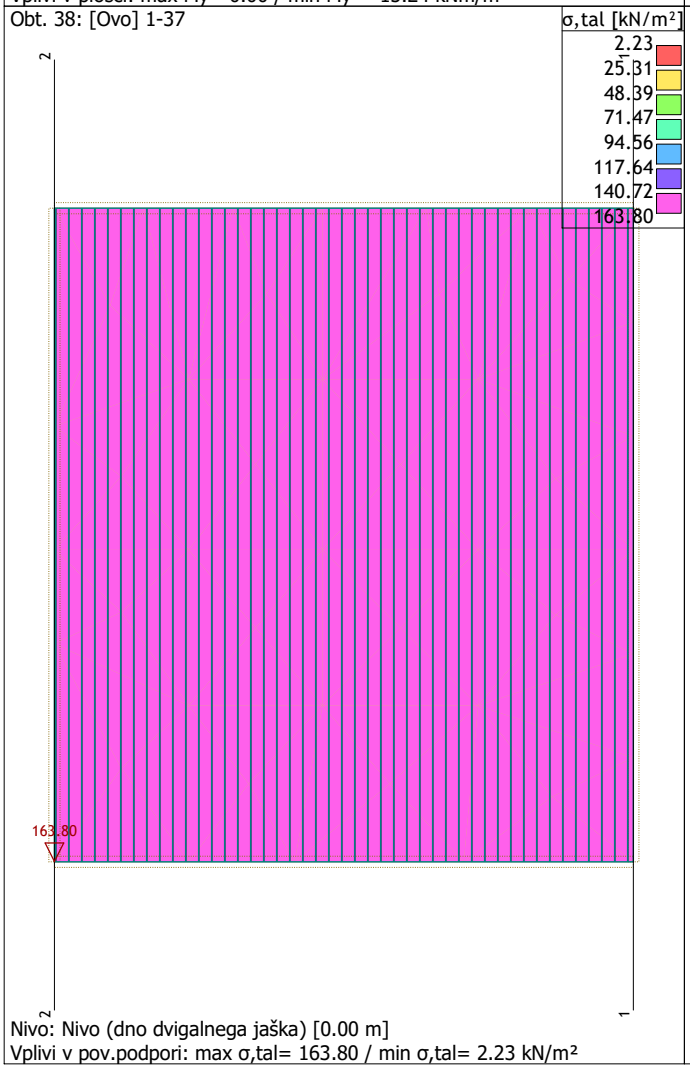
Obt. 38: [Ovo] 1-37

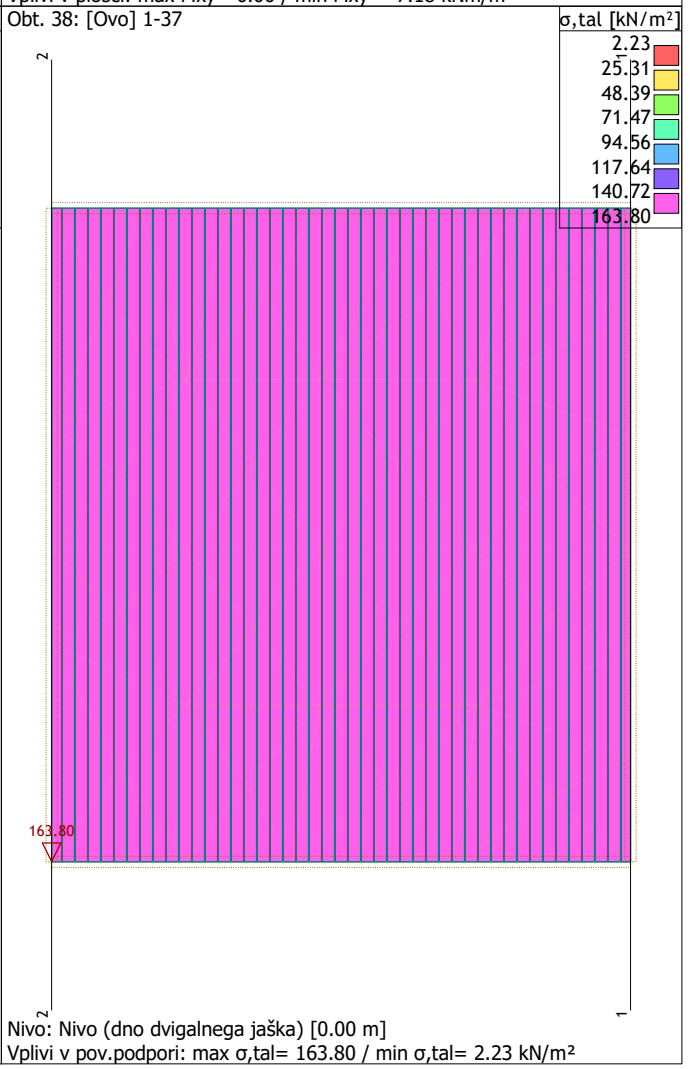


Nivo: Nivo (dno dvigalnega jaška) [0.00 m]
Vplivi v plošči: max Mx= 0.00 / min Mx= -20.27 kNm/m

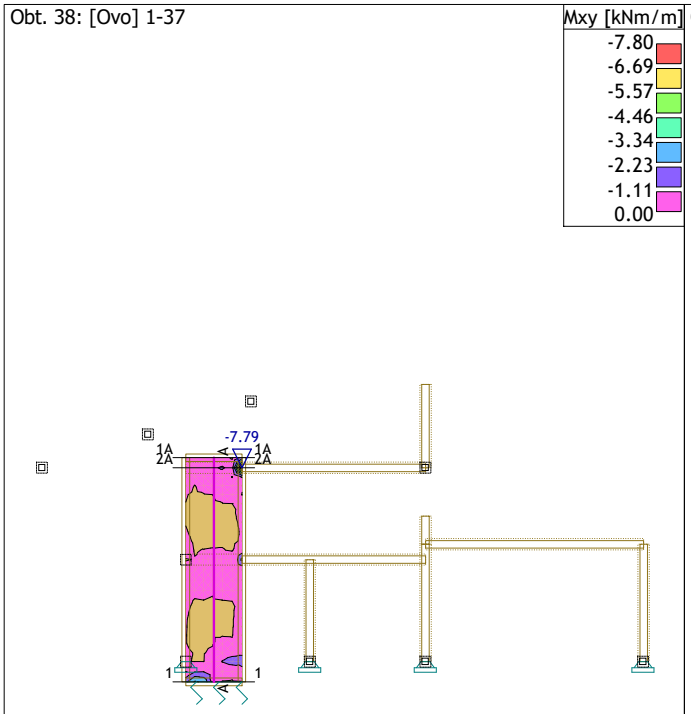

Obt. 38: [Ovo] 1-37
My [kNm/m]
-15.24
-13.06
-10.89
-8.71
-6.53
-4.35
-2.18
-0.00
-15.24
2
1
Nivo: Nivo (dno dvigalnega jaška) [0.00 m]
Vplivi v plošči: max My= 0.00 / min My= -15.24 kNm/m


Obt. 38: [Ovo] 1-37
Mxy [kNm/m]
-7.18
-6.15
-5.13
-4.10
-3.08
-2.05
-1.03
-0.00
-7.18
2
1
Nivo: Nivo (dno dvigalnega jaška) [0.00 m]
Vplivi v plošči: max Mxy= 0.00 / min Mxy= -7.18 kNm/m


Obt. 38: [Ovo] 1-37
σ,tal [kN/m²]
2.23
25.31
48.39
71.47
94.56
117.64
140.72
163.80
163.80
2
1
Nivo: Nivo (dno dvigalnega jaška) [0.00 m]
Vplivi v pov.podpori: max σ,tal= 163.80 / min σ,tal= 2.23 kN/m²

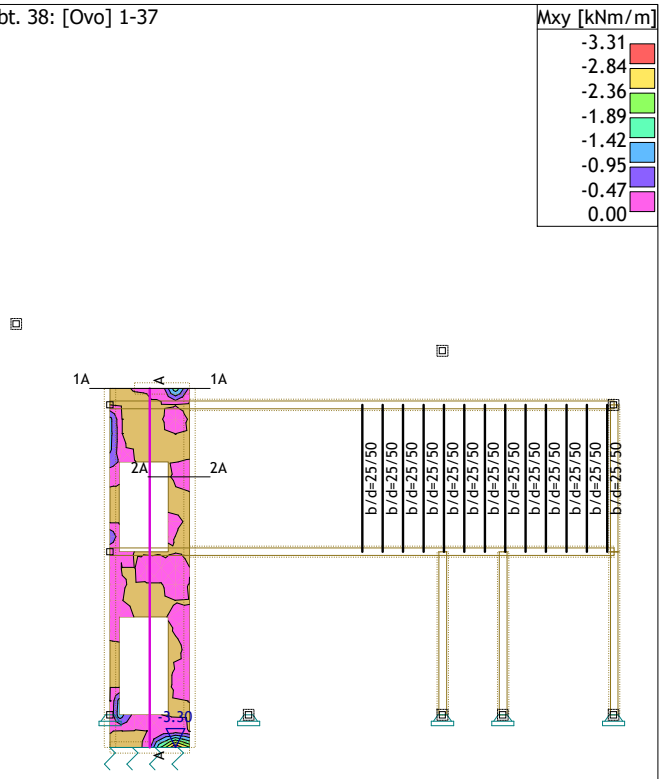

Obt. 38: [Ovo] 1-37
σ,tal [kN/m²]
2.23
25.31
48.39
71.47
94.56
117.64
140.72
163.80
163.80
2
1
Nivo: Nivo (dno dvigalnega jaška) [0.00 m]
Vplivi v pov.podpori: max σ,tal= 163.80 / min σ,tal= 2.23 kN/m²

Obt. 38: [Ovo] 1-37



Okvir: V_2
Vplivi v plošči: max Mxy= 0.00 / min Mxy= -7.79 kNm/m

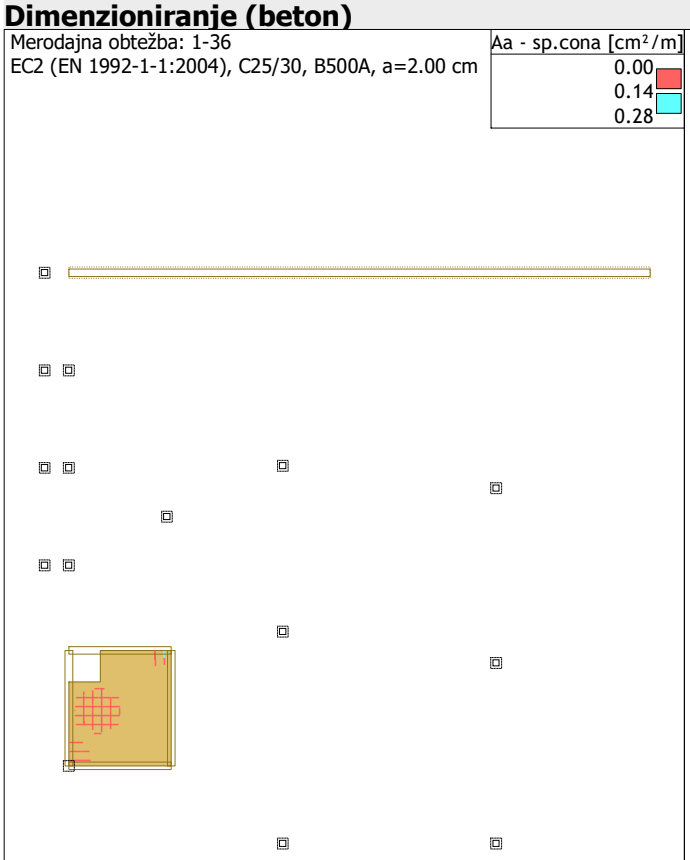
Obt. 38: [Ovo] 1-37



Okvir: H_1
Vplivi v plošči: max Mxy= 0.00 / min Mxy= -3.30 kNm/m

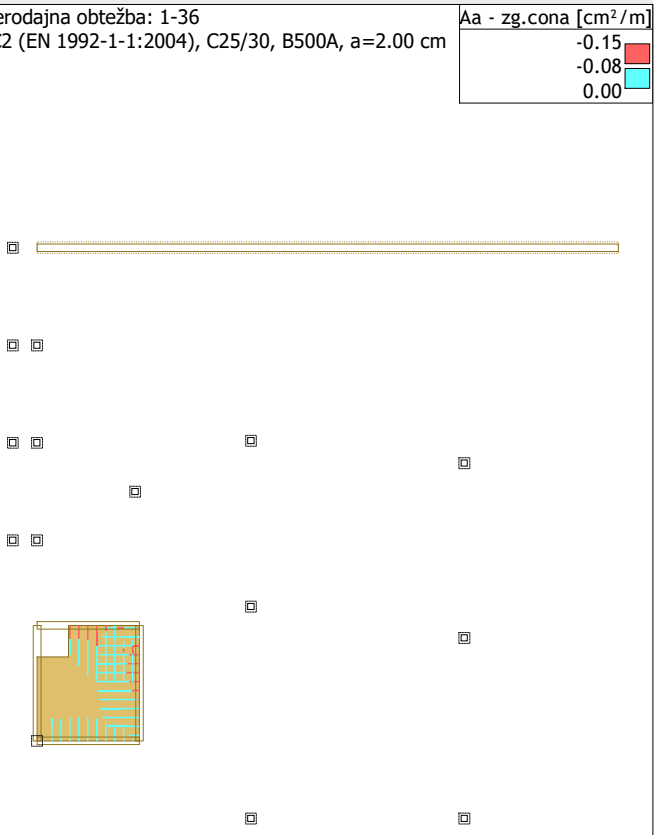
Dimenzioniranje (beton)

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=2.00 cm



Nivo: Nivo (streha jaška) [8.80 m]
Aa - sp.cona - max Aa,s= 0.28 cm²/m

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=2.00 cm



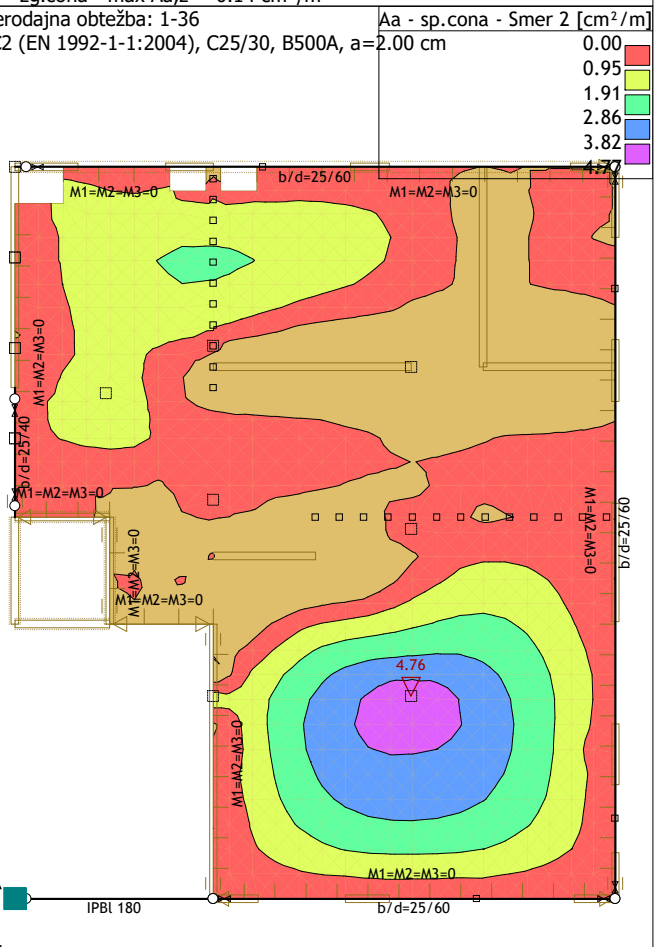
Nivo: Nivo (streha jaška) [8.80 m]
Aa - zg.cona - max Aa,z= -0.14 cm²/m

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=2.00 cm



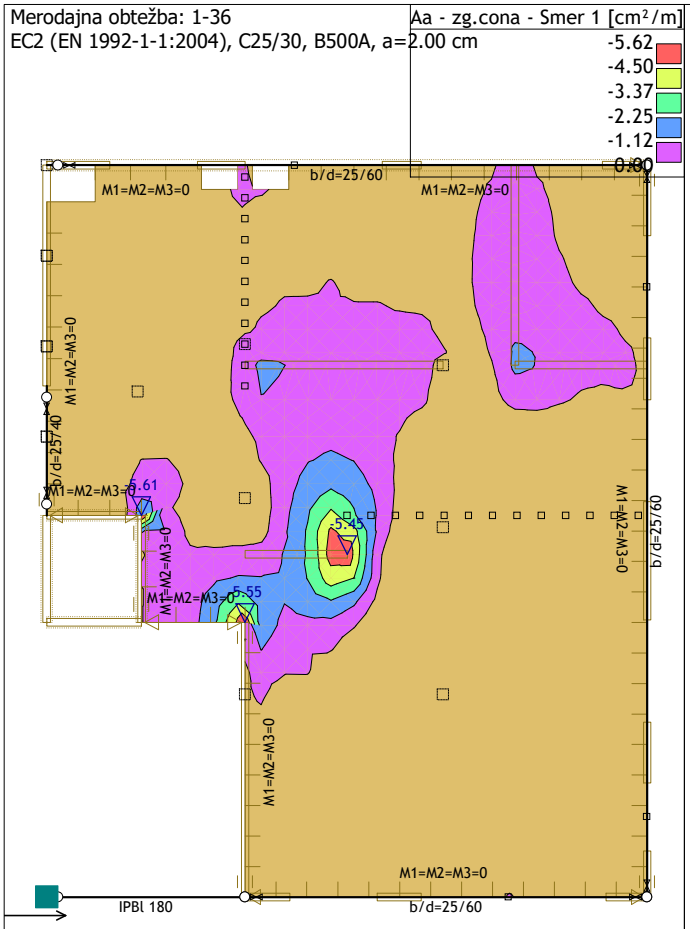
Nivo: Nivo (podstreha) [8.40 m]
Aa - sp.cona - Smer 1 - max Aa1,s= 5.20 cm²/m

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=2.00 cm



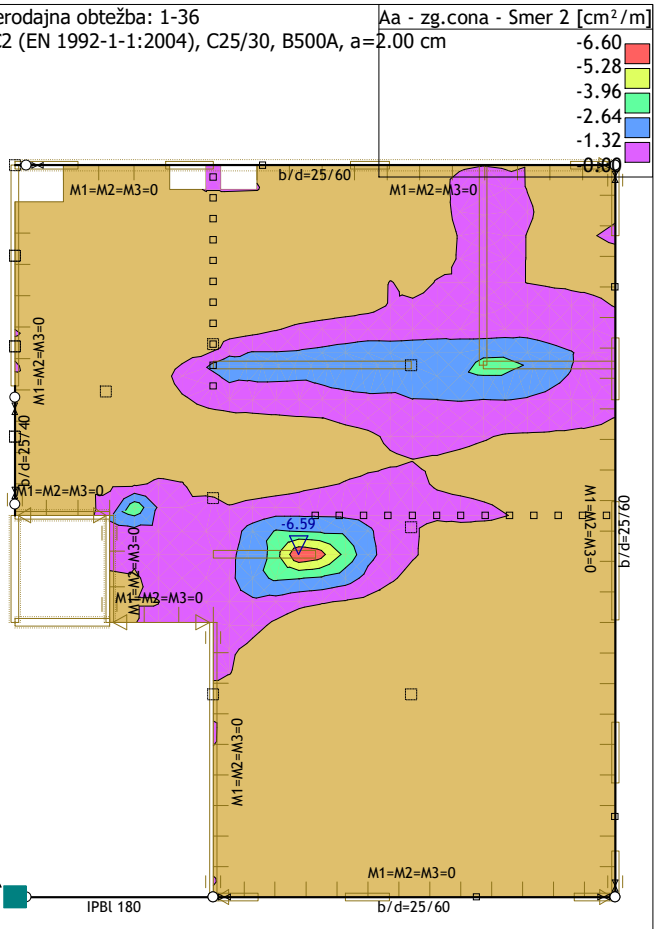
Nivo: Nivo (podstreha) [8.40 m]
Aa - sp.cona - Smer 2 - max Aa2,s= 4.76 cm²/m

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=2.00 cm



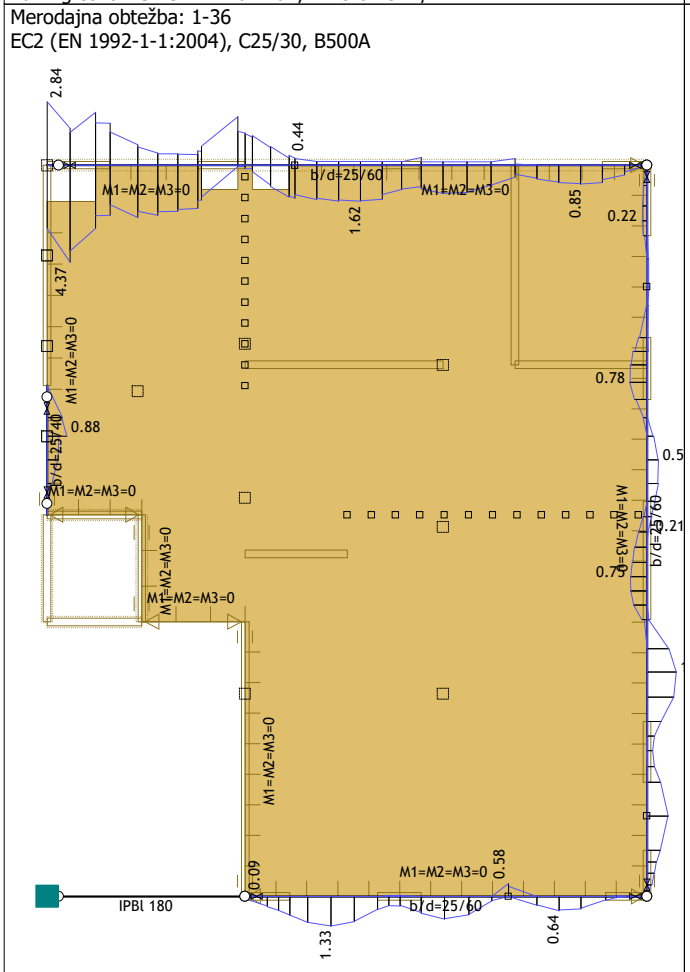
Nivo: Nivo (podstreha) [8.40 m]
Aa - zg.cona - Smer 1 - max Aa1,z= -5.61 cm²/m

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=2.00 cm



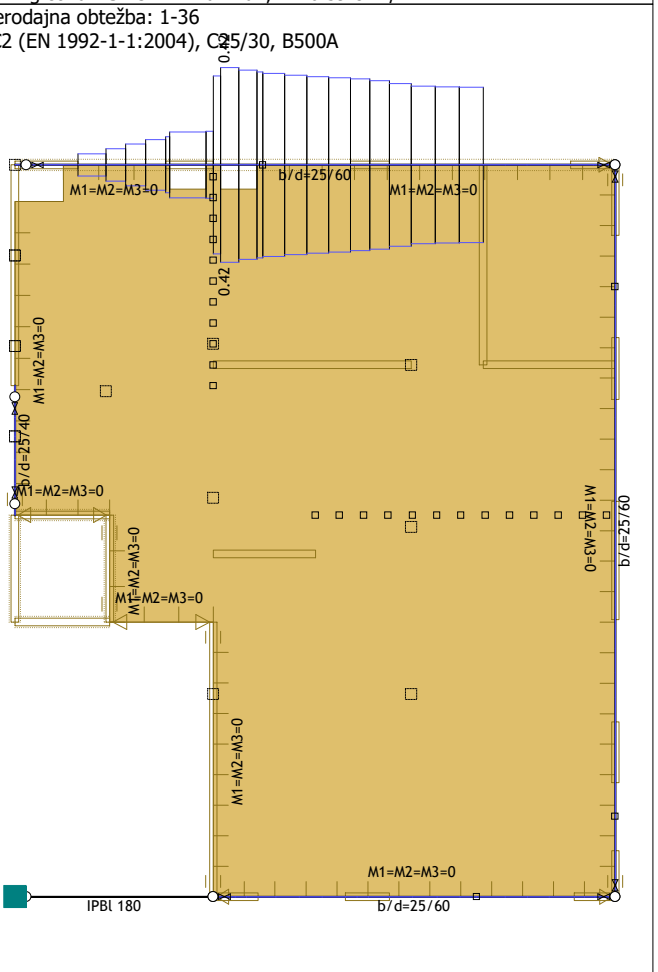
Nivo: Nivo (podstreha) [8.40 m]
Aa - zg.cona - Smer 2 - max Aa2,z= -6.59 cm²/m

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A



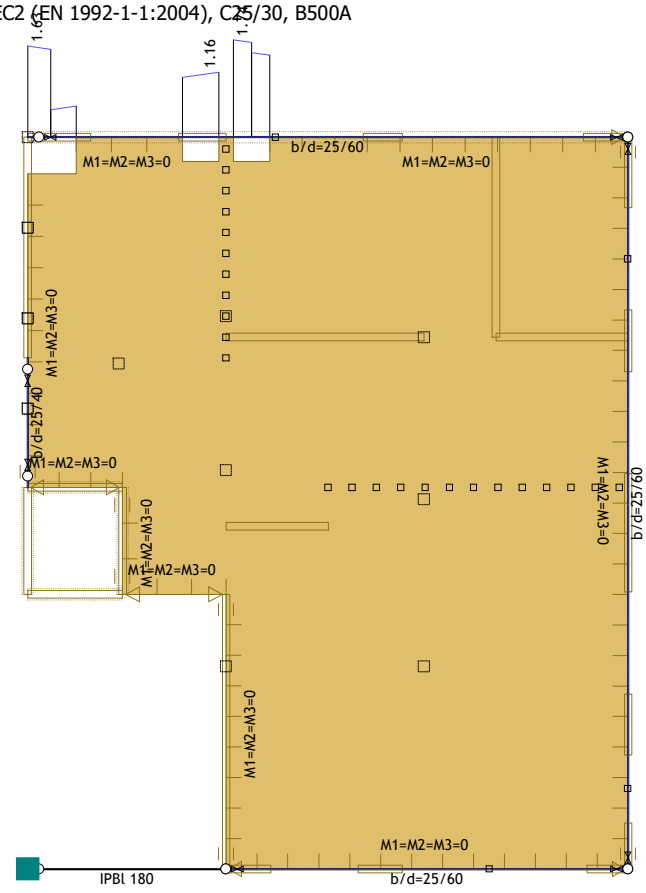
Nivo: Nivo (podstreha) [8.40 m]
Armatura v gredah: max Aa2/Aa1= 2.84 / 4.37 cm²

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A

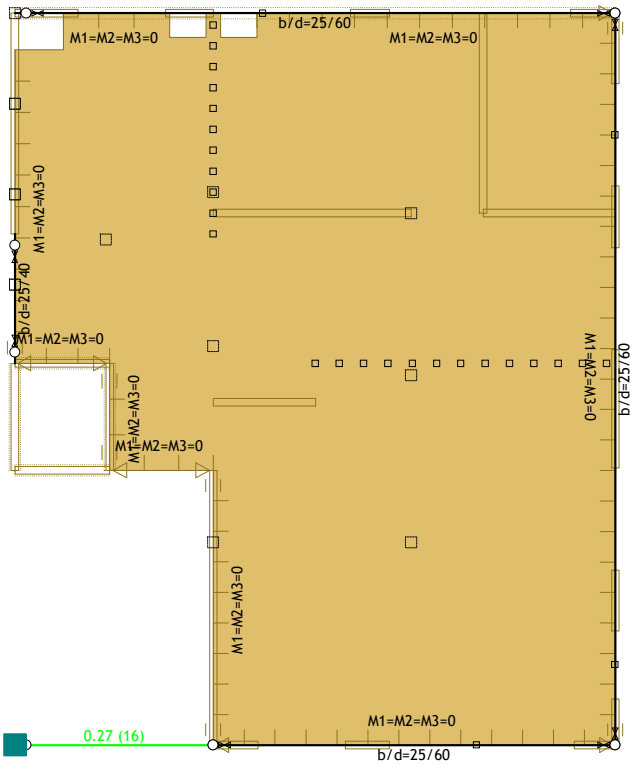


Nivo: Nivo (podstreha) [8.40 m]
Armatura v gredah: max Aa3/Aa4= 0.42 / 0.42 cm²

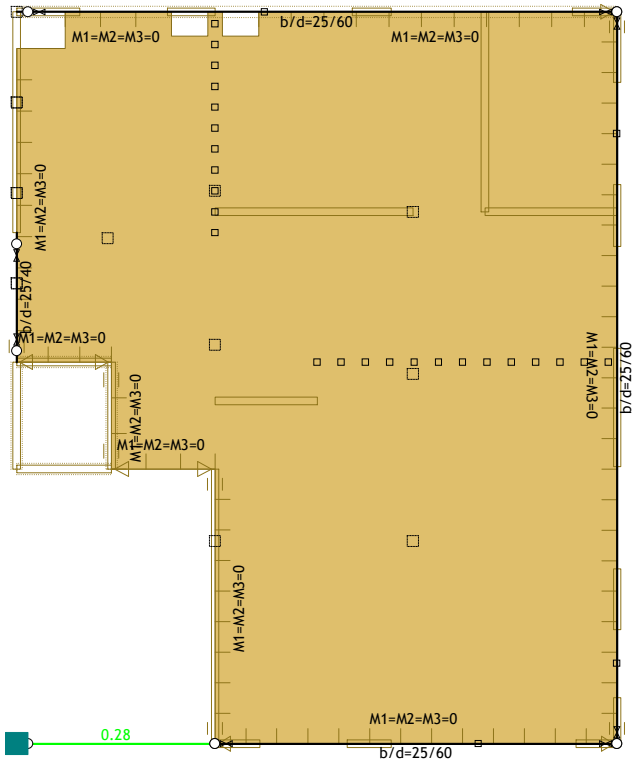
Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A



Nivo: Nivo (podstreha) [8.40 m]
Armatura v gredah: max Aa,st= 1.74 cm²

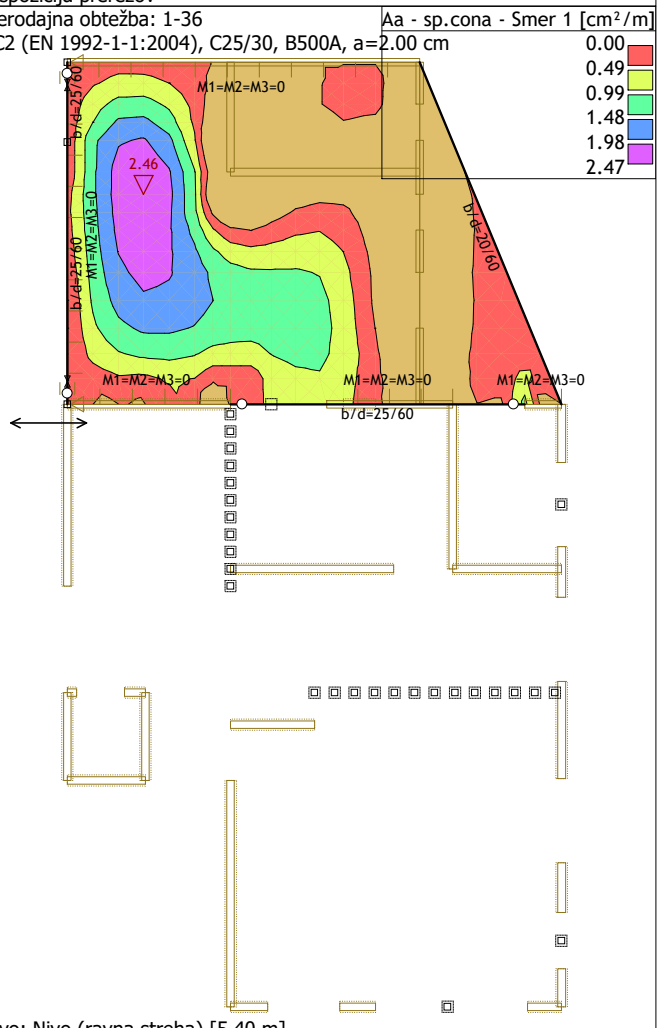


Nivo: Nivo (podstreha) [8.40 m]
Dispozicija prerezov



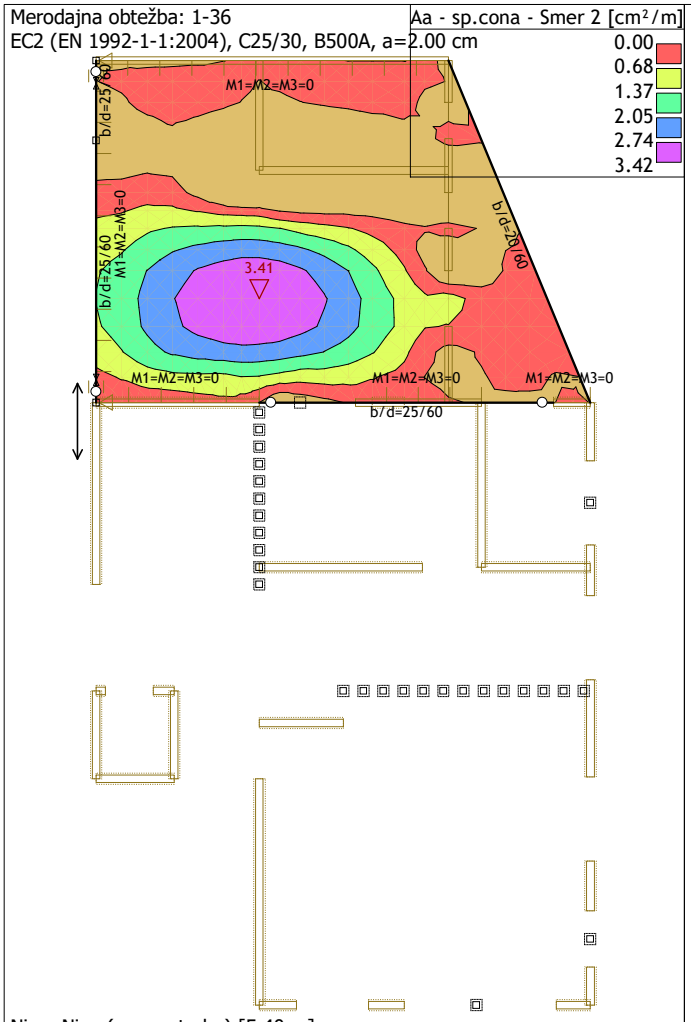
Nivo: Nivo (podstreha) [8.40 m]
Dispozicija prerezov

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=2.00 cm



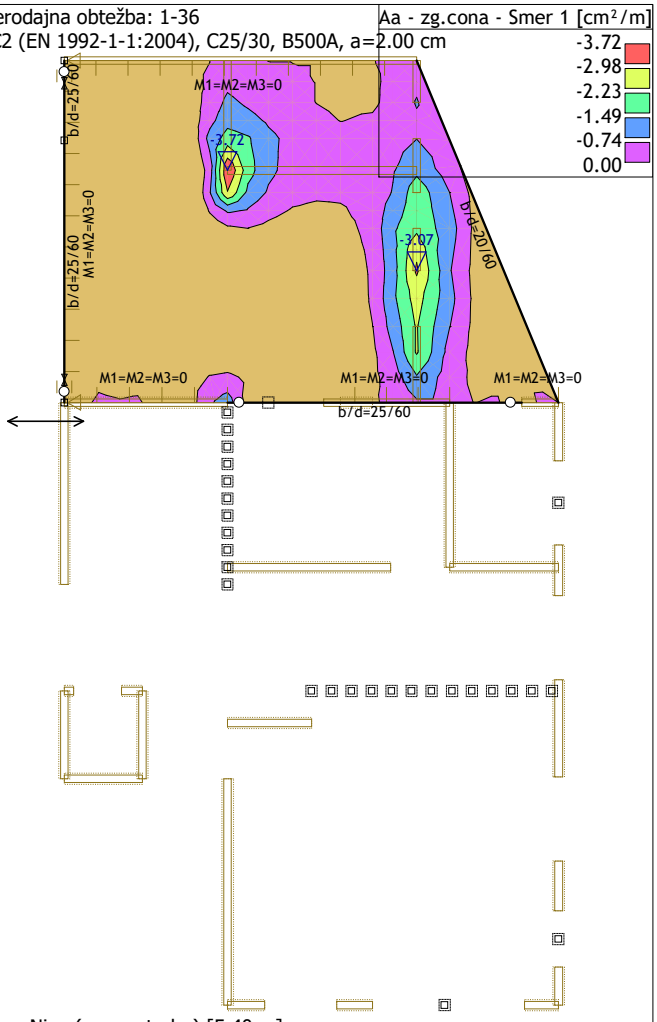
Nivo: Nivo (ravna streha) [5.40 m]
Aa - sp.cona - Smer 1 - max Aa1,s= 2.46 cm²/m

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=2.00 cm



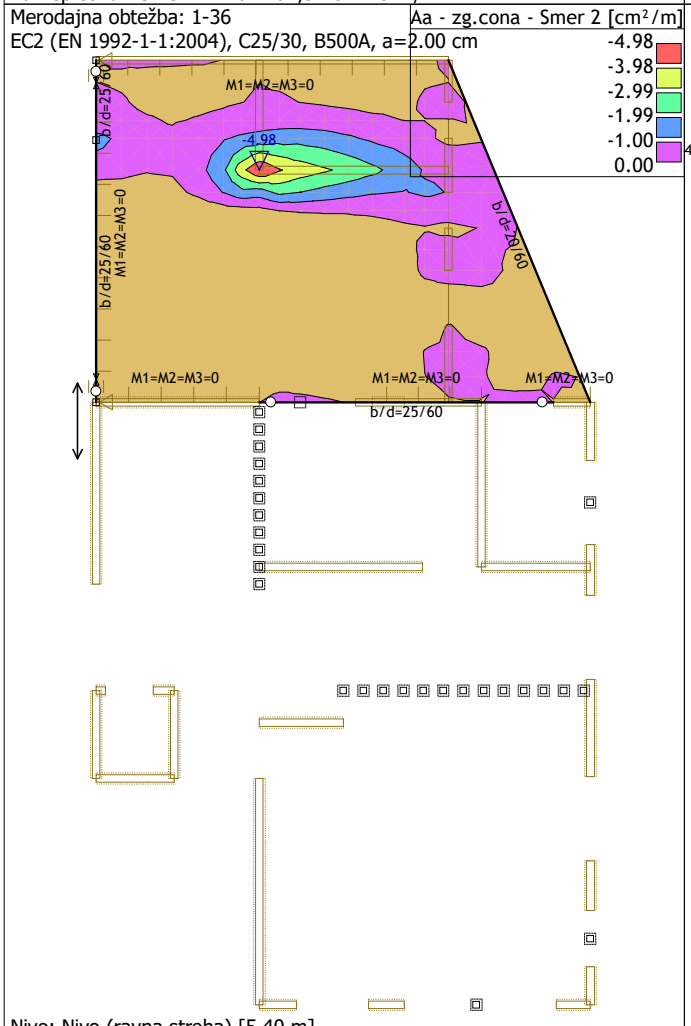
Nivo: Nivo (ravna streha) [5.40 m]
Aa - sp.cona - Smer 2 - max Aa2,s= 3.41 cm²/m

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=2.00 cm



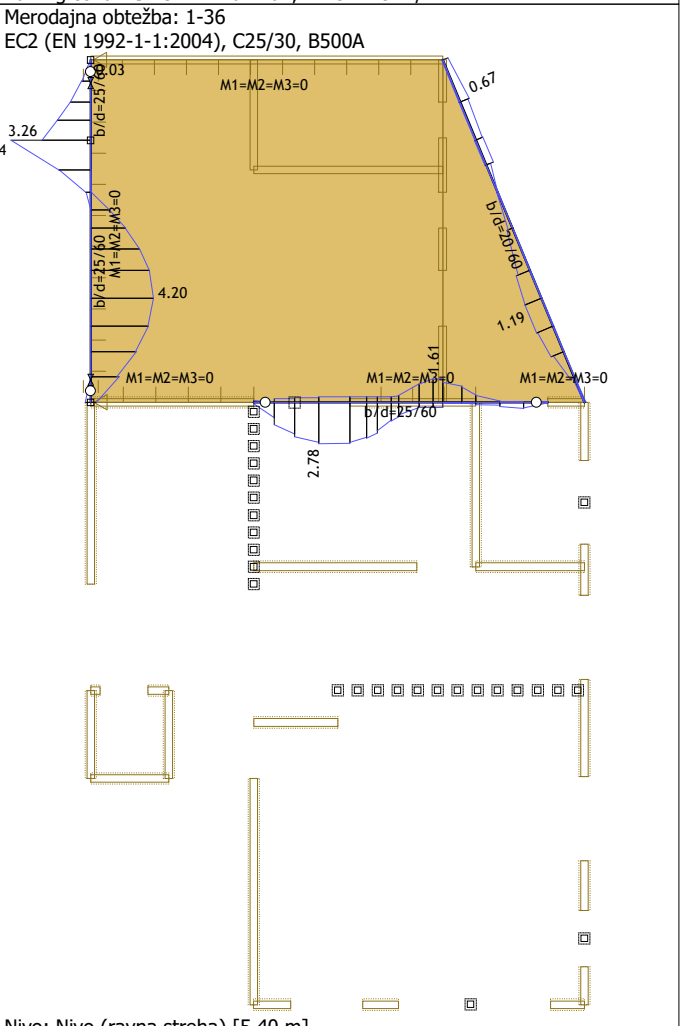
Nivo: Nivo (ravna streha) [5.40 m]
Aa - zg.cona - Smer 1 - max Aa1,z= -3.72 cm²/m

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=2.00 cm



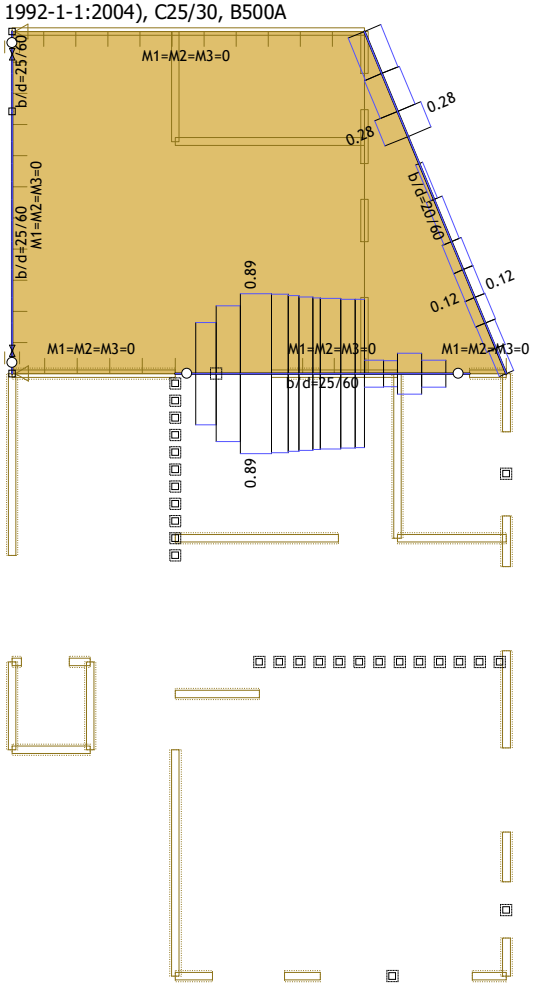
Nivo: Nivo (ravna streha) [5.40 m]
Aa - zg.cona - Smer 2 - max Aa2,z= -4.98 cm²/m

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A



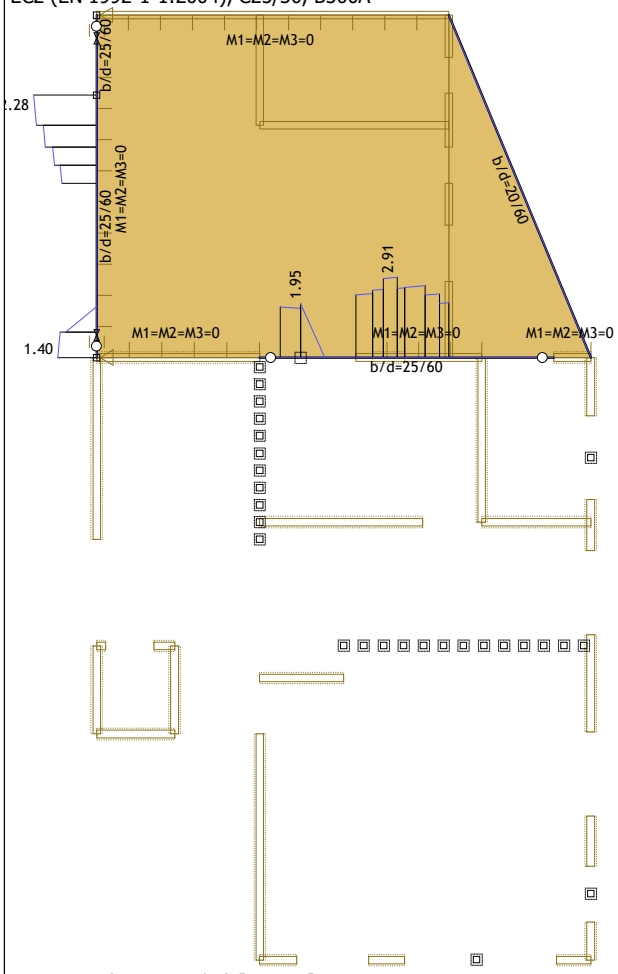
Nivo: Nivo (ravna streha) [5.40 m]
Armatura v gredah: max Aa2/Aa1= 5.34 / 4.20 cm²

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A



Nivo: Nivo (ravna streha) [5.40 m]
Armatura v gredah: max Aa3/Aa4= 0.89 / 0.89 cm²

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A



Nivo: Nivo (ravna streha) [5.40 m]
Armatura v gredah: max Aa,st= 2.91 cm²

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=2.00 cm

Aa - sp.cona - Smer 1 [cm²/m]
0.00
0.63
1.26
1.90
2.53
3.16



Nivo: Nivo (1.nadstropje) [4.80 m]
Aa - sp.cona - Smer 1 - max Aa1,s= 3.16 cm²/m

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=2.00 cm

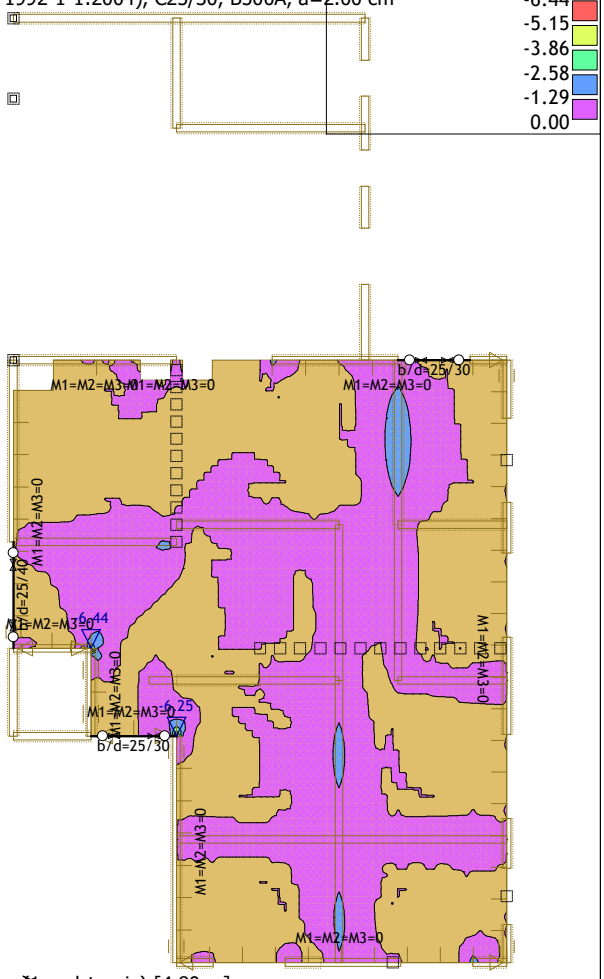
Aa - sp.cona - Smer 2 [cm²/m]
0.00
1.05
2.10
3.16
4.21
5.26



Nivo: Nivo (1.nadstropje) [4.80 m]
Aa - sp.cona - Smer 2 - max Aa2,s= 5.26 cm²/m

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=2.00 cm

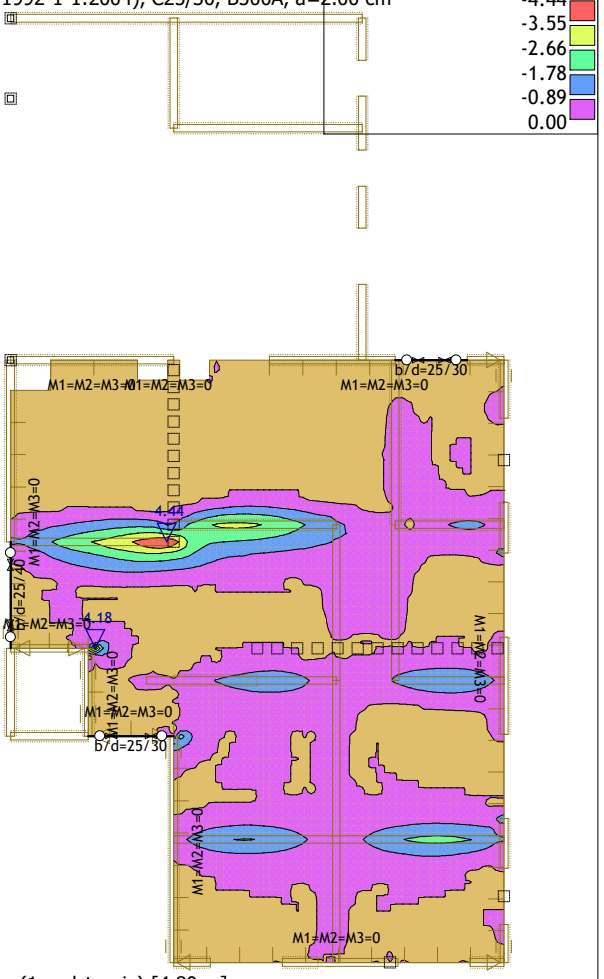
Aa - zg.cona - Smer 1 [cm²/m]
-6.44
-5.15
-3.86
-2.58
-1.29
0.00



Nivo: Nivo (1.nadstropje) [4.80 m]
Aa - zg.cona - Smer 1 - max Aa1,z= -6.44 cm²/m

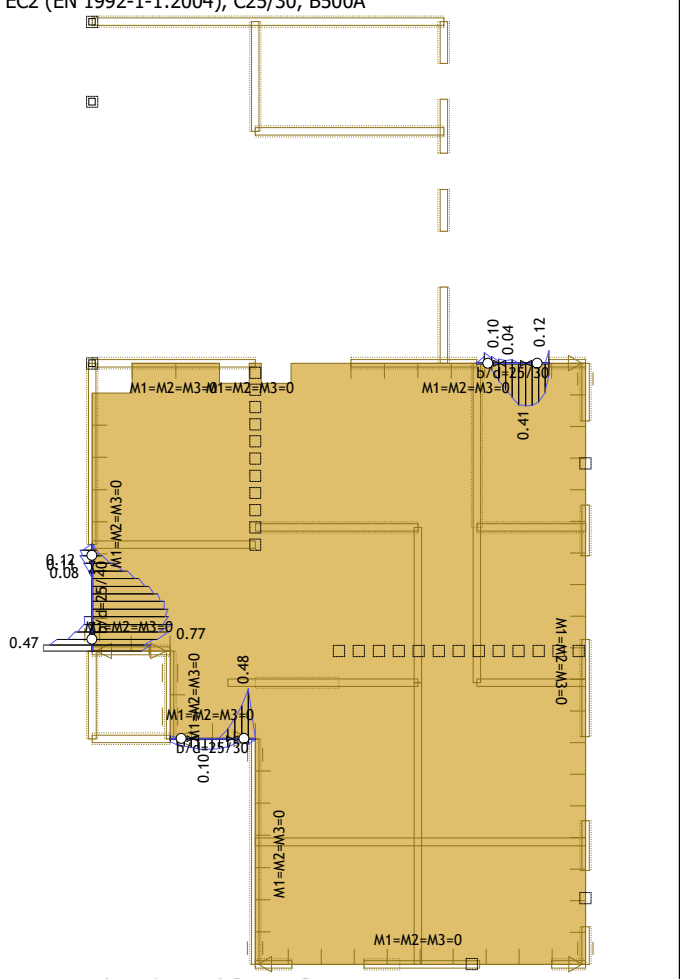
Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=2.00 cm

Aa - zg.cona - Smer 2 [cm²/m]
-4.44
-3.55
-2.66
-1.78
-0.89
0.00



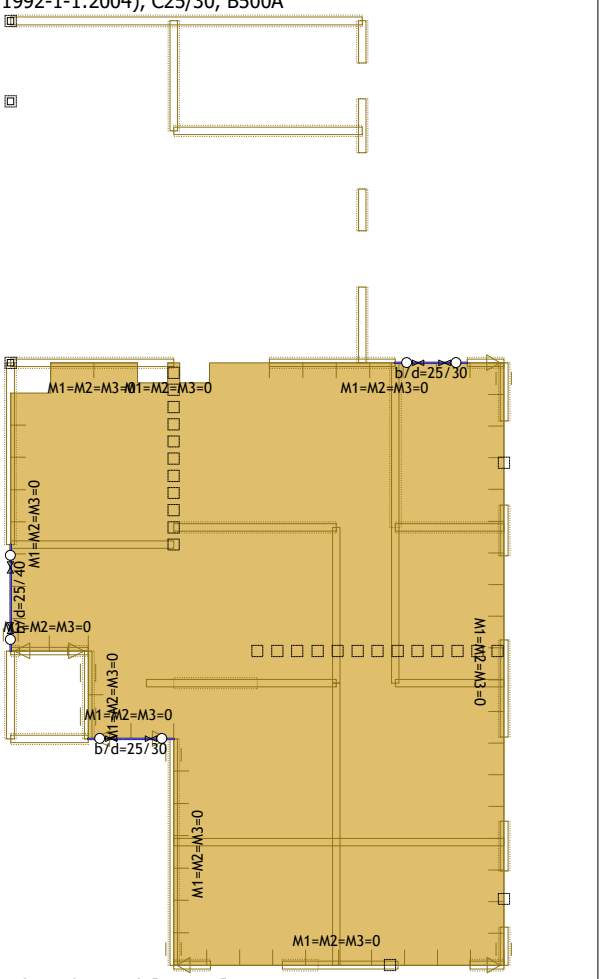
Nivo: Nivo (1.nadstropje) [4.80 m]
Aa - zg.cona - Smer 2 - max Aa2,z= -4.44 cm²/m

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A



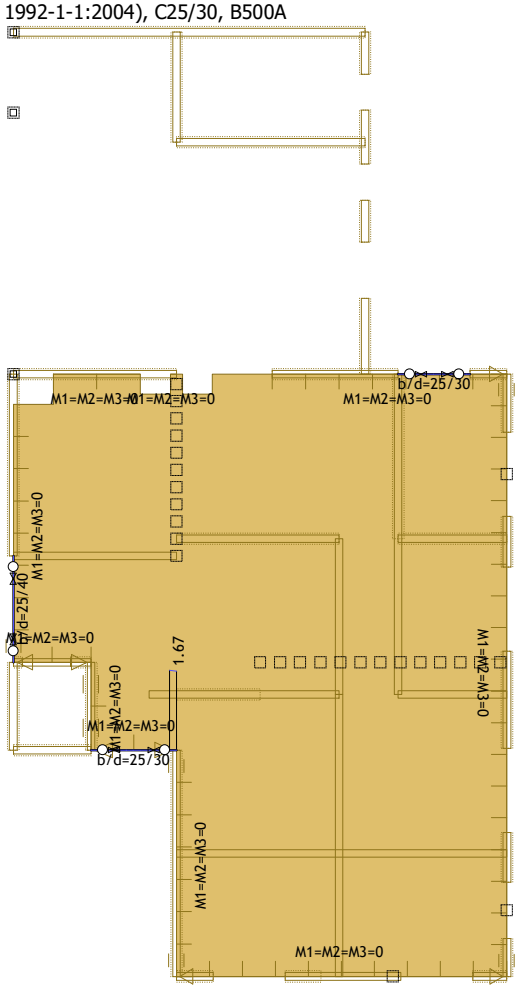
Nivo: Nivo (1.nadstropje) [4.80 m]
Armatura v gredah: max Aa2/Aa1= 0.48 / 0.77 cm²

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A



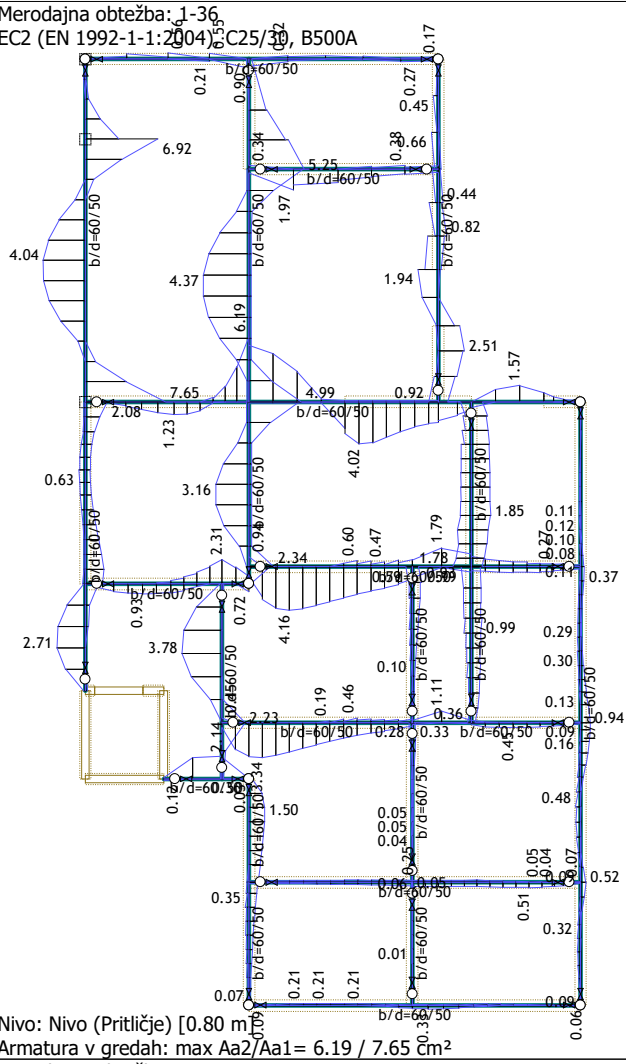
Nivo: Nivo (1.nadstropje) [4.80 m]
Armatura v gredah: max Aa3/Aa4= 0.00 cm²

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A



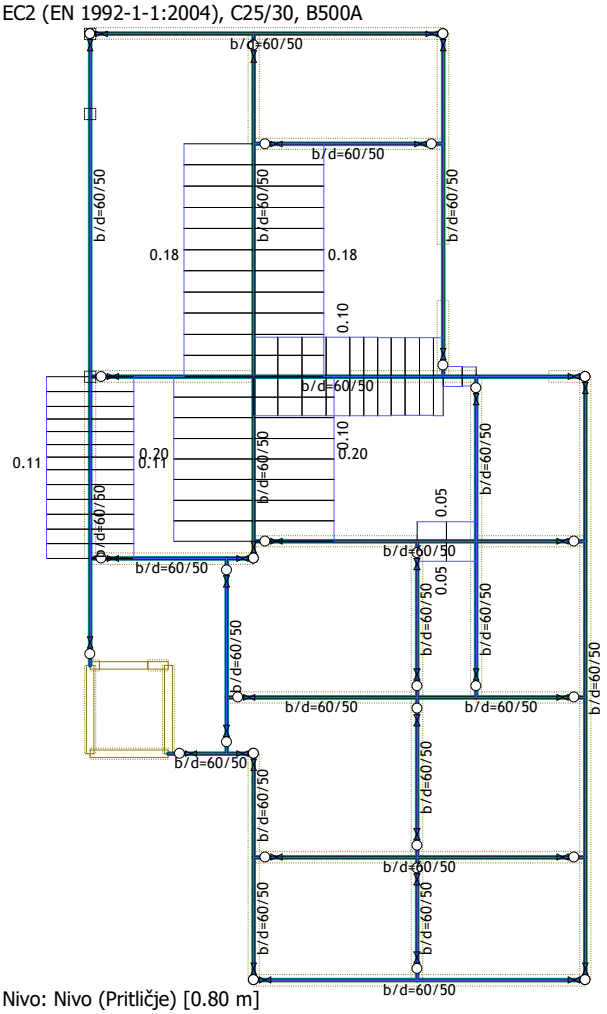
Nivo: Nivo (1.nadstropje) [4.80 m]
Armatura v gredah: max Aa,st= 1.67 cm²

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A



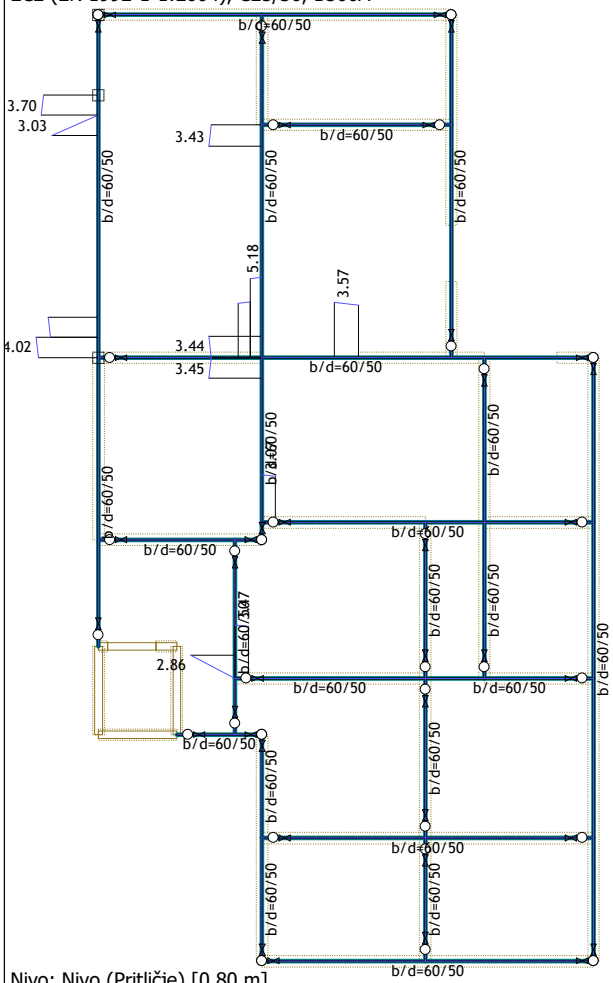
Nivo: Nivo (Pritličje) [0.80 m]
Armatura v gredah: max Aa2/Aa1= 6.19 / 7.65 cm²

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A



Nivo: Nivo (Pritličje) [0.80 m]
Armatura v gredah: max Aa3/Aa4= 0.20 / 0.20 cm²

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A



Nivo: Nivo (Pritličje) [0.80 m]
Armatura v gredah: max Aa,st= 5.18 cm²

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=2.00 cm



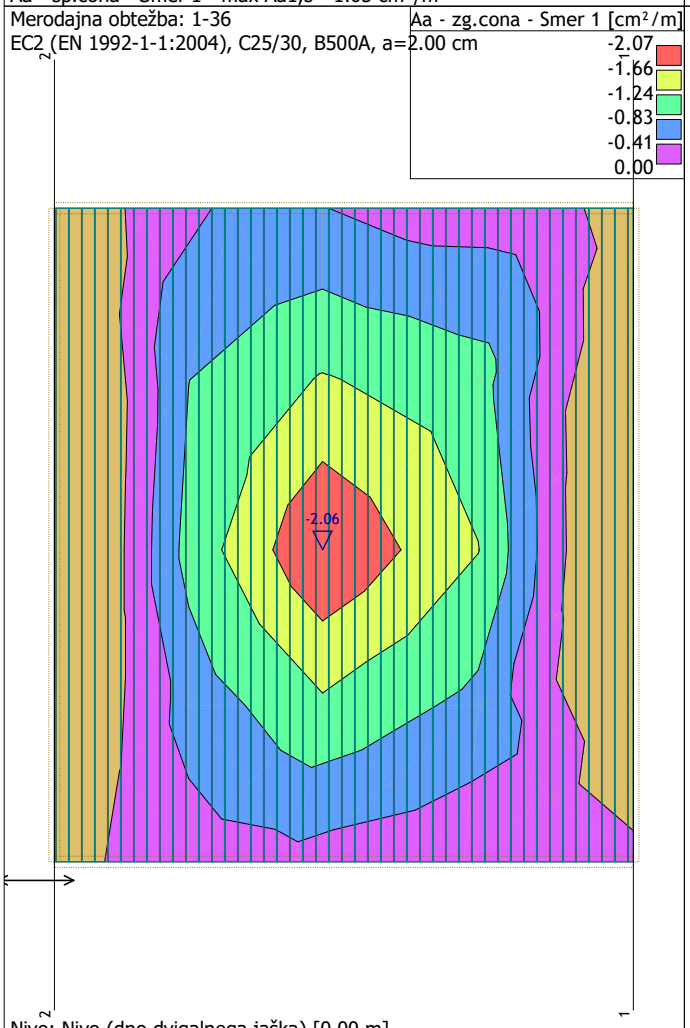
Nivo: Nivo (dno dvigalnega jaška) [0.00 m]
Aa - sp.cona - Smer 1 - max Aa1,s= 1.05 cm²/m

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=2.00 cm



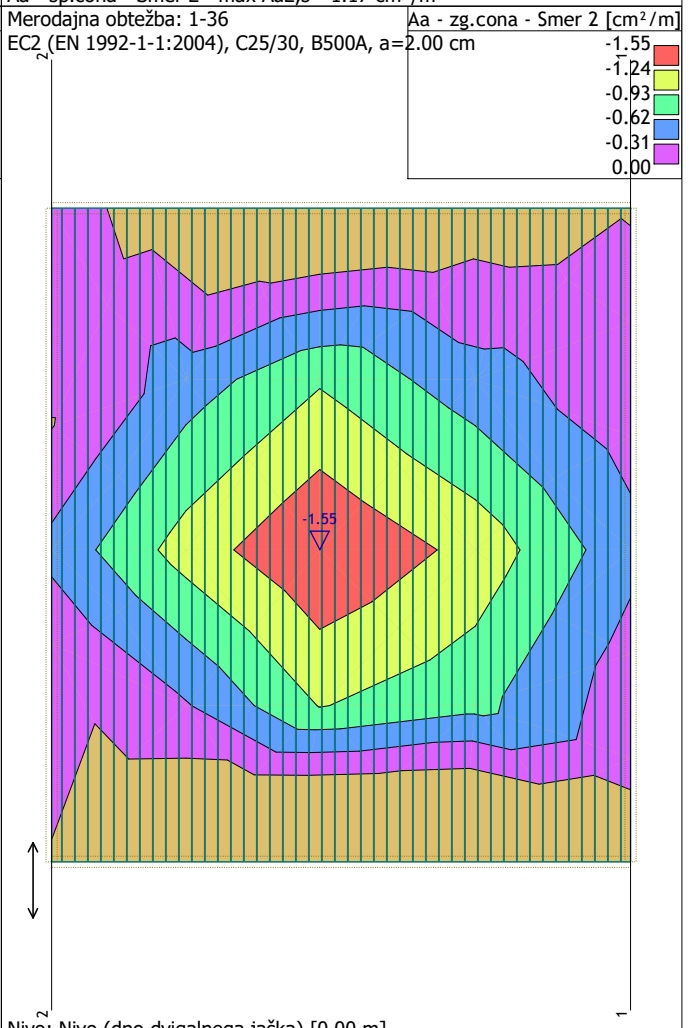
Nivo: Nivo (dno dvigalnega jaška) [0.00 m]
Aa - sp.cona - Smer 2 - max Aa2,s= 1.17 cm²/m

Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=2.00 cm



Nivo: Nivo (dno dvigalnega jaška) [0.00 m]
Aa - zg.cona - Smer 1 - max Aa1,z= -2.06 cm²/m

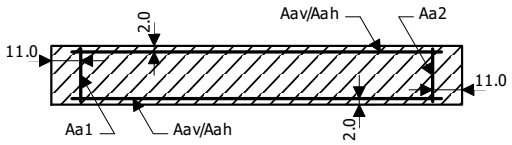
Merodajna obtežba: 1-36
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=2.00 cm



Nivo: Nivo (dno dvigalnega jaška) [0.00 m]
Aa - zg.cona - Smer 2 - max Aa2,z= -1.55 cm²/m

Okvir: V_2
EC2 (EN 1992-1-1:2004)
C25/30 (γC = 1.50, γS = 1.15) [SP]
Vogalna armatura B500C
Vzdolžna armatura B500C
Dimenzioniranje skupine obtežnih primerov: 1-37
(Računska ovojnica sil)

Prerez 1A - 1A (Z=8.80m)
Merodajni prerez za upogib



b/d = 25/220 cm Ab = 5500 cm²

Merodajna kombinacija za upogib:
1.35xI+1.05xII+1.50xV
Merodajna kombinacija za strig:
1.35xI+1.50xII+0.75xV
Med = 35.58 kNm
Ned = 22.76 kN
Ved = 17.90 kN (Vrd,max = 2116.13 kN)

εb/εa = -0.397/20.000 ‰
Aa1 = 0.00 cm² (min:8.25)
Aa2 = 0.00 cm² (min:8.25)
Aav = ±0.32 cm²/m (min:±1.88)
Aah = ±0.11 cm²/m (min:±2.50)

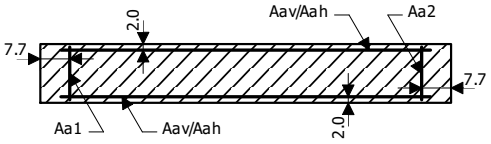
Prerez 2A - 2A (Z=8.40m)
Merodajni prerez za strig
b/d = 25/220 cm Ab = 5500 cm²

Merodajna kombinacija za upogib:
I
Merodajna kombinacija za strig:
1.35xI+1.50xII+0.75xV
Med = -15.13 kNm
Ned = -28.70 kN
Ved = 28.31 kN (Vrd,max = 2116.13 kN)

Aa1 = 0.00 cm² (min:8.25)
Aa2 = 0.00 cm² (min:8.25)
Aav = ±0.00 cm²/m (min:±1.88)
Aah = ±0.17 cm²/m (min:±2.50)

Okvir: H_1
EC2 (EN 1992-1-1:2004)
C25/30 (γC = 1.50, γS = 1.15) [SP]
Vogalna armatura B500C
Vzdolžna armatura B500C
Dimenzioniranje skupine obtežnih primerov: 1-37
(Računska ovojnica sil)

Prerez 1A - 1A (Z=8.80m)
Merodajni prerez za upogib

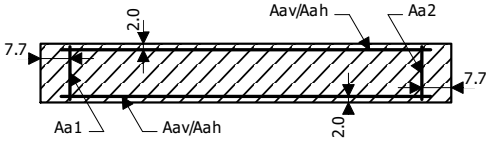


b/d = 25/195 cm Ab = 4875 cm²

Merodajna kombinacija za upogib:
1.35xI+1.05xII+1.50xV
Merodajna kombinacija za strig:
1.35xI+1.50xIV
Med = 47.63 kNm
Ned = 43.81 kN
Ved = 8.23 kN (Vrd,max = 1896.75 kN)

εb/εa = -0.516/20.000 ‰
Aa1 = 0.00 cm² (min:7.31)
Aa2 = 0.00 cm² (min:7.31)
Aav = ±0.60 cm²/m (min:±1.88)
Aah = ±0.06 cm²/m (min:±2.50)

Prerez 2A - 2A (Z=6.63m)
Merodajni prerez za strig



b/d = 25/52 cm Ab = 1300 cm²

Merodajna kombinacija za upogib:
1.35xI+1.50xII+0.75xV
Merodajna kombinacija za strig:
1.35xI+1.50xII+0.75xV
Med = -9.95 kNm
Ned = 15.98 kN
Ved = 26.75 kN (Vrd,max = 448.88 kN)

εb/εa = -1.043/20.000 ‰
Aa1 = 0.00 cm² (min:1.95)
Aa2 = 0.00 cm² (min:1.95)
Aav = ±1.74 cm²/m (min:±1.88)
Aah = ±0.77 cm²/m (min:±2.50)

Dimenzioniranje (jeklo)

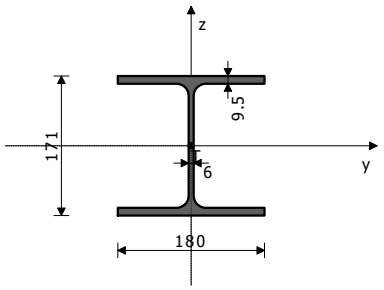
Kontrola napetosti - EUROCODE 3 (ENV)

Opis	LC	σ [kN/cm²]	τ [kN/cm²]	σu [kN/cm²]
Set 17: IPBl 180				
(1107 - 155)	6	5.709	**1.101**	5.709
	7	3.784	0.720	3.784
	8	3.774	0.720	3.774
	9	5.258	1.014	5.258
	10	3.333	0.632	3.333
	11	3.323	0.632	3.323
	12	5.683	**1.101**	5.683
	13	5.660	**1.101**	5.660
	14	1.837	0.338	1.837
	15	1.828	0.338	1.828
	16	**5.737**	**1.101**	**5.737**
	17	3.758	0.720	3.758
	18	3.725	0.720	3.725
	19	3.835	0.720	3.835
	20	5.232	1.014	5.232
	21	5.209	1.014	5.209
	22	1.386	0.250	1.386
	23	1.376	0.250	1.376
	24	5.286	1.014	5.286
	25	3.306	0.632	3.306
	26	3.274	0.632	3.274
	27	3.384	0.632	3.384
	28	5.634	**1.101**	5.634
	29	1.811	0.338	1.811
	30	1.779	0.338	1.779
	31	1.889	0.338	1.889
	32	5.183	1.014	5.183
	33	1.360	0.250	1.360
	34	1.327	0.250	1.327
	35	1.437	0.250	1.437
	36	1.741	0.338	1.741
	37	1.290	0.250	1.290

PALICA 155-1107

PREČNI PREREZ: IPBl 180 [S 235] [Set: 17]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



[mm]

Ax =	45.251	cm2
Ay =	34.200	cm2
Az =	14.471	cm2
Ix =	11.269	cm4
Iy =	2508.8	cm4
Iz =	923.82	cm4
Wy =	293.43	cm3
Wz =	102.65	cm3
Wy,pl =	316.62	cm3
Wz,pl =	153.90	cm3
γM0 =	1.100	
γM1 =	1.100	
γM2 =	1.250	
Anet/A =	0.900	

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

28. γ=0.28	13. γ=0.28	12. γ=0.28
6. γ=0.28	16. γ=0.27	32. γ=0.26
21. γ=0.26	20. γ=0.25	9. γ=0.25
24. γ=0.25	18. γ=0.18	17. γ=0.18
8. γ=0.18	7. γ=0.18	19. γ=0.17
26. γ=0.16	25. γ=0.16	11. γ=0.16
10. γ=0.16	27. γ=0.15	22. γ=0.12
23. γ=0.12	14. γ=0.12	29. γ=0.12
30. γ=0.12	31. γ=0.12	15. γ=0.12
33. γ=0.12	34. γ=0.12	35. γ=0.12
36. γ=0.12	37. γ=0.12	

PALICA IZPOSTAVLJENA NATEGU IN UPOGIBU
(obtežni primer 28, na 204.0 cm od začetka palice)

Računska osna sila	Nsd =	4.237 kN
Upogibni moment okoli y osi	Msd_y =	16.257 kNm
Sistemska dolžina palice	L =	408.00 cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.3 Nateg

Plast.rač.nosilnost bruto prereza	Npl.Rd =	966.73 kN
Mejna rač.nosilnost neto prereza	Nu.Rd =	1055.6 kN
Računska nos. na nateg	Nt.Rd =	966.73 kN

Pogoj 5.13: Nsd <= Nt.Rd (4.24 <= 966.73)

5.4.5 Upogib y-y

Računski plastični moment	Mpl.Rd =	67.641 kNm

Računska nos.na lokalno izbočitev	Mo.Rd =	62.687 kNm
Računski elastični moment	Mel.Rd =	62.687 kNm
Računska nosilnost na upogib	Mc.Rd =	67.641 kNm

Pogoj 5.17: Msd_y <= Mc.Rd_y (16.26 <= 67.64)

5.4.8 Upogib in osna sila

Razmerje Msd_y / Mpl.Rd_y		0.240

Pogoj 5.36: (0.24 <= 1)

5.5 NOSILNOST ELEMENTOV

5.5.2 Bočna zvrnitev upogibnih nosilcev

Koeficient	C1 =	1.132
Koeficient	C2 =	0.459
Koeficient	C3 =	0.525
Koef.ukl.dolžine za uklon	k =	1.000
Koef.ukl.dolžine za vbočenje	kw =	1.000
Koordinata	zg =	0.000 cm
Koordinata	zj =	0.000 cm
Razmak med bočnimi podporami	L =	408.00 cm
Sektorski vztrajnostni moment	Iw =	60211 cm6
Krit.moment bočne zvrnitve	Mcr =	156.41 kNm
Koeficient	βw =	1.000
Koeficient imperf.	αLT =	0.210
Brezdimenz.vitkost	λLT_ =	0.690
Koeficient zmanjšanja	χLT =	0.853
Računska uklonska nosilnost	Mb.Rd =	57.665 kNm

5.5.3 Upogib in nateg

Redukcijski koef.za vektorske vplive	ψvec =	0.800
Elast.odp.mom.za krajne tlač.vlakno	Wcom =	293.43 cm3
Efektivni rač.notranji moment	Meff.sd =	16.037 kNm

Pogoj 5.50: Meff.sd <= Mb.Rd (16.04 <= 57.67)

5.7 VNOS KONCENTRIRANIH SIL V STOJINO

5.7.7 Uklon pasnice v smeri stojine

Koeficient(razred pasnice 1)	k =	0.300
Površina stojine	Aw =	10.260 cm2
Površina tlač.pasnice	Afc =	17.100 cm2

Preprečen je uklon pasnice v smeri stojine

Pogoj 5.80: (25.33 <= 207.66)

KONTROLA STRIŽNE NOSILNOSTI
(obtežni primer 28, začetek palice)

Računska osna sila	Nsd =	4.237 kN
Prečna sila v z smeri	Vsd_z =	-15.938 kN
Sistemska dolžina palice	L =	408.00 cm

5.4 NOSILNOST PREČNIH PREREZOV

5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	178.49 kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (15.94 <= 178.49)

5.6 LOKALNO IZBOČENJE ZARADI STRIGA

za strig v ravnini z-z

Višina stojine	d =	15.200 cm
Debelina stojine	tw =	0.600 cm

Ni prečnih ojačitev v sredini

Koeficient izbočenja pri strigu	kτ =	5.340

Ni potrebna kontrola izbočenja zaradi striga

Pogoj: d / tw <= 69 ε (25.33 <= 69.00)

GRADBENI BIRO
Vrvarska pot 1a
1310 Ribnica, Slovenija
T 01 836 90 60
info@zasnova.si
www.zasnova.si

2.5.2. Analiza jeklenega stopnišč POZ-600

2.5.2.1. Analiza jeklenega stopnišča

Glej prilogo:

Vhodni podatki - Konstrukcija

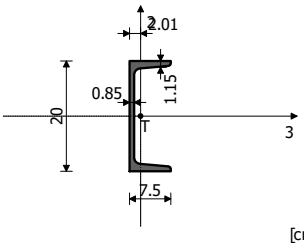
Tabele materialov

No	Naziv materiala	E[kN/m2]	μ	γ[kN/m3]	αt[1/C]	Em[kN/m2]	μm
1	Jeklo	2.100e+8	0.30	78.50	1.000e-5	2.100e+8	0.30

Seti gred

Set: 1 Prerez: [200, Fiktivna ekscentričnost

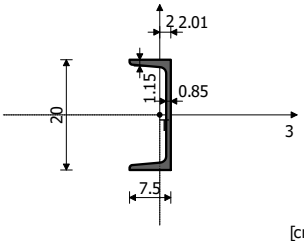
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	3.220e-3	1.662e-3	1.558e-3	1.190e-7	1.480e-6	1.910e-5



[cm]

Set: 2 Prerez: [200, Fiktivna ekscentričnost

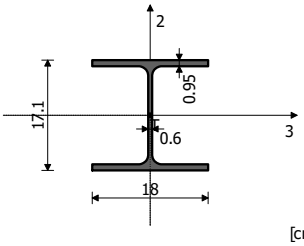
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	3.220e-3	1.662e-3	1.558e-3	1.190e-7	1.480e-6	1.910e-5



[cm]

Set: 3 Prerez: IPBl 180, Fiktivna ekscentričnost

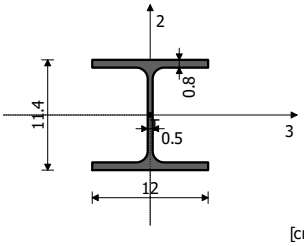
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	4.525e-3	1.447e-3	3.420e-3	1.127e-7	9.238e-6	2.509e-5



[cm]

Set: 4 Prerez: IPBl 120, Fiktivna ekscentričnost

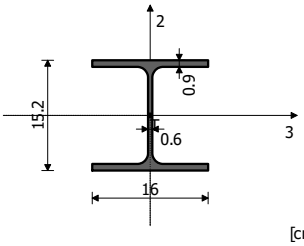
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	2.534e-3	8.456e-4	1.920e-3	4.459e-8	2.306e-6	6.059e-6



[cm]

Set: 5 Prerez: IPBl 160, Fiktivna ekscentričnost

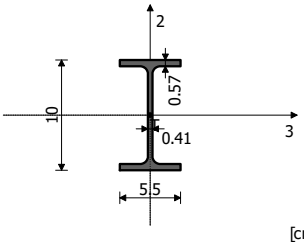
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	3.877e-3	1.321e-3	2.880e-3	8.653e-8	6.149e-6	1.672e-5



[cm]

Set: 6 Prerez: IPE 100, Prosta palica, Fiktivna ekscentričnost

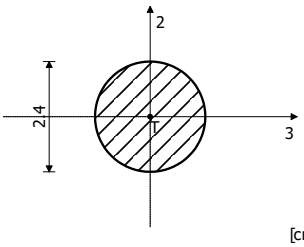
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	1.032e-3	5.085e-4	6.270e-4	8.738e-9	1.590e-7	1.709e-6



[cm]

Set: 7 Prerez: D=2.4, Prosta palica, Fiktivna ekscentričnost

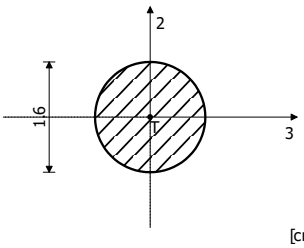
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	4.524e-4	4.072e-4	4.072e-4	3.257e-8	1.629e-8	1.629e-8



[cm]

Set: 8 Prerez: D=1.6, Prosta palica, Fiktivna ekscentričnost

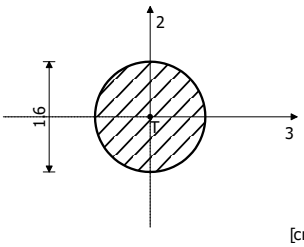
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	2.011e-4	1.810e-4	1.810e-4	6.434e-9	3.217e-9	3.217e-9



[cm]

Set: 9 Prerez: D=1.6, Prosta palica, Fiktivna ekscentričnost

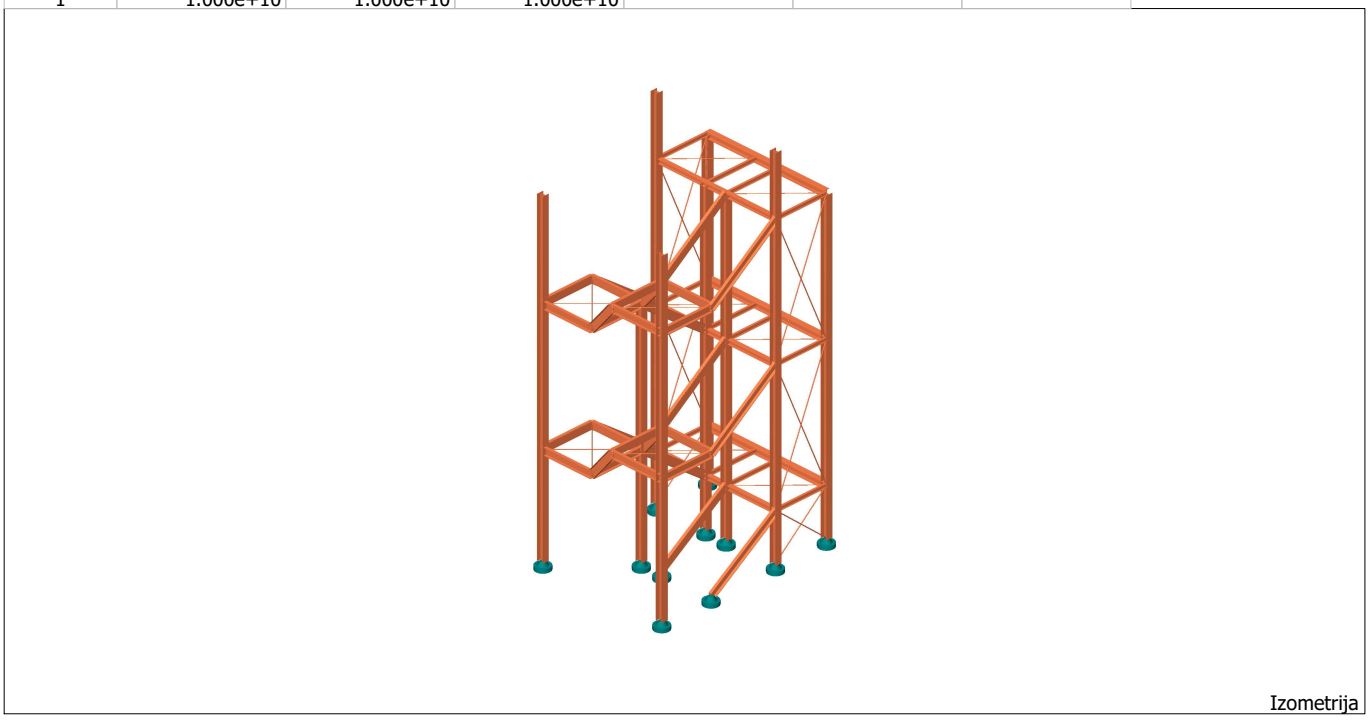
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	2.011e-4	1.810e-4	1.810e-4	6.434e-9	3.217e-9	3.217e-9



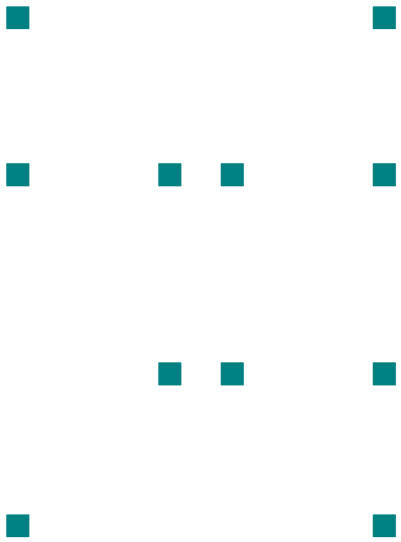
[cm]

Seti točkovnih podpor

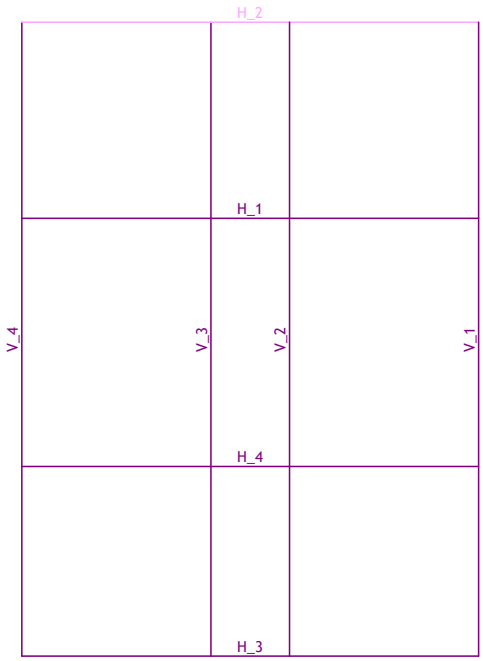
Set	K,R1	K,R2	K,R3	K,M1	K,M2	K,M3
1	1.000e+10	1.000e+10	1.000e+10			



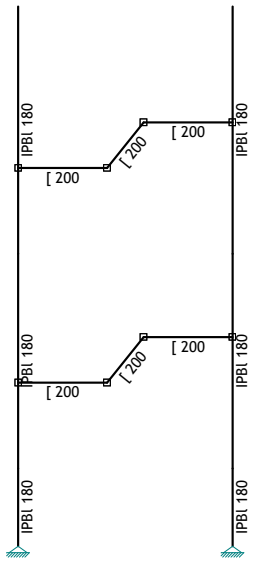
Izometrija



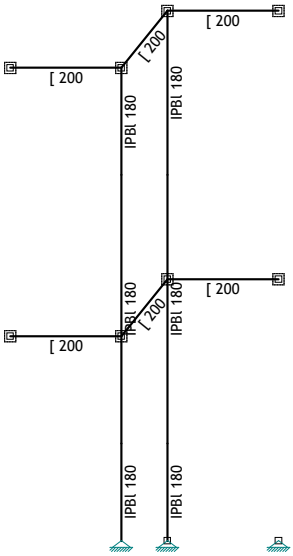
Nivo: [0.00 m]



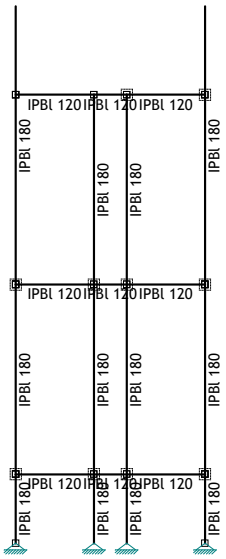
Dispozicija okvirjev



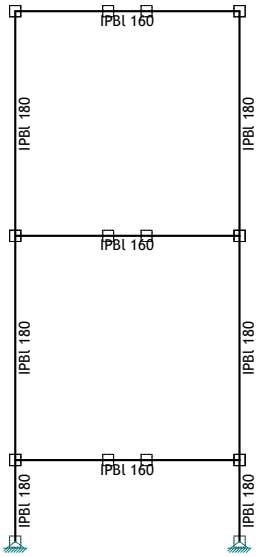
Okvir: H_3



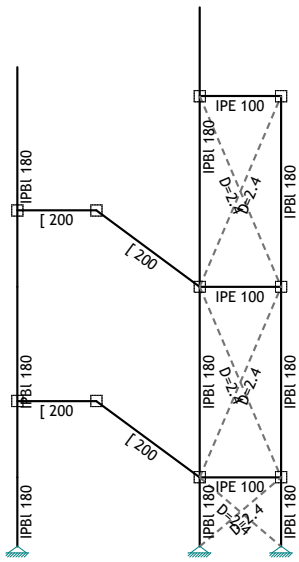
Okvir: H_4



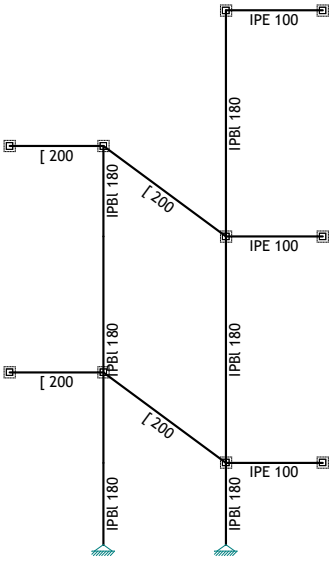
Okvir: H_1



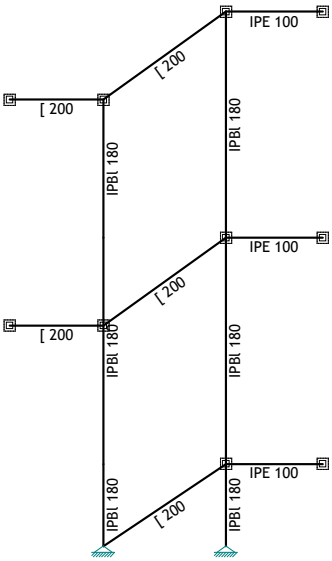
Okvir: H_2



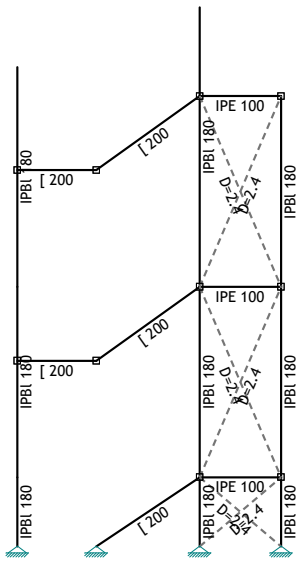
Okvir: V_4



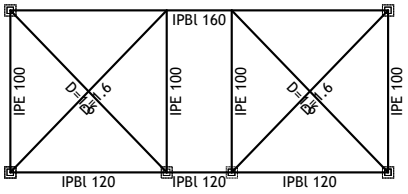
Okvir: V_3



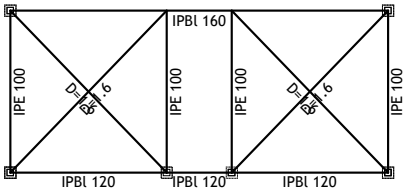
Okvir: V_2



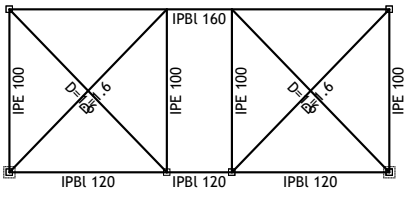
Okvir: V_1



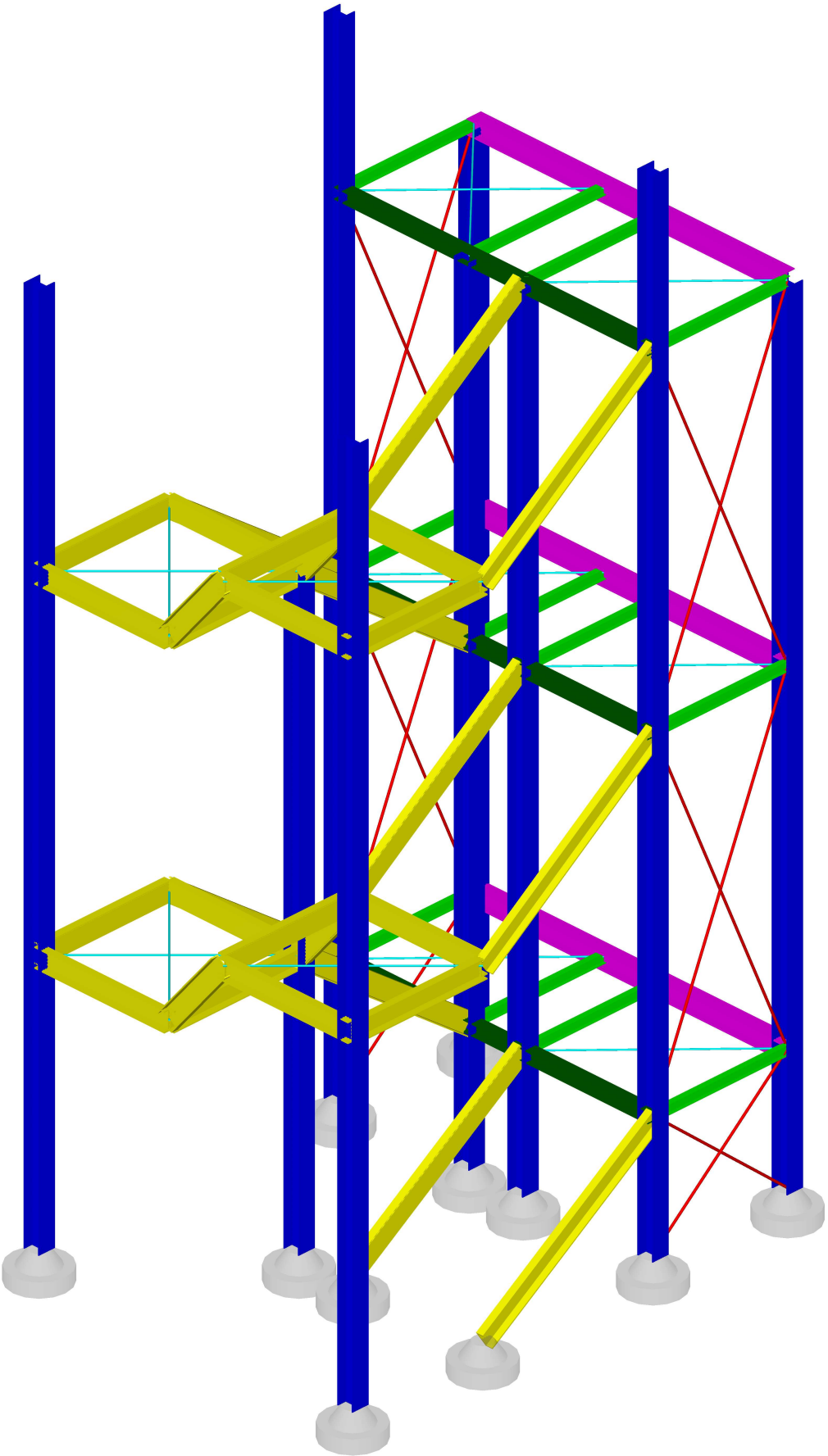
Pogled: Level_1



Pogled: Level_2



Pogled: Level_3



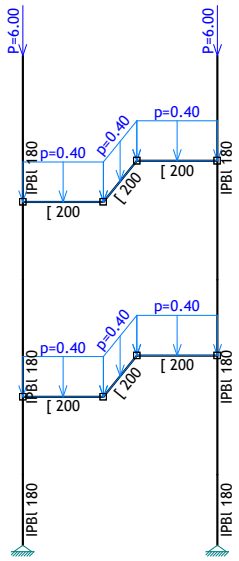
Seti numeričnih podatkov
Greda (1-9)

Vhodni podatki - Obtežba

Lista obtežnih primerov

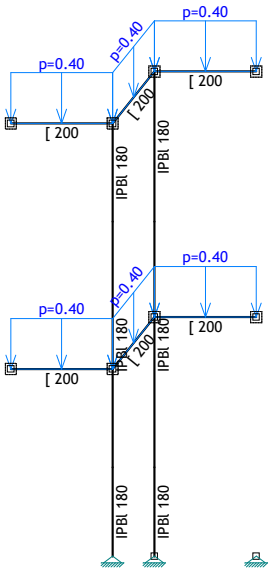
LC	Naziv	LC	Naziv
1	Lastna teža (g)	10	Komb.: I+1.5xIII
2	Koristna teža	11	Komb.: I+1.5xII
3	Sneg	12	Komb.: 1.35xI
4	Komb.: 1.35xI+1.05xII+1.5xIII	13	Komb.: I
5	Komb.: 1.35xI+1.5xII+0.75xIII	14	Komb.: I+0.7xII+III
6	Komb.: I+1.05xII+1.5xIII	15	Komb.: I+II+0.5xIII
7	Komb.: I+1.5xII+0.75xIII	16	Komb.: I+III
8	Komb.: 1.35xI+1.5xIII	17	Komb.: I+II
9	Komb.: 1.35xI+1.5xII	18	Komb.: I

Obt. 1: Lastna teža (g)



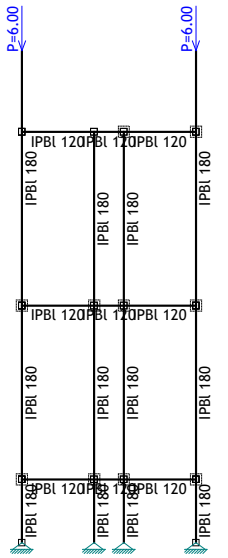
Okvir: H_3

Obt. 1: Lastna teža (g)



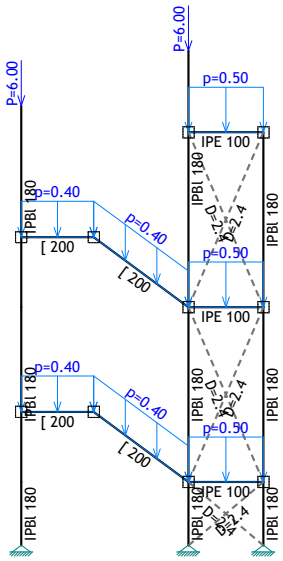
Okvir: H_4

Obt. 1: Lastna teža (g)



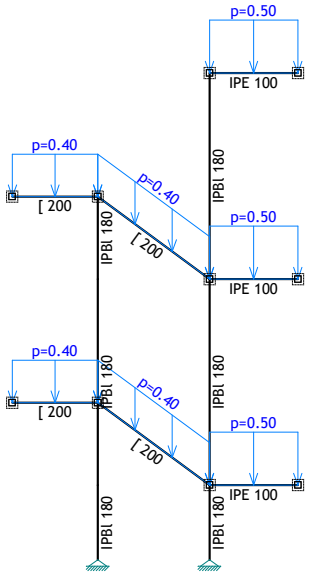
Okvir: H_1

Obt. 1: Lastna teža (g)



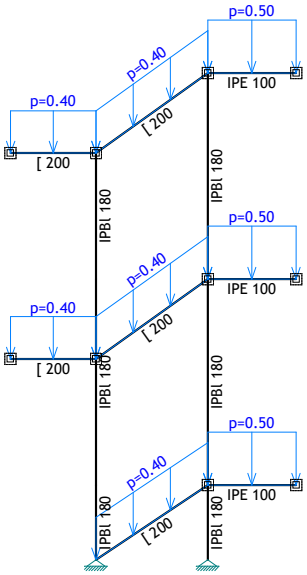
Okvir: V_4

Obt. 1: Lastna teža (g)



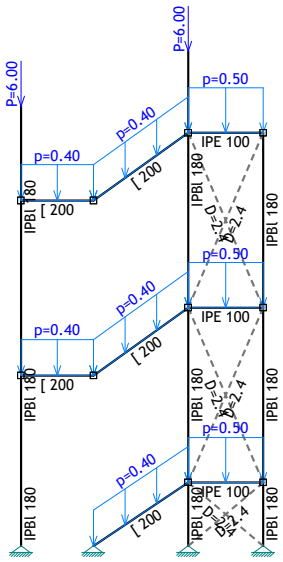
Okvir: V_3

Obt. 1: Lastna teža (g)



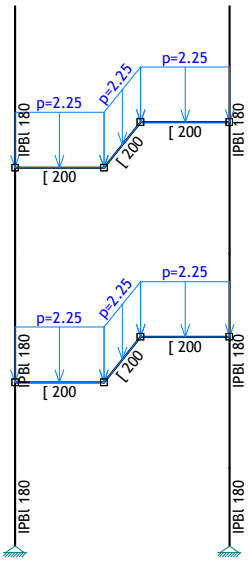
Okvir: V_2

Obt. 1: Lastna teža (g)



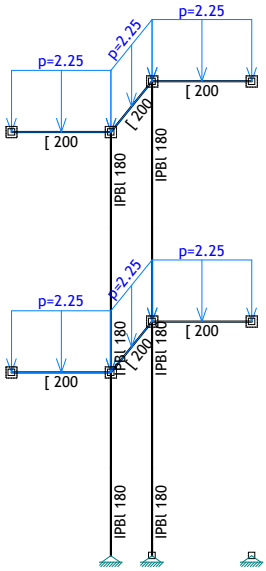
Okvir: V_1

Obt. 2: Koristna teža



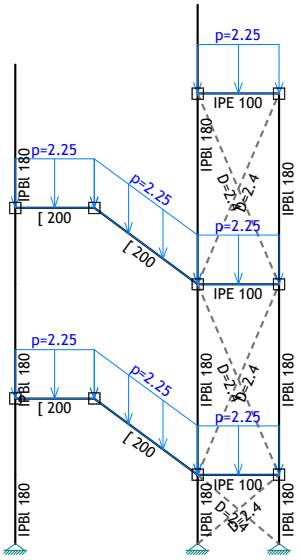
Okvir: H_3

Obt. 2: Koristna teža



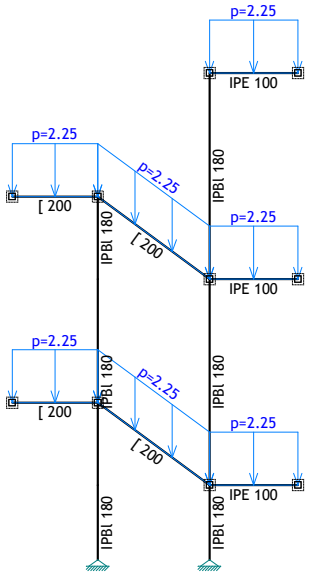
Okvir: H_4

Obt. 2: Koristna teža



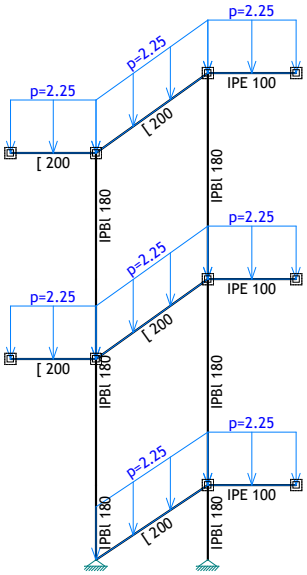
Okvir: V_4

Obt. 2: Koristna teža



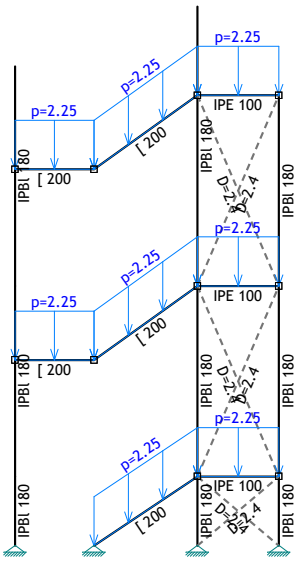
Okvir: V_3

Obt. 2: Koristna teža



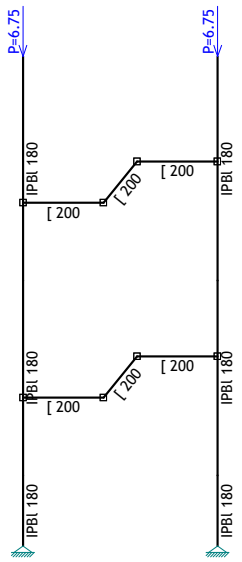
Okvir: V_2

Obt. 2: Koristna teža



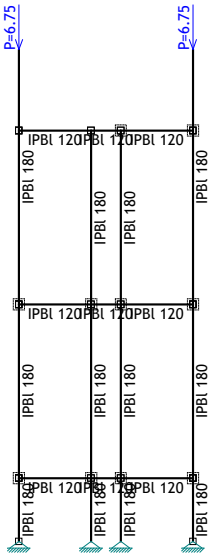
Okvir: V_1

Obt. 3: Sneg

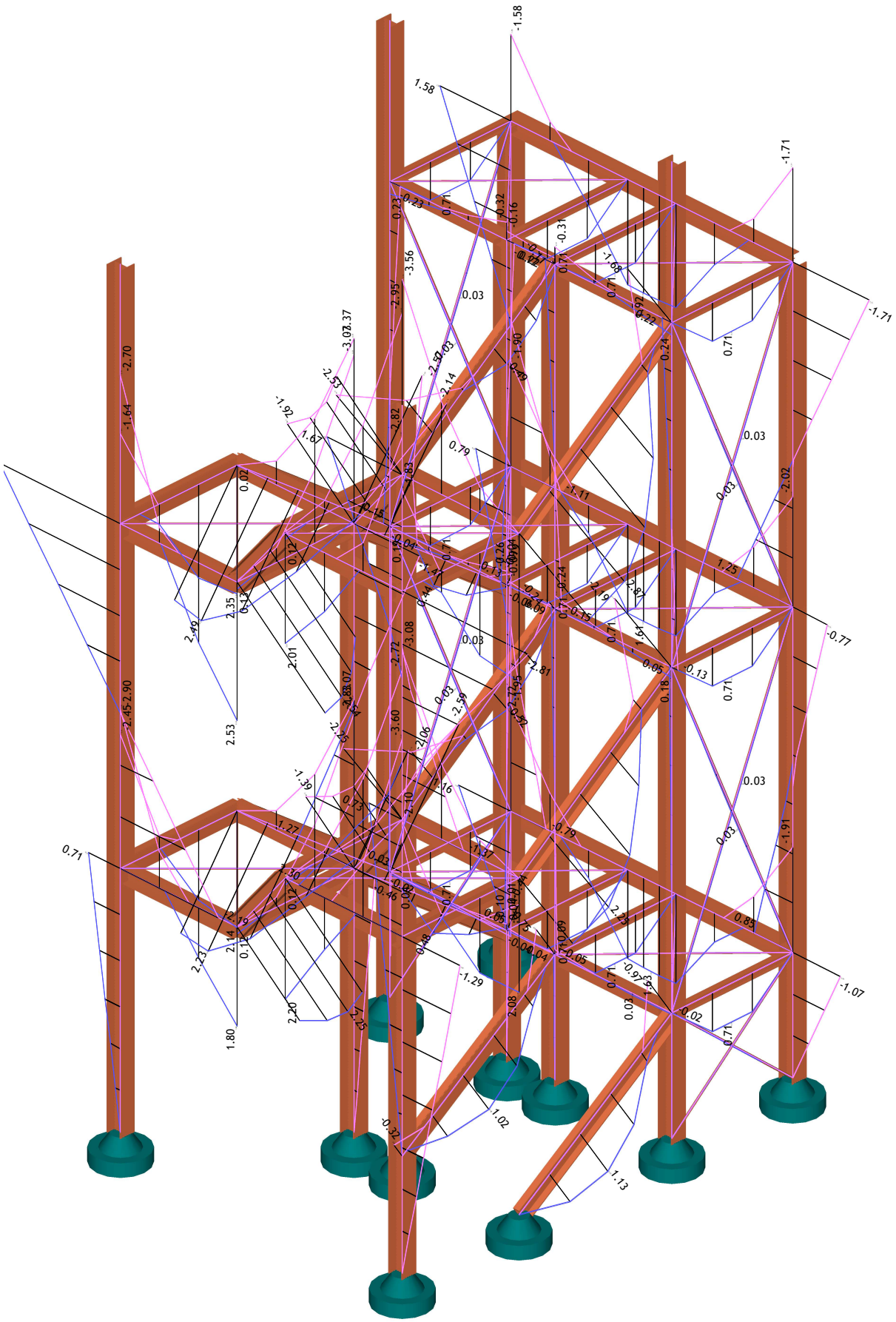


Okvir: H_3

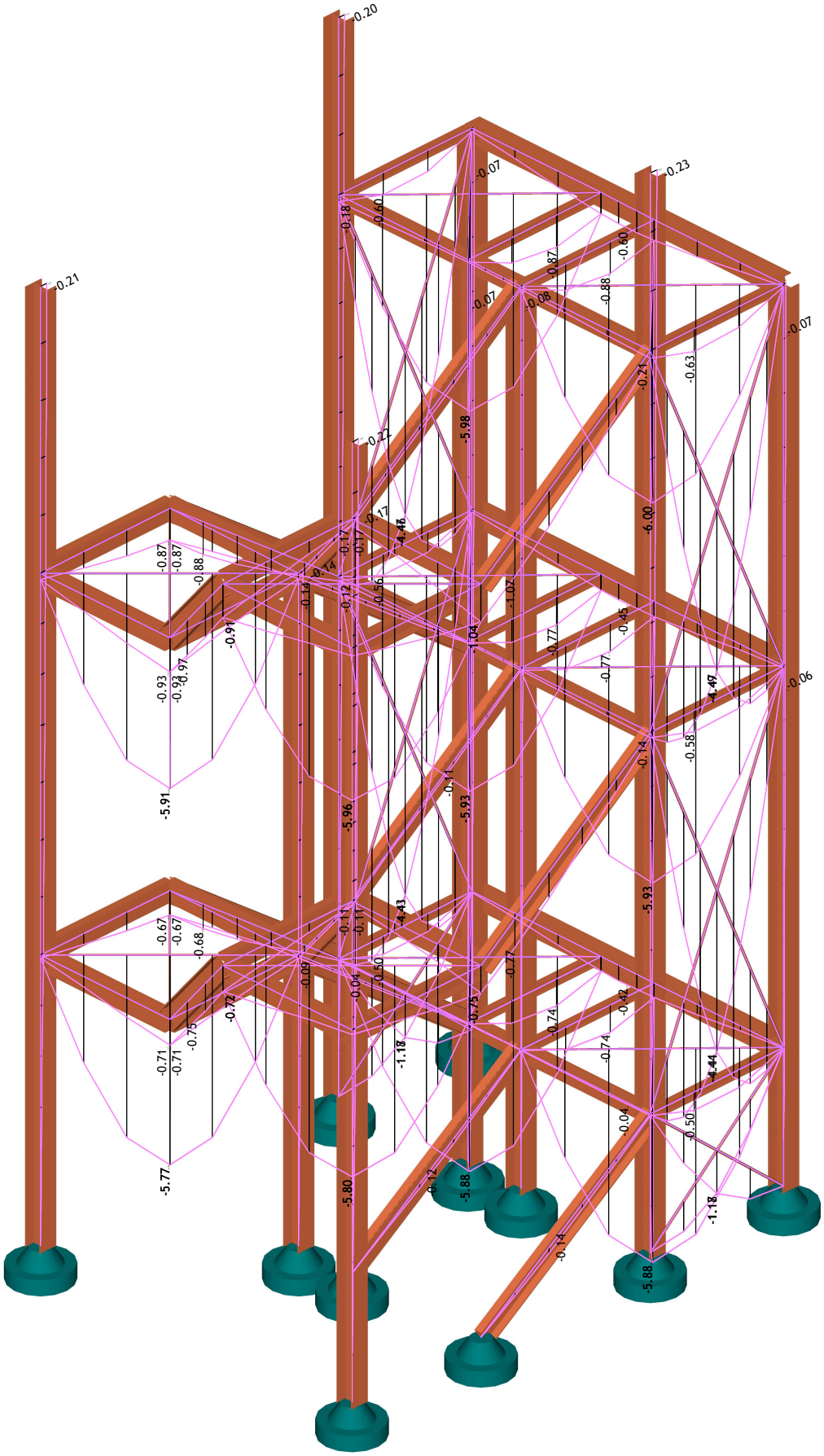
Obt. 3: Sneg



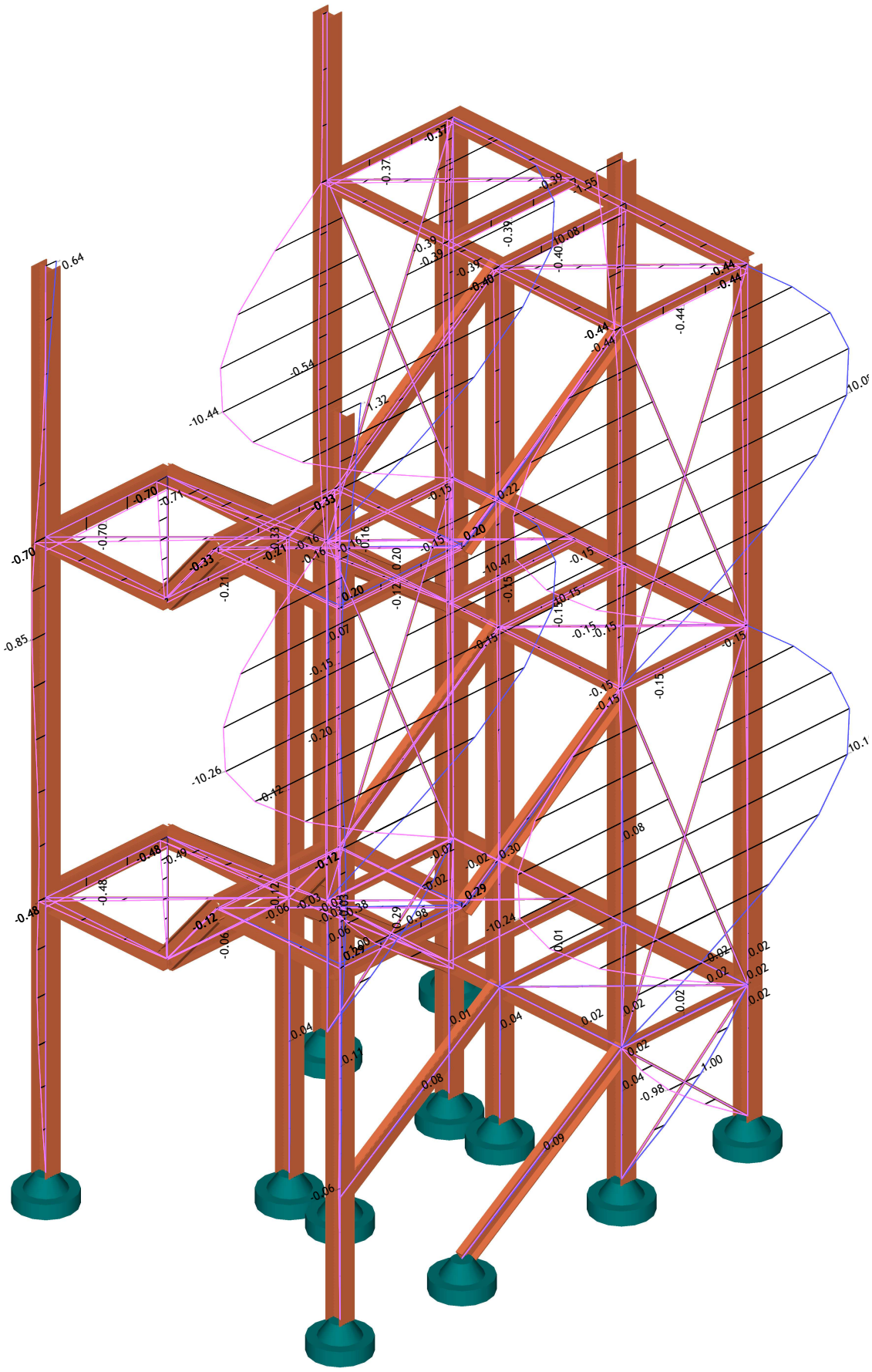
Okvir: H_1



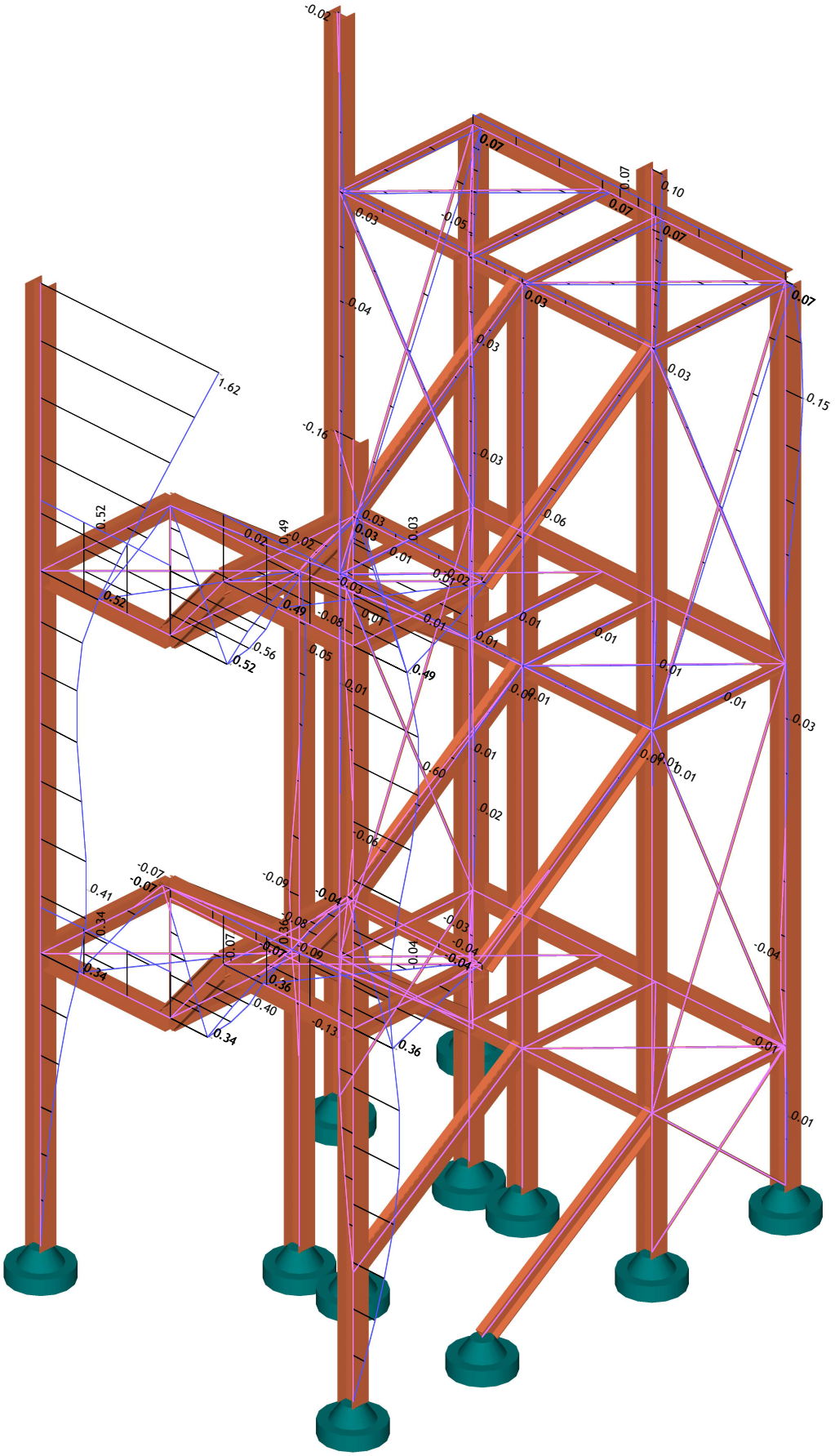
Izometrija
Vplivi v gredi: max M3= 2.87 / min M3= -3.60 kNm



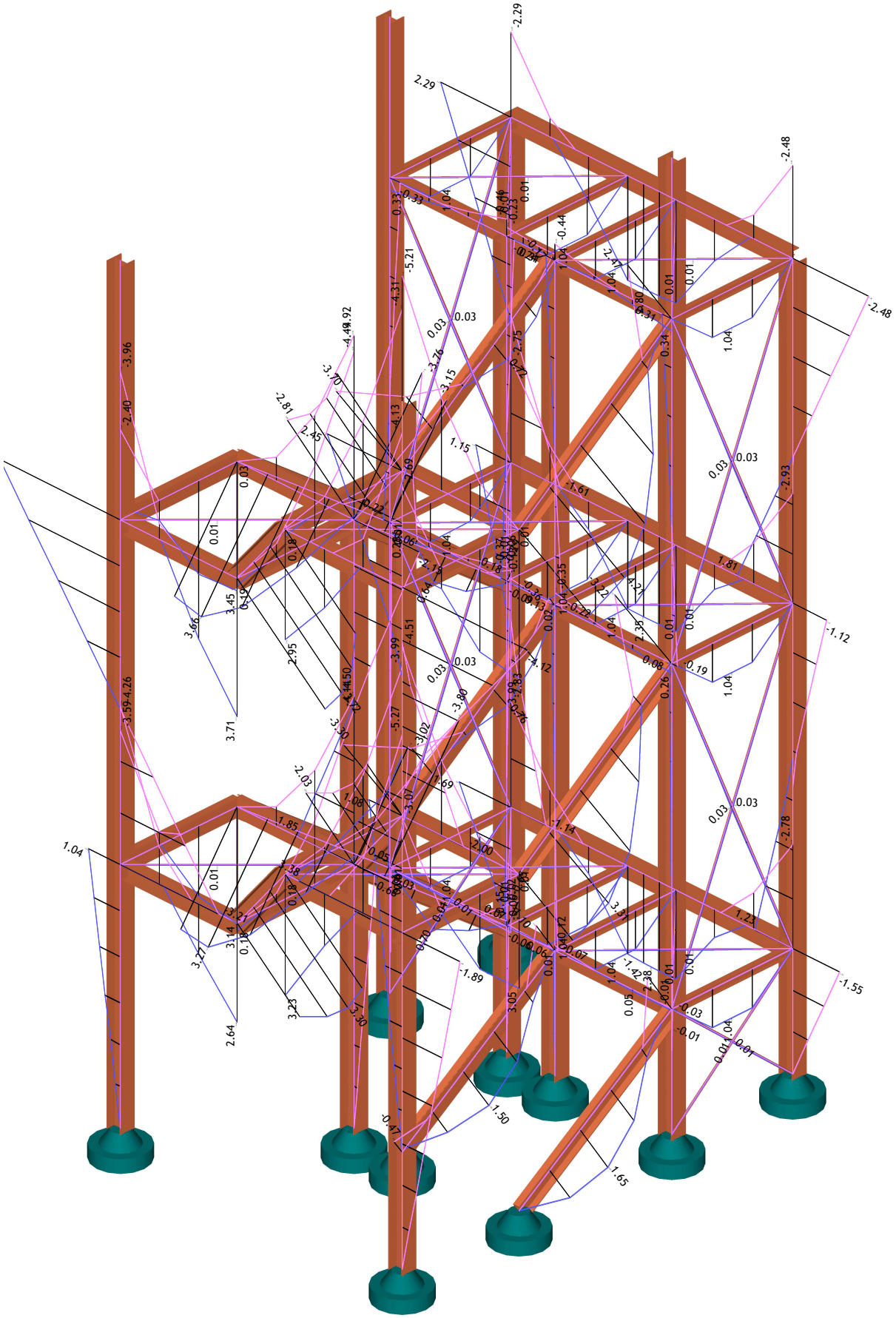
Izometrija
Vplivi v gredi: max Zp= -0.00 / min Zp= -6.00 m / 1000



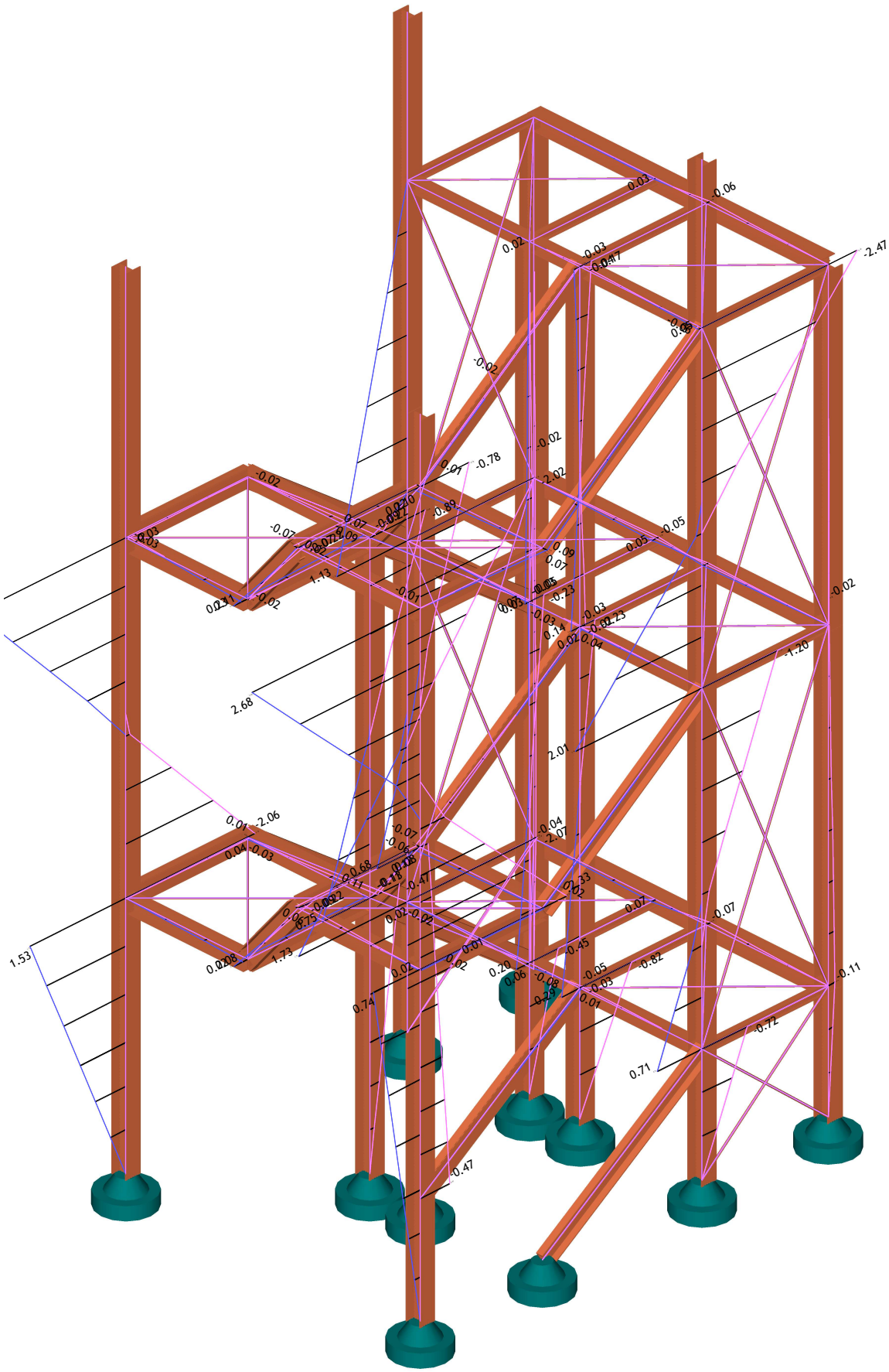
Izometrija
Vplivi v gredi: max Yp= 10.16 / min Yp= -10.47 m / 1000



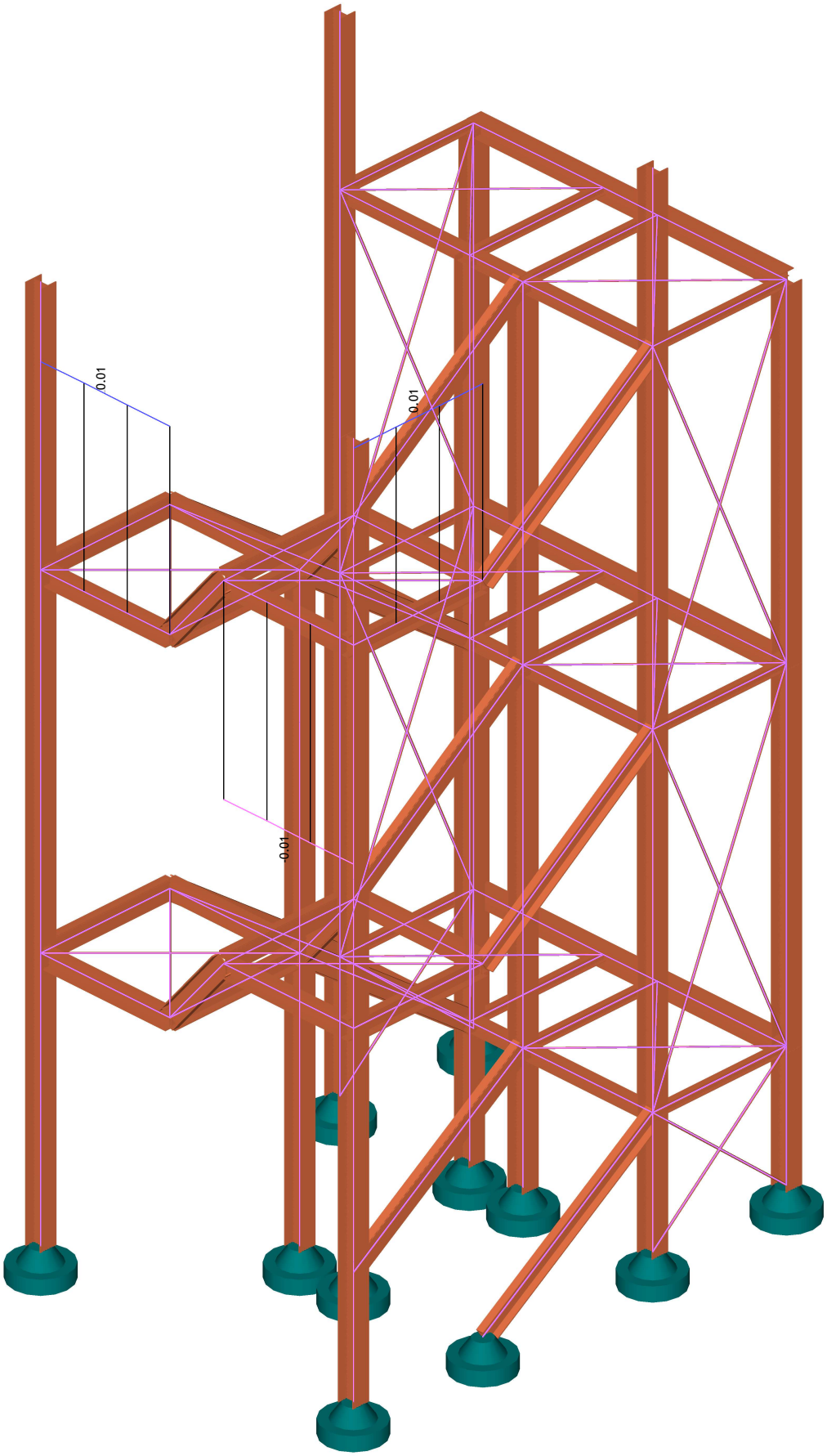
Izometrija
Vplivi v gredi: max Xp= 1.62 / min Xp= -0.16 m / 1000



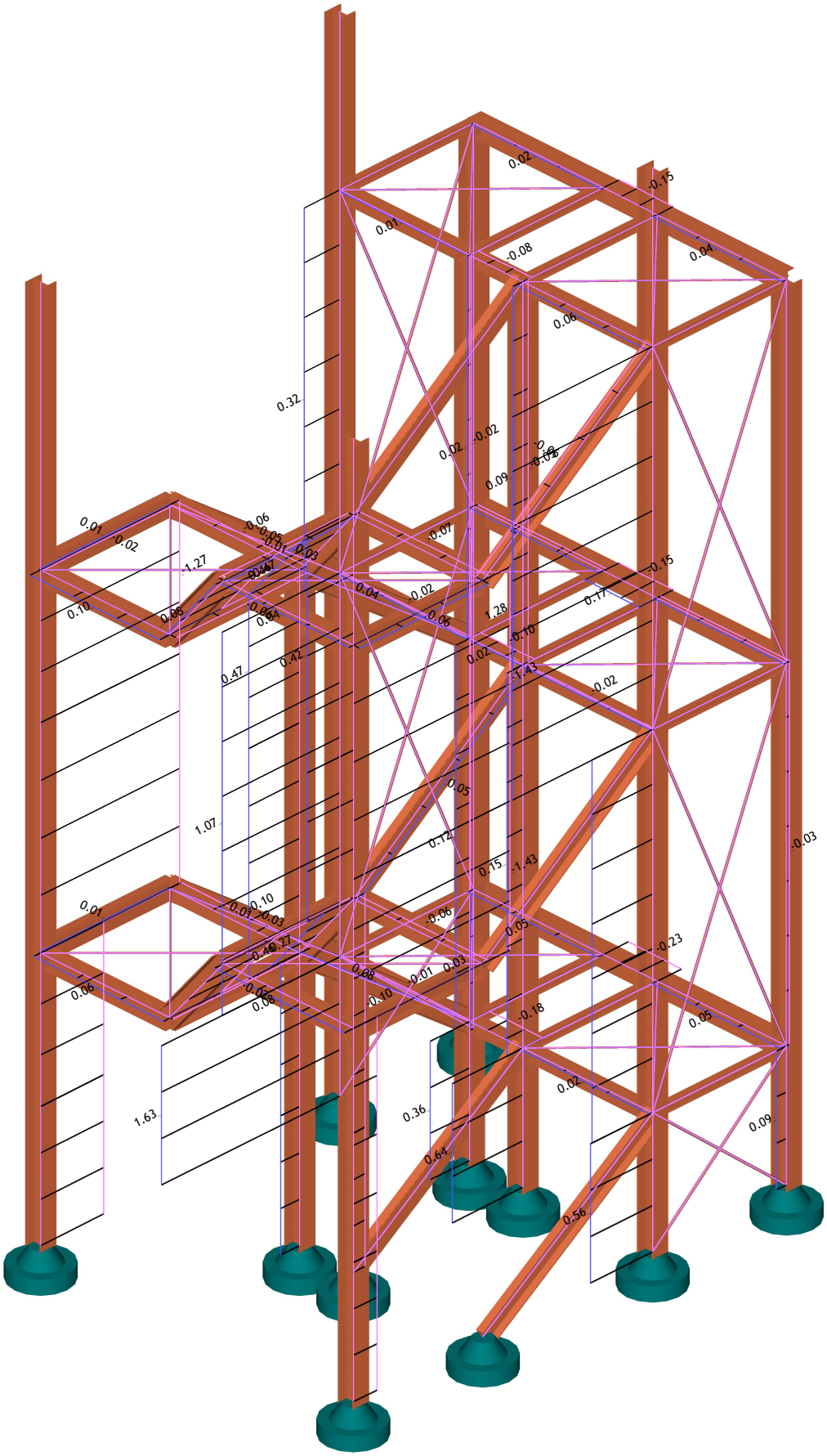
Izometrija
Vplivi v gredi: max M3= 4.21 / min M3= -5.27 kNm



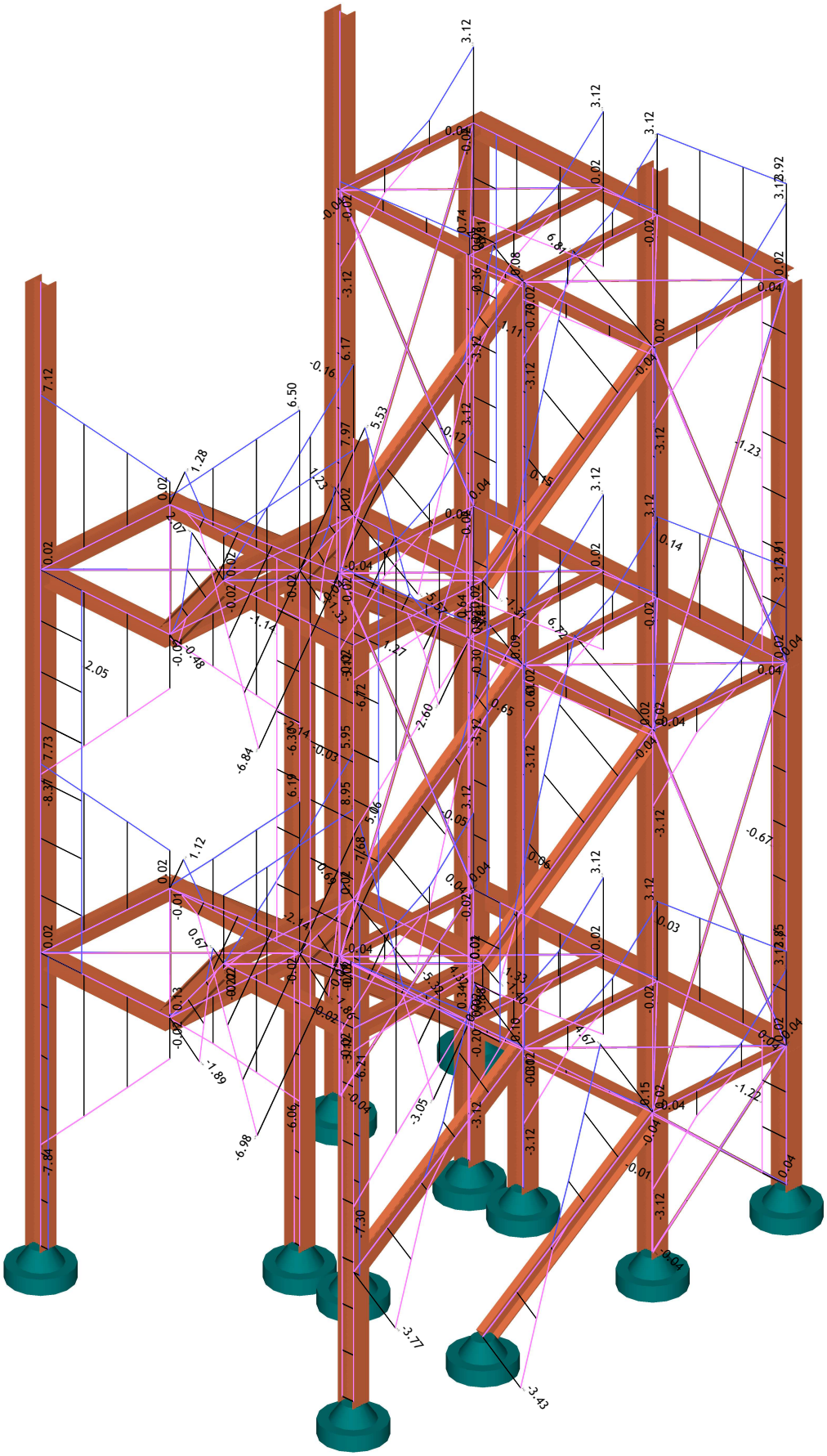
Izometrija
Vplivi v gredi: max M2= 2.68 / min M2= -2.47 kNm



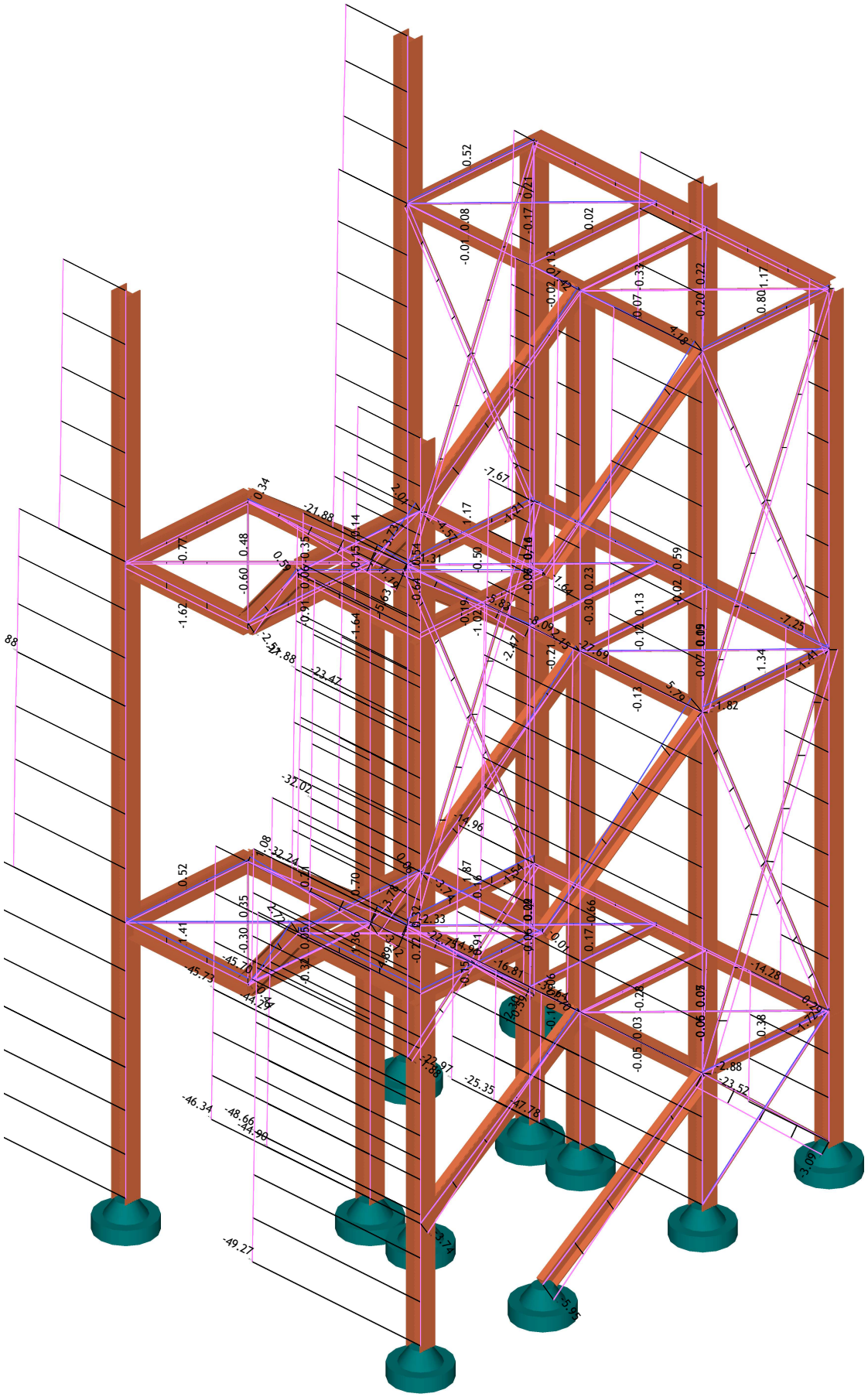
Izometrija
Vplivi v gredi: max M1= 0.01 / min M1= -0.01 kNm



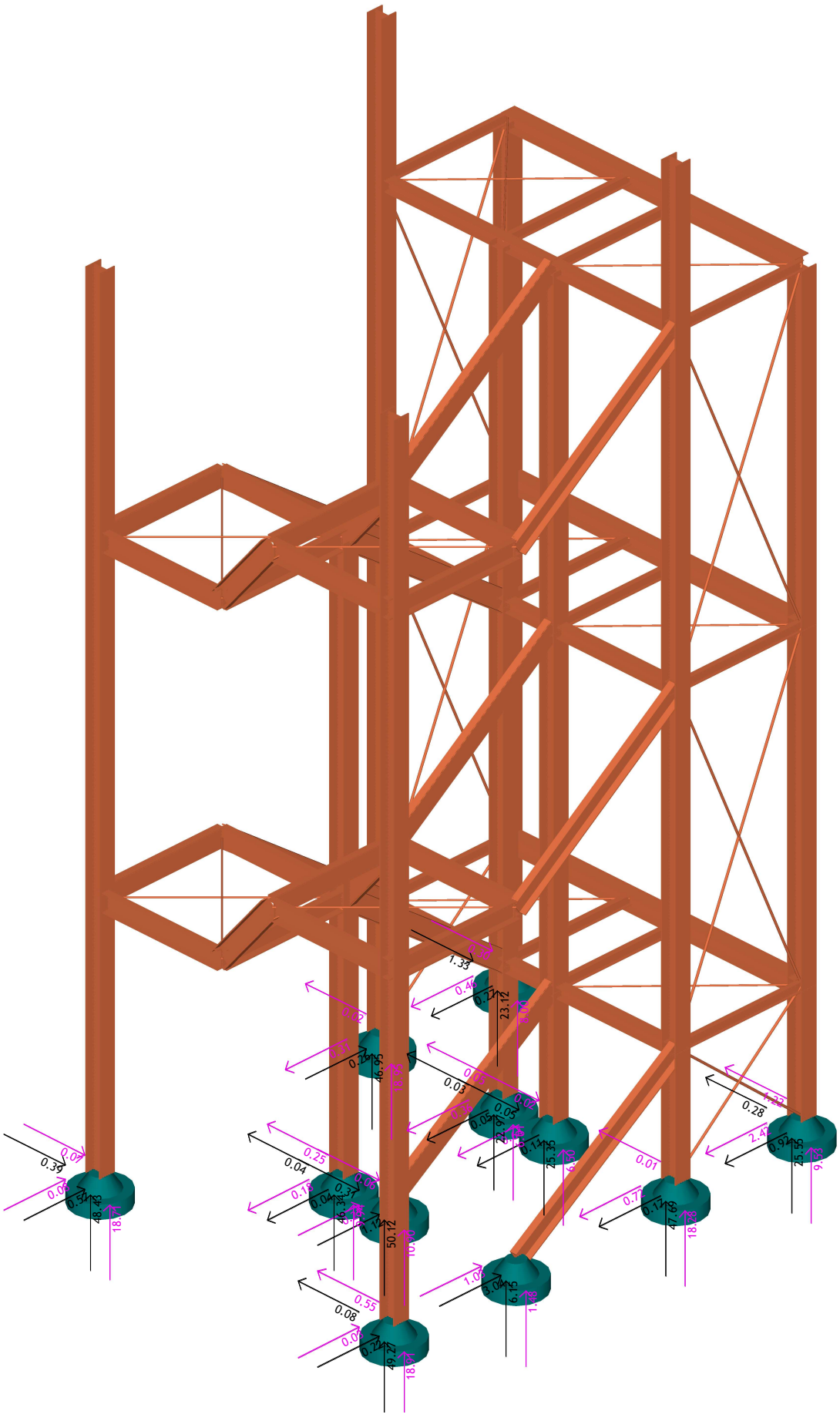
Izometrija
Vplivi v gredi: max T3= 1.63 / min T3= -1.43 kN



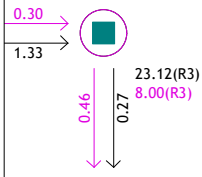
Izometrija
Vplivi v gredi: max T2= 8.95 / min T2= -8.37 kN

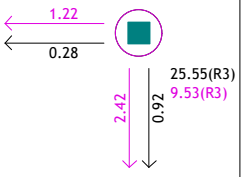


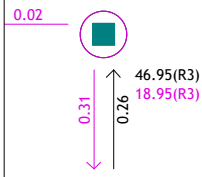
Izometrija
Vplivi v gredi: max N1= 5.79 / min N1= -49.27 kN

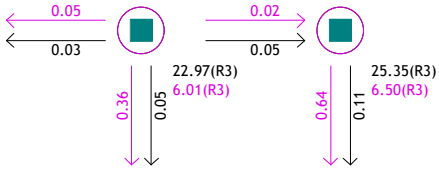


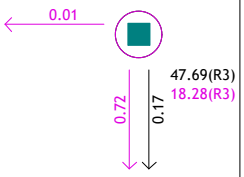
Izometrija
Reakcije podpor

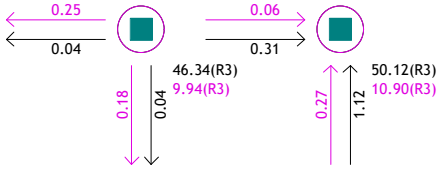


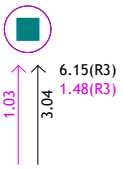


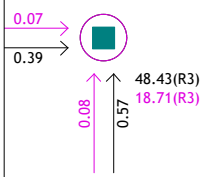


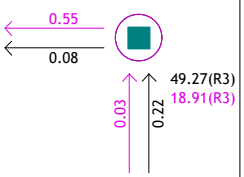












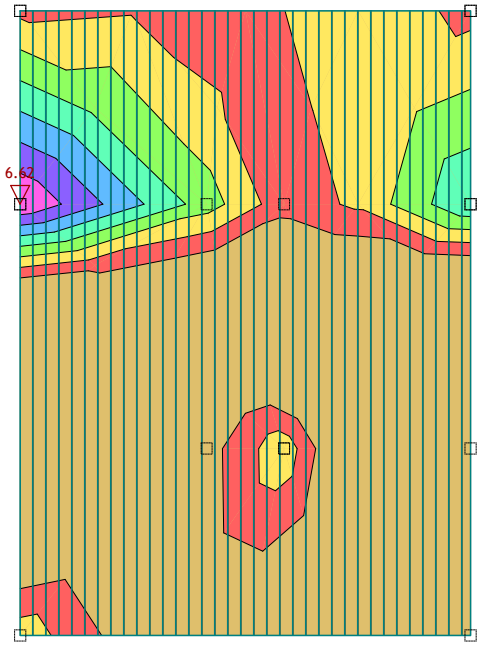
Nivo: [0.00 m]
Reakcije podpor (Min/Max)

Obt. 19: [MSN] 4-12



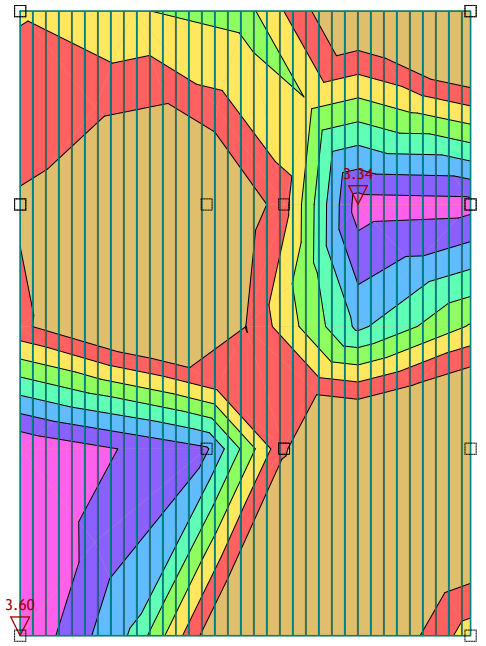
Nivo: [0.00 m]
Vplivi v plošči: max Mx= 6.99 / min Mx= 0.00 kNm/m

Obt. 19: [MSN] 4-12



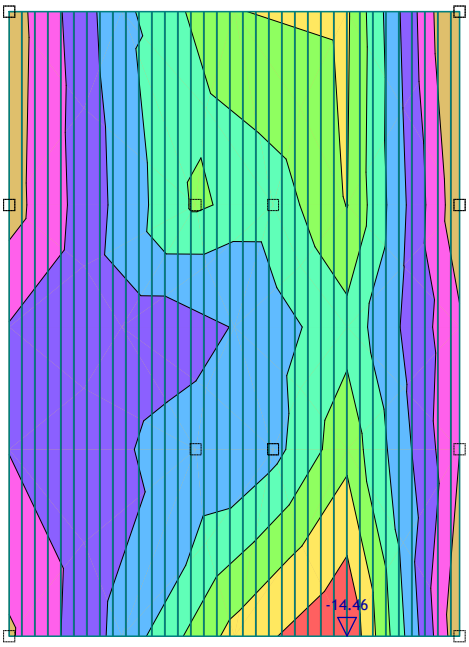
Nivo: [0.00 m]
Vplivi v plošči: max My= 6.62 / min My= 0.00 kNm/m

Obt. 19: [MSN] 4-12



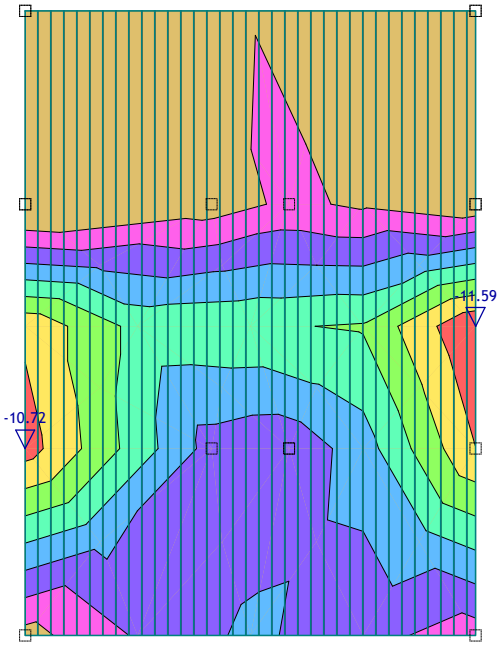
Nivo: [0.00 m]
Vplivi v plošči: max Mxy= 3.60 / min Mxy= 0.00 kNm/m

Obt. 19: [MSN] 4-12



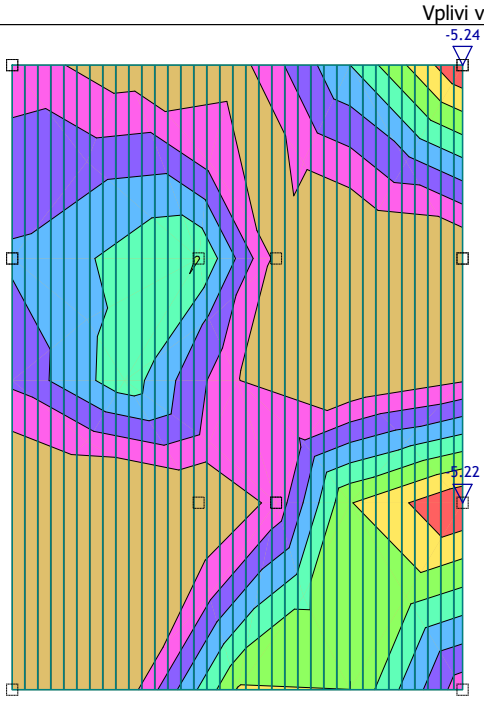
Nivo: [0.00 m]
Vplivi v plošči: max Mx= 0.00 / min Mx= -14.46 kNm/m

Obt. 19: [MSN] 4-12



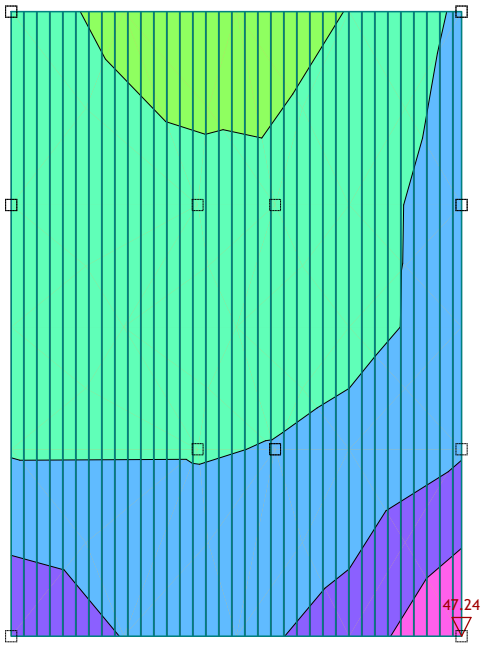
Nivo: [0.00 m]
Vplivi v plošči: max My= 0.00 / min My= -11.59 kNm/m

Obt. 19: [MSN] 4-12



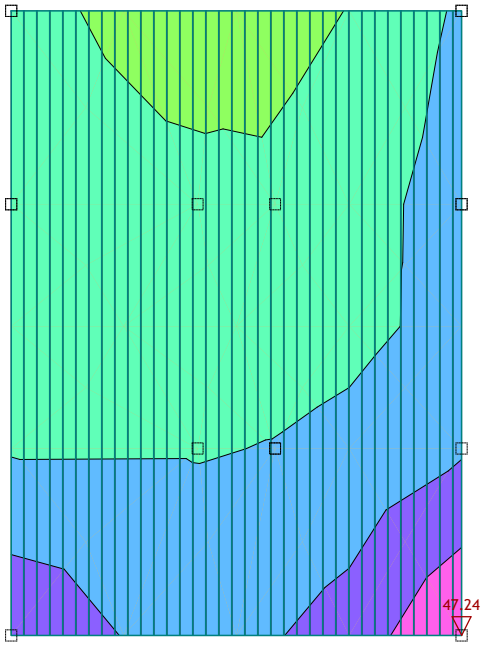
Nivo: [0.00 m]
Vplivi v plošči: max Mxy= 0.00 / min Mxy= -5.24 kNm/m

Obt. 19: [MSN] 4-12



Nivo: [0.00 m]
Vplivi v pov.podpori: max σ,tal= 47.24 / min σ,tal= 11.61 kN/m²

Obt. 19: [MSN] 4-12



Nivo: [0.00 m]
Vplivi v pov.podpori: max σ,tal= 47.24 / min σ,tal= 11.61 kN/m²

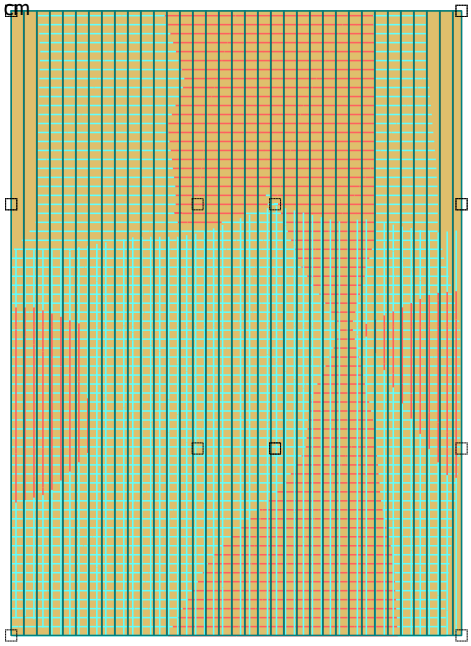
Dimenzioniranje (beton)

Merodajna obtežba: Kompletna shema
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=4.00 cm

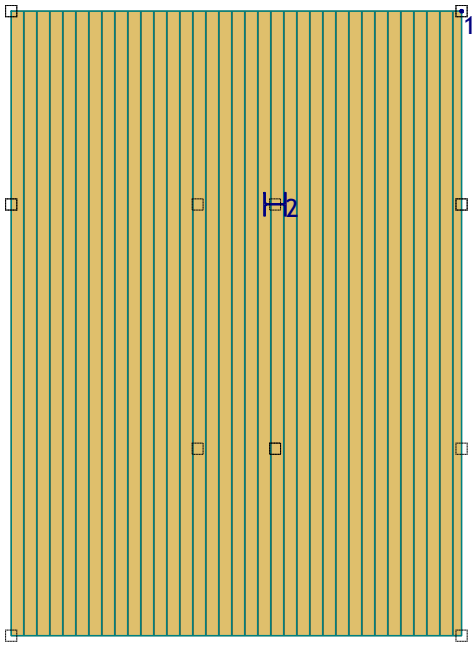


Nivo: [0.00 m]
Aa - sp.cona - max Aa,s= 0.62 cm²/m

Merodajna obtežba: Kompletna shema
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=4.00 cm

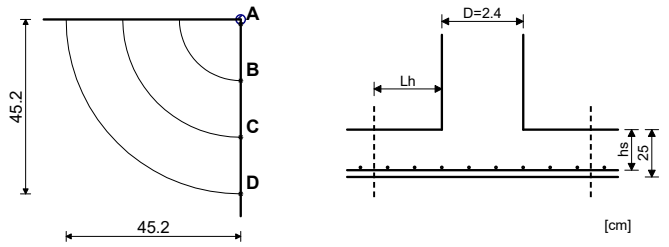


Nivo: [0.00 m]
Aa - zg.cona - max Aa,z= -1.61 cm²/m



Nivo: [0.00 m]
Kontrola plošč na preboj - dispozicija

Kontrola plošče proti preboju
EC2 (EN 1992-1-1:2004)
Nivo: [0.00 m]
Prerez 1 (3.50,4.85,0.00)
C25/30



KONTROLA PREREZA OB ROBU STEBRA

Merodajna kombinacija:
1.35xI+1.50xII+0.75xIII

Merodajna strižna napetost (točka A)	ved =	0.110 MPa
Debelina plošče	d,pl =	0.250 m
Statična višina plošče	hs =	0.220 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.11 <= 3.60)
Pogoj je izpolnjen.

KONTROLA PREREZA 1. (Lh = 0.15m od roba stebra)

Merodajna kombinacija:
1.35xI+1.50xII+0.75xIII

Merodajna strižna napetost (točka B)	ved =	0.108 MPa
Debelina plošče	d,pl =	0.250 m
Statična višina plošče	hs =	0.220 m
Obseg prereza	u =	0.249 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.11 <= 3.60)
Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.478
Normalna napetost v betonu	σcp =	0.003 MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.	vRd,c =	1.433 MPa

Pogoj: ved <= vRd,c (0.11 <= 1.43)
Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA PREREZA 2. (Lh = 0.29m od roba stebra)

Merodajna kombinacija:
1.35xI+1.50xII+0.75xIII

Merodajna strižna napetost (točka C)	ved =	0.105 MPa
Debelina plošče	d,pl =	0.250 m
Statična višina plošče	hs =	0.220 m
Obseg prereza	u =	0.480 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.11 <= 3.60)
Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100

Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.478
Normalna napetost v betonu	σcp =	0.001 MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.		
	vRd,c =	0.717 MPa

Pogoj: ved <= vRd,c (0.11 <= 0.72)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA KRITIČNEGA PREREZA 3. (Lh = 0.44m od roba stebra)

Merodajna kombinacija:
1.35xI+1.50xII+0.75xIII

Merodajna strižna napetost (točka D)	ved =	0.103 MPa
Debelina plošče	d,pl =	0.250 m
Statična višina plošče	hs =	0.220 m
Obseg kritičnega prereza	u1 =	0.710 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.10 <= 3.60)

Pogoj je izpolnjen.

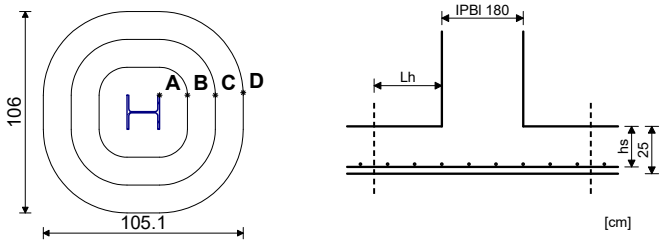
Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.478
Normalna napetost v betonu	σcp =	-0.000 MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.		
	vRd,c =	0.478 MPa

Pogoj: ved <= vRd,c (0.10 <= 0.48)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

Kontrola plošče proti preboju

EC2 (EN 1992-1-1:2004)
Nivo: [0.00 m]
Prerez 2 (2.05,3.35,0.00)
C25/30



KONTROLA PREREZA OB ROBU STEBRA

Merodajna kombinacija:
1.35xI+1.50xII+0.75xIII

Merodajna strižna napetost (točka A)	ved =	0.024 MPa
Debelina plošče	d,pl =	0.250 m
Statična višina plošče	hs =	0.220 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.02 <= 3.60)

Pogoj je izpolnjen.

KONTROLA PREREZA 1. (Lh = 0.15m od roba stebra)

Merodajna kombinacija:
1.35xI+1.50xII+0.75xIII

Merodajna strižna napetost (točka B)	ved =	0.030 MPa
Debelina plošče	d,pl =	0.250 m
Statična višina plošče	hs =	0.220 m
Obseg prereza	u =	1.624 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540

Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.03 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.478
Normalna napetost v betonu	σcp =	0.001 MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.		
	vRd,c =	1.433 MPa

Pogoj: ved <= vRd,c (0.03 <= 1.43)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA PREREZA 2. (Lh = 0.29m od roba stebra)

Merodajna kombinacija:
1.35xI+1.50xII+0.75xIII

Merodajna strižna napetost (točka C)	ved =	0.036 MPa
Debelina plošče	d,pl =	0.250 m
Statična višina plošče	hs =	0.220 m
Obseg prereza	u =	2.545 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.04 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.478
Normalna napetost v betonu	σcp =	0.000 MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.		
	vRd,c =	0.717 MPa

Pogoj: ved <= vRd,c (0.04 <= 0.72)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA KRITIČNEGA PREREZA 3. (Lh = 0.44m od roba stebra)

Merodajna kombinacija:
1.35xI+1.50xII+0.75xIII

Merodajna strižna napetost (točka D)	ved =	0.042 MPa
Debelina plošče	d,pl =	0.250 m
Statična višina plošče	hs =	0.220 m
Obseg kritičnega prereza	u1 =	3.467 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.04 <= 3.60)

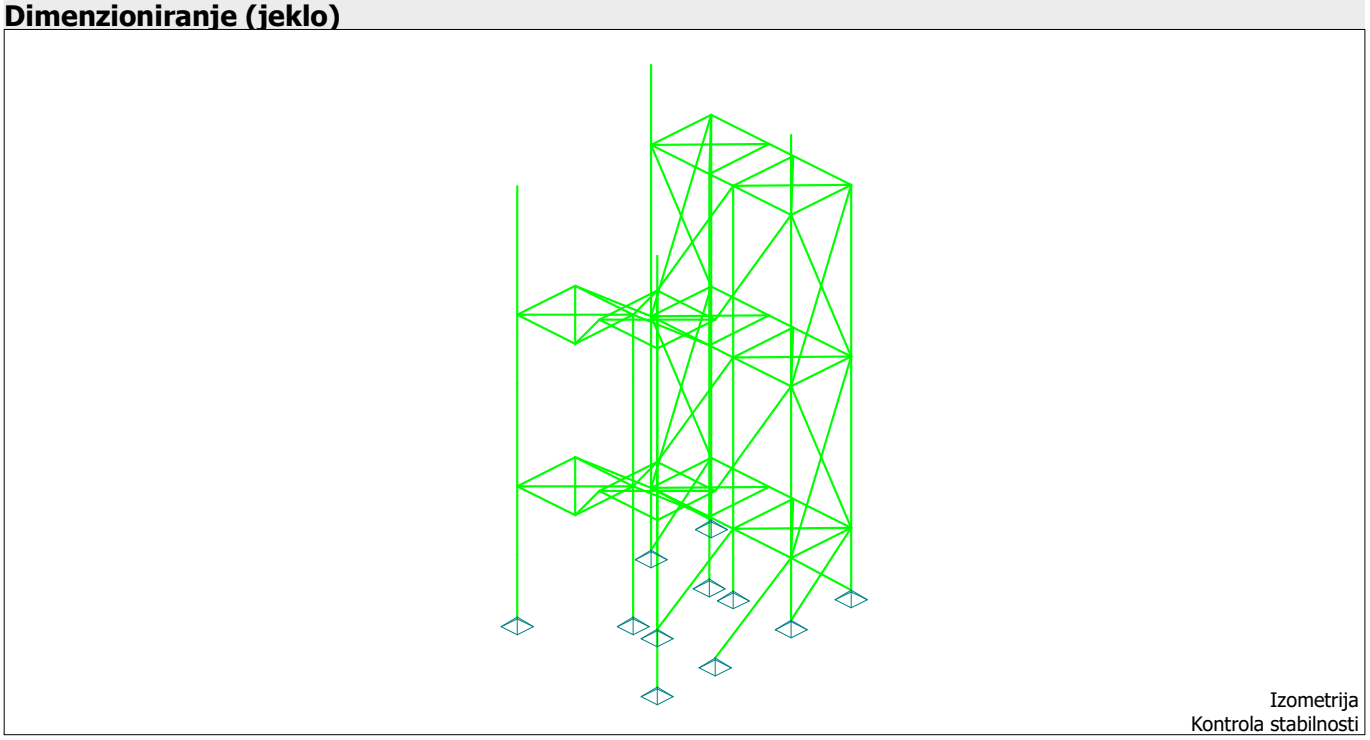
Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.478
Normalna napetost v betonu	σcp =	0.000 MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.		
	vRd,c =	0.478 MPa

Pogoj: ved <= vRd,c (0.04 <= 0.48)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

Dimenzioniranje (jeklo)



Izometrija
Kontrola stabilnosti

Kontrola napetosti - EUROCODE 3 (ENV)

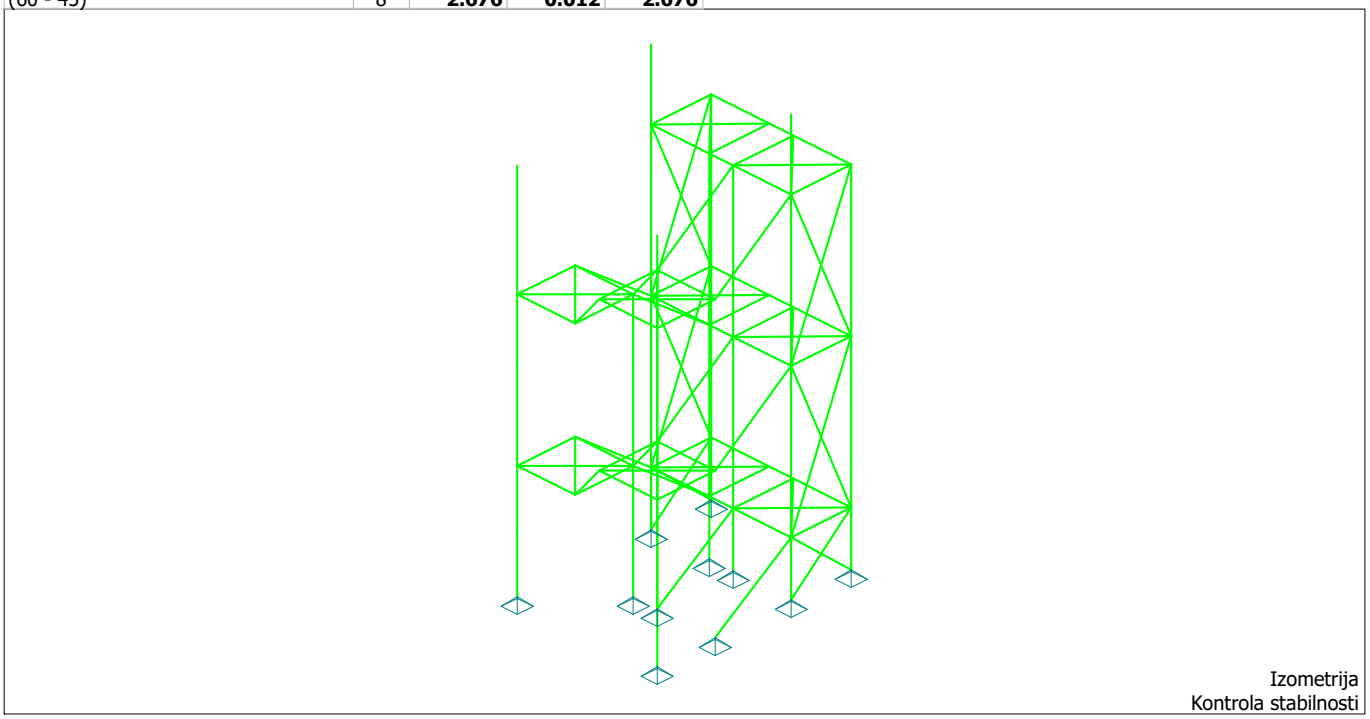
Opis	LC	σ [kN/cm²]	τ [kN/cm²]	σu [kN/cm²]
Set 1: [200				
(20 - 30)	9	**2.735**	**0.544**	**2.893**
(33 - 45)	9	**2.595**	**0.155**	**2.597**
(8 - 20)	9	**2.324**	**0.143**	**2.328**
(3 - 8)	9	**2.153**	**0.476**	**2.306**
(25 - 33)	9	**2.180**	**0.511**	**2.302**
(45 - 54)	9	**2.125**	**0.483**	**2.284**
(60 - 69)	5	**2.257**	0.412	**2.257**
	9	2.257	**0.414**	2.257
(12 - 10)	9	**2.112**	**0.421**	**2.234**
(54 - 60)	9	**2.182**	**0.466**	**2.188**
(10 - 3)	9	**1.799**	**0.466**	**1.971**
(43 - 56)	9	**1.777**	**0.405**	**1.911**
(36 - 34)	9	**1.871**	**0.412**	**1.875**
(30 - 43)	5	**1.632**	0.440	**1.801**
	9	1.624	**0.440**	1.794
(34 - 25)	9	**1.769**	**0.430**	**1.772**
(18 - 37)	5	**0.898**	0.280	**0.900**
	9	0.887	**0.281**	0.889
Set 2: [200				
(52 - 60)	5	**2.945**	**0.409**	**3.029**
(34 - 46)	5	**2.757**	**0.395**	**2.841**
(10 - 21)	5	**2.641**	**0.379**	**2.721**
(46 - 33)	5	**2.594**	**0.382**	**2.677**
(28 - 43)	5	**2.505**	**0.377**	**2.589**
(45 - 52)	5	**2.315**	0.372	**2.403**
	9	2.252	**0.372**	2.343
(21 - 8)	5	**2.268**	**0.365**	**2.354**
(20 - 28)	5	**2.219**	**0.359**	**2.305**
(47 - 46)	5	**2.064**	**0.335**	**2.144**
(46 - 52)	5	**2.117**	**0.108**	**2.125**
(52 - 67)	5	**1.989**	**0.336**	**2.072**
(28 - 51)	5	**1.840**	**0.323**	**1.923**
(22 - 21)	5	**1.777**	**0.309**	**1.856**
(21 - 28)	5	**1.392**	**0.129**	**1.410**
(6 - 26)	5	**0.778**	0.260	**0.778**
	9	0.777	**0.261**	0.778
Set 3: IPBl 180				
(61 - 41)	5	**4.663**	0.189	**4.674**
	9	4.540	**0.190**	4.552
(44 - 13)	5	**4.327**	0.178	**4.338**
	9	4.223	**0.179**	4.235
(41 - 15)	5	**4.108**	0.189	**4.121**
	9	3.980	**0.190**	3.993
(13 - 2)	5	**3.796**	0.178	**3.808**
	9	3.685	**0.179**	3.698
(12 - 5)	5	**3.018**	**0.049**	**3.019**
(73 - 56)	5	**2.987**	**0.045**	**2.988**
(36 - 12)	5	**2.628**	**0.033**	**2.629**
(52 - 40)	5	**2.081**	**0.100**	**2.088**
(46 - 35)	5	**2.064**	**0.093**	**2.070**
(56 - 37)	5	**2.026**	**0.018**	**2.027**
(2 - 1)	5	**1.930**	**0.044**	**1.931**
(40 - 14)	5	**1.864**	**0.100**	**1.872**
(35 - 11)	5	**1.864**	**0.093**	**1.870**
(37 - 27)	5	**1.741**	**0.017**	**1.741**

Kontrola napetosti - EUROCODE 3 (ENV)

Opis	LC	σ [kN/cm²]	τ [kN/cm²]	σu [kN/cm²]
(15 - 7)	5	**1.582**	0.044	**1.584**
	9	1.473	**0.045**	1.475
(66 - 36)	5	**1.536**	**0.018**	**1.537**
(14 - 6)	5	**1.454**	**0.025**	**1.455**
(26 - 19)	5	**1.364**	**0.022**	**1.365**
(11 - 4)	5	**1.337**	**0.023**	**1.337**
(50 - 42)	5	**1.142**	**0.087**	**1.152**
(24 - 17)	5	**1.101**	**0.093**	**1.113**
(72 - 65)	9	**0.970**	**0.085**	**0.981**
(22 - 16)	5	0.947	**0.013**	0.948
	9	**0.950**	0.013	**0.950**
(64 - 49)	5	0.911	**0.077**	0.920
	9	**0.911**	0.077	**0.921**
(65 - 50)	5	**0.842**	**0.047**	**0.846**
(49 - 24)	5	**0.756**	0.045	**0.760**
	9	0.750	**0.045**	0.754
(51 - 26)	5	0.663	**0.008**	0.663
	9	**0.675**	0.008	**0.675**
(47 - 22)	5	0.531	**0.006**	0.531
	9	**0.545**	0.006	**0.545**
(67 - 51)	5	0.374	**0.012**	0.374
	9	**0.395**	0.011	**0.395**
(62 - 47)	8	0.180	**0.009**	0.180
	9	**0.228**	0.005	**0.228**
Set 4: IPBl 120				
(67 - 69)	4	**0.525**	0.111	**0.559**
	5	0.458	**0.111**	0.497
(57 - 62)	4	**0.466**	**0.088**	**0.490**
(36 - 47)	4	0.354	**0.076**	0.377
	5	**0.363**	0.069	**0.383**
(51 - 56)	4	0.339	**0.073**	0.362
	5	**0.352**	0.069	**0.372**
(62 - 67)	4	**0.248**	0.034	**0.255**
	9	0.204	**0.044**	0.218
(22 - 26)	5	**0.230**	0.032	**0.236**
	9	0.218	**0.033**	0.225
(26 - 37)	4	0.198	**0.037**	0.208
	5	**0.205**	0.037	**0.215**
(12 - 22)	4	**0.164**	**0.040**	**0.178**
(47 - 51)	4	**0.160**	0.029	**0.168**
	9	0.141	**0.036**	0.154
Set 5: IPBl 160				
(49 - 65)	9	**1.343**	**0.297**	**1.438**
(24 - 50)	5	**1.303**	**0.295**	**1.400**
(64 - 72)	5	**1.317**	**0.297**	**1.385**
Set 6: IPE 100				
(12 - 24)	5	**3.223**	**0.613**	**3.227**
(56 - 65)	5	**3.172**	**0.613**	**3.175**
(36 - 49)	5	**3.156**	**0.613**	**3.159**
(69 - 72)	5	**3.120**	**0.613**	**3.123**
(57 - 64)	5	**3.092**	**0.613**	**3.096**
(37 - 50)	5	**3.079**	**0.613**	**3.083**
(26 - 39)	5	**3.070**	**0.613**	**3.073**
(47 - 55)	9	**3.069**	**0.613**	**3.073**
(67 - 71)	5	**3.061**	**0.613**	**3.065**
(22 - 31)	5	**3.054**	**0.613**	**3.058**
(51 - 59)	9	**3.054**	**0.613**	**3.057**
(62 - 68)	5	**3.043**	**0.613**	**3.046**
Set 7: D=2.4				
(12 - 49)	5	**2.986**	**0.009**	**2.986**
(56 - 72)	5	**2.874**	**0.009**	**2.874**
(56 - 50)	4	**2.852**	**0.009**	**2.852**
(36 - 24)	4	**2.812**	**0.009**	**2.812**
(69 - 65)	8	**2.783**	**0.009**	**2.783**
(36 - 64)	5	**2.761**	**0.009**	**2.761**
(57 - 49)	8	**2.740**	**0.009**	**2.740**
(37 - 42)	5	**1.978**	**0.009**	**1.978**
(5 - 24)	5	**1.711**	**0.009**	**1.711**
(12 - 17)	4	**1.426**	**0.009**	**1.426**
(27 - 50)	12	**1.288**	**0.009**	**1.288**
(37 - 65)	5	**0.636**	0.000	**0.636**
Set 8: D=1.6				
(67 - 72)	8	**3.022**	**0.012**	**3.022**
(64 - 62)	8	**3.007**	**0.012**	**3.007**
(49 - 47)	9	**2.935**	**0.012**	**2.935**
(24 - 22)	9	**2.933**	**0.012**	**2.933**
(26 - 50)	9	**2.928**	**0.012**	**2.928**
(59 - 56)	8	**2.896**	**0.012**	**2.896**
(39 - 37)	8	**2.895**	**0.012**	**2.895**
(36 - 55)	8	**2.894**	**0.012**	**2.894**
(51 - 65)	9	**2.887**	**0.012**	**2.887**
(12 - 31)	8	**2.860**	**0.012**	**2.860**
(57 - 68)	9	**2.840**	**0.012**	**2.840**
(71 - 69)	12	**2.802**	**0.012**	**2.802**
Set 9: D=1.6				
(54 - 52)	9	**3.166**	**0.012**	**3.166**
(46 - 25)	9	**3.143**	**0.012**	**3.143**
(8 - 10)	5	**2.888**	**0.012**	**2.888**

Kontrola napetosti - EUROCODE 3 (ENV)

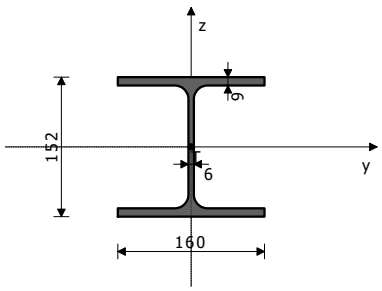
Opis	LC	σ [kN/cm²]	τ [kN/cm²]	σu [kN/cm²]
(20 - 43)	5	**2.848**	**0.012**	**2.848**
(30 - 28)	12	**2.805**	**0.012**	**2.805**
(21 - 3)	12	**2.794**	**0.012**	**2.794**
(33 - 34)	8	**2.703**	**0.012**	**2.703**
(60 - 45)	8	**2.676**	**0.012**	**2.676**



Izometrija
Kontrola stabilnosti

PALICA 72-64
PREČNI PREREZ: IPBl 160 [S 235] [Set: 5]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



[mm]

Ax =	38.771 cm2
Ay =	28.800 cm2
Az =	13.211 cm2
Ix =	8.653 cm4
Iy =	1672.2 cm4
Iz =	614.86 cm4
Wy =	220.03 cm3
Wz =	76.857 cm3
Wy,pl =	237.43 cm3
Wz,pl =	115.20 cm3
γM0 =	1.100
γM1 =	1.100
γM2 =	1.250
Anet/A =	0.900

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

4. γ=0.10	5. γ=0.10	6. γ=0.10
7. γ=0.10	8. γ=0.10	9. γ=0.10
10. γ=0.10	11. γ=0.10	12. γ=0.10
13. γ=0.10	14. γ=0.10	15. γ=0.10
16. γ=0.10	17. γ=0.10	18. γ=0.10

PALICA IZPOSTAVLJENA PRITISKU IN UPOGIBU
(obtežni primer 9, konec palice)

Računska osna sila	Nsd =	-1.167 kN
Prečna sila v z smeri	Vsd_z =	3.917 kN
Upogibni moment okoli y osi	Msd_y =	-2.483 kNm
Sistemska dolžina palice	L =	350.00 cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.4 Tlak

Plastična računska nosilnost	Npl.Rd =	828.30 kN
Računska nosilnost na tlak	Nc.Rd =	828.30 kN

Pogoj 5.16: Nsd <= Nc.Rd (1.17 <= 828.30)

5.4.5 Upogib y-y

Računski plastični moment	Mpl.Rd =	50.725 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	47.007 kNm
Računski elastični moment	Mel.Rd =	47.007 kNm
Računska nosilnost na upogib	Mc.Rd =	50.725 kNm

Pogoj 5.17: Msd_y <= Mc.Rd_y (2.48 <= 50.72)

5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	162.95 kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (3.92 <= 162.95)

5.4.9 Upogib z osno in prečno silo
Ni potrebno zmanjšanje upogibne nosilnosti
Pogoj: Vsd_z <= 50%Vpl.Rd_z

5.4.8 Upogib in osna sila

Razmerje Msd_y / Mpl.Rd_y		0.049

Pogoj 5.36: (0.05 <= 1)

5.5 NOSILNOST ELEMENTOV
5.5.1 Uklonska nosilnost

Uklonska dolžina y-y	l,y =	350.00 cm
Vztrajnostni radij y-y	i,y =	6.567 cm
Vitkost y-y	λ,y =	53.294
Relativna vitkost y-y	λ_y =	0.568
Uklonska krivulja za os y-y: B	α =	0.340
Koeficient nepopolnosti	χ,y =	0.853
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_y =	706.55 kN

Pogoj 5.45: Nsd <= Nb.Rd_y (1.17 <= 706.55)

Uklonska dolžina z-z	l,z =	350.00 cm
Vztrajnostni radij z-z	i,z =	3.982 cm
Vitkost z-z	λ,z =	87.890
Relativna vitkost z-z	λ_z =	0.936
Uklonska krivulja za os z-z: C	α =	0.490
Koeficient nepopolnosti	χ,z =	0.578
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_z =	478.66 kN

Pogoj 5.45: Nsd <= Nb.Rd_z (1.17 <= 478.66)

5.5.2 Bočna zvrnitev upogibnih nosilcev

Koeficient	C1 =	1.565
Koeficient	C2 =	1.267
Koeficient	C3 =	2.640
Koef.ukl.dolžine za uklon	k =	1.000
Koef.ukl.dolžine za vbočenje	kw =	1.000
Koordinata	zg =	0.000 cm
Koordinata	zj =	0.000 cm
Razmak med bočnimi podporami	L =	350.00 cm
Sektorski vztrajnostni moment	Iw =	31410 cm6
Krit.moment bočne zvrnitve	Mcr =	177.06 kNm
Koeficient	βw =	1.000
Koeficient imperf.	αLT =	0.210
Brezdimenz.vitkost	λLT_ =	0.561
Koeficient zmanjšanja	χLT =	0.904
Računska uklonska nosilnost	Mb.Rd =	45.858 kNm

Pogoj 5.48: Msd_y <= Mb.Rd (2.48 <= 45.86)

5.5.4 Upogib in tlak

Koeficient nepopolnosti	χmin =	0.578
Nsd / ...		0.002
Koeficient oblike momenta	βy =	1.395
Koeficient	μy =	-0.608
Koeficient	ky =	1.001
ky * My / ...		0.049

Pogoj 5.51: (0.05 <= 1)

Koeficient nepopolnosti	χ_z =	0.578
Nsd/ ...		0.002
Koeficient nepopolnosti	χLT =	0.904
Koef.obl.mom.za bočno zvrnitev	βM.LT =	1.395
Koeficient	μLT =	0.046
Koeficient	kLT =	1.000
kLT * My / ...		0.054

Pogoj 5.52: (0.06 <= 1)

5.6 LOKALNO IZBOČENJE ZARADI STRIGA
za strig v ravnini z-z

Višina stojine	d =	13.400 cm
Debelina stojine	tw =	0.600 cm

Ni prečnih ojačitev v sredini

Koeficient izbočenja pri strigu	kτ =	5.340

Ni potrebna kontrola izbočenja zaradi striga
Pogoj: d / tw <= 69 ε (22.33 <= 69.00)

5.6.7 Interakcija prečne sile, upogiba in osne sile
za strig v ravnini z-z

Računski plastični moment pasnic	Mf.Rd =	46.761 kNm

Pogoji 5.66a in 5.66b so izpolnjeni

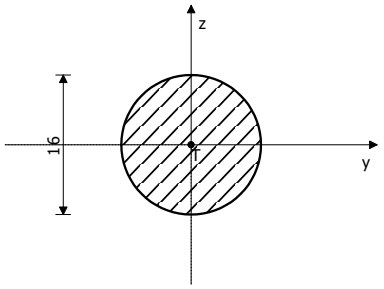
5.7 VNOS KONCENTRIRANIH SIL V STOJINO
5.7.7 Uklon pasnice v smeri stojine

Koeficient(razred pasnice 1)	k =	0.300
Površina stojine	Aw =	9.120 cm2
Površina tlač.pasnice	Afc =	14.400 cm2

Prepročen je uklon pasnice v smeri stojine
Pogoj 5.80: (22.33 <= 213.35)

PALICA 72-67
PREČNI PREREZ: Krožni [S 235] [Set: 8]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



Ax =	2.011	cm2
Ay =	1.810	cm2
Az =	1.810	cm2
Ix =	0.643	cm4
Iy =	0.322	cm4
Iz =	0.322	cm4
Wy =	0.402	cm3
Wz =	0.402	cm3
Wy,pl =	0.683	cm3
Wz,pl =	0.683	cm3
γM0 =	1.100	
γM1 =	1.100	
γM2 =	1.250	
Anet/A =	0.900	

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

8. γ=0.27	4. γ=0.27	5. γ=0.23
12. γ=0.19	9. γ=0.18	10. γ=0.13
6. γ=0.13	16. γ=0.11	14. γ=0.11
7. γ=0.09	15. γ=0.08	13. γ=0.05
18. γ=0.05	17. γ=0.05	11. γ=0.05

PALICA IZPOSTAVLJENA PRITISKU IN UPOGIBU
(obtežni primer 8, na 104.3 cm od začetka palice)

Računska osna sila	Nsd =	-0.196 kN
Upogibni moment okoli y osi	Msd_y =	0.012 kNm
Sistemska dolžina palice	L =	208.63 cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.4 Tlak

Plastična računska nosilnost	Npl.Rd =	42.954 kN
Računska nosilnost na tlak	Nc.Rd =	42.954 kN

Pogoj 5.16: Nsd <= Nc.Rd (0.20 <= 42.95)

5.4.5 Upogib y-y

Računski plastični moment	Mpl.Rd =	0.146 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	0.086 kNm
Računski elastični moment	Mel.Rd =	0.086 kNm
Računska nosilnost na upogib	Mc.Rd =	0.146 kNm

Pogoj 5.17: Msd_y <= Mc.Rd_y (0.01 <= 0.15)

5.4.8 Upogib in osna sila

Razmerje Msd_y / Mpl.Rd_y		0.081

Pogoj 5.36: (0.09 <= 1)

5.5 NOSILNOST ELEMENTOV
5.5.1 Uklonska nosilnost

Uklonska dolžina y-y	l,y =	208.63 cm
Vztrajnostni radij y-y	i,y =	0.400 cm
Vitkost y-y	λ,y =	521.57
Relativna vitkost y-y	λ_y =	5.554
Uklonska krivulja za os y-y: C	α =	0.490
Koeficient nepopolnosti	χ,y =	0.030
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_y =	1.280 kN

Pogoj 5.45: Nsd <= Nb.Rd_y (0.20 <= 1.28)

Uklonska dolžina z-z	l,z =	208.63 cm
Vztrajnostni radij z-z	i,z =	0.400 cm
Vitkost z-z	λ,z =	521.57
Relativna vitkost z-z	λ_z =	5.554
Uklonska krivulja za os z-z: C	α =	0.490
Koeficient nepopolnosti	χ,z =	0.030
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_z =	1.280 kN

Pogoj 5.45: Nsd <= Nb.Rd_z (0.20 <= 1.28)

5.5.2 Bočna zvrnitev upogibnih nosilcev

Koeficient	C1 =	1.132
Koeficient	C2 =	0.459
Koeficient	C3 =	0.525
Koef.ukl.dolžine za uklon	k =	1.000
Koef.ukl.dolžine za vbočenje	kw =	1.000
Koordinata	zg =	0.000 cm
Koordinata	zj =	0.000 cm

Razmak med bočnimi podporami	L =	208.63 cm
Sektorski vztrajnostni moment	Iw =	0.000 cm6
Krit.moment bočne zvrnitve	Mcr =	1.010 kNm
Koeficient	βw =	1.000
Koeficient imperf.	αLT =	0.210
Brezdimenz.vitkost	λLT_ =	0.399
Koeficient zmanjšanja	χLT =	0.953
Računska uklonska nosilnost	Mb.Rd =	0.139 kNm

Kontrola bočne zvrnitve ni potrebna: λ_LT <= 0.4

5.5.4 Upogib in tlak

Koeficient nepopolnosti	χmin =	0.030
Nsd / ...		0.153
Koeficient oblike momenta	βy =	1.299
Koeficient	μy =	-7.094
Koeficient	ky =	1.500
ky * My / ...		0.121

Pogoj 5.51: (0.27 <= 1)

Koeficient nepopolnosti	χ_z =	0.030
Nsd/ ...		0.153
Koeficient nepopolnosti	χLT =	0.953
Koef.obl.mom.za bočno zvrnitev	βM.LT =	1.299
Koeficient	μLT =	0.900
Koeficient	kLT =	0.875
kLT * My / ...		0.074

Pogoj 5.52: (0.23 <= 1)

KONTROLA STRIŽNE NOSILNOSTI
(obtežni primer 8, začetek palice)

Računska osna sila	Nsd =	-0.196 kN
Prečna sila v z smeri	Vsd_z =	0.022 kN
Sistemska dolžina palice	L =	208.63 cm

5.4 NOSILNOST PREČNIH PREREZOV
5.4.6 Strig

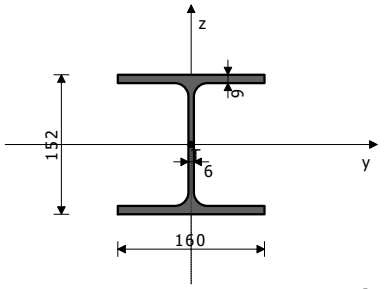
Računska plast.nos.na strig z-z	Vpl.Rd =	22.320 kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (0.02 <= 22.32)

PALICA 65-49

PREČNI PREREZ: IPBl 160 [S 235] [Set: 5]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



Ax =	38.771 cm2	
Ay =	28.800 cm2	
Az =	13.211 cm2	
Ix =	8.653 cm4	
Iy =	1672.2 cm4	
Iz =	614.86 cm4	
Wy =	220.03 cm3	
Wz =	76.857 cm3	
Wy,pl =	237.43 cm3	
Wz,pl =	115.20 cm3	
γM0 =	1.100	
γM1 =	1.100	
γM2 =	1.250	
Anet/A =	0.900	

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

4. γ=0.10	5. γ=0.10	6. γ=0.10
7. γ=0.10	8. γ=0.10	9. γ=0.10
10. γ=0.10	11. γ=0.10	12. γ=0.10
13. γ=0.10	14. γ=0.10	15. γ=0.10
16. γ=0.10	17. γ=0.10	18. γ=0.10

PALICA IZPOSTAVLJENA NATEGU IN UPOGIBU
(obtežni primer 9, konec palice)

Računska osna sila	Nsd =	0.522 kN
Prečna sila v y smeri	Vsd_y =	-0.032 kN
Prečna sila v z smeri	Vsd_z =	3.911 kN
Upogibni moment okoli y osi	Msd_y =	-2.926 kNm
Sistemska dolžina palice	L =	350.00 cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.3 Nateg

Plast.rač.nosilnost bruto prereza	Npl.Rd =	828.30 kN
Mejna rač.nosilnost neto prereza	Nu.Rd =	904.46 kN
Računska nos. na nateg	Nt.Rd =	828.30 kN

Pogoj 5.13: Nsd <= Nt.Rd (0.52 <= 828.30)

5.4.5 Upogib y-y

Računski plastični moment	Mpl.Rd =	50.725 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	47.007 kNm
Računski elastični moment	Mel.Rd =	47.007 kNm
Računska nosilnost na upogib	Mc.Rd =	50.725 kNm

Pogoj 5.17: Msd_y <= Mc.Rd_y (2.93 <= 50.72)

5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	162.95 kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (3.91 <= 162.95)

Računska plast.nos.na strig y-y	Vpl.Rd =	355.23 kN

Pogoj 5.20: Vsd_y <= Vpl.Rd_y (0.03 <= 355.23)

5.4.9 Upogib z osno in prečno silo
Ni potrebno zmanjšanje upogibne nosilnosti
Pogoj: Vsd_z <= 50%Vpl.Rd_z i Vsd_y <= 50%Vpl.Rd_y

5.4.8 Upogib in osna sila

Razmerje Msd_y / Mpl.Rd_y		0.058

Pogoj 5.36: (0.06 <= 1)

5.5 NOSILNOST ELEMENTOV
5.5.2 Bočna zvrnitev upogibnih nosilcev

Koeficient	C1 =	1.565
Koeficient	C2 =	1.267
Koeficient	C3 =	2.640
Koef.ukl.dolžine za uklon	k =	1.000
Koef.ukl.dolžine za vbočenje	kw =	1.000
Koordinata	zg =	0.000 cm
Koordinata	zj =	0.000 cm
Razmak med bočnimi podporami	L =	350.00 cm
Sektorski vztrajnostni moment	Iw =	31410 cm6
Krit.moment bočne zvrnitve	Mcr =	177.06 kNm
Koeficient	βw =	1.000
Koeficient imperf.	αLT =	0.210
Brezdimenz.vitkost	λLT_ =	0.561
Koeficient zmanjšanja	χLT =	0.904
Računska uklonska nosilnost	Mb.Rd =	45.858 kNm

5.5.3 Upogib in nateg

Redukcijski koef.za vektorske vplive	ψvec =	0.800
Elast.odp.mom.za krajne tlač.vlakno	Wcom =	220.03 cm3
Efektivni rač.notranji moment	Meff.sd =	2.902 kNm

Pogoj 5.50: Meff.sd <= Mb.Rd (2.90 <= 45.86)

5.6 LOKALNO IZBOČENJE ZARADI STRIGA
za strig v ravnini z-z

Višina stojine	d =	13.400 cm
Debelina stojine	tw =	0.600 cm

Ni prečnih ojačitev v sredini

Koeficient izbočenja pri strigu	kτ =	5.340

Ni potrebna kontrola izbočenja zaradi striga

Pogoj: d / tw <= 69 ε (22.33 <= 69.00)

5.6.7 Interakcija prečne sile, upogiba in osne sile
za strig v ravnini z-z

Računski plastični moment pasnic	Mf.Rd =	46.761 kNm

Pogoji 5.66a in 5.66b so izpolnjeni

5.7 VNOS KONCENTRIRANIH SIL V STOJINO
5.7.7 Uklon pasnice v smeri stojine

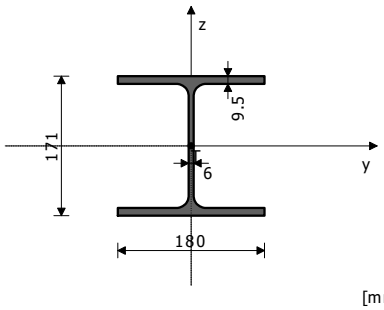
Koeficient(razred pasnice 1)	k =	0.300
Površina stojine	Aw =	9.120 cm2
Površina tlač.pasnice	Afc =	14.400 cm2

Preprečen je uklon pasnice v smeri stojine

Pogoj 5.80: (22.33 <= 213.35)

PALICA 41-61
PREČNI PREREZ: IPBl 180 [S 235] [Set: 3]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



[mm]

Ax =	45.251 cm2	
Ay =	34.200 cm2	
Az =	14.471 cm2	
Ix =	11.269 cm4	
Iy =	2508.8 cm4	
Iz =	923.82 cm4	
Wy =	293.43 cm3	
Wz =	102.65 cm3	
Wy,pl =	316.62 cm3	
Wz,pl =	153.90 cm3	
γM0 =	1.100	
γM1 =	1.100	
γM2 =	1.250	
Anet/A =	0.900	

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

5. γ=0.20	9. γ=0.19	7. γ=0.19
11. γ=0.18	4. γ=0.17	6. γ=0.16
15. γ=0.14	17. γ=0.13	12. γ=0.12
13. γ=0.12	14. γ=0.12	10. γ=0.12
16. γ=0.12	8. γ=0.12	18. γ=0.12

PALICA IZPOSTAVLJENA PRITISKU IN UPOGIBU
(obtežni primer 5, na 189.0 cm od začetka palice)

Računska osna sila	Nsd =	-29.706 kN
Prečna sila v y smeri	Vsd_y =	-1.430 kN
Prečna sila v z smeri	Vsd_z =	-2.135 kN
Upogibni moment okoli y osi	Msd_y =	-4.106 kNm
Upogibni moment okoli z osi	Msd_z =	-2.676 kNm
Sistemska dolžina palice	L =	403.00 cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.4 Tlak

Plastična računska nosilnost	Npl.Rd =	966.73 kN
Računska nosilnost na tlak	Nc.Rd =	966.73 kN

Pogoj 5.16: Nsd <= Nc.Rd (29.71 <= 966.73)

5.4.5 Upogib y-y

Računski plastični moment	Mpl.Rd =	67.641 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	62.687 kNm
Računski elastični moment	Mel.Rd =	62.687 kNm
Računska nosilnost na upogib	Mc.Rd =	67.641 kNm

Pogoj 5.17: Msd_y <= Mc.Rd_y (4.11 <= 67.64)

5.4.5 Upogib z-z

Računski plastični moment	Mpl.Rd =	32.879 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	21.929 kNm
Računski elastični moment	Mel.Rd =	21.929 kNm
Računska nosilnost na upogib	Mc.Rd =	32.879 kNm

Pogoj 5.17: Msd_z <= Mc.Rd_z (2.68 <= 32.88)

5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	112.49 kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (2.14 <= 112.49)

Računska plast.nos.na strig y-y	Vpl.Rd =	377.92 kN

Pogoj 5.20: Vsd_y <= Vpl.Rd_y (1.43 <= 377.92)

5.4.9 Upogib z osno in prečno silo
Ni potrebno zmanjšanje upogibne nosilnosti
Pogoj: Vsd_z <= 50%Vpl.Rd_z i Vsd_y <= 50%Vpl.Rd_y

5.4.8 Upogib in osna sila

Razmerje Nsd / Npl.Rd	0.031
Razmerje Msd_y / Mpl.Rd_y	0.061
Razmerje Msd_z / Mpl.Rd_z	0.081

Pogoj 5.36: (0.17 <= 1)

5.5 NOSILNOST ELEMENTOV
5.5.1 Uklonska nosilnost

Uklonska dolžina y-y	l,y =	403.00 cm
Vztrajnostni radij y-y	i,y =	7.446 cm
Vitkost y-y	λ,y =	54.124
Relativna vitkost y-y	λ_y =	0.540
Uklonska krivulja za os y-y: B	α =	0.340
Koeficient nepopolnosti	χ,y =	0.866
Koeficient efektivnega prereza	βA =	0.879
Računska uklonska nosilnost	Nb.Rd_y =	735.53 kN

Pogoj 5.45: Nsd <= Nb.Rd_y (29.71 <= 735.53)

Uklonska dolžina z-z	l,z =	403.00 cm
Vztrajnostni radij z-z	i,z =	4.518 cm
Vitkost z-z	λ,z =	89.193
Relativna vitkost z-z	λ_z =	0.890
Uklonska krivulja za os z-z: C	α =	0.490
Koeficient nepopolnosti	χ,z =	0.606
Koeficient efektivnega prereza	βA =	0.879
Računska uklonska nosilnost	Nb.Rd_z =	514.54 kN

Pogoj 5.45: Nsd <= Nb.Rd_z (29.71 <= 514.54)

5.5.2 Bočna zvrnitev upogibnih nosilcev

Koeficient	C1 =	1.285
Koeficient	C2 =	1.562
Koeficient	C3 =	0.753
Koef.ukl.dolžine za uklon	k =	1.000
Koef.ukl.dolžine za vbočenje	kw =	1.000
Koordinata	zg =	0.000 cm
Koordinata	zj =	0.000 cm
Razmak med bočnimi podporami	L =	403.00 cm

Sektorski vztrajnostni moment	Iw =	60211 cm6
Krit.moment bočne zvrnitve	Mcr =	180.77 kNm
Koeficient	βw =	1.000
Koeficient imperf.	αLT =	0.210
Brezdimenz.vitkost	λLT_ =	0.642
Koeficient zmanjšanja	χLT =	0.874
Računska uklonska nosilnost	Mb.Rd =	59.086 kNm

Pogoj 5.48: Msd_y <= Mb.Rd (4.11 <= 59.09)

5.5.4 Upogib in tlak

Koeficient nepopolnosti	χmin =	0.606
Nsd / ...		0.051
Koeficient oblike momenta	βy =	1.371
Koeficient	μy =	-0.601
Koeficient	ky =	1.019
ky * My / ...		0.062
Koeficient oblike momenta	βz =	1.439
Koeficient	μz =	-0.499
Koeficient	kz =	1.023
kz * Mz / ...		0.083

Pogoj 5.51: (0.20 <= 1)

Koeficient nepopolnosti	χ_z =	0.606
Nsd/ ...		0.051
Koeficient nepopolnosti	χLT =	0.874
Koef.obl.mom.za bočno zvrnitev	βM.LT =	1.371
Koeficient	μLT =	0.033
Koeficient	kLT =	0.998
kLT * My / ...		0.069
Koeficient oblike momenta	βz =	1.439
Koeficient	μz =	-0.499
Koeficient	kz =	1.023
kz * Mz / ...		0.083

Pogoj 5.52: (0.20 <= 1)

5.6 LOKALNO IZBOČENJE ZARADI STRIGA
za strig v ravnini z-z

Višina stojine	d =	15.200 cm
Debelina stojine	tw =	0.600 cm
Ni prečnih ojačitev v sredini		
Koeficient izbočenja pri strigu	kτ =	5.340

Ni potrebna kontrola izbočenja zaradi striga

Pogoj: d / tw <= 69 ε (25.33 <= 69.00)

5.6.7 Interakcija prečne sile, upogiba in osne sile
za strig v ravnini z-z

Računski plastični moment pasnic	Mf.Rd =	52.807 kNm

Pogoji 5.66a in 5.66b so izpolnjeni

KONTROLA STRIŽNE NOSILNOSTI
(obtežni primer 9, na 189.0 cm od začetka palice)

Računska osna sila	Nsd =	-24.681 kN
Prečna sila v y smeri	Vsd_y =	-1.418 kN
Prečna sila v z smeri	Vsd_z =	-2.143 kN
Upogibni moment okoli y osi	Msd_y =	-4.123 kNm
Upogibni moment okoli z osi	Msd_z =	-2.657 kNm
Sistemska dolžina palice	L =	403.00 cm

5.4 NOSILNOST PREČNIH PREREZOV
5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	112.49 kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (2.14 <= 112.49)

Računska plast.nos.na strig y-y	Vpl.Rd =	377.96 kN

Pogoj 5.20: Vsd_y <= Vpl.Rd_y (1.42 <= 377.96)

5.6 LOKALNO IZBOČENJE ZARADI STRIGA
za strig v ravnini z-z

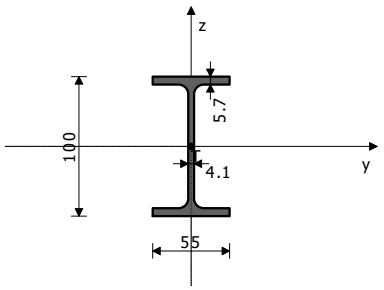
Višina stojine	d =	15.200 cm
Debelina stojine	tw =	0.600 cm
Ni prečnih ojačitev v sredini		
Koeficient izbočenja pri strigu	kτ =	5.340

Ni potrebna kontrola izbočenja zaradi striga

Pogoj: d / tw <= 69 ε (25.33 <= 69.00)

PALICA 39-26
PREČNI PREREZ: IPE 100 [S 235] [Set: 6]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



Ax =	10.323	cm2
Ay =	6.270	cm2
Az =	5.085	cm2
Ix =	0.874	cm4
Iy =	170.92	cm4
Iz =	15.902	cm4
Wy =	34.184	cm3
Wz =	5.783	cm3
Wy,pl =	38.825	cm3
Wz,pl =	8.621	cm3
γM0 =	1.100	
γM1 =	1.100	
γM2 =	1.250	
Anet/A =	0.900	

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

5. γ=0.16	9. γ=0.16	7. γ=0.15
11. γ=0.15	4. γ=0.12	6. γ=0.11
15. γ=0.11	17. γ=0.11	14. γ=0.08
13. γ=0.07	10. γ=0.07	8. γ=0.07
16. γ=0.07	12. γ=0.07	18. γ=0.07

PALICA IZPOSTAVLJENA PRITISKU IN UPOGIBU
(obtežni primer 5, na 64.3 cm od začetka palice)

Računska osna sila	Nsd =	-0.285 kN
Prečna sila v z smeri	Vsd_z =	-0.446 kN
Upogibni moment okoli y osi	Msd_y =	1.040 kNm
Sistemska dolžina palice	L =	150.00 cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.4 Tlak

Plastična računska nosilnost	Npl.Rd =	220.54 kN
Računska nosilnost na tlak	Nc.Rd =	220.54 kN

Pogoj 5.16: Nsd <= Nc.Rd (0.28 <= 220.54)

5.4.5 Upogib y-y

Računski plastični moment	Mpl.Rd =	8.294 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	7.303 kNm
Računski elastični moment	Mel.Rd =	7.303 kNm
Računska nosilnost na upogib	Mc.Rd =	8.294 kNm

Pogoj 5.17: Msd_y <= Mc.Rd_y (1.04 <= 8.29)

5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	62.719 kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (0.45 <= 62.72)

5.4.9 Upogib z osno in prečno silo
Ni potrebno zmanjšanje upogibne nosilnosti
Pogoj: Vsd_z <= 50%Vpl.Rd_z

5.4.8 Upogib in osna sila

Razmerje Msd_y / Mpl.Rd_y		0.125

Pogoj 5.36: (0.13 <= 1)

5.5 NOSILNOST ELEMENTOV
5.5.1 Uklonska nosilnost

Uklonska dolžina y-y	l,y =	150.00 cm
Vztrajnostni radij y-y	i,y =	4.069 cm
Vitkost y-y	λ,y =	36.864
Relativna vitkost y-y	λ_y =	0.393
Uklonska krivulja za os y-y: A	α =	0.210
Koeficient nepopolnosti	χ,y =	0.955
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_y =	210.56 kN

Pogoj 5.45: Nsd <= Nb.Rd_y (0.28 <= 210.56)

Uklonska dolžina z-z	l,z =	150.00 cm
Vztrajnostni radij z-z	i,z =	1.241 cm
Vitkost z-z	λ,z =	120.86
Relativna vitkost z-z	λ_z =	1.287
Uklonska krivulja za os z-z: B	α =	0.340
Koeficient nepopolnosti	χ,z =	0.433
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_z =	95.528 kN

Pogoj 5.45: Nsd <= Nb.Rd_z (0.28 <= 95.53)

5.5.2 Bočna zvrnitev upogibnih nosilcev

Koeficient	C1 =	1.132
Koeficient	C2 =	0.459

Koeficient	C3 =	0.525
Koef.ukl.dolžine za uklon	k =	1.000
Koef.ukl.dolžine za vbočenje	kw =	1.000
Koordinata	zg =	0.000 cm
Koordinata	zj =	0.000 cm
Razmak med bočnimi podporami	L =	150.00 cm
Sektorski vztrajnostni moment	Iw =	351.38 cm6
Krit.moment bočne zvrnitve	Mcr =	13.901 kNm
Koeficient	βw =	1.000
Koeficient imperf.	αLT =	0.210
Brezdimenz.vitkost	λLT_ =	0.810
Koeficient zmanjšanja	χLT =	0.790
Računska uklonska nosilnost	Mb.Rd =	6.551 kNm

Pogoj 5.48: Msd_y <= Mb.Rd (1.04 <= 6.55)

5.5.4 Upogib in tlak

Koeficient nepopolnosti	χmin =	0.433
Nsd / ...		0.003
Koeficient oblike momenta	βy =	1.300
Koeficient	μy =	-0.414
Koeficient	ky =	1.001
ky * My / ...		0.125

Pogoj 5.51: (0.13 <= 1)

Koeficient nepopolnosti	χ_z =	0.433
Nsd/ ...		0.003
Koeficient nepopolnosti	χLT =	0.790
Koef.obl.mom.za bočno zvrnitev	βM.LT =	1.300
Koeficient	μLT =	0.101
Koeficient	kLT =	1.000
kLT * My / ...		0.159

Pogoj 5.52: (0.16 <= 1)

5.6 LOKALNO IZBOČENJE ZARADI STRIGA
za strig v ravnini z-z

Višina stojine	d =	8.860 cm
Debelina stojine	tw =	0.410 cm

Ni prečnih ojačitev v sredini

Koeficient izbočenja pri strigu	kτ =	5.340

Ni potrebna kontrola izbočenja zaradi striga

Pogoj: d / tw <= 69 ε (21.61 <= 69.00)

5.6.7 Interakcija prečne sile, upogiba in osne sile
za strig v ravnini z-z

Računski plastični moment pasnic	Mf.Rd =	6.697 kNm

Pogoji 5.66a in 5.66b so izpolnjeni

5.7 VNOS KONCENTRIRANIH SIL V STOJINO
5.7.7 Uklon pasnice v smeri stojine

Koeficient(razred pasnice 1)	k =	0.300
Površina stojine	Aw =	4.100 cm2
Površina tlač.pasnice	Afc =	3.135 cm2

Preprečen je uklon pasnice v smeri stojine

Pogoj 5.80: (21.61 <= 306.58)

KONTROLA STRIŽNE NOSILNOSTI
(obtežni primer 5, začetek palice)

Računska osna sila	Nsd =	-0.285 kN
Prečna sila v z smeri	Vsd_z =	-3.120 kN
Sistemska dolžina palice	L =	150.00 cm

5.4 NOSILNOST PREČNIH PREREZOV
5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	62.719 kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (3.12 <= 62.72)

5.6 LOKALNO IZBOČENJE ZARADI STRIGA
za strig v ravnini z-z

Višina stojine	d =	8.860 cm
Debelina stojine	tw =	0.410 cm

Ni prečnih ojačitev v sredini

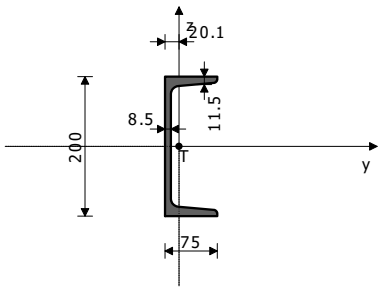
Koeficient izbočenja pri strigu	kτ =	5.340

Ni potrebna kontrola izbočenja zaradi striga

Pogoj: d / tw <= 69 ε (21.61 <= 69.00)

PALICA 30-20
PREČNI PREREZ: [200 [S 235] [Set: 1]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



Ax =	32.200	cm2
Ay =	15.583	cm2
Az =	16.618	cm2
Ix =	11.900	cm4
Iy =	1910.0	cm4
Iz =	148.00	cm4
Wy =	191.00	cm3
Wz =	26.958	cm3
Wy,pl =	229.16	cm3
Wz,pl =	57.765	cm3
γM0 =	1.100	
γM1 =	1.100	
γM2 =	1.250	
Anet/A =	0.900	

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

5. γ=0.11	9. γ=0.11	7. γ=0.11
11. γ=0.11	4. γ=0.08	6. γ=0.08
17. γ=0.08	15. γ=0.07	14. γ=0.06
12. γ=0.02	8. γ=0.02	13. γ=0.02
16. γ=0.02	10. γ=0.02	18. γ=0.02

PALICA IZPOSTAVLJENA NATEGU IN UPOGIBU
(obtežni primer 9, konec palice)

Računska osna sila	Nsd =	1.360 kN
Prečna sila v y smeri	Vsd_y =	0.081 kN
Prečna sila v z smeri	Vsd_z =	8.949 kN
Upogibni moment okoli y osi	Msd_y =	-5.273 kNm
Upogibni moment okoli z osi	Msd_z =	-0.024 kNm
Sistemska dolžina palice	L =	145.00 cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.3 Nateg

Plast.rač.nosilnost bruto prereza	Npl.Rd =	687.91 kN
Mejna rač.nosilnost neto prereza	Nu.Rd =	751.16 kN
Računska nos. na nateg	Nt.Rd =	687.91 kN

Pogoj 5.13: Nsd <= Nt.Rd (1.36 <= 687.91)

5.4.5 Upogib y-y

Računski plastični moment	Mpl.Rd =	48.956 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	40.805 kNm
Računski elastični moment	Mel.Rd =	40.805 kNm
Računska nosilnost na upogib	Mc.Rd =	48.956 kNm

Pogoj 5.17: Msd_y <= Mc.Rd_y (5.27 <= 48.96)

5.4.5 Upogib z-z

Računski plastični moment	Mpl.Rd =	12.341 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	5.759 kNm
Računski elastični moment	Mel.Rd =	5.759 kNm
Računska nosilnost na upogib	Mc.Rd =	12.341 kNm

Pogoj 5.17: Msd_z <= Mc.Rd_z (0.02 <= 12.34)

5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	204.97 kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (8.95 <= 204.97)

Računska plast.nos.na strig y-y	Vpl.Rd =	192.20 kN

Pogoj 5.20: Vsd_y <= Vpl.Rd_y (0.08 <= 192.20)

5.4.9 Upogib z osno in prečno silo
Ni potrebno zmanjšanje upogibne nosilnosti
Pogoj: Vsd_z <= 50%Vpl.Rd_z i Vsd_y <= 50%Vpl.Rd_y

5.4.8 Upogib in osna sila
Razmerje Msd_y / Mpl.Rd_y 0.108

Pogoj 5.36: (0.11 <= 1)

5.5 NOSILNOST ELEMENTOV
5.5.2 Bočna zvrnitev upogibnih nosilcev

Koeficient	C1 =	2.804
Koeficient	C2 =	0.000
Koeficient	C3 =	0.537
Koef.ukl.dolžine za uklon	k =	1.000
Koef.ukl.dolžine za vbočenje	kw =	1.000
Koordinata	zg =	0.000 cm
Koordinata	zj =	0.000 cm
Razmak med bočnimi podporami	L =	145.00 cm
Sektorski vztrajnostni moment	Iw =	12375 cm6
Krit.moment bočne zvrnitve	Mcr =	500.20 kNm

Koeficient	βw =	1.000
Koeficient imperf.	αLT =	0.210
Brezdimenz.vitkost	$\lambda LT\_$ =	0.328
Koeficient zmanjšanja	χLT =	0.971
Računska uklonska nosilnost	Mb.Rd =	47.528 kNm

5.5.3 Upogib in nateg

Redukcijski koef.za vektorske vplive	ψvec =	0.800
Elast.odp.mom.za krajne tlač.vlakno	Wcom =	191.00 cm3
Efektivni rač.notranji moment	Meff.sd =	5.209 kNm

Pogoj 5.50: Meff.sd <= Mb.Rd (5.21 kNm <= 47.53 kNm)

5.6 LOKALNO IZBOČENJE ZARADI STRIGA
za strig v ravnini z-z

Višina stojine	d =	17.700 cm
Debelina stojine	tw =	0.850 cm

Ni prečnih ojačitev v sredini

Koeficient izbočenja pri strigu	$k\tau$ =	5.340

Ni potrebna kontrola izbočenja zaradi striga
Pogoj: d / tw <= 69 ε (20.82 <= 69.00)

5.6.7 Interakcija prečne sile, upogiba in osne sile
za strig v ravnini z-z

Računski plastični moment pasnic	Mf.Rd =	40.804 kNm

Pogoji 5.66a in 5.66b so izpolnjeni

5.7 VNOS KONCENTRIRANIH SIL V STOJINO
5.7.7 Uklon pasnice v smeri stojine

Koeficient(razred pasnice 1)	k =	0.300
Površina stojine	Aw =	23.000 cm2
Površina tlač.pasnice	Afc =	8.625 cm2

Preprečen je uklon pasnice v smeri stojine
Pogoj 5.80: (7.70 <= 437.78)

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2.5.2.2. Analiza spoj jeklenega stopnišča

- *Spoj na temeljna tla*

Comment

Spoj Fe stopnišča na temeljno ploščo

Design Specifications

Anchor

Anchor system	fischer Injection system FIS EM plus
Injection resin	FIS EM Plus 390 S
Fixing element	Threaded rod FIS A M 16 x 250 8.8, zinc plated steel, Property Class 8.8
Calculated anchorage depth	173 mm
Design Data	Anchor design in Concrete according European Technical Assessment ETA-17/0979, Option 1, Issued 17/06/2020



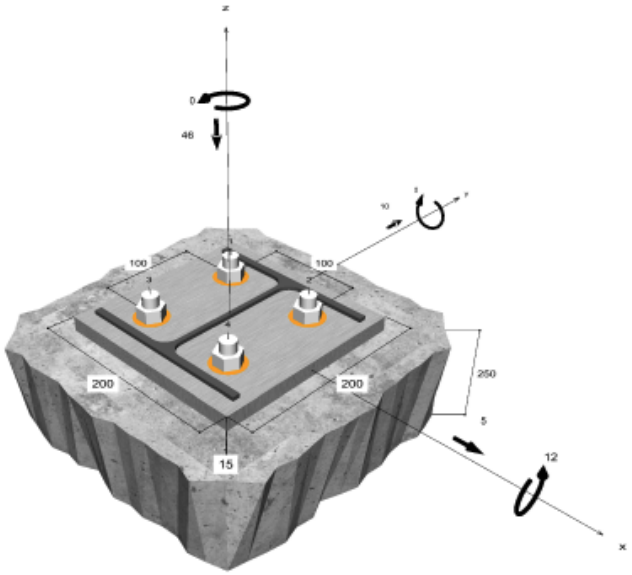


Geometry / Loads / Scale units

mm, kN, kNm

Value of design actions (including partial safety factor for the load)





Not drawn to scale

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Input data

Design method	EN1992-4:2018 bonded fastener
Base material	C25/30, EN 206
Concrete condition	Cracked, dry hole
Temperature range	24 °C long term temperature, 40 °C short term temperature
Reinforcement	No or standard reinforcement. No edge reinforcement. With reinforcement against splitting
Drilling method	Hammer drilling
Installation type	Push-through installation
Annular gap	Annular gap filled
Type of loading	Permanent-Transient/Static
Base plate location	Base plate flush installed on base material
Base plate geometry	200 mm x 200 mm x 15 mm
Profile type	HEAA 180

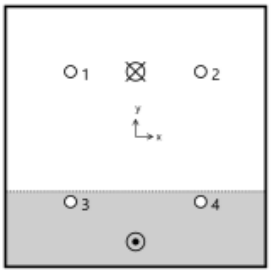
Design actions *)

#	N_{Ed} kN	$V_{Ed,x}$ kN	$V_{Ed,y}$ kN	$M_{Ed,x}$ kNm	$M_{Ed,y}$ kNm	$M_{T,Ed}$ kNm	Type of loading
1	-46.00	5.00	10.00	12.00	0.00	0.00	Permanent-Transient/Static

*) The required partial safety factors for actions are included

Resulting anchor forces

Anchor no.	Tensile action kN	Shear Action kN	Shear Action x kN	Shear Action y kN
1	31.68	2.80	1.25	2.50
2	31.68	2.80	1.25	2.50
3	0.00	2.80	1.25	2.50
4	0.00	2.80	1.25	2.50



max. concrete compressive strain :	0.60 ‰
max. concrete compressive stress :	18.9 N/mm²
Resulting tensile actions :	63.37 kN , X/Y position (0 / 50)
Resulting compression actions :	109.37 kN , X/Y position (0 / -81)

Resistance to tension loads

Proof	Action kN	Capacity kN	Utilisation β_N %
Steel failure *	31.68	84.00	37.7
Combined pull-out and concrete cone failure	63.37	63.45	**99.9**
Concrete cone failure	63.37	104.22	60.8

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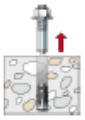
Steel failure

$$N_{Ed} \leq \frac{N_{Rk,s}}{\gamma_{Ms}} \quad (\mathbf{N_{Rd,s}})$$



$N_{Rk,s}$ kN	γ_{Ms}	$N_{Rd,s}$ kN	N_{Ed} kN	$\beta_{N,s}$ %
126.00	1.50	84.00	31.68	37.7

Anchor no.	$\beta_{N,s}$ %	Group N°	Decisive Beta
1	37.7	1	$\beta_{N,s;1}$
2	37.7	2	$\beta_{N,s;2}$
3	0.0	3	$\beta_{N,s;3}$
4	0.0	4	$\beta_{N,s;4}$

Combined pull-out and concrete cone failure

$$N_{Ed} \leq \frac{N_{Rk,p}}{\gamma_{Mp}} \quad (\mathbf{N_{Rd,p}})$$



$$N_{Rk,p} = N^0_{Rk,p} \cdot \frac{A_{p,N}}{A^0_{p,N}} \cdot \Psi_{s,Np} \cdot \Psi_{g,Np} \cdot \Psi_{ec,Np} \cdot \Psi_{re,Np} \quad \text{Eq. (7.13)}$$

$$N_{Rk,p} = 75.39kN \cdot \frac{280{,}524mm^2}{232{,}324mm^2} \cdot 1.000 \cdot 1.045 \cdot 1.000 \cdot 1.000 = 95.18kN$$

$$N^0_{Rk,p} = \Psi_{sus} \cdot \pi \cdot d \cdot h_{ef} \cdot \tau_{Rk} = 1.00 \cdot \pi \cdot 16mm \cdot 173mm \cdot 8.7N/mm^2 = 75.39kN \quad \text{Eq. (7.14)}$$

$$\Psi_{sus} = 1.00 \quad \text{Eq. (7.14a)}$$

$$\alpha_{sus} = 0.00 \leq \Psi^0_{sus} = 0.60$$

$$s_{cr,Np} = min\left(7.3 \cdot d \cdot \left(\Psi_{sus} \cdot \tau_{Rk,ucr}\right)^{0.5};\ 3 \cdot h_{ef}\right) \quad \text{Eq. (7.15)}$$

$$s_{cr,Np} = min\left(7.3 \cdot 16mm \cdot \left(1.00 \cdot 17.0N/mm^2\right)^{0.5};\ 3 \cdot 173mm\right) = 482mm$$

$$c_{cr,Np} = \frac{s_{cr,Np}}{2} = \frac{482mm}{2} = 241mm \quad \text{Eq. (7.16)}$$

$$\Psi_{s,Np} = min\left(1;\ 0.7 + 0.3 \cdot \frac{c}{c_{cr,Np}}\right) = min\left(1;\ 0.7 + 0.3 \cdot \frac{\infty}{241mm}\right) = 1.000 \leq 1 \quad \text{Eq. (7.20)}$$

$$\Psi_{g,Np} = \Psi^0_{g,Np} - \sqrt{\frac{s}{s_{cr,Np}}} \cdot \left(\Psi^0_{g,Np} - 1\right) = 1.084 - \sqrt{\frac{100mm}{482mm}} \cdot \left(1.084 - 1\right) = 1.045 \geq 1 \quad \text{Eq. (7.17)}$$

$$\Psi^0_{g,Np} = \sqrt{n} - \left(\sqrt{n} - 1\right) \cdot \left(\frac{\tau_{Rk}}{\tau_{Rk,c}}\right)^{1.5} \quad \text{Eq. (7.18)}$$

$$\Psi^0_{g,Np} = \sqrt{2} - \left(\sqrt{2} - 1\right) \cdot \left(\frac{8.7N/mm^2}{10.1N/mm^2}\right)^{1.5} = 1.084 \geq 1$$

$$\tau_{Rk,c} = \frac{k_3}{\pi \cdot d}\sqrt{h_{ef} \cdot f_{ck}} = \frac{7.7}{3.14 \cdot 16mm}\sqrt{173mm \cdot 25.0N/mm^2} = 10.1N/mm^2 \quad \text{Eq. (7.19)}$$

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$$\Psi_{ec,Np} = \frac{1}{1+\frac{2c_a}{s_{cr,Np}}} = \Psi_{ec,Npx} \cdot \Psi_{ec,Npy} = 1.000 \cdot 1.000 = 1.000 \leq 1$$ Eq. (7.21)

$$\Psi_{ec,Npx} = \frac{1}{1+\frac{2 \cdot 0mm}{482mm}} = 1.000 \leq 1 \qquad \Psi_{ec,Npy} = \frac{1}{1+\frac{2 \cdot 0mm}{482mm}} = 1.000 \leq 1$$

$$\Psi_{re,Np} = 1.000$$ Eq. (7.5)

$N_{Rk,p}$ kN	γ_{Mp}	$N_{Rd,p}$ kN	N_{Ed} kN	$\beta_{N,p}$ %
95.18	1.50	63.45	63.37	99.9

Anchor no.	$\beta_{N,p}$ %	Group N°	Decisive Beta
1, 2	99.9	1	$\beta_{N,p;1}$

Concrete cone failure



$$N_{Ed} \leq \frac{N_{Rk,c}}{\gamma_{Mc}} \quad (N_{Rd,c})$$

$$N_{Rk,c} = N^0_{Rk,c} \cdot \frac{A_{c,N}}{A^0_{c,N}} \cdot \Psi_{s,N} \cdot \Psi_{re,N} \cdot \Psi_{ec,N} \cdot \Psi_{M,N}$$ Eq. (7.1)

$$N_{Rk,c} = 87.61kN \cdot \frac{321,261mm^2}{269,361mm^2} \cdot 1.000 \cdot 1.000 \cdot 1.000 \cdot 1.496 = 156.32kN$$

$$N^0_{Rk,c} = k_1 \cdot \sqrt{f_{ck}} \cdot h_{ef}^{1.5} = 7.7 \cdot \sqrt{25.0N/mm^2} \cdot \left(173mm\right)^{1.5} = 87.61kN$$ Eq. (7.2)

$$\Psi_{s,N} = min\left(1;\ 0.7+0.3 \cdot \frac{c}{c_{cr,N}}\right) = min\left(1;\ 0.7+0.3 \cdot \frac{\infty}{260mm}\right) = 1.000 \leq 1$$ Eq. (7.4)

$$\Psi_{re,N} = 1.000$$ Eq. (7.5)

$$\Psi_{ec,N} = \frac{1}{1+\frac{2c_a}{s_{cr,N}}} \Rightarrow \Psi_{ec,Nx} \cdot \Psi_{ec,Ny} = 1.000 \cdot 1.000 = 1.000 \leq 1$$ Eq. (7.6)

$$\Psi_{ec,Nx} = \frac{1}{1+\frac{2 \cdot 0mm}{519mm}} = 1.000 \leq 1 \qquad \Psi_{ec,Ny} = \frac{1}{1+\frac{2 \cdot 0mm}{519mm}} = 1.000 \leq 1$$

$$\Psi_{M,N} = 2 - \frac{z}{1.5 \cdot h_{ef}} = 2 - \frac{131mm}{1.5 \cdot 173mm} = 1.50 \geq 1$$ Eq. (7.7)

$N_{Rk,c}$ kN	γ_{Mc}	$N_{Rd,c}$ kN	N_{Ed} kN	$\beta_{N,c}$ %
156.32	1.50	104.22	63.37	60.8

Anchor no.	$\beta_{N,c}$ %	Group N°	Decisive Beta
1, 2	60.8	1	$\beta_{N,c;1}$

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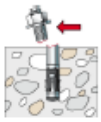
Resistance to shear loads

Proof	Action kN	Capacity kN	Utilisation β_V %
Steel failure without lever arm *	2.80	50.40	5.5
Concrete pry-out failure	11.18	162.65	6.9

* Most unfavourable anchor

Steel failure without lever arm

$$V_{Ed} \leq \frac{V_{Rk,s}}{\gamma_{Ms}} \quad (V_{Rd,s})$$



$$V_{Rk,s} = k_7 \cdot V^0_{Rk,s} = 1.00 \cdot 63.00kN = 63.00kN$$ Eq. (7.35)/ (7.36)

$V_{Rk,s}$ kN	γ_{Ms}	$V_{Rd,s}$ kN	V_{Ed} kN	β_{Vs} %
63.00	1.25	50.40	2.80	5.5

Anchor no.	β_{Vs} %	Group N°	Decisive Beta
1	5.5	1	$\beta_{Vs;1}$
2	5.5	2	$\beta_{Vs;2}$
3	5.5	3	$\beta_{Vs;3}$
4	5.5	4	$\beta_{Vs;4}$

Concrete pry-out failure

$$V_{Ed} \leq \frac{V_{Rk,cp}}{\gamma_{Mc}} \quad (V_{Rd,cp})$$



$$V_{Rk,cp} = k_8 \cdot N_{Rk,p} = 2 \cdot 121.99kN = 243.98kN$$ Eq. (7.39c)

$$N_{Rk,p} = N^0_{Rk,p} \cdot \frac{A_{p,N}}{A^0_{p,N}} \cdot \Psi_{s,Np} \cdot \Psi_{g,Np} \cdot \Psi_{ec,Np} \cdot \Psi_{re,Np}$$ Eq. (7.13)

$$N_{Rk,p} = 75.39kN \cdot \frac{338,724mm^2}{232,324mm^2} \cdot 1.000 \cdot 1.110 \cdot 1.000 \cdot 1.000 = 121.99kN$$

$$N^0_{Rk,p} = \Psi_{sus} \cdot \pi \cdot d \cdot h_{ef} \cdot \tau_{Rk} = 1.00 \cdot \pi \cdot 16mm \cdot 173mm \cdot 8.7N/mm^2 = 75.39kN$$ Eq. (7.14)

$$\Psi_{sus} = 1.00$$ Eq. (7.14a)

$$\alpha_{sus} = 0.00 \leq \Psi^0_{sus} = 0.60$$

$$s_{cr,Np} = min\left(7.3 \cdot d \cdot \left(\Psi_{sus} \cdot \tau_{Rk,ucr}\right)^{0.5};\ 3 \cdot h_{ef}\right)$$ Eq. (7.15)

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$$s_{cr,Np} = min\left(7.3 \cdot 16mm \cdot \left(1.00 \cdot 17.0N/mm^2\right)^{0.5};\ 3 \cdot 173mm\right) = 482mm$$

$$c_{cr,Np} = \frac{s_{cr,Np}}{2} = \frac{482mm}{2} = 241mm \qquad \text{Eq. (7.16)}$$

$$\Psi_{s,Np} = min\left(1;\ 0.7 + 0.3 \cdot \frac{c}{c_{cr,Np}}\right) = min\left(1;\ 0.7 + 0.3 \cdot \frac{\infty}{241mm}\right) = 1.000 \leq 1 \qquad \text{Eq. (7.20)}$$

$$\Psi_{g,Np} = \Psi^0_{g,Np} - \sqrt{\frac{s}{s_{cr,Np}}} \cdot \left(\Psi^0_{g,Np} - 1\right) \qquad \text{Eq. (7.17)}$$

$$\Psi_{g,Np} = 1.202 - \sqrt{\frac{100mm}{482mm}} \cdot \left(1.202 - 1\right) = 1.110 \geq 1$$

$$\Psi^0_{g,Np} = \sqrt{n} - \left(\sqrt{n} - 1\right) \cdot \left(\frac{\tau_{Rk}}{\tau_{Rk,c}}\right)^{1.5} \qquad \text{Eq. (7.18)}$$

$$\Psi^0_{g,Np} = \sqrt{4} - \left(\sqrt{4} - 1\right) \cdot \left(\frac{8.7N/mm^2}{10.1N/mm^2}\right)^{1.5} = 1.202 \geq 1$$

$$\tau_{Rk,c} = \frac{k_3}{\pi \cdot d}\sqrt{h_{ef} \cdot f_{ck}} = \frac{7.7}{3.14 \cdot 16mm}\sqrt{173mm \cdot 25.0N/mm^2} = 10.1N/mm^2 \qquad \text{Eq. (7.19)}$$

$$\Psi_{ec,Np} = \frac{1}{1 + \frac{2c_a}{s_{cr,Np}}} = \Psi_{ec,Npx} \cdot \Psi_{ec,Npy} = 1.000 \cdot 1.000 = 1.000 \leq 1 \qquad \text{Eq. (7.21)}$$

$$\Psi_{re,Np} = 1.000 \qquad \text{Eq. (7.5)}$$

$V_{Rk,cp}$ kN	γ_{Mcp}	$V_{Rd,cp}$ kN	V_{Ed} kN	$\beta_{V,cp}$ %
243.98	1.50	162.65	11.18	6.9

Anchor no.	$\beta_{V,cp}$ %	Group N°	Decisive Beta
1, 2, 3, 4	6.9	1	$\beta_{V,cp;1}$

Utilization of tension and shear loads

Tension loads	Utilisation β_N %
Steel failure *	37.7
Combined pull-out and concrete cone failure	99.9
Concrete cone failure	60.8

Shear Loads	Utilisation β_V %
Steel failure without lever arm *	5.5
Concrete pry-out failure	6.9

* Most unfavourable anchor

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Resistance to combined tensile and shear loads

Utilisation steel

$$\beta_{N,s} = \beta_{N,s;2} = 0.38 \leq 1$$
$$\beta_{V,s} = \beta_{Vs;1} = 0.06 \leq 1$$
$$\beta_N^2 + \beta_V^2 = \beta_{N,s;2}^2 + \beta_{Vs;2}^2 = 0.15 \leq 1 \quad \text{Eq. (7.55)}$$

Utilisation concrete



Proof successful

$$\beta_{N,p} = \beta_{N,p;1} = 1.00 \leq 1$$
$$\beta_{V,cp} = \beta_{V,cp;1} = 0.07 \leq 1$$
$$\frac{\beta_N + \beta_V}{1.2} = \frac{\beta_{N,p;1} + \beta_{V,cp;1}}{1.2} = 0.89 \leq 1 \quad \text{Eq. (7.57)}$$

Information concerning the anchor plate

Base plate details

Plate thickness specified by user without proof	t = 15 mm
Profile type	HEAA 180

Technical remarks

The transmission of the anchor loads to the supports of the concrete member shall be shown for the ultimate limit state and the serviceability limit state; for this purpose, the normal verifications shall be carried out under due consideration of the actions introduced by the anchors. For these verifications the additional provisions given in the current design method shall be taken into account.
As a pre-condition the anchor plate is assumed to be flat when subjected to the actions. Therefore, the plate (if present) must be sufficiently stiff. The C-Fix anchor plate design is based on a proof of stresses and does not allow a statement about the stiffness of the plate. The proof of the necessary stiffness is not carried out by C-Fix.

During the design process, the following hints and warnings were issued:

- Anchors have to be greater than ≥ 30 mm to the edge of the profile.
- The factor ψM,N is taking into account the effect of a compression force between the fixture and concrete in case of bending moments with or without axial force. If the bending moment does not act continuously, please also check this load case. See EN 1992-4, 7.2.1.4 (7)

Legal provisions

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All values contained are average values; therefore, application-specific tests must always be carried out before using the respective fischer product. The results of the calculations carried out using the software are based mainly on the data you enter. You are therefore solely responsible for the accuracy, completeness and relevance of the data you enter. Furthermore, you are solely responsible for having the results of the calculation obtained checked and approved by a specialist before use for your specific system(s), in particular with regard to conformity with applicable standards and approvals. The design software is intended solely as an aid for the interpretation of standards and approvals without any guarantee of accuracy, correctness and relevance of the results or suitability for a specific application.
You must take all necessary and reasonable measures to prevent or limit damage caused by the design program. In particular, you must ensure that programs and data are backed up regularly and that updates of the design program offered by fischer are carried out regularly. If you do not use the automatic update function of the software, you must ensure that you always use the current and valid version of the design program by manually updating the software via the fischer website. If you culpably violate this obligation, fischer is not liable for any consequences arising from this, in particular not for the replacement of lost or damaged data or programs.

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Installation data

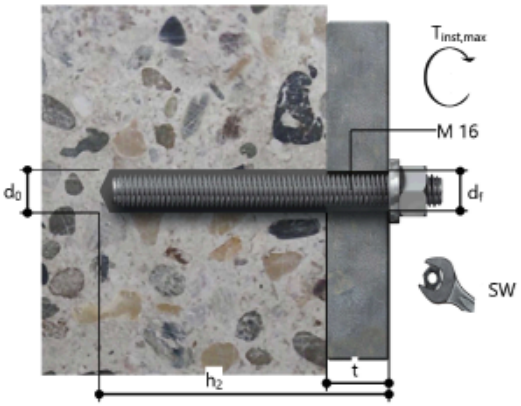
Anchor

Anchor system	**fischer Injection system FIS EM plus**	
Injection resin	FIS EM Plus 390 S (other cartridge sizes available)	Art.-No. 544171
Fixing element	Threaded rod FIS A M 16 x 250 8.8, zinc plated steel, Property Class 8.8	Art.-No. 517940
Accessories	FIS MR Plus	Art.-No. 545853
	FIS Extension tube 9mm	Art.-No. 48983
	Dispenser FIS DM S	Art.-No. 511118
	Compressed-air cleaning tool	Art.-No. 93286
	compressed air (oil-free), min. 6 bar	By job site.
	BSD 18	Art.-No. 1493
	SDS Chuck with internal thread M8	Art.-No. 530332
	Quattric II 18/200/250	Art.-No. 549956
	or alternatively	
	FHD 18/320/450	Art.-No. 546600
	Hammer drilling with or without suction	
Alternative cartdriges	FIS EM Plus 585 S	Art.-No. 544166
	FIS EM Plus 1500 S	Art.-No. 544167
	The shown cartdriges are alternative to the highlighted one above with the same approval number.	



Installation details

Thread diameter	M 16
Drill hole diameter	d_0 = 18 mm
Drill hole depth	h_2 = 188 mm
Calculated anchorage depth	h_{ef} = 173 mm
Drilling method	Hammer drilling
Drill hole cleaning	2 times blowing (compressed air), 2 times brushing, 2 times blowing (compressed air) No borehole cleaning required in case of using a hollow drill bit, e.g. fischer FHD.
Installation type	Push-through installation
Annular gap	Annular gap filled
Maximum torque	$T_{inst,max}$ = 60.0 Nm
Socket size	24 mm
Base plate thickness	t = 15 mm
Total fixing thickness Tfix,max	t_{fix} = 15 mm
Volume of resin per drill hole	22 ml/11 scale divisions



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Base plate details

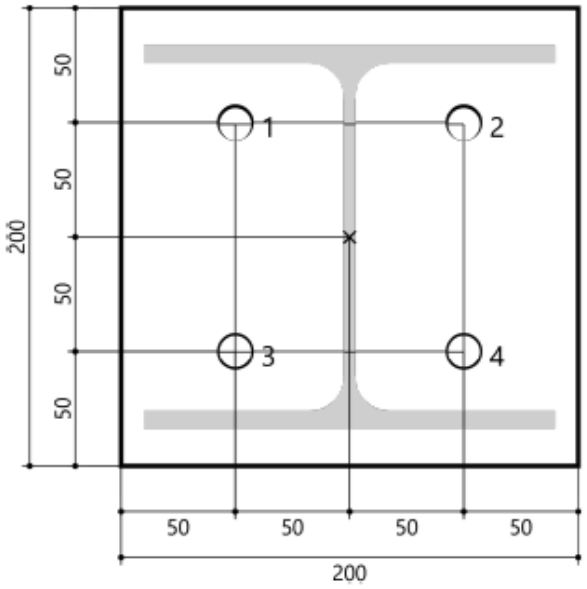
Base plate material	Not available
Base plate thickness	t = 15 mm
Clearance hole in base plate	d_f=20 mm

Attachment

Profile type	HEAA 180

Anchor coordinates

Anchor no.	x mm	y mm
1	-50	50
2	50	50
3	-50	-50
4	50	-50



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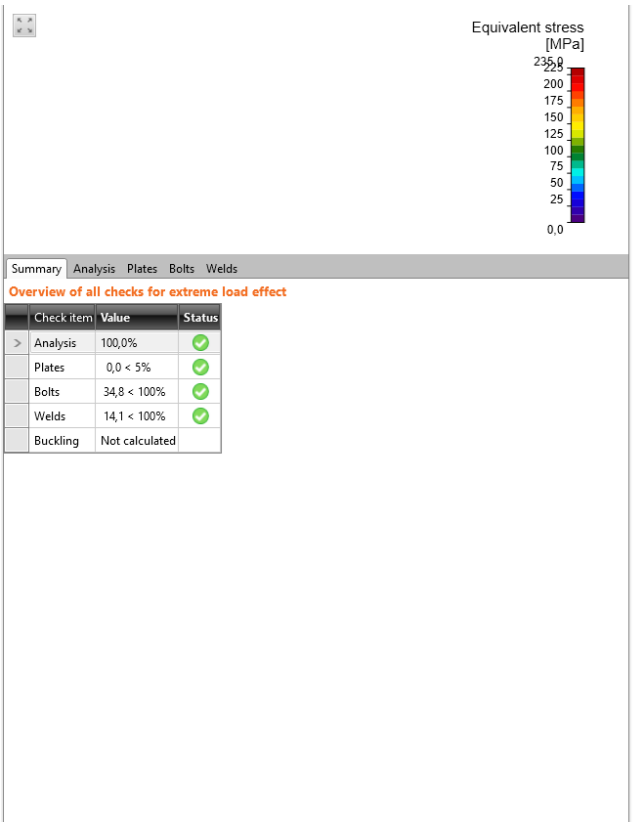
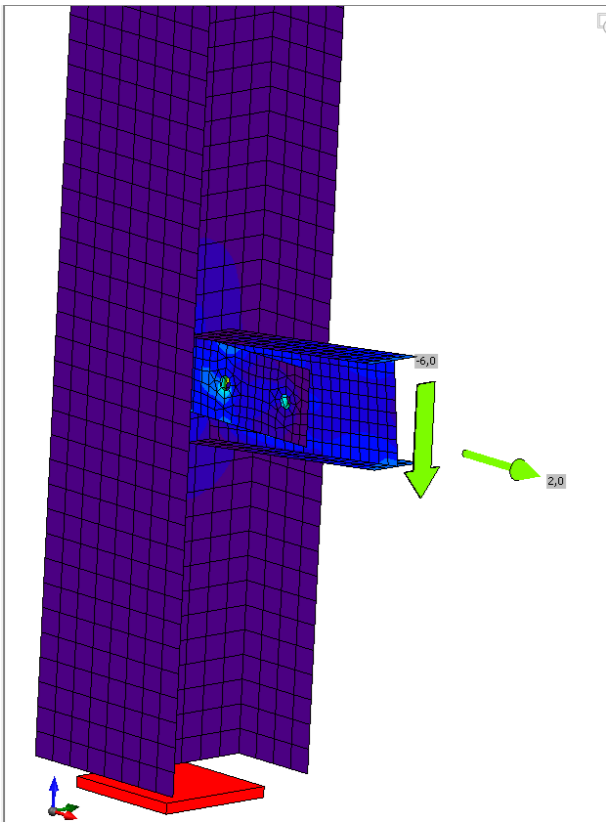
➢ *Analiza spoja glavnih profilov HEA 180 – IPE 100*





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Cross-sections

Name	Material
3 - HEA180	S 235
4 - IPE100	S 235

Bolts

Name	Bolt assembly	Diameter [mm]	fu [MPa]	Gross area [mm²]
M12 8.8	M12 8.8	12	800,0	113

Load effects (equilibrium not required)

Name	Member	Pos.	X [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
LE1	B	End	0	2,0	0,0	-6,0	0,0	0,0	0,0

Check

Summary

Name	Value	Check status
Analysis	100,0%	OK
Plates	0,0 < 5%	OK
Bolts	34,8 < 100%	OK
Welds	14,1 < 100%	OK
Buckling	Not calculated	

Plates

Name	Thickness [mm]	Loads	σ_{Ed} [MPa]	ε_{Pl} [1e-4]	Check status
C-bfl 1	9,5	LE1	6,0	0,0	OK
C-tfl 1	9,5	LE1	6,1	0,0	OK
C-w 1	6,0	LE1	42,1	0,0	OK
B-bfl 1	5,7	LE1	56,9	0,0	OK
B-tfl 1	5,7	LE1	52,2	0,0	OK
B-w 1	4,1	LE1	173,8	0,0	OK
FP1	10,0	LE1	74,7	0,0	OK

Design data

Material	fy [MPa]	ε_{lim} [1e-4]
S 235	235,0	500,0

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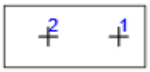
Bolts

	Name	Loads	$F_{t,Ed}$ [kN]	V [kN]	Ut_t [%]	$F_{b,Rd}$ [kN]	Ut_s [%]	Ut_{ts} [%]	Status
	B1	LE1	0,7	4,1	1,6	35,4	12,7	13,8	OK
	B2	LE1	2,5	10,0	5,6	35,4	31,1	34,8	OK

Design data

Name	$F_{t,Rd}$ [kN]	$B_{p,Rd}$ [kN]	$F_{v,Rd}$ [kN]
M12 8.8 - 1	48,4	44,5	32,3

Symbol explanation

$F_{t,Rd}$	Bolt tension resistance EN 1993-1-8 tab. 3.4
$F_{t,Ed}$	Tension force
$B_{p,Rd}$	Punching shear resistance
V	Resultant of shear forces Vy, Vz in bolt.
$F_{v,Rd}$	Bolt shear resistance EN_1993-1-8 table 3.4
$F_{b,Rd}$	Plate bearing resistance EN 1993-1-8 tab. 3.4
Ut_t	Utilization in tension
Ut_s	Utilization in shear
Ut_{ts}	Utilization in tension and shear EN 1993-1-8 table 3.4

Welds (Plastic redistribution)

Item	Edge	Throat th. [mm]	Length [mm]	Loads	$\sigma_{w,Ed}$ [MPa]	ε_{Pl} [%]	$\sigma_{\perp}$ [MPa]	$\tau_{\parallel}$ [MPa]	$\tau_{\perp}$ [MPa]	Ut [%]	Ut_c [%]	Status
C-w 1	FP1	◢4,0◣	70	LE1	40,8	0,0	17,1	18,5	10,7	11,3	5,7	OK
		◢4,0◣	70	LE1	50,7	0,0	4,4	-27,1	-10,7	14,1	10,2	OK

Design data

	β_w [-]	$\sigma_{w,Rd}$ [MPa]	0.9 σ [MPa]
S 235	0,80	360,0	259,2

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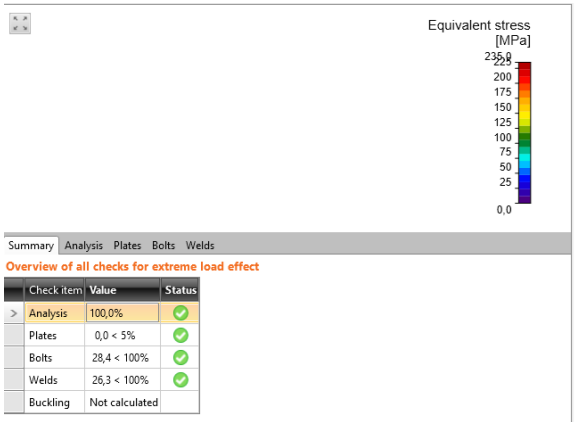
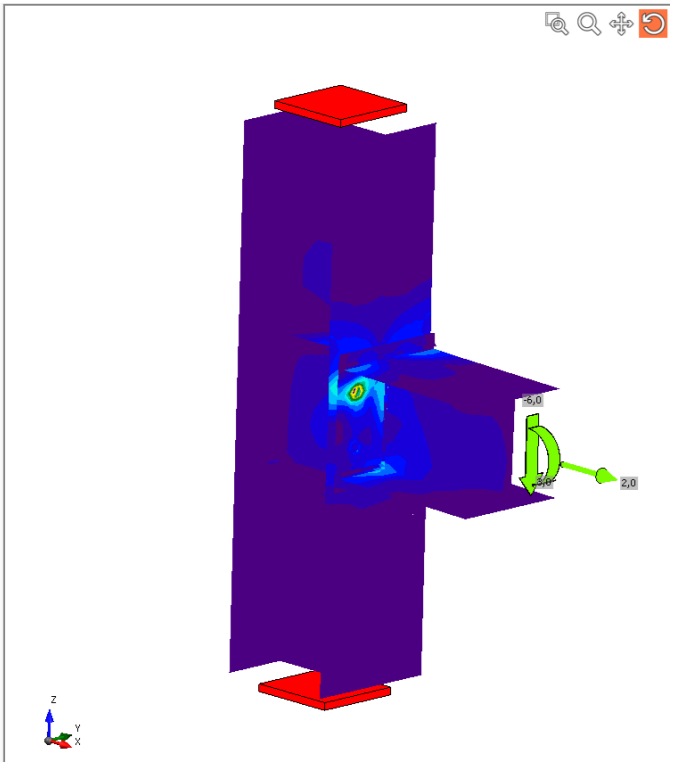
➢ *Analiza spoja glavnih profilov HEA 180 – HEA 160 (HEA 120)*





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Cross-sections

Name	Material
3 - HEA180	S 235
7 - HEA160	S 235

Bolts

Name	Bolt assembly	Diameter [mm]	fu [MPa]	Gross area [mm^2]
M12 8.8	M12 8.8	12	800,0	113

Load effects (equilibrium not required)

Name	Member	Pos.	X [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
LE1	B	End	0	2,0	0,0	-6,0	0,0	3,0	0,0

Check

Summary

Name	Value	Check status
Analysis	100,0%	OK
Plates	0,0 < 5%	OK
Bolts	28,4 < 100%	OK
Welds	26,3 < 100%	OK
Buckling	Not calculated	

Plates

Name	Thickness [mm]	Loads	σ_{Ed} [MPa]	ε_{Pl} [1e-4]	Check status
C-bfl 1	9,5	LE1	167,2	0,0	OK
C-tfl 1	9,5	LE1	10,9	0,0	OK
C-w 1	6,0	LE1	33,0	0,0	OK
B-bfl 1	9,0	LE1	63,8	0,0	OK
B-tfl 1	9,0	LE1	55,9	0,0	OK
B-w 1	6,0	LE1	47,5	0,0	OK
EP1	10,0	LE1	138,9	0,0	OK
STIFF1a	8,0	LE1	43,1	0,0	OK
STIFF1b	8,0	LE1	43,2	0,0	OK
STIFF2a	8,0	LE1	11,6	0,0	OK
STIFF2b	8,0	LE1	12,9	0,0	OK

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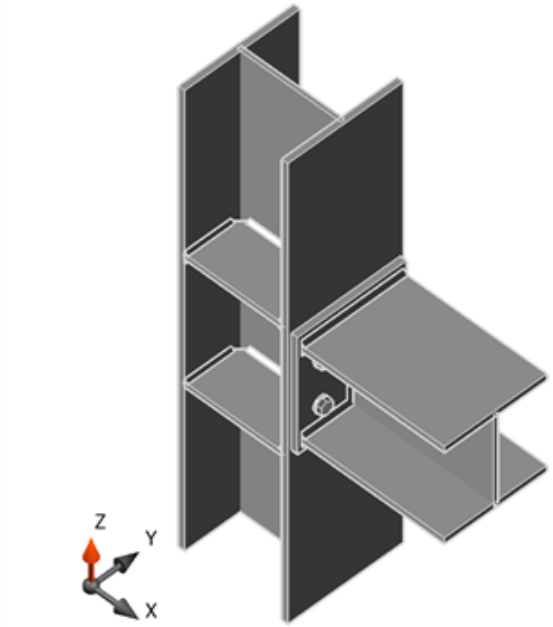
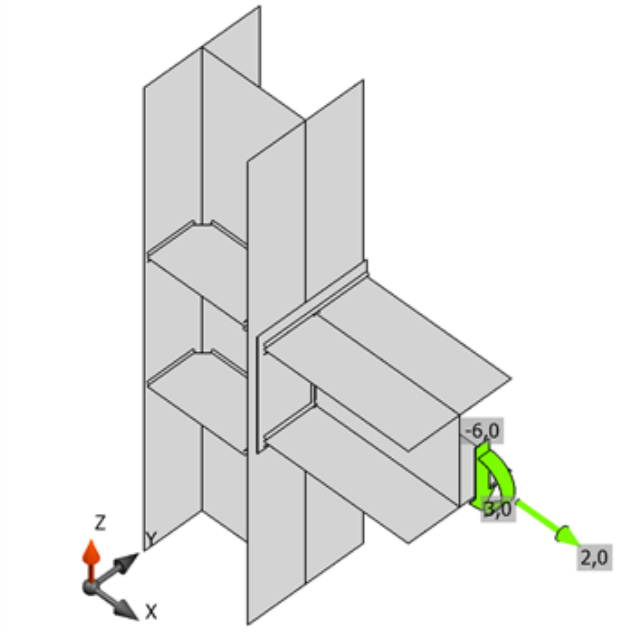
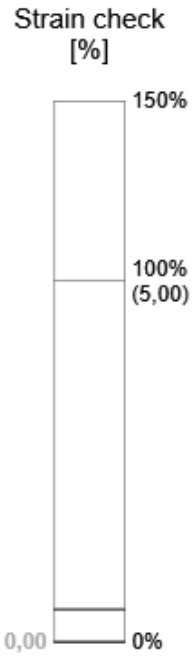
Symbol explanation

ε_{Pl}	Strain
σ_{Ed}	Eq. stress

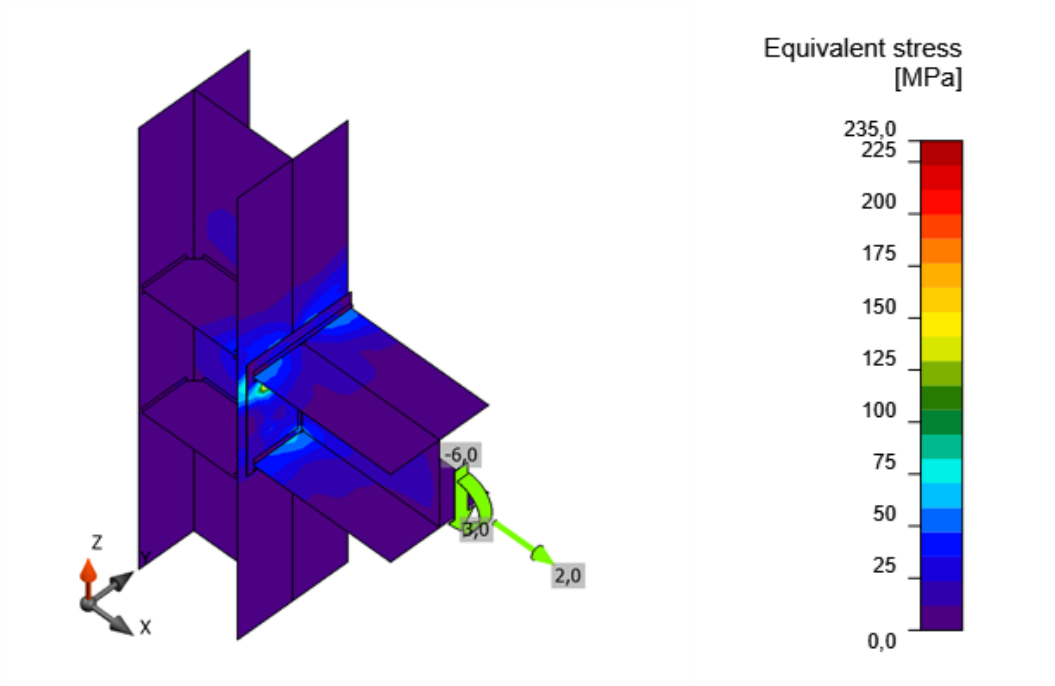


Overall check, LE1



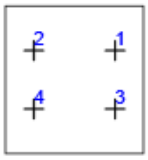


Strain check, LE1



Equivalent stress, LE1

Bolts

	Name	Loads	$F_{t,Ed}$ [kN]	V [kN]	Ut_t [%]	$F_{b,Rd}$ [kN]	Ut_s [%]	Ut_{ts} [%]	Status
	B1	LE1	13,7	1,5	28,4	82,1	4,6	24,9	OK
	B2	LE1	13,7	1,5	28,4	82,1	4,6	24,9	OK
	B3	LE1	2,5	1,5	5,1	82,1	4,7	8,4	OK
	B4	LE1	2,4	1,5	5,0	82,1	4,7	8,3	OK

Design data

Name	$F_{t,Rd}$ [kN]	$B_{p,Rd}$ [kN]	$F_{v,Rd}$ [kN]
M12 8.8 - 1	48,4	103,1	32,3

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Symbol explanation

$F_{t,Rd}$	Bolt tension resistance EN 1993-1-8 tab. 3.4
$F_{t,Ed}$	Tension force
$B_{p,Rd}$	Punching shear resistance
V	Resultant of shear forces Vy, Vz in bolt.
$F_{v,Rd}$	Bolt shear resistance EN_1993-1-8 table 3.4
$F_{b,Rd}$	Plate bearing resistance EN 1993-1-8 tab. 3.4
Ut_t	Utilization in tension
Ut_s	Utilization in shear
Ut_{ts}	Utilization in tension and shear EN 1993-1-8 table 3.4

Welds (Plastic redistribution)

Item	Edge	Throat th. [mm]	Length [mm]	Loads	$\sigma_{w,Ed}$ [MPa]	ε_{Pl} [%]	$\sigma_{\perp}$ [MPa]	$\tau_{\parallel}$ [MPa]	$\tau_{\perp}$ [MPa]	Ut [%]	Ut_c [%]	Status
EP1	B-bfl 1	◢5,0◣	160	LE1	55,6	0,0	-6,9	-15,7	-27,7	15,4	5,0	OK
		◢5,0◣	160	LE1	94,6	0,0	-61,1	-10,6	40,3	26,3	11,4	OK
EP1	B-tfl 1	◢5,0◣	160	LE1	35,1	0,0	-11,3	-9,9	-16,5	9,8	6,1	OK
		◢5,0◣	160	LE1	46,4	0,0	11,7	24,6	-8,1	12,9	9,5	OK
EP1	B-w 1	◢4,0◣	143	LE1	59,4	0,0	29,4	4,7	29,4	16,5	7,3	OK
		◢4,0◣	143	LE1	59,2	0,0	29,4	-4,6	-29,3	16,4	7,3	OK
C-bfl 1	STIFF1a	◢4,0◣	72	LE1	21,8	0,0	-1,2	4,2	-11,8	6,0	5,1	OK
		◢4,0◣	72	LE1	37,3	0,0	14,3	17,5	-9,4	10,4	8,9	OK
C-w 1	STIFF1a	◢4,0◣	122	LE1	9,3	0,0	1,8	4,7	2,3	2,6	2,0	OK
		◢4,0◣	122	LE1	12,7	0,0	-7,9	-4,5	3,5	3,5	2,0	OK
C-tfl 1	STIFF1a	◢4,0◣	72	LE1	7,9	0,0	2,1	-4,0	1,7	2,2	1,3	OK
		◢4,0◣	72	LE1	5,7	0,0	0,8	3,1	-1,2	1,6	0,8	OK
C-bfl 1	STIFF1b	◢4,0◣	72	LE1	37,7	0,0	14,4	-17,7	9,5	10,5	8,9	OK
		◢4,0◣	72	LE1	22,0	0,0	-1,3	-4,3	11,9	6,1	5,1	OK
C-w 1	STIFF1b	◢4,0◣	122	LE1	12,7	0,0	-7,9	4,5	-3,5	3,5	2,0	OK
		◢4,0◣	122	LE1	9,3	0,0	1,8	-4,7	-2,3	2,6	2,0	OK
C-tfl 1	STIFF1b	◢4,0◣	72	LE1	5,7	0,0	0,8	-3,1	1,2	1,6	0,8	OK
		◢4,0◣	72	LE1	7,9	0,0	2,1	4,1	-1,7	2,2	1,3	OK
C-bfl 1	STIFF2a	◢4,0	72	LE1	37,9	0,0	-17,8	-8,0	17,6	10,5	7,2	OK
C-w 1	STIFF2a	◢4,0	122	LE1	21,5	0,0	-3,0	12,0	2,7	6,0	4,4	OK
C-tfl 1	STIFF2a	◢4,0	72	LE1	18,5	0,0	-4,2	-9,4	4,4	5,1	2,2	OK
C-bfl 1	STIFF2b	◢4,0	72	LE1	42,8	0,0	-20,2	-8,6	20,0	11,9	7,6	OK
C-w 1	STIFF2b	◢4,0	122	LE1	21,6	0,0	-2,8	12,0	3,0	6,0	4,6	OK
C-tfl 1	STIFF2b	◢4,0	72	LE1	18,6	0,0	-4,4	-9,6	4,2	5,2	2,2	OK

Design data

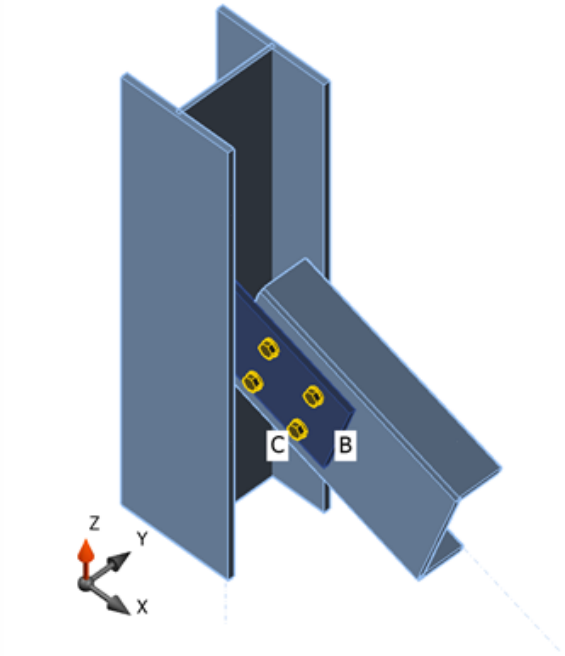
	β_w [-]	$\sigma_{w,Rd}$ [MPa]	0.9 σ [MPa]
S 235	0,80	360,0	259,2

PODOBNO IZVESTI TUDI SPOJ HEA 180 – HEA 120

➢ *Analiza spoja steber HEA180 – C 200 profil stopnic*

Beams and columns

Name	Cross-section	β – Direction [°]	γ - Pitch [°]	α - Rotation [°]	Offset ex [mm]	Offset ey [mm]	Offset ez [mm]
C	3 - HEA180	90,0	-90,0	0,0	0	0	0
B	4 - U200	0,0	20,0	0,0	0	0	0



Cross-sections

Name	Material
3 - HEA180	S 235
4 - U200	S 235

Bolts

Name	Bolt assembly	Diameter [mm]	fu [MPa]	Gross area [mm²]
M12 8.8	M12 8.8	12	800,0	113

Load effects (equilibrium not required)

Name	Member	Pos.	X [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
LE1	B	End	0	3,0	0,0	-7,0	0,0	0,0	0,0

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Check

Summary

Name	Value	Check status
Analysis	100,0%	OK
Plates	0,0 < 5%	OK
Bolts	21,7 < 100%	OK
Welds	19,9 < 100%	OK
Buckling	Not calculated	

Plates

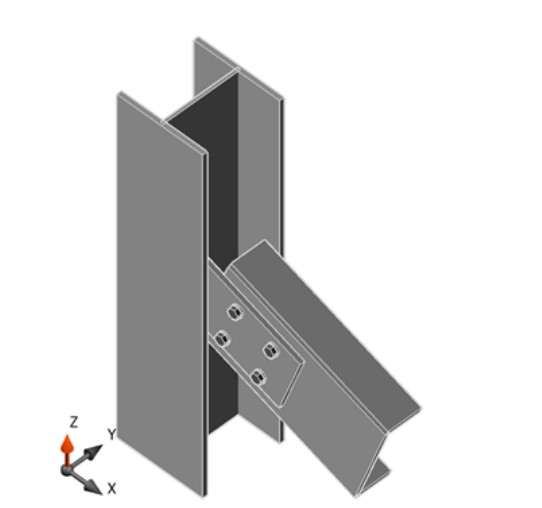
Name	Thickness [mm]	Loads	σ_{Ed} [MPa]	ε_{Pl} [1e-4]	Check status
C-bfl 1	9,5	LE1	2,9	0,0	OK
C-tfl 1	9,5	LE1	2,8	0,0	OK
C-w 1	6,0	LE1	36,2	0,0	OK
B-bfl 1	11,5	LE1	32,8	0,0	OK
B-tfl 1	11,5	LE1	30,5	0,0	OK
B-w 1	8,5	LE1	71,3	0,0	OK
FP1	10,0	LE1	112,6	0,0	OK

Design data

Material	fy [MPa]	ε_{lim} [1e-4]
S 235	235,0	500,0

Symbol explanation

ε_{Pl}	Strain
σ_{Ed}	Eq. stress



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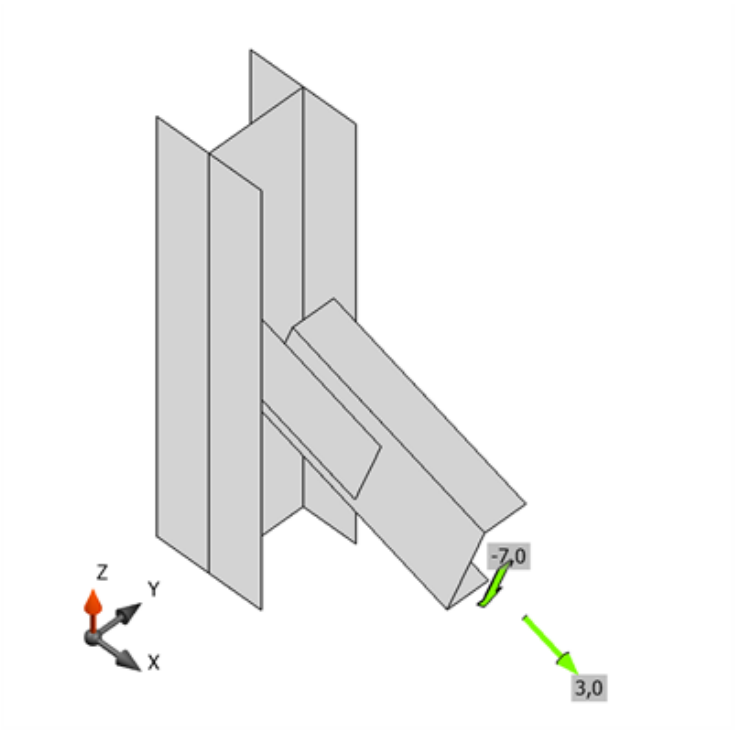
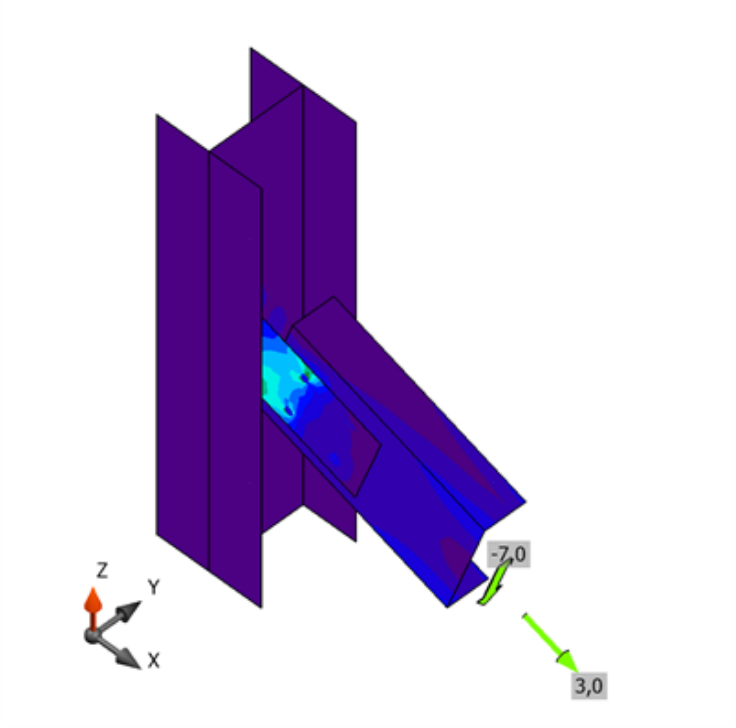


Strain check, LE1



Equivalent stress, LE1

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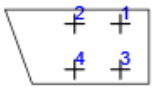
Bolts

	Name	Loads	$F_{t,Ed}$ [kN]	V [kN]	Ut_t [%]	$F_{b,Rd}$ [kN]	Ut_s [%]	Ut_{ts} [%]	Status
	B1	LE1	0,2	2,8	0,4	73,4	8,6	8,9	OK
	B2	LE1	3,5	5,3	7,3	73,4	16,5	21,7	OK
	B3	LE1	0,2	4,0	0,5	73,4	12,4	12,7	OK
	B4	LE1	1,2	6,3	2,5	65,0	19,5	21,2	OK

Design data

Name	$F_{t,Rd}$ [kN]	$B_{p,Rd}$ [kN]	$F_{v,Rd}$ [kN]
M12 8.8 - 1	48,4	92,3	32,3

Symbol explanation

$F_{t,Rd}$	Bolt tension resistance EN 1993-1-8 tab. 3.4
$F_{t,Ed}$	Tension force
$B_{p,Rd}$	Punching shear resistance
V	Resultant of shear forces Vy, Vz in bolt.
$F_{v,Rd}$	Bolt shear resistance EN_1993-1-8 table 3.4
$F_{b,Rd}$	Plate bearing resistance EN 1993-1-8 tab. 3.4
Ut_t	Utilization in tension
Ut_s	Utilization in shear
Ut_{ts}	Utilization in tension and shear EN 1993-1-8 table 3.4

Welds (Plastic redistribution)

Item	Edge	Throat th. [mm]	Length [mm]	Loads	$\sigma_{w,Ed}$ [MPa]	ε_{Pl} [%]	$\sigma_{\perp}$ [MPa]	$\tau_{\parallel}$ [MPa]	$\tau_{\perp}$ [MPa]	Ut [%]	Ut_c [%]	Status
C-w 1	FP1	◢4,0◣	138	LE1	43,7	0,0	-34,9	-4,0	-14,6	13,5	4,4	OK
		◢4,0◣	138	LE1	71,7	0,0	45,4	-20,0	-25,1	19,9	9,2	OK

Design data

	β_w [-]	$\sigma_{w,Rd}$ [MPa]	0.9 σ [MPa]
S 235	0,80	360,0	259,2

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2.5.3. Analiza jeklenega požarnega stopnišč POZ-700

2.5.3.1. Analiza jeklenega stopnišča

Glej prilogo:

2. Načrt gradbeništva

Vhodni podatki - Konstrukcija

Shema nivojev

Naziv	z [m]	h [m]
	3.95	3.95

Naziv	z [m]	h [m]
	0.00	

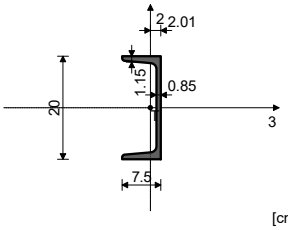
Tabele materialov

No	Naziv materiala	E[kN/m2]	μ	γ[kN/m3]	αt[1/C]	Em[kN/m2]	μm
1	Jeklo	2.100e+8	0.30	78.50	1.000e-5	2.100e+8	0.30

Seti gred

Set: 1 Prerez: [200, Fiktivna ekscentričnost

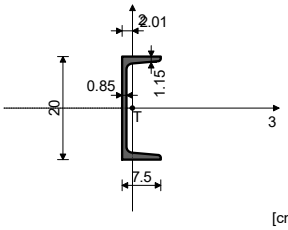
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	3.220e-3	1.662e-3	1.558e-3	1.190e-7	1.480e-6	1.910e-5



[cm]

Set: 2 Prerez: [200, Fiktivna ekscentričnost

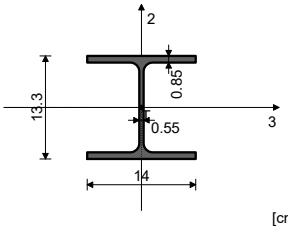
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	3.220e-3	1.662e-3	1.558e-3	1.190e-7	1.480e-6	1.910e-5



[cm]

Set: 3 Prerez: IPBl 140, Fiktivna ekscentričnost

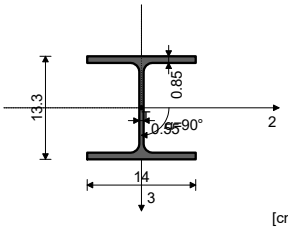
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	3.140e-3	1.011e-3	2.129e-3	8.160e-8	3.890e-6	1.030e-5



[cm]

Set: 4 Prerez: IPBl 140, Fiktivna ekscentričnost

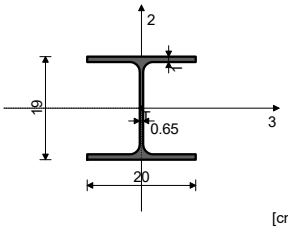
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	3.140e-3	2.129e-3	1.011e-3	8.160e-8	1.030e-5	3.890e-6



[cm]

Set: 6 Prerez: IPBl 200, Fiktivna ekscentričnost

Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	5.380e-3	1.805e-3	3.575e-3	2.110e-7	1.340e-5	3.690e-5

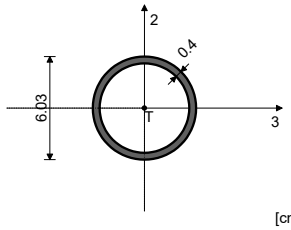


[cm]

2. Načrt gradbeništva

Set: 7 Prerez: D= 60.3x4, Fiktivna ekscentričnost

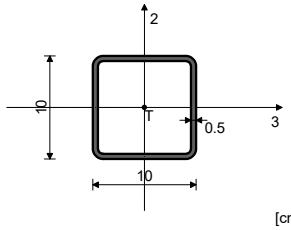
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	7.070e-4	3.536e-4	3.536e-4	5.632e-7	2.817e-7	2.817e-7



[cm]

Set: 8 Prerez: HOP [] 100x100x5, Fiktivna ekscentričnost

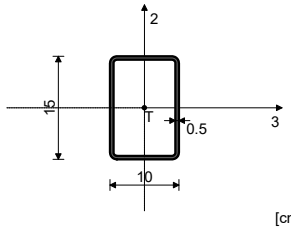
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	1.836e-3	1.000e-3	1.000e-3	4.390e-6	2.711e-6	2.711e-6



[cm]

Set: 9 Prerez: HOP [] 150x100x5, Fiktivna ekscentričnost

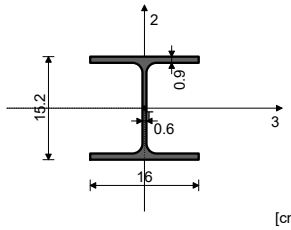
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	2.336e-3	1.500e-3	1.000e-3	8.067e-6	3.840e-6	7.192e-6



[cm]

Set: 10 Prerez: IPBl 160, Fiktivna ekscentričnost

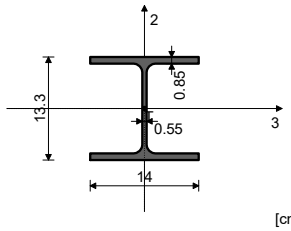
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	3.880e-3	1.324e-3	2.556e-3	1.230e-7	6.160e-6	1.670e-5



[cm]

Set: 11 Prerez: IPBl 140, Fiktivna ekscentričnost

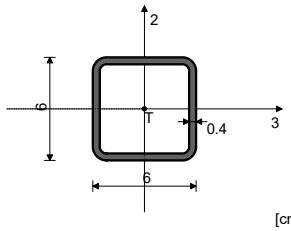
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	3.140e-3	1.011e-3	2.129e-3	8.160e-8	3.890e-6	1.030e-5



[cm]

Set: 12 Prerez: HOP [] 60x60x4, Prosta palica, Fiktivna ekscentričnost

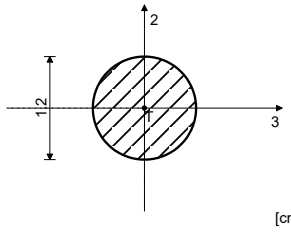
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	8.550e-4	4.800e-4	4.800e-4	7.219e-7	4.355e-7	4.355e-7



[cm]

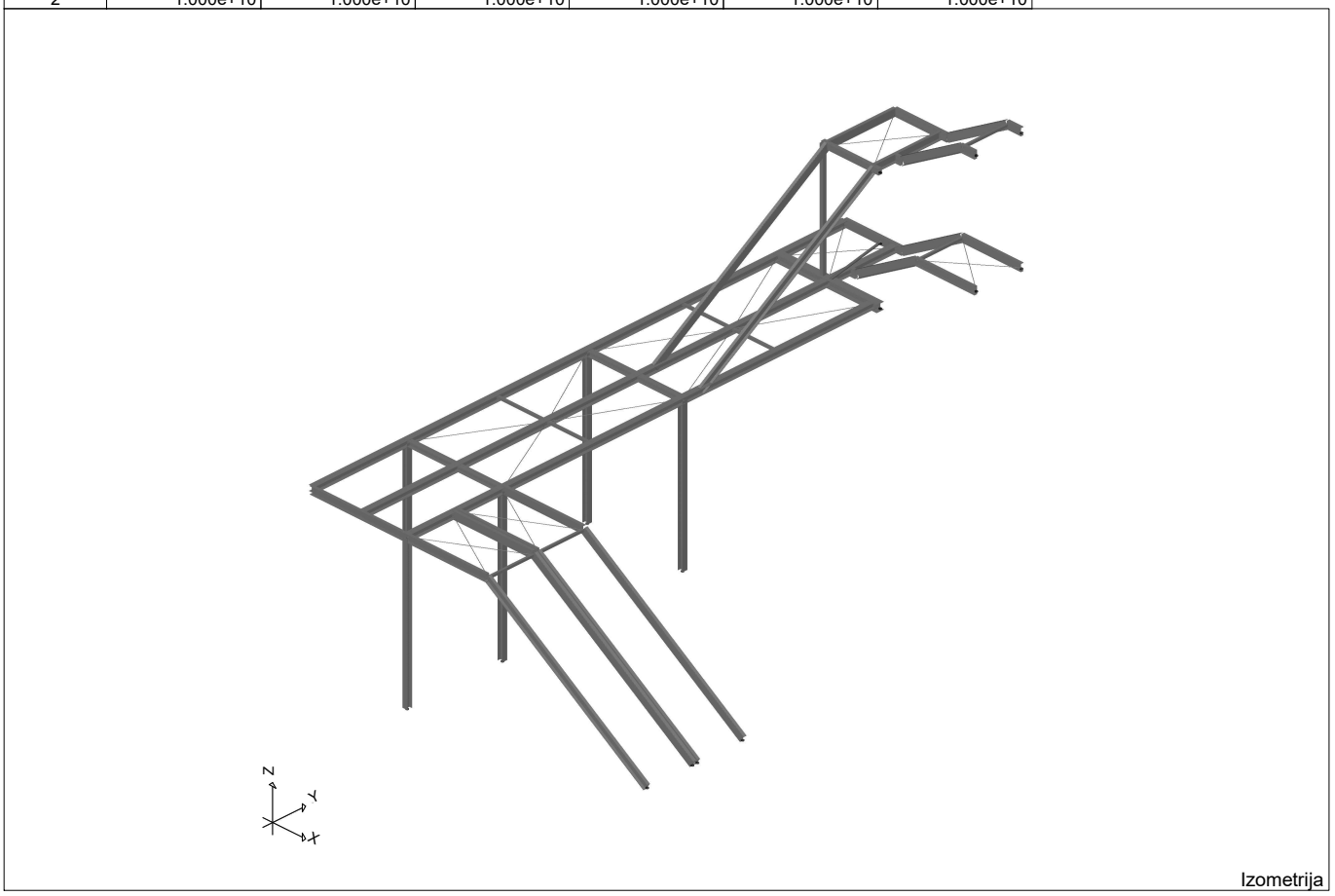
2. Načrt gradbeništva

Set: 13 Prerez: D=1.2, Prosta palica, Fiktivna ekscentričnost						
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	1.131e-4	1.018e-4	1.018e-4	2.036e-9	1.018e-9	1.018e-9



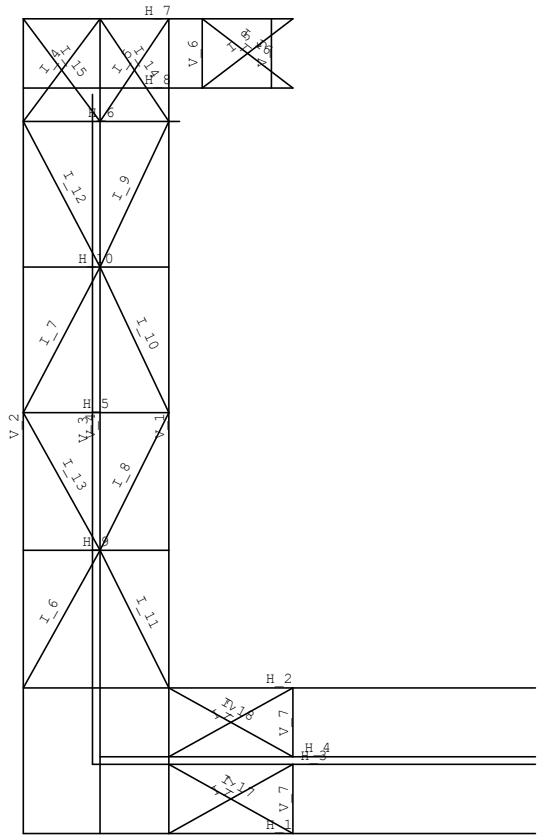
[cm]

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	1.000e+10	1.000e+10	1.000e+10	1.000e+10	1.000e+10

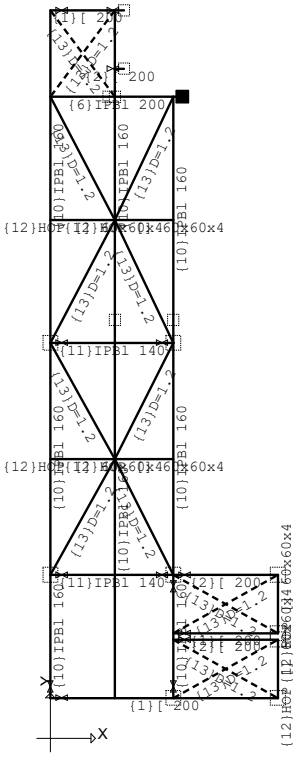


Izometrija

2. Načrt gradbeništva

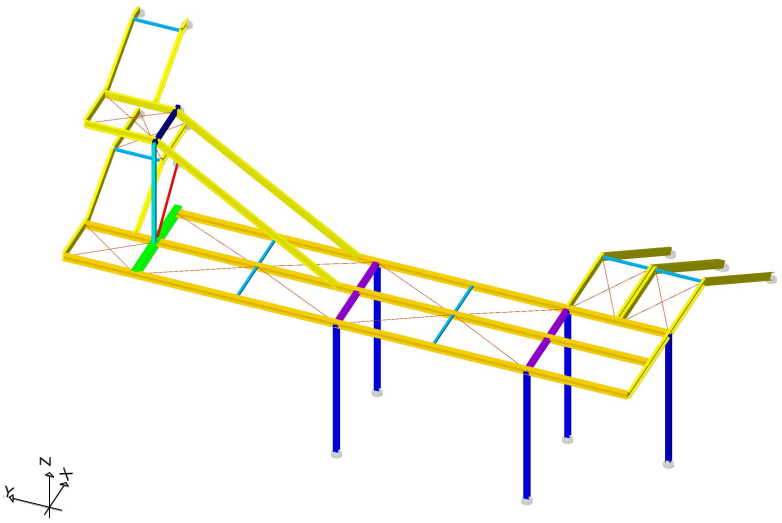


Dispozicija okvirjev



Pogled: Nivo_1

2. Načrt gradbeništva



Greda
1. [200
2. [200
3. IPBl 140
4. IPBl 140
6. IPBl 200
7. D= 60.3x4
8. HOP [] 100x100x5
9. HOP [] 150x100x5
10. IPBl 160
11. IPBl 140
12. HOP [] 60x60x4
13. D=1.2

Seti numeričnih podatkov
Greda (1-4,6-13)

2. Načrt gradbeništva

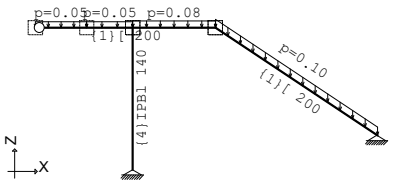
Vhodni podatki - Obtežba

Lista obtežnih primerov

LC	Naziv
1	Lastna teža (g)
2	Koristna teža

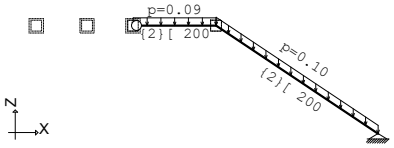
LC	Naziv
3	Komb.: 1.35xI+1.5xII
4	Komb.: I+II

Obt. 1: Lastna teža (g)



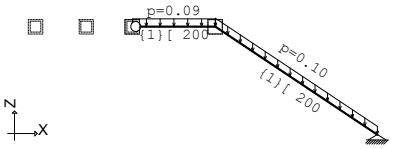
Okvir: H_1

Obt. 1: Lastna teža (g)



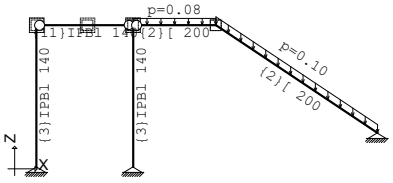
Okvir: H_3

Obt. 1: Lastna teža (g)



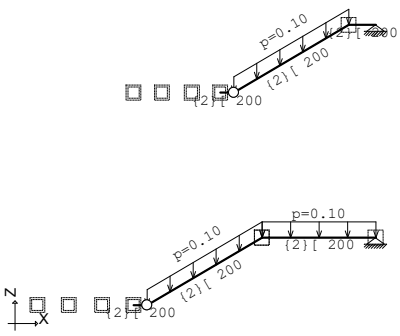
Okvir: H_4

Obt. 1: Lastna teža (g)



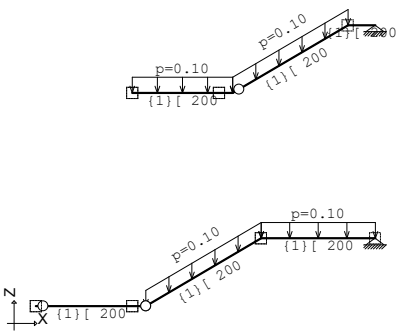
Okvir: H_2

Obt. 1: Lastna teža (g)



Okvir: H_8

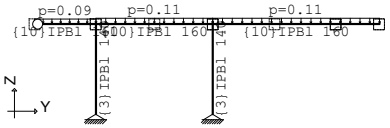
Obt. 1: Lastna teža (g)



Okvir: H_7

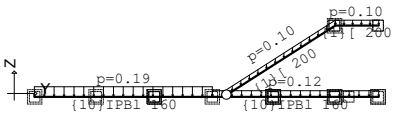
2. Načrt gradbeništva

Obt. 1: Lastna teža (g)



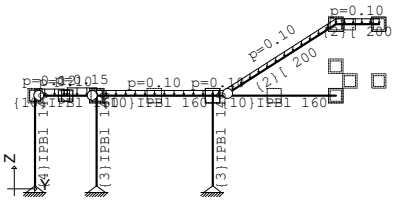
Okvir: V_2

Obt. 1: Lastna teža (g)



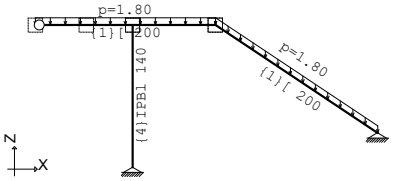
Okvir: V_4

Obt. 1: Lastna teža (g)



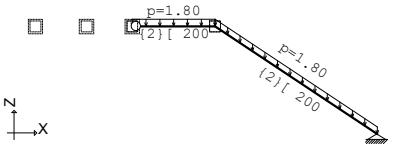
Okvir: V_1

Obt. 2: Koristna teža



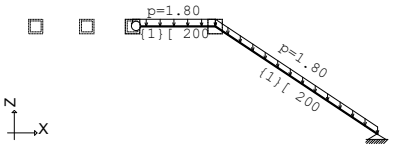
Okvir: H_1

Obt. 2: Koristna teža



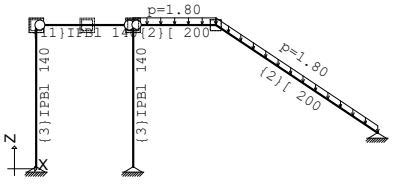
Okvir: H_3

Obt. 2: Koristna teža



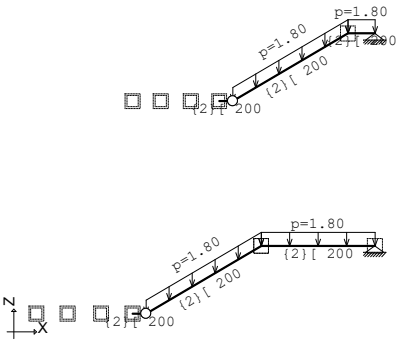
Okvir: H_4

Obt. 2: Koristna teža



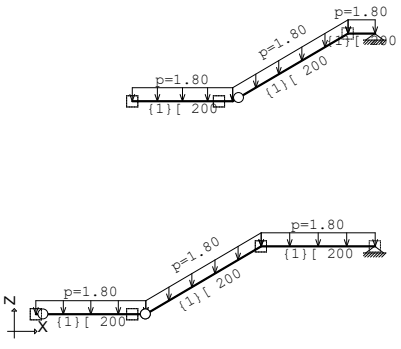
Okvir: H_2

Obt. 2: Koristna teža



Okvir: H_8

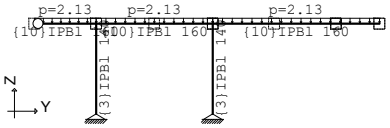
Obt. 2: Koristna teža



Okvir: H_7

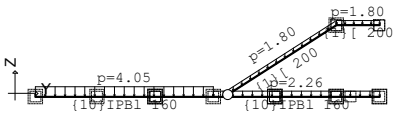
2. Načrt gradbeništva

Obt. 2: Koristna teža



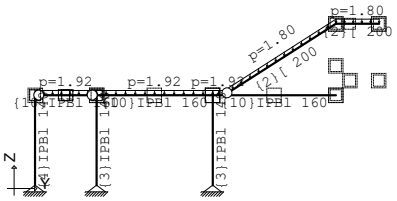
Okvir: V_2

Obt. 2: Koristna teža



Okvir: V_4

Obt. 2: Koristna teža

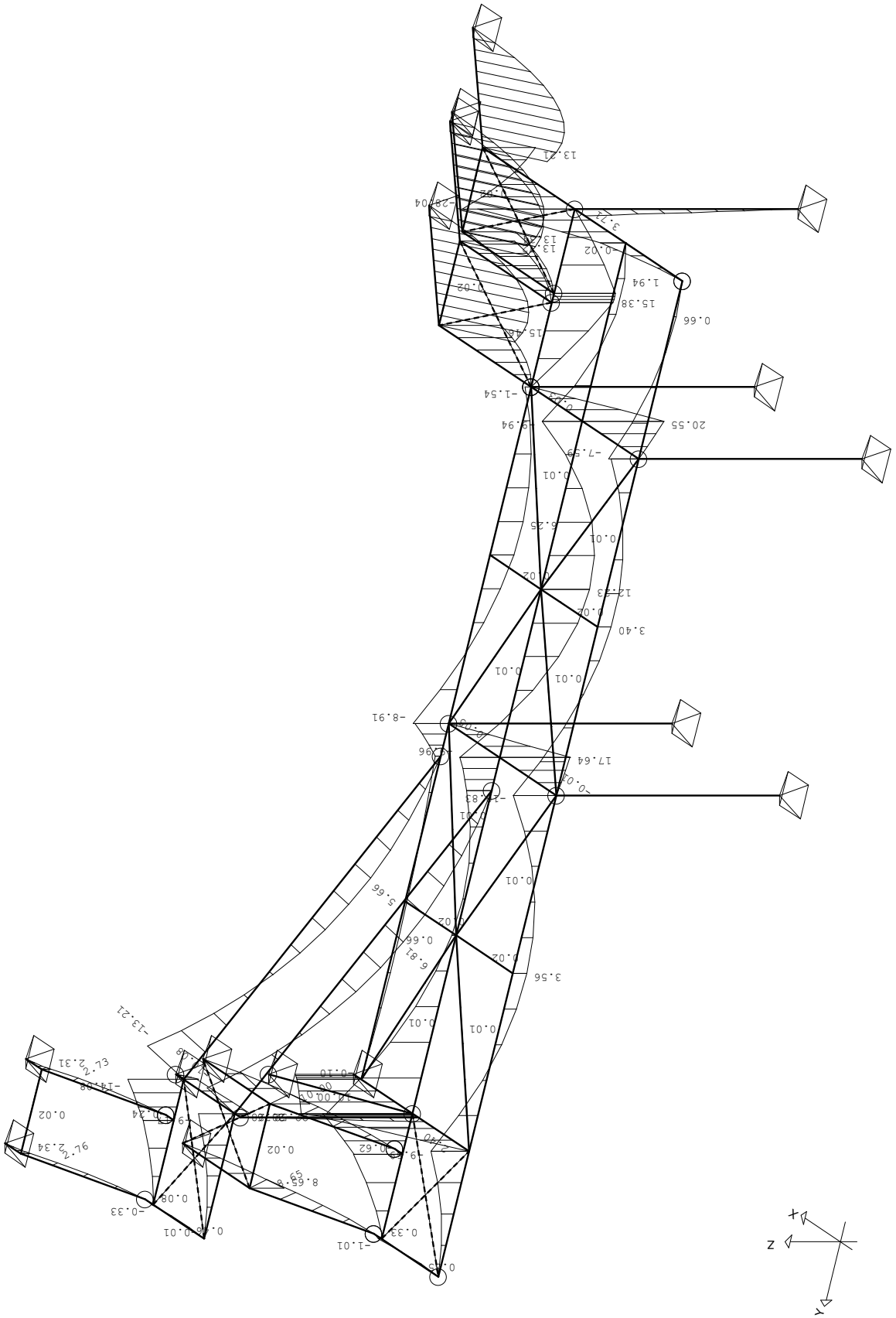


Okvir: V_1

2. Načrt gradbeništva

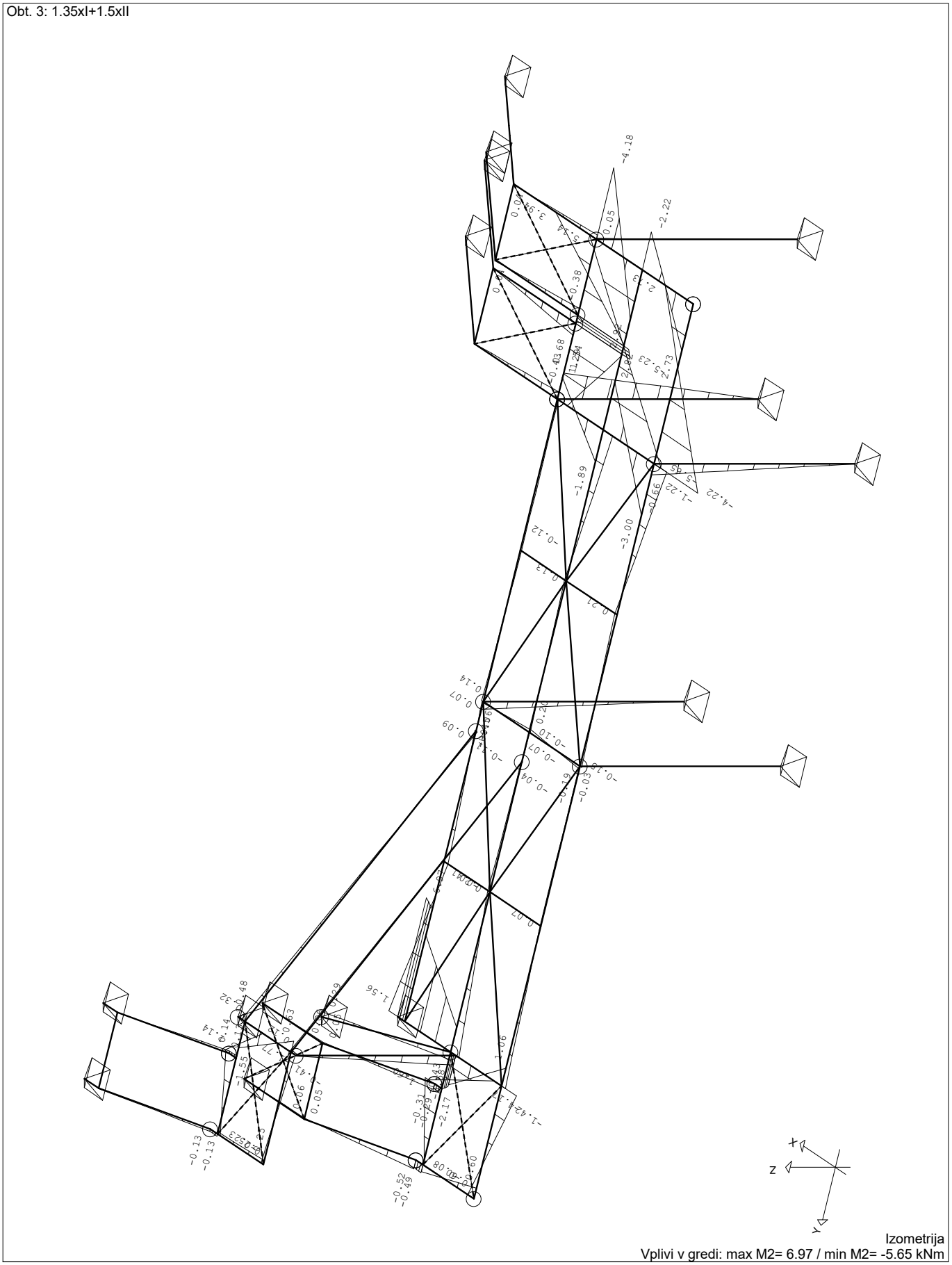
Statični preračun

Obt. 3: 1.35xI+1.5xII

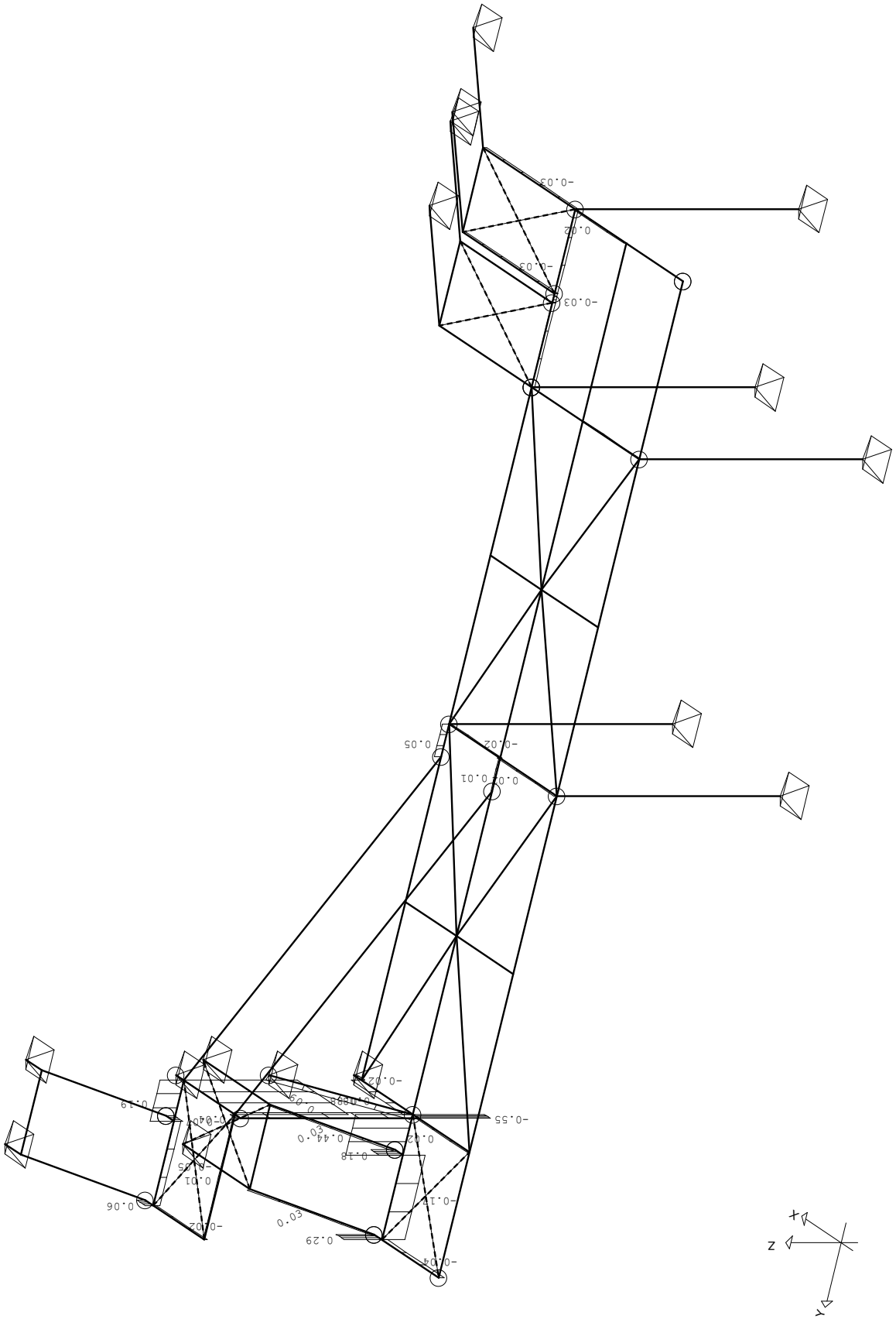


2. Načrt gradbeništva

Obt. 3: 1.35xI+1.5xII

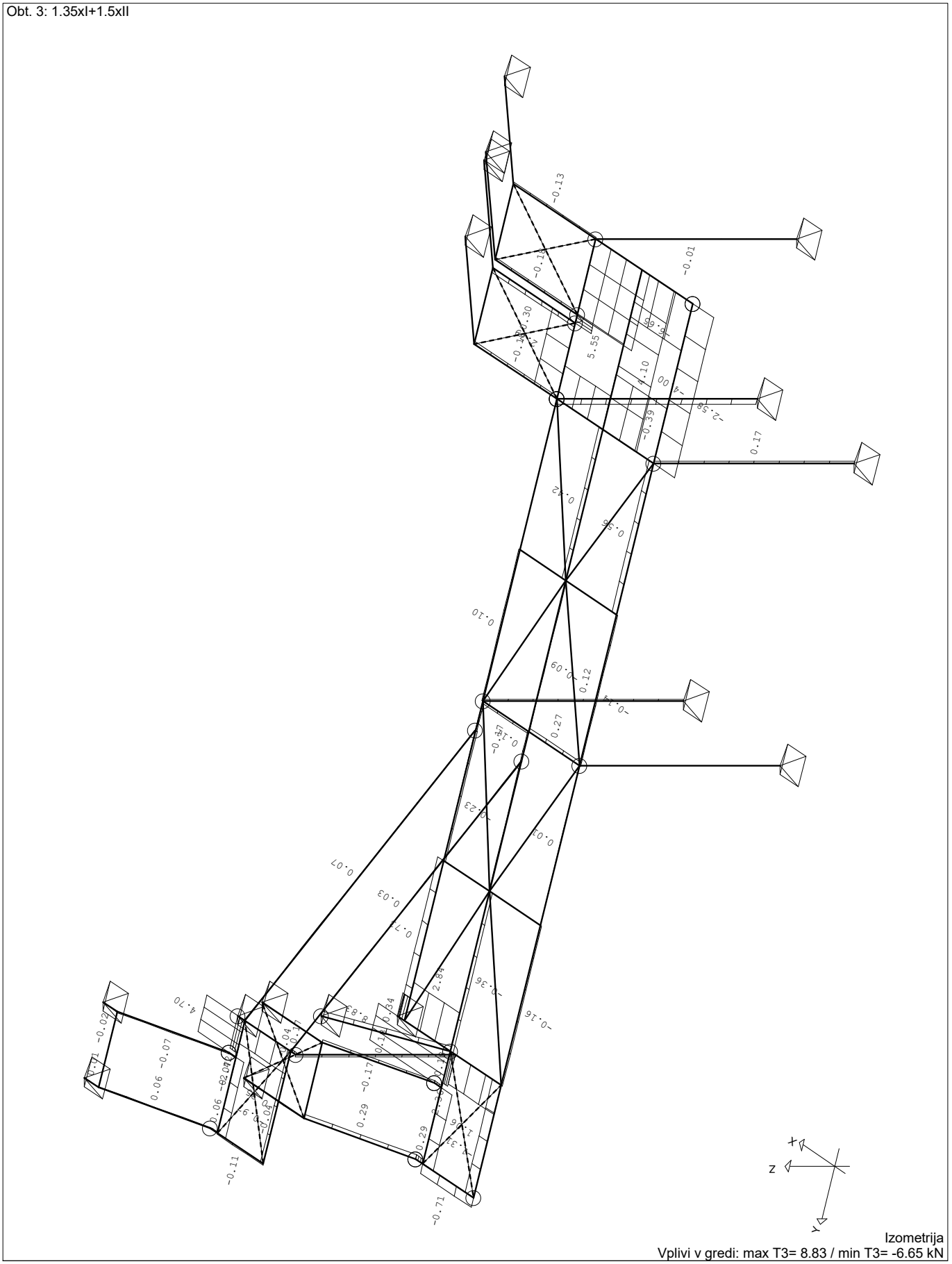


Obt. 3: 1.35xI+1.5xII



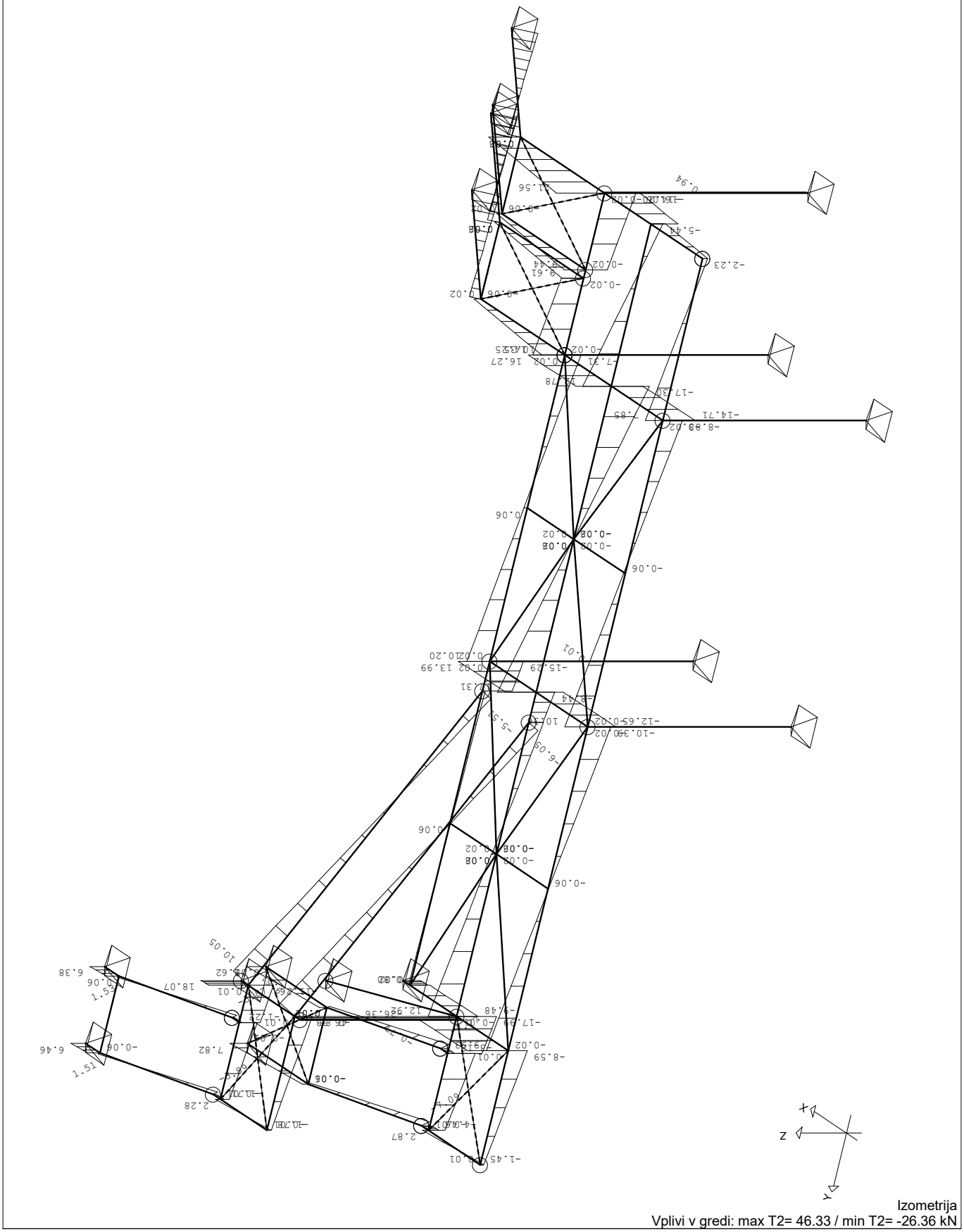
Izometrija
Vplivi v gredi: max M1= 0.44 / min M1= -0.88 kNm

2. Načrt gradbeništva



2. Načrt gradbeništva

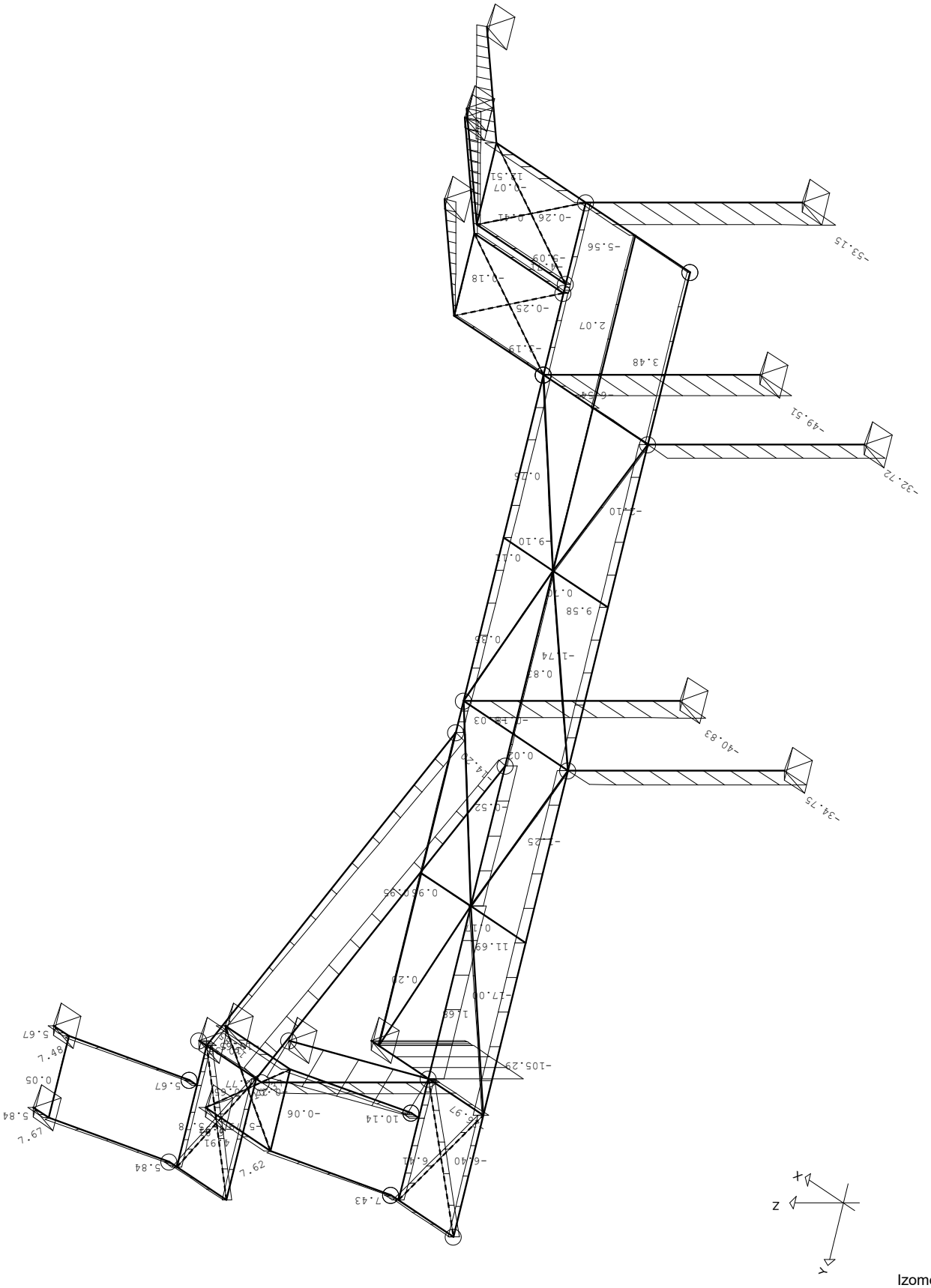
Obt. 3: 1.35xI+1.5xII



Izometrija
Vplivi v gredi: max T2= 46.33 / min T2= -26.36 kN

2. Načrt gradbeništva

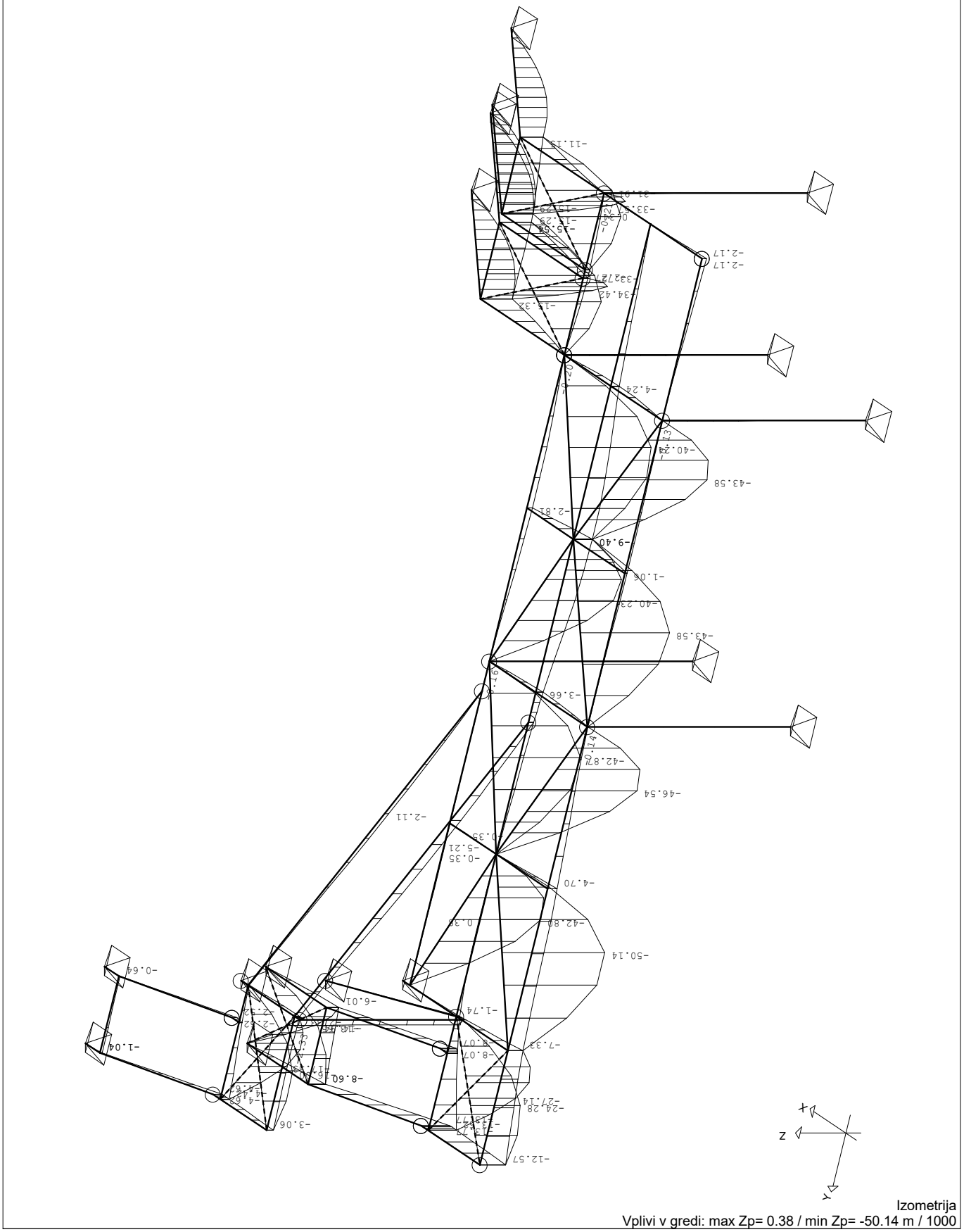
Obt. 3: 1.35xI+1.5xII



Izometrija
Vplivi v gredi: max N1= 122.00 / min N1= -105.29 kN

2. Načrt gradbeništva

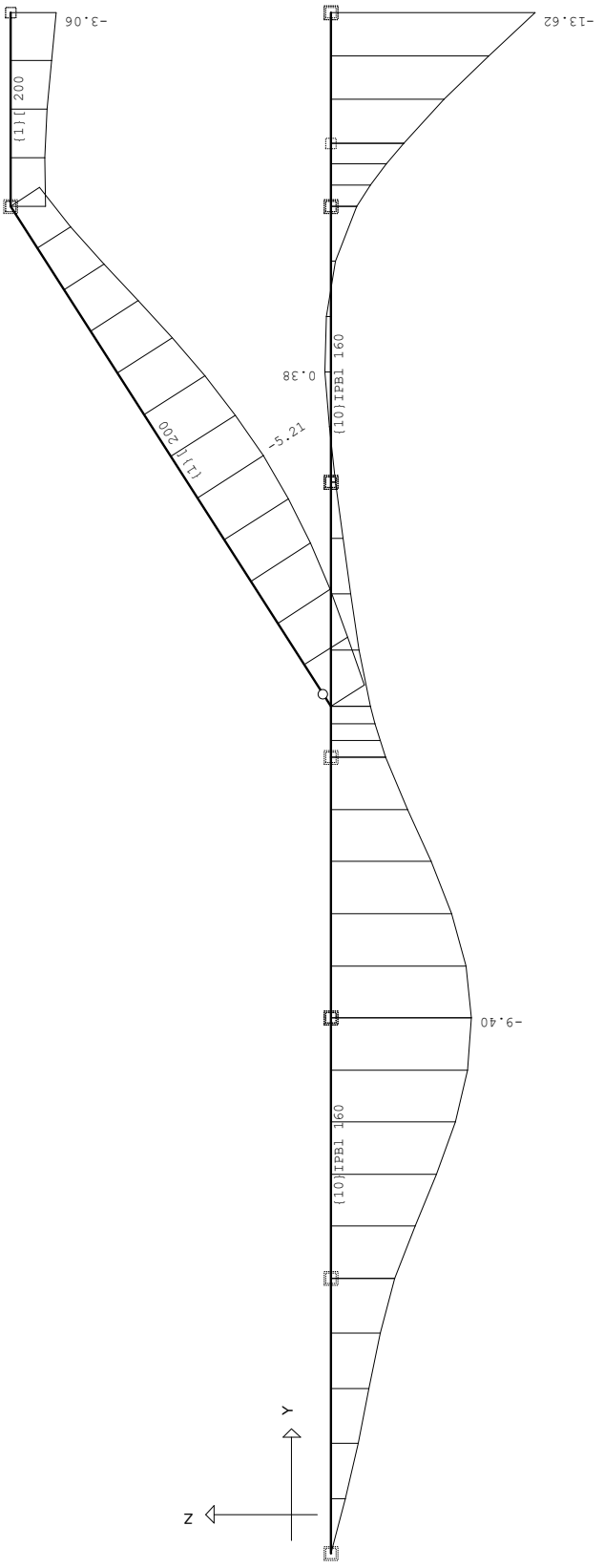
Obt. 4: I+II



Izometrija
Vplivi v gredi: max Zp= 0.38 / min Zp= -50.14 m / 1000

2. Načrt gradbeništva

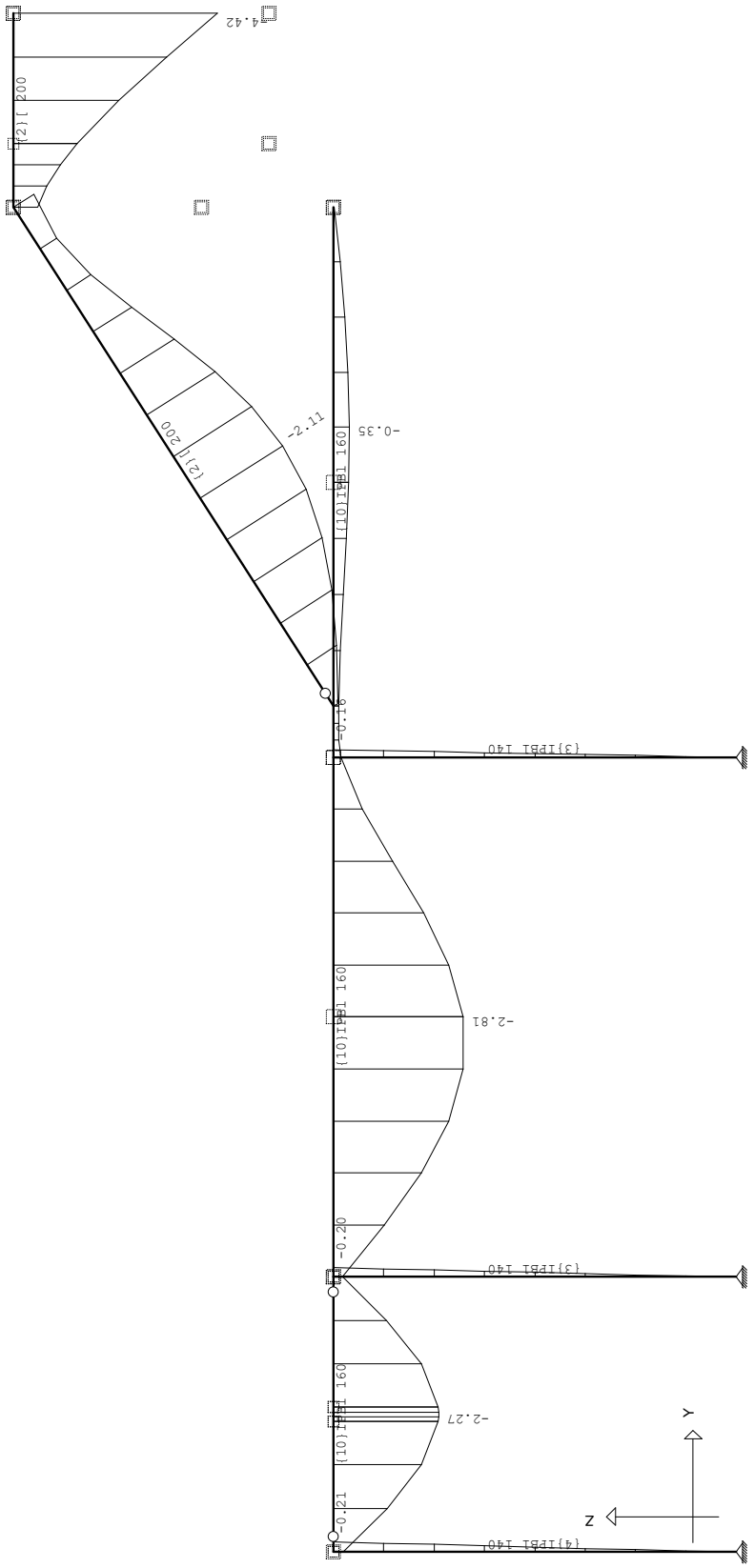
Obt. 4: I+II



Okvir: V_4
Vplivi v gredi: max Zp= 0.38 / min Zp= -13.62 m / 1000

2. Načrt gradbeništva

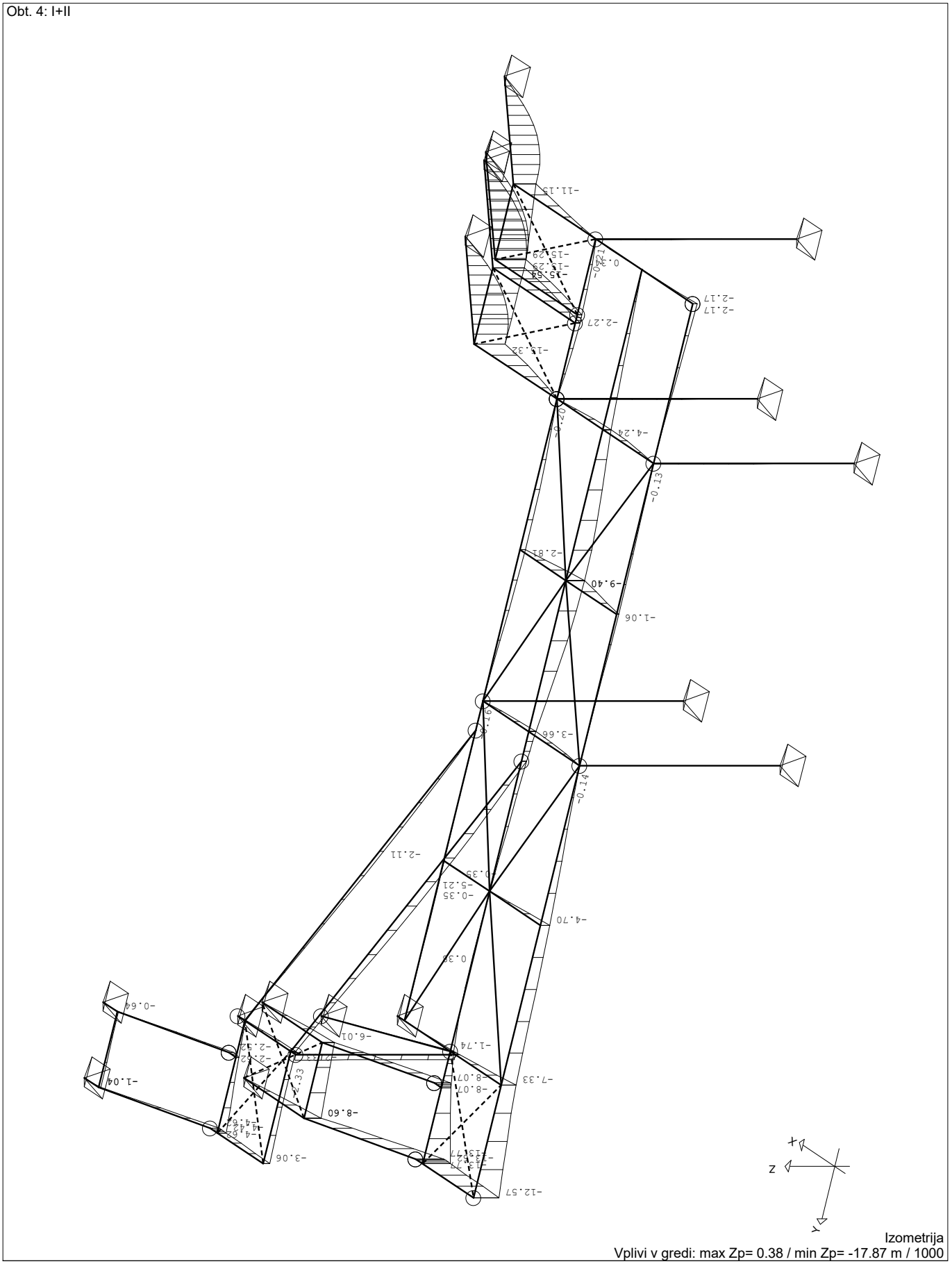
Obt. 4: I+II



Okvir: V_1
Vplivi v gredi: max Zp= -0.00 / min Zp= -4.42 m / 1000

2. Načrt gradbeništva

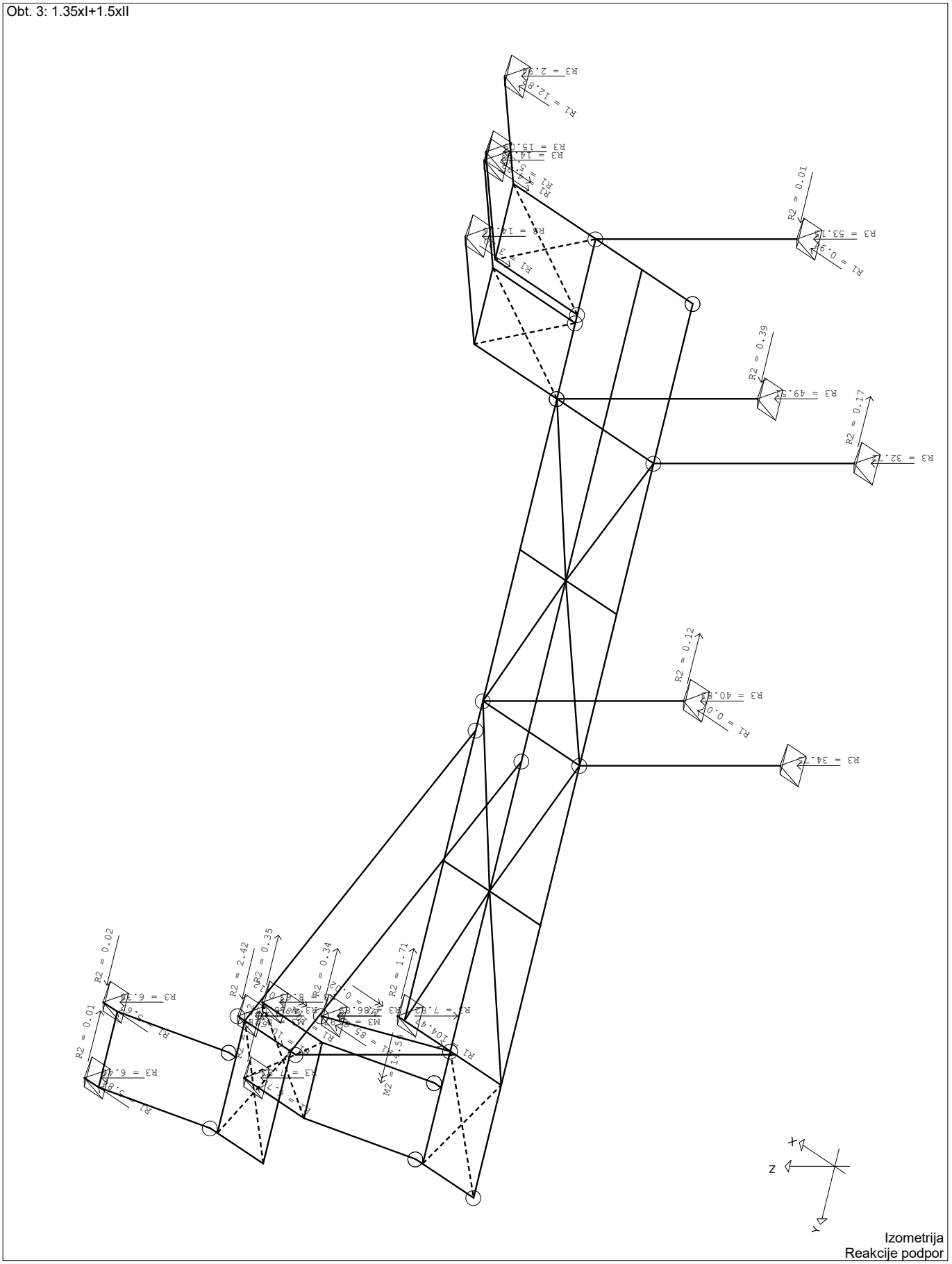
Obt. 4: I+II



Izometrija
Vplivi v gredi: max Zp= 0.38 / min Zp= -17.87 m / 1000

2. Načrt gradbeništva

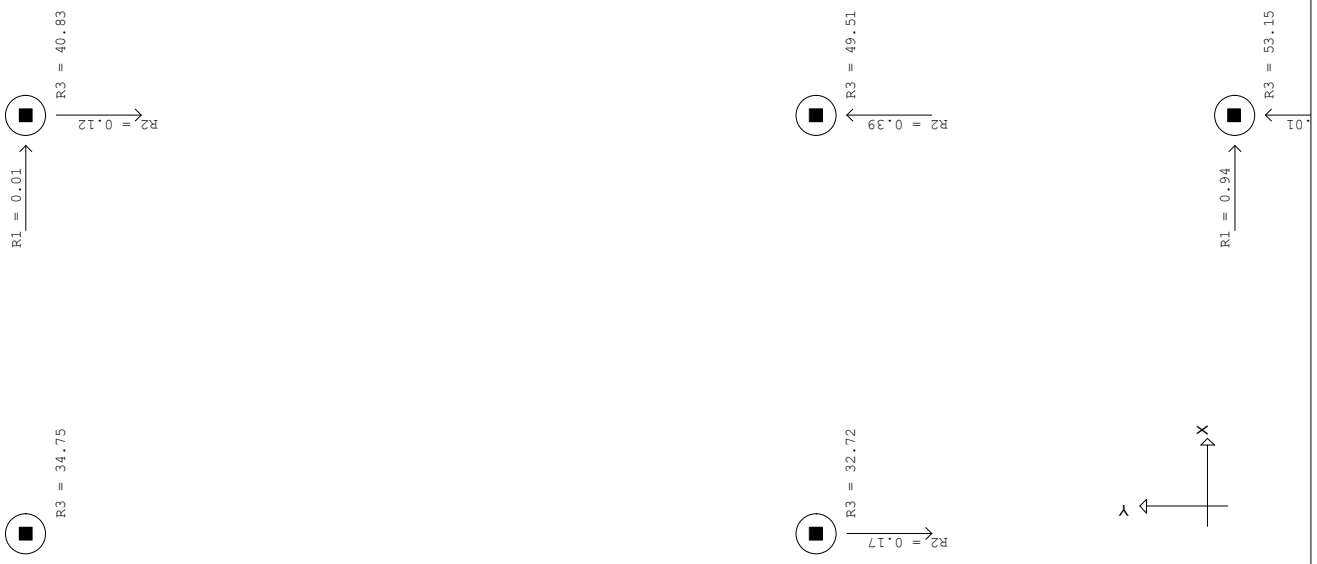
Obt. 3: 1.35xI+1.5xII



Izometrija
Reakcije podpor

2. Načrt gradbeništva

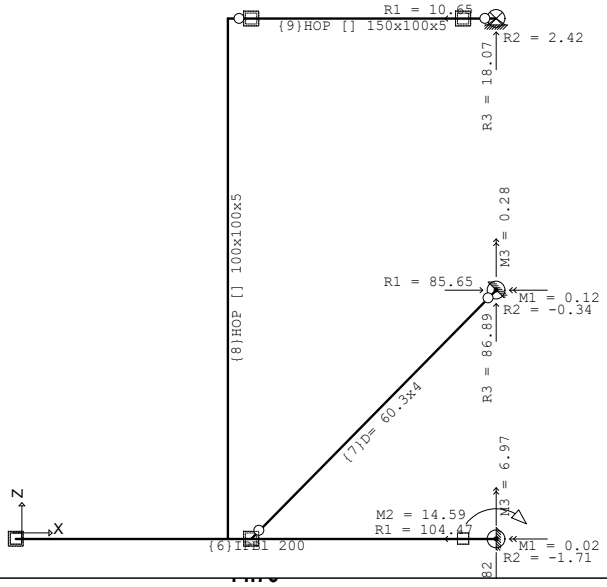
Obt. 3: 1.35xI+1.5xII



Nivo: [0.00 m]
Reakcije podpor

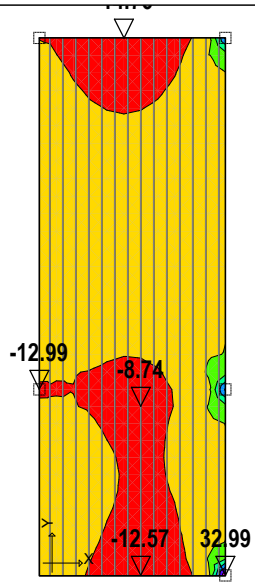
2. Načrt gradbeništva

Obt. 3: 1.35xI+1.5xII



Okvir: H_6
Reakcije podpor

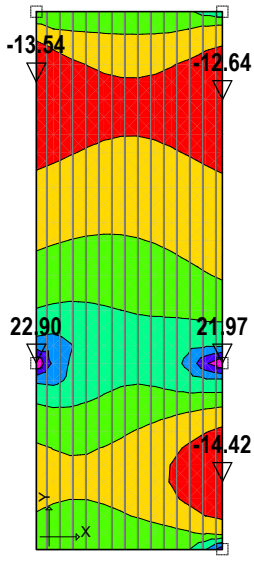
Obt. 3: 1.35xI+1.5xII



Mx [kNm/m]
-14.76
-7.38
0.00
6.60
13.20
19.79
26.39
32.99

Nivo: [0.00 m]
Vplivi v plošči: max Mx= 32.99 / min Mx= -14.76 kNm/m

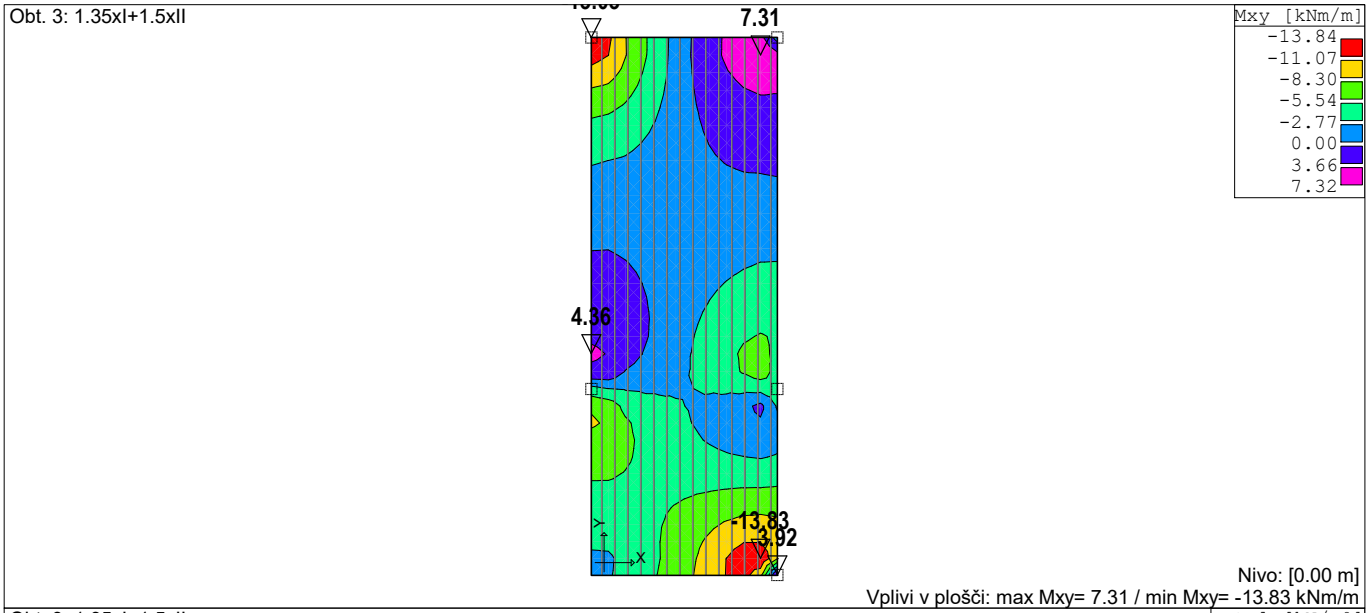
Obt. 3: 1.35xI+1.5xII

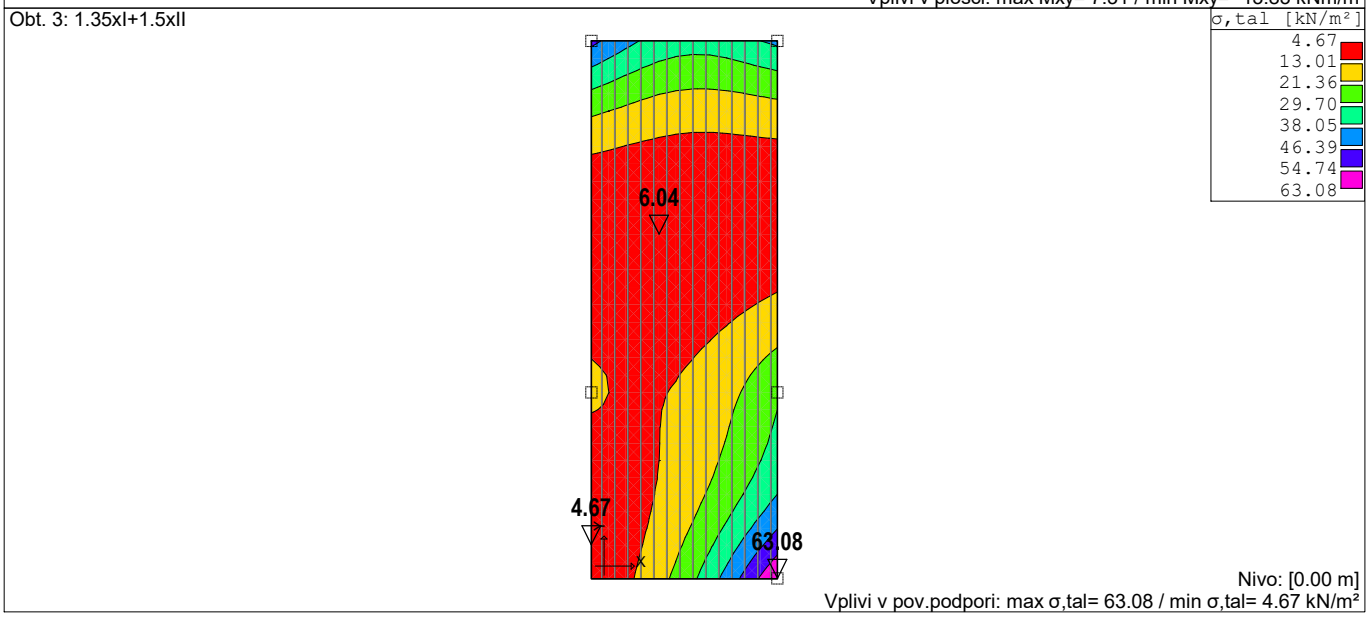


My [kNm/m]
-14.42
-9.61
-4.81
0.00
5.73
11.45
17.18
22.90

Nivo: [0.00 m]
Vplivi v plošči: max My= 22.90 / min My= -14.42 kNm/m

2. Načrt gradbeništva

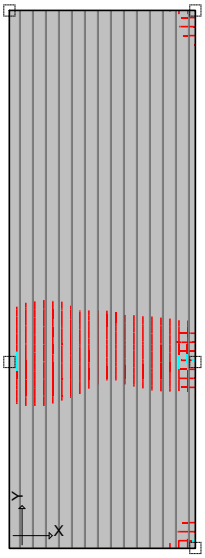




2. Načrt gradbeništva

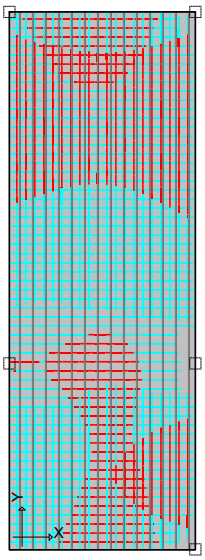
Dimenzioniranje (beton)

Merodajna obtežba: 1.35xI+1.50xII
EC2 (EN 1992-1-1:2004), C 25, S500H, a=2.00 cm



Nivo: [0.00 m]
Aa - sp.cona - max Aa,s= 2.99 cm²/m

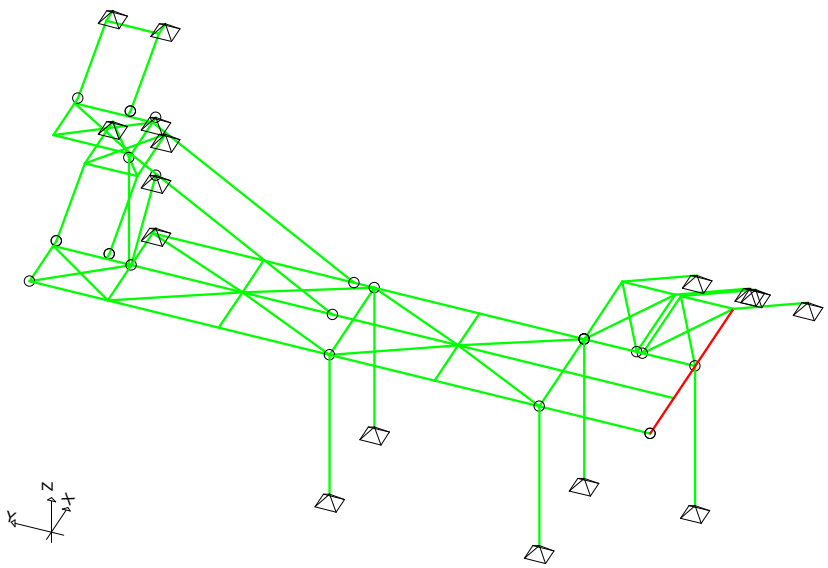
Merodajna obtežba: 1.35xI+1.50xII
EC2 (EN 1992-1-1:2004), C 25, S500H, a=2.00 cm



Nivo: [0.00 m]
Aa - zg.cona - max Aa,z= -1.94 cm²/m

2. Načrt gradbeništva

Dimenzioniranje (jeklo)

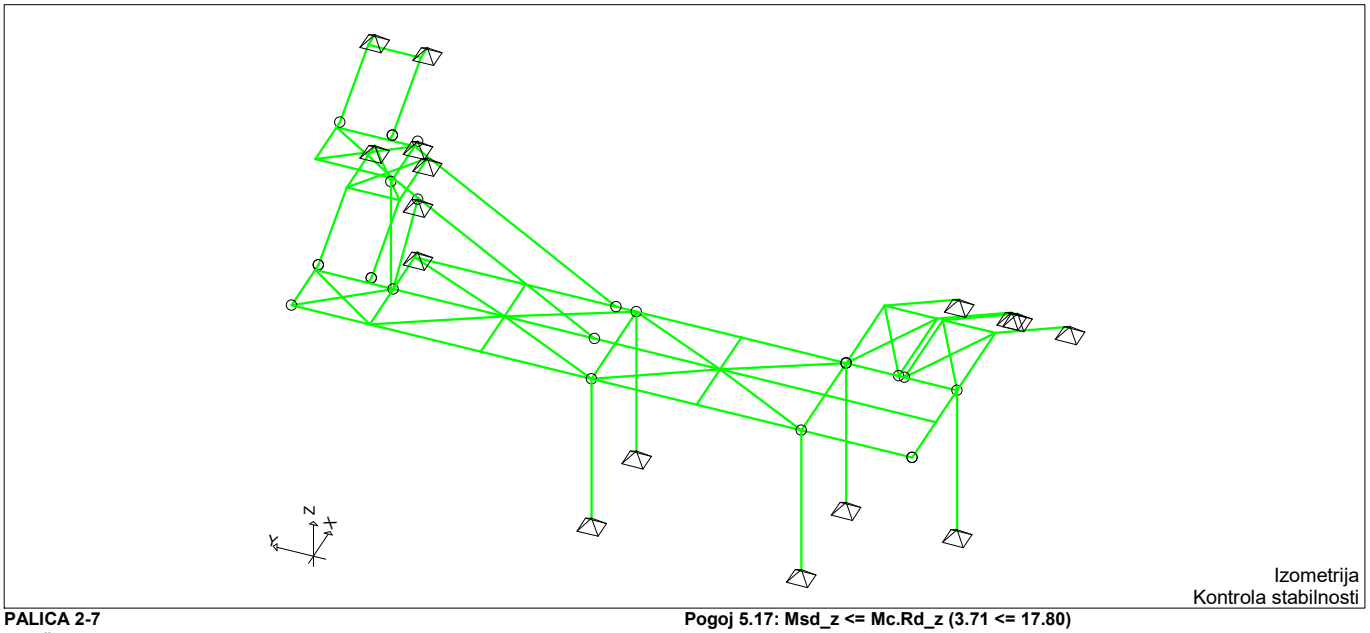


Izometrija
Kontrola napetosti

Kontrola napetosti - EUROCODE 3 (ENV)

Opis	LC	σ [kN/cm²]	τ [kN/cm²]	σu [kN/cm²]
Set 1: [200				
(12 - 3)	3	**27.718**	**1.324**	**27.813**
(17 - 12)	3	**9.070**	**0.577**	**9.070**
(23 - 16)	3	**8.911**	**0.583**	**8.911**
(16 - 10)	3	**6.925**	**0.597**	**6.930**
(45 - 50)	3	**6.208**	**0.494**	**6.266**
(27 - 45)	3	**5.755**	**0.574**	**5.840**
(42 - 49)	3	**4.580**	**0.447**	**4.585**
(49 - 55)	3	**4.570**	**0.473**	**4.577**
(36 - 42)	3	**2.477**	**0.306**	**2.533**
(56 - 59)	3	**1.700**	**0.238**	**1.700**
(59 - 60)	3	**1.358**	**0.390**	**1.464**
(50 - 56)	3	**0.868**	**0.146**	**0.870**
Set 2: [200				
(47 - 54)	3	**13.677**	**0.991**	**13.785**
(25 - 20)	3	**9.468**	**0.602**	**9.468**
(21 - 15)	3	**8.836**	**0.579**	**8.836**
(20 - 14)	3	**7.770**	**0.635**	**7.777**
(30 - 47)	3	**7.565**	**0.610**	**7.638**
(15 - 9)	3	**6.796**	**0.582**	**6.800**
(46 - 52)	3	**5.493**	**0.521**	**5.504**
(38 - 46)	3	**5.461**	**0.481**	**5.467**
(53 - 57)	3	**1.693**	**0.237**	**1.693**
(57 - 58)	3	**1.342**	**0.385**	**1.447**
(37 - 38)	3	**1.054**	**0.211**	**1.115**
(51 - 53)	3	**0.784**	**0.082**	**0.797**
Set 3: IPBl 140				
(14 - 5)	3	**4.327**	**0.019**	**4.327**
(6 - 1)	3	**2.185**	**0.008**	**2.185**
(28 - 18)	3	**2.107**	**0.007**	**2.107**
(22 - 8)	3	**1.126**	0.001	**1.126**
Set 4: IPBl 140				
(7 - 2)	3	**8.362**	**0.045**	**8.362**
Set 6: IPBl 200				
(32 - 40)	3	**11.050**	**6.406**	**14.301**
Set 7: D= 60.3x4				
(35 - 43)	3	**17.256**	**0.675**	**17.296**
Set 8: HOP [] 100x100x5				
(44 - 34)	3	**6.743**	**0.217**	**6.753**
Set 9: HOP [] 150x100x5				
(44 - 48)	3	**5.413**	**1.930**	**5.636**

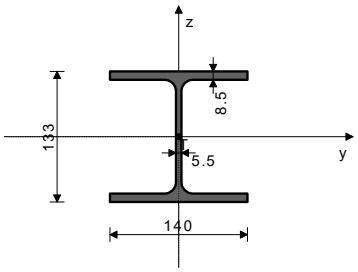
Opis	LC	σ [kN/cm²]	τ [kN/cm²]	σu [kN/cm²]
Set 10: IPBl 160				
(26 - 41)	3	**15.825**	**6.329**	**19.251**
(7 - 14)	3	**13.933**	**1.600**	**13.947**
(4 - 26)	3	**11.912**	**1.323**	**12.081**
(3 - 6)	3	**9.031**	**0.694**	**9.110**
(22 - 36)	3	**6.361**	**0.871**	**6.472**
(6 - 22)	3	**5.372**	**0.819**	**5.557**
(28 - 39)	3	**4.159**	**1.697**	**5.093**
(14 - 28)	3	**4.466**	**0.806**	**4.679**
Set 11: IPBl 140				
(6 - 14)	3	**18.408**	**1.858**	**18.674**
(22 - 28)	3	**11.735**	**1.597**	**12.023**
Set 12: HOP [] 60x60x4				
(31 - 33)	3	**0.218**	**0.014**	**0.218**
(13 - 19)	3	**0.213**	**0.015**	**0.213**
(29 - 31)	3	**0.151**	**0.015**	**0.151**
(20 - 16)	3	**0.127**	**0.014**	**0.127**
(19 - 24)	3	**0.119**	**0.014**	**0.119**
(15 - 12)	3	**0.114**	**0.014**	**0.114**
(49 - 46)	3	**0.113**	**0.014**	**0.113**
(59 - 57)	3	**0.112**	**0.014**	**0.112**
Set 13: D=1.2				
(35 - 36)	3	**10.432**	**0.014**	**10.432**
(50 - 47)	3	**9.565**	**0.013**	**9.565**
(6 - 19)	3	**9.212**	**0.017**	**9.212**
(22 - 31)	3	**9.140**	**0.018**	**9.140**
(31 - 28)	3	**8.174**	**0.018**	**8.174**
(31 - 39)	3	**7.534**	**0.018**	**7.534**
(19 - 28)	3	**6.879**	**0.017**	**6.879**
(22 - 19)	3	**6.621**	**0.017**	**6.621**
(32 - 31)	3	**6.554**	**0.018**	**6.554**
(19 - 14)	3	**6.519**	**0.017**	**6.519**
(7 - 15)	3	**6.100**	**0.015**	**6.100**
(14 - 16)	3	**6.096**	**0.015**	**6.096**
(10 - 20)	3	**5.877**	**0.015**	**5.877**
(41 - 32)	3	**5.671**	**0.014**	**5.671**
(9 - 12)	3	**5.507**	**0.015**	**5.507**
(54 - 45)	3	**5.112**	**0.013**	**5.112**
(55 - 46)	3	**3.996**	**0.012**	**3.996**
(49 - 52)	3	**3.188**	**0.012**	**3.188**



Izometrija
Kontrola stabilnosti

PALICA 2-7
PREČNI PREREZ: IPBl 140 [S 235] [Set: 4]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



[mm]

Ax =	31.400 cm2
Ay =	21.293 cm2
Az =	10.107 cm2
Ix =	8.160 cm4
Iy =	1030.0 cm4
Iz =	389.00 cm4
Wy =	154.89 cm3
Wz =	55.571 cm3
Wy,pl =	170.19 cm3
Wz,pl =	83.300 cm3
γM0 =	1.100
γM1 =	1.100
γM2 =	1.250
Anet/A =	0.900

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB
3. γ=0.39 4. γ=0.26

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

Računska osna sila	Nsd =	-51.835 kN
Prečna sila v y smeri	Vsd_y =	0.940 kN
Prečna sila v z smeri	Vsd_z =	0.012 kN
Upogibni moment okoli y osi	Msd_y =	0.047 kNm
Upogibni moment okoli z osi	Msd_z =	3.713 kNm
Sistemska dolžina palice	L =	395.00 cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.4 Tlak

Plastična računska nosilnost	Npl.Rd =	670.82 kN
Računska nosilnost na tlak	Nc.Rd =	670.82 kN

Pogoj 5.16: Nsd <= Nc.Rd (51.84 <= 670.82)

5.4.5 Upogib y-y

Računski plastični moment	Mpl.Rd =	36.358 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	33.090 kNm
Računski elastični moment	Mel.Rd =	33.090 kNm
Računska nosilnost na upogib	Mc.Rd =	36.358 kNm

Pogoj 5.17: Msd_y <= Mc.Rd_y (0.05 <= 36.36)

5.4.5 Upogib z-z

Računski plastični moment	Mpl.Rd =	17.796 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	11.872 kNm
Računski elastični moment	Mel.Rd =	11.872 kNm
Računska nosilnost na upogib	Mc.Rd =	17.796 kNm

Pogoj 5.17: Msd_z <= Mc.Rd_z (3.71 <= 17.80)

5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	124.67 kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (0.01 <= 124.67)

Računska plast.nos.na strig y-y	Vpl.Rd =	262.63 kN

Pogoj 5.20: Vsd_y <= Vpl.Rd_y (0.94 <= 262.63)

5.4.9 Upogib z osno in prečno silo
Ni potrebno zmanjšanje upogibne nosilnosti
Pogoj: Vsd_z <= 50%Vpl.Rd_z i Vsd_y <= 50%Vpl.Rd_y

5.4.8 Upogib in osna sila

Razmerje Nsd / Npl.Rd	0.077
Razmerje Msd_z / Mpl.Rd_z	0.209

Pogoj 5.36: (0.29 <= 1)

5.5 NOSILNOST ELEMENTOV
5.5.1 Uklonska nosilnost

Uklonska dolžina y-y	l,y =	395.00 cm
Vztrajnostni radij y-y	i,y =	5.727 cm
Vitkost y-y	λ,y =	68.967
Relativna vitkost y-y	λ_y =	0.734
Uklonska krivulja za os y-y: B	α =	0.340
Koeficient nepopolnosti	χ,y =	0.764
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_y =	512.43 kN

Pogoj 5.45: Nsd <= Nb.Rd_y (51.84 <= 512.43)

Uklonska dolžina z-z	l,z =	395.00 cm
Vztrajnostni radij z-z	i,z =	3.520 cm
Vitkost z-z	λ,z =	112.22
Relativna vitkost z-z	λ_z =	1.195
Uklonska krivulja za os z-z: C	α =	0.490
Koeficient nepopolnosti	χ,z =	0.436
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_z =	292.54 kN

Pogoj 5.45: Nsd <= Nb.Rd_z (51.84 <= 292.54)

5.5.2 Bočna zvrnitev upogibnih nosilcev

Koeficient	C1 =	1.879
Koeficient	C2 =	0.000
Koeficient	C3 =	0.939
Koef.ukl.dolžine za uklon	k =	1.000
Koef.ukl.dolžine za vbočenje	kw =	1.000
Koordinata	zg =	0.000 cm
Koordinata	zj =	0.000 cm
Razmak med bočnimi podporami	L =	395.00 cm
Sektorski vztrajnostni moment	Iw =	15064 cm6
Krit.moment bočne zvrnitve	Mcr =	125.20 kNm
Koeficient	βw =	1.000
Koeficient imperf.	αLT =	0.210
Brezdimenz.vitkost	λLT_ =	0.565
Koeficient zmanjšanja	χLT =	0.903
Računska uklonska nosilnost	Mb.Rd =	32.821 kNm

Pogoj 5.48: Msd_y <= Mb.Rd (0.05 <= 32.82)

5.5.4 Upogib in tlak

Koeficient nepopolnosti	χmin =	0.436
Nsd / ...		0.177
Koeficient oblike momenta	βy =	1.800
Koeficient	μy =	-0.195
Koeficient	ky =	1.018
ky * My / ...		0.001
Koeficient oblike momenta	βz =	1.800
Koeficient	μz =	0.021
Koeficient	kz =	0.997
kz * Mz / ...		0.208

Pogoj 5.51: (0.39 <= 1)

Koeficient nepopolnosti	χ_z =	0.436
Nsd/ ...		0.177
Koeficient nepopolnosti	χLT =	0.903
Koef.obl.mom.za bočno zvrnitev	βM.LT =	1.800
Koeficient	μLT =	0.173
Koeficient	kLT =	0.972
kLT * My / ...		0.001
Koeficient oblike momenta	βz =	1.800
Koeficient	μz =	0.021
Koeficient	kz =	0.997
kz * Mz / ...		0.208

Pogoj 5.52: (0.39 <= 1)

5.6 LOKALNO IZBOČENJE ZARADI STRIGA
za strig v ravnini z-z

Višina stojine	d =	11.600 cm
Debelina stojine	tw =	0.550 cm

Ni prečnih ojačitev v sredini

Koeficient izbočenja pri strigu	kτ =	5.340

Ni potrebna kontrola izbočenja zaradi striga
Pogoj: d / tw <= 69 ε (21.09 <= 69.00)

5.6.7 Interakcija prečne sile, upogiba in osne sile
za strig v ravnini z-z

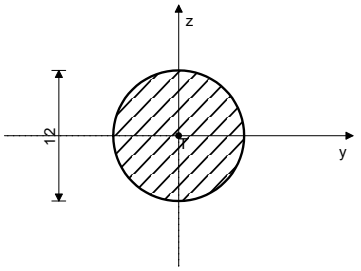
Računski plastični moment pasnic	Mf.Rd =	33.610 kNm

Pogoji 5.66a in 5.66b so izpolnjeni

PALICA 15-7

PREČNI PREREZ: Krožni [S 235] [Set: 13]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



[mm]

Ax =	1.131 cm2
Ay =	1.018 cm2
Az =	1.018 cm2
Ix =	0.204 cm4
Iy =	0.102 cm4
Iz =	0.102 cm4
Wy =	0.170 cm3
Wz =	0.170 cm3
Wy,pl =	0.288 cm3
Wz,pl =	0.288 cm3
γM0 =	1.100
γM1 =	1.100
γM2 =	1.250
Anet/A =	0.900

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB
3. γ=0.97 4. γ=0.66

PALICA IZPOSTAVLJENA CENTRIČNEMU TLAKU
(obtežni primer 3, začetek palice)

Računska osna sila	Nsd =	-0.256 kN
Prečna sila v z smeri	Vsd_z =	0.016 kN
Sistemska dolžina palice	L =	263.22 cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.4 Tlak

Plastična računska nosilnost	Npl.Rd =	24.162 kN
Računska nosilnost na tlak	Nc.Rd =	24.162 kN

Pogoj 5.16: Nsd <= Nc.Rd (0.26 <= 24.16)

5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	12.555 kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (0.02 <= 12.55)

5.5 NOSILNOST ELEMENTOV
5.5.1 Uklonska nosilnost

Uklonska dolžina y-y	l,y =	263.22 cm
Vztrajnostni radij y-y	i,y =	0.300 cm
Vitkost y-y	λ,y =	877.40
Relativna vitkost y-y	λ_y =	9.344
Uklonska krivulja za os y-y: C	α =	0.490
Koeficient nepopolnosti	χ,y =	0.011
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_y =	0.263 kN

Pogoj 5.45: Nsd <= Nb.Rd_y (0.26 <= 0.26)

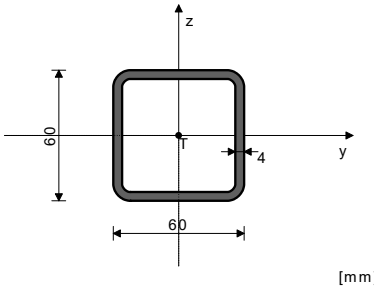
Uklonska dolžina z-z	l,z =	263.22 cm
Vztrajnostni radij z-z	i,z =	0.300 cm
Vitkost z-z	λ,z =	877.40
Relativna vitkost z-z	λ_z =	9.344
Uklonska krivulja za os z-z: C	α =	0.490
Koeficient nepopolnosti	χ,z =	0.011
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_z =	0.263 kN

Pogoj 5.45: Nsd <= Nb.Rd_z (0.26 <= 0.26)

PALICA 12-15

PREČNI PREREZ: HOP [] 60x60x4 [S 235] [Set: 12]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



[mm]

Ax =	8.550 cm2
Ay =	4.275 cm2
Az =	4.275 cm2
Ix =	72.188 cm4
Iy =	43.550 cm4
Iz =	43.550 cm4
Wy =	14.517 cm3
Wz =	14.517 cm3
Wy,pl =	18.848 cm3
Wz,pl =	18.848 cm3
γM0 =	1.100
γM1 =	1.100
γM2 =	1.250
Anet/A =	0.900

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB
3. γ=0.02 4. γ=0.02

PALICA IZPOSTAVLJENA CENTRIČNEMU TLAKU
(obtežni primer 3, začetek palice)

Računska osna sila	Nsd =	-0.067 kN
Prečna sila v z smeri	Vsd_z =	-0.058 kN
Sistemska dolžina palice	L =	128.00 cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.4 Tlak

Plastična računska nosilnost	Npl.Rd =	182.66 kN
Računska nosilnost na tlak	Nc.Rd =	182.66 kN

Pogoj 5.16: Nsd <= Nc.Rd (0.07 <= 182.66)

5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	52.729 kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (0.06 <= 52.73)

5.5 NOSILNOST ELEMENTOV
5.5.1 Uklonska nosilnost

Uklonska dolžina y-y	l,y =	128.00 cm
Vztrajnostni radij y-y	i,y =	2.257 cm
Vitkost y-y	λ,y =	56.715
Relativna vitkost y-y	λ_y =	0.604
Uklonska krivulja za os y-y: B	α =	0.340
Koeficient nepopolnosti	χ,y =	0.835
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_y =	152.53 kN

Pogoj 5.45: Nsd <= Nb.Rd_y (0.07 <= 152.53)

Uklonska dolžina z-z	l,z =	128.00 cm
Vztrajnostni radij z-z	i,z =	2.257 cm
Vitkost z-z	λ,z =	56.715
Relativna vitkost z-z	λ_z =	0.604
Uklonska krivulja za os z-z: B	α =	0.340
Koeficient nepopolnosti	χ,z =	0.835
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_z =	152.53 kN

Pogoj 5.45: Nsd <= Nb.Rd_z (0.07 <= 152.53)

5.6 LOKALNO IZBOČENJE ZARADI STRIGA
za strig v ravnini z-z

Višina stojine	d =	5.200 cm
Debelina stojine	tw =	0.400 cm

Ni prečnih ojačitev v sredini

Koeficient izbočenja pri strigu	kτ =	5.340

Ni potrebna kontrola izbočenja zaradi striga

Pogoj: d / tw <= 69 ε (13.00 <= 69.00)

5.7 VNOS KONCENTRIRANIH SIL V STOJINO
5.7.7 Uklon pasnice v smeri stojine

Koeficient(razred pasnice 1)	k =	0.300
Površina stojine	Aw =	2.400 cm2
Površina tlač.pasnice	Afc =	2.400 cm2

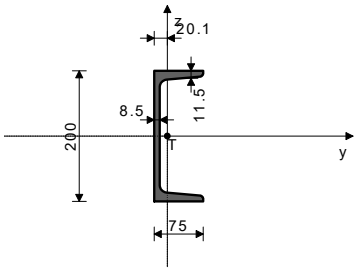
Preprečen je uklon pasnice v smeri stojine

Pogoj 5.80: (6.50 <= 268.09)

PALICA 20-25

PREČNI PREREZ: [200 [S 235] [Set: 2]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



Ax =	32.200 cm2	
Ay =	15.583 cm2	
Az =	16.618 cm2	
Ix =	11.900 cm4	
Iy =	1910.0 cm4	
Iz =	148.00 cm4	
Wy =	191.00 cm3	
Wz =	26.958 cm3	
Wy,pl =	229.16 cm3	
Wz,pl =	57.765 cm3	
γM0 =	1.100	
γM1 =	1.100	
γM2 =	1.250	
Anet/A =	0.900	

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB
3. γ=0.76 4. γ=0.52

PALICA IZPOSTAVLJENA PRITISKU IN UPOGIBU
(obtežni primer 3, na 360.6 cm od začetka palice)

Računska osna sila	Nsd =	-4.159 kN
Prečna sila v z smeri	Vsd_z =	-0.476 kN
Upogibni moment okoli y osi	Msd_y =	18.824 kNm
Sistemska dolžina palice	L =	540.83 cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.4 Tlak

Plastična računska nosilnost	Npl.Rd =	687.91 kN
Računska nosilnost na tlak	Nc.Rd =	687.91 kN

Pogoj 5.16: Nsd <= Nc.Rd (4.16 <= 687.91)

5.4.5 Upogib y-y

Računski plastični moment	Mpl.Rd =	48.956 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	40.805 kNm
Računski elastični moment	Mel.Rd =	40.805 kNm
Računska nosilnost na upogib	Mc.Rd =	48.956 kNm

Pogoj 5.17: Msd_y <= Mc.Rd_y (18.82 <= 48.96)

5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	204.97 kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (0.48 <= 204.97)

5.4.9 Upogib z osno in prečno silo
Ni potrebno zmanjšanje upogibne nosilnosti
Pogoj: Vsd_z <= 50%Vpl.Rd_z

5.4.8 Upogib in osna sila

Razmerje Msd_y / Mpl.Rd_y		0.385

Pogoj 5.36: (0.39 <= 1)

5.5 NOSILNOST ELEMENTOV
5.5.1 Uklonska nosilnost

Uklonska dolžina y-y	l,y =	540.83 cm
Vztrajnostni radij y-y	i,y =	7.702 cm
Vitkost y-y	λ,y =	70.222
Relativna vitkost y-y	λ_y =	0.748
Uklonska krivulja za os y-y: C	α =	0.490
Koeficient nepopolnosti	χ,y =	0.695
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_y =	478.02 kN

Pogoj 5.45: Nsd <= Nb.Rd_y (4.16 <= 478.02)

Uklonska dolžina z-z	l,z =	540.83 cm
Vztrajnostni radij z-z	i,z =	2.144 cm
Vitkost z-z	λ,z =	252.27
Relativna vitkost z-z	λ_z =	2.687
Uklonska krivulja za os z-z: C	α =	0.490
Koeficient nepopolnosti	χ,z =	0.116
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_z =	80.024 kN

Pogoj 5.45: Nsd <= Nb.Rd_z (4.16 <= 80.02)

5.5.2 Bočna zvrnitev upogibnih nosilcev

Koeficient	C1 =	1.132
Koeficient	C2 =	0.459
Koeficient	C3 =	0.525
Koef.ukl.dolžine za uklon	k =	1.000
Koef.ukl.dolžine za vbočenje	kw =	1.000
Koordinata	zg =	0.000 cm
Koordinata	zj =	0.000 cm
Razmak med bočnimi podporami	L =	540.83 cm
Sektorski vztrajnostni moment	Iw =	12375 cm6
Krit.moment bočne zvrnitve	Mcr =	37.543 kNm
Koeficient	βw =	1.000
Koeficient imperf.	αLT =	0.210
Brezdimenz.vitkost	λLT_ =	1.198
Koeficient zmanjšanja	χLT =	0.531
Računska uklonska nosilnost	Mb.Rd =	26.019 kNm

Pogoj 5.48: Msd_y <= Mb.Rd (18.82 <= 26.02)

5.5.4 Upogib in tlak

Koeficient nepopolnosti	χmin =	0.116
Nsd / ...		0.052
Koeficient oblike momenta	βy =	1.539
Koeficient	μy =	-0.490
Koeficient	ky =	1.004
ky * My / ...		0.386

Pogoj 5.51: (0.44 <= 1)

Koeficient nepopolnosti	χ_z =	0.116
Nsd/ ...		0.052
Koeficient nepopolnosti	χLT =	0.531
Koef.obl.mom.za bočno zvrnitev	βM.LT =	1.539
Koeficient	μLT =	0.470
Koeficient	kLT =	0.978
kLT * My / ...		0.707

Pogoj 5.52: (0.76 <= 1)

5.6 LOKALNO IZBOČENJE ZARADI STRIGA
za strig v ravnini z-z

Višina stojine	d =	17.700 cm
Debelina stojine	tw =	0.850 cm

Ni prečnih ojačitev v sredini

Koeficient izbočenja pri strigu	kτ =	5.340

Ni potrebna kontrola izbočenja zaradi striga

Pogoj: d / tw <= 69 ε (20.82 <= 69.00)

5.6.7 Interakcija prečne sile, upogiba in osne sile
za strig v ravnini z-z

Računski plastični moment pasnic	Mf.Rd =	40.803 kNm

Pogoji 5.66a in 5.66b so izpolnjeni

5.7 VNOS KONCENTRIRANIH SIL V STOJINO
5.7.7 Uklon pasnice v smeri stojine

Koeficient(razred pasnice 1)	k =	0.300
Površina stojine	Aw =	23.000 cm2
Površina tlač.pasnice	Afc =	8.625 cm2

Preprečen je uklon pasnice v smeri stojine

Pogoj 5.80: (7.70 <= 437.78)

KONTROLA STRIŽNE NOSILNOSTI
(obtežni primer 3, začetek palice)

Računska osna sila	Nsd =	-10.511 kN
Prečna sila v z smeri	Vsd_z =	-10.005 kN
Sistemska dolžina palice	L =	540.83 cm

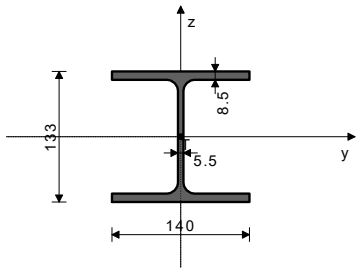
5.4 NOSILNOST PREČNIH PREREZOV
5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	204.97 kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (10.00 <= 204.97)

PALICA 14-6
PREČNI PREREZ: IPBl 140 [S 235] [Set: 11]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



[mm]

Ax =	31.400 cm2
Ay =	21.293 cm2
Az =	10.107 cm2
Ix =	8.160 cm4
Iy =	1030.0 cm4
Iz =	389.00 cm4
Wy =	154.89 cm3
Wz =	55.571 cm3
Wy,pl =	170.19 cm3
Wz,pl =	83.300 cm3
γM0 =	1.100
γM1 =	1.100
γM2 =	1.250
Anet/A =	0.900

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB
3. γ=0.78 4. γ=0.53

PALICA IZPOSTAVLJENA PRITISKU IN UPOGIBU
(obtežni primer 3, na 142.0 cm od začetka palice)

Računska osna sila	Nsd =	-2.118 kN
Prečna sila v y smeri	Vsd_y =	4.099 kN
Prečna sila v z smeri	Vsd_z =	-14.237 kN
Upogibni moment okoli y osi	Msd_y =	20.553 kNm
Upogibni moment okoli z osi	Msd_z =	-2.818 kNm
Moment torzije	Mt =	-0.016 kNm
Sistemska dolžina palice	L =	270.00 cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.4 Tlak

Plastična računska nosilnost	Npl.Rd =	670.82 kN
Računska nosilnost na tlak	Nc.Rd =	670.82 kN

Pogoj 5.16: Nsd <= Nc.Rd (2.12 <= 670.82)

5.4.5 Upogib y-y

Računski plastični moment	Mpl.Rd =	36.358 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	33.090 kNm
Računski elastični moment	Mel.Rd =	33.090 kNm
Računska nosilnost na upogib	Mc.Rd =	36.358 kNm

Pogoj 5.17: Msd_y <= Mc.Rd_y (20.55 <= 36.36)

5.4.5 Upogib z-z

Računski plastični moment	Mpl.Rd =	17.796 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	11.872 kNm
Računski elastični moment	Mel.Rd =	11.872 kNm
Računska nosilnost na upogib	Mc.Rd =	17.796 kNm

Pogoj 5.17: Msd_z <= Mc.Rd_z (2.82 <= 17.80)

5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	124.67 kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (14.24 <= 124.67)

Računska plast.nos.na strig y-y	Vpl.Rd =	262.63 kN

Pogoj 5.20: Vsd_y <= Vpl.Rd_y (4.10 <= 262.63)

5.4.9 Upogib z osno in prečno silo
Ni potrebno zmanjšanje upogibne nosilnosti
Pogoj: Vsd_z <= 50%Vpl.Rd_z i Vsd_y <= 50%Vpl.Rd_y

5.4.8 Upogib in osna sila

Razmerje Msd_y / Mpl.Rd_y	0.565
Razmerje Msd_z / Mpl.Rd_z	0.158

5.6 LOKALNO IZBOČENJE ZARADI STRIGA
za strig v ravnini z-z

Višina stojine	d =	17.700 cm
Debelina stojine	tw =	0.850 cm
Ni prečnih ojačitev v sredini		
Koeficient izbočenja pri strigu	kτ =	5.340
Ni potrebna kontrola izbočenja zaradi striga		

Pogoj: d / tw <= 69 ε (20.82 <= 69.00)

Pogoj 5.36: (0.73 <= 1)

5.5 NOSILNOST ELEMENTOV
5.5.1 Uklonska nosilnost

Uklonska dolžina y-y	l,y =	270.00 cm
Vztrajnostni radij y-y	i,y =	5.727 cm
Vitkost y-y	λ,y =	47.142
Relativna vitkost y-y	λ_y =	0.502
Uklonska krivulja za os y-y: B	α =	0.340
Koeficient nepopolnosti	χ,y =	0.883
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_y =	592.54 kN

Pogoj 5.45: Nsd <= Nb.Rd_y (2.12 <= 592.54)

Uklonska dolžina z-z	l,z =	270.00 cm
Vztrajnostni radij z-z	i,z =	3.520 cm
Vitkost z-z	λ,z =	76.710
Relativna vitkost z-z	λ_z =	0.817
Uklonska krivulja za os z-z: C	α =	0.490
Koeficient nepopolnosti	χ,z =	0.652
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_z =	437.05 kN

Pogoj 5.45: Nsd <= Nb.Rd_z (2.12 <= 437.05)

5.5.2 Bočna zvrnitev upogibnih nosilcev

Koeficient	C1 =	1.365
Koeficient	C2 =	0.553
Koeficient	C3 =	1.730
Koef.ukl.dolžine za uklon	k =	1.000
Koef.ukl.dolžine za vbočenje	kw =	1.000
Koordinata	zg =	0.000 cm
Koordinata	zj =	0.000 cm
Razmak med bočnimi podporami	L =	270.00 cm
Sektorski vztrajnostni moment	Iw =	15064 cm6
Krit.moment bočne zvrnitve	Mcr =	149.69 kNm
Koeficient	βw =	1.000
Koeficient imperf.	αLT =	0.210
Brezdimenz.vitkost	λLT_ =	0.517
Koeficient zmanjšanja	χLT =	0.919
Računska uklonska nosilnost	Mb.Rd =	33.411 kNm

Pogoj 5.48: Msd_y <= Mb.Rd (20.55 <= 33.41)

5.5.4 Upogib in tlak

Koeficient nepopolnosti	χmin =	0.652
Nsd / ...		0.005
Koeficient oblike momenta	βy =	1.400
Koeficient	μy =	-0.504
Koeficient	ky =	1.002
ky * My / ...		0.566
Koeficient oblike momenta	βz =	1.831
Koeficient	μz =	0.223
Koeficient	kz =	0.999
kz * Mz / ...		0.158

Pogoj 5.51: (0.73 <= 1)

Koeficient nepopolnosti	χ_z =	0.652
Nsd/ ...		0.005
Koeficient nepopolnosti	χLT =	0.919
Koef.obl.mom.za bočno zvrnitev	βM.LT =	1.400
Koeficient	μLT =	0.022
Koeficient	kLT =	1.000
kLT * My / ...		0.615
Koeficient oblike momenta	βz =	1.831
Koeficient	μz =	0.223
Koeficient	kz =	0.999
kz * Mz / ...		0.158

Pogoj 5.52: (0.78 <= 1)

5.6 LOKALNO IZBOČENJE ZARADI STRIGA
za strig v ravnini z-z

Višina stojine	d =	11.600 cm
Debelina stojine	tw =	0.550 cm
Ni prečnih ojačitev v sredini		
Koeficient izbočenja pri strigu	kτ =	5.340
Ni potrebna kontrola izbočenja zaradi striga		

Pogoj: d / tw <= 69 ε (21.09 <= 69.00)

5.6.7 Interakcija prečne sile, upogiba in osne sile za strig v ravnini z-z
Računski plastični moment pasnic Mf.Rd = 33.812 kNm
Pogoji 5.66a in 5.66b so izpolnjeni

5.7 VNOS KONCENTRIRANIH SIL V STOJINO
5.7.7 Uklon pasnice v smeri stojine
Koeficient(razred pasnice 1) k = 0.300
Površina stojine Aw = 7.315 cm2
Površina tlač.pasnice Afc = 11.900 cm2
Prepričen je uklon pasnice v smeri stojine
Pogoj 5.80: (21.09 <= 210.19)

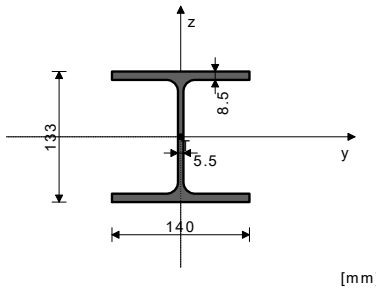
KONTROLA STRIŽNE NOSILNOSTI
(obtežni primer 3, konec palice)

Računska osna sila Nsd = -6.538 kN
Prečna sila v y smeri Vsd_y = 2.485 kN
Prečna sila v z smeri Vsd_z = 16.266 kN

PALICA 5-14

PREČNI PREREZ: IPBl 140 [S 235] [Set: 3]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



Ax = 31.400 cm2
Ay = 21.293 cm2
Az = 10.107 cm2
Ix = 8.160 cm4
Iy = 1030.0 cm4
Iz = 389.00 cm4
Wy = 154.89 cm3
Wz = 55.571 cm3
Wy,pl = 170.19 cm3
Wz,pl = 83.300 cm3
γM0 = 1.100
γM1 = 1.100
γM2 = 1.250
Anet/A = 0.900

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB
3. γ=0.25 4. γ=0.17

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

Računska osna sila Nsd = -48.201 kN
Prečna sila v y smeri Vsd_y = -0.390 kN
Upogibni moment okoli y osi Msd_y = 0.029 kNm
Upogibni moment okoli z osi Msd_z = -1.541 kNm
Sistemska dolžina palice L = 395.00 cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.4 Tlak
Plastična računska nosilnost Npl.Rd = 670.82 kN
Računska nosilnost na tlak Nc.Rd = 670.82 kN
Pogoj 5.16: Nsd <= Nc.Rd (48.20 <= 670.82)

5.4.5 Upogib y-y
Računski plastični moment Mpl.Rd = 36.358 kNm
Računska nos.na lokalno izbočitev Mo.Rd = 33.090 kNm
Računski elastični moment Mel.Rd = 33.090 kNm
Računska nosilnost na upogib Mc.Rd = 36.358 kNm
Pogoj 5.17: Msd_y <= Mc.Rd_y (0.03 <= 36.36)

5.4.5 Upogib z-z
Računski plastični moment Mpl.Rd = 17.796 kNm
Računska nos.na lokalno izbočitev Mo.Rd = 11.872 kNm
Računski elastični moment Mel.Rd = 11.872 kNm
Računska nosilnost na upogib Mc.Rd = 17.796 kNm
Pogoj 5.17: Msd_z <= Mc.Rd_z (1.54 <= 17.80)

5.4.6 Strig
Računska plast.nos.na strig y-y Vpl.Rd = 262.63 kN
Pogoj 5.20: Vsd_y <= Vpl.Rd_y (0.39 <= 262.63)

5.4.9 Upogib z osno in prečno silo
Ni potrebno zmanjšanje upogibne nosilnosti

Upogibni moment okoli z osi Msd_z = -1.292 kNm
Sistemska dolžina palice L = 270.00 cm

5.4 NOSILNOST PREČNIH PREREZOV
5.4.6 Strig
Računska plast.nos.na strig z-z Vpl.Rd = 124.67 kN
Pogoj 5.20: Vsd_z <= Vpl.Rd_z (16.27 <= 124.67)

Računska plast.nos.na strig y-y Vpl.Rd = 262.63 kN
Pogoj 5.20: Vsd_y <= Vpl.Rd_y (2.48 <= 262.63)

5.6 LOKALNO IZBOČENJE ZARADI STRIGA
za strig v ravnini z-z
Višina stojine d = 11.600 cm
Debelina stojine tw = 0.550 cm
Ni prečnih ojačitev v sredini
Koeficient izbočenja pri strigu kτ = 5.340
Ni potrebna kontrola izbočenja zaradi striga
Pogoj: d / tw <= 69 ε (21.09 <= 69.00)

Pogoj: Vsd_y <= 50%Vpl.Rd_y

5.4.8 Upogib in osna sila
Razmerje Nsd / Npl.Rd 0.072
Razmerje Msd_z / Mpl.Rd_z 0.087
Pogoj 5.36: (0.16 <= 1)

5.5 NOSILNOST ELEMENTOV
5.5.1 Uklonska nosilnost
Uklonska dolžina y-y l,y = 395.00 cm
Vztrajnostni radij y-y i,y = 5.727 cm
Vitkost y-y λ,y = 68.967
Relativna vitkost y-y λ_y = 0.734
Uklonska krivulja za os y-y: B α = 0.340
Koeficient nepopolnosti χ,y = 0.764
Koeficient efektivnega prereza βA = 1.000
Računska uklonska nosilnost Nb.Rd_y = 512.43 kN
Pogoj 5.45: Nsd <= Nb.Rd_y (48.20 <= 512.43)

Uklonska dolžina z-z l,z = 395.00 cm
Vztrajnostni radij z-z i,z = 3.520 cm
Vitkost z-z λ,z = 112.22
Relativna vitkost z-z λ_z = 1.195
Uklonska krivulja za os z-z: C α = 0.490
Koeficient nepopolnosti χ,z = 0.436
Koeficient efektivnega prereza βA = 1.000
Računska uklonska nosilnost Nb.Rd_z = 292.54 kN
Pogoj 5.45: Nsd <= Nb.Rd_z (48.20 <= 292.54)

5.5.2 Bočna zvrnitev upogibnih nosilcev
Koeficient C1 = 1.879
Koeficient C2 = 0.000
Koeficient C3 = 0.939
Koef.ukl.dolžine za uklon k = 1.000
Koef.ukl.dolžine za vbočenje kw = 1.000
Koordinata zg = 0.000 cm
Koordinata zj = 0.000 cm
Razmak med bočnimi podporami L = 395.00 cm
Sektorski vztrajnostni moment Iw = 15064 cm6
Krit.moment bočne zvrnitve Mcr = 125.20 kNm
Koeficient βw = 1.000
Koeficient imperf. αLT = 0.210
Brezdimenz.vitkost λLT_ = 0.565
Koeficient zmanjšanja χLT = 0.903
Računska uklonska nosilnost Mb.Rd = 32.821 kNm
Pogoj 5.48: Msd_y <= Mb.Rd (0.03 <= 32.82)

5.5.4 Upogib in tlak
Koeficient nepopolnosti χmin = 0.436
Nsd / ... 0.165
Koeficient oblike momenta βy = 1.800
Koeficient μy = -0.195
Koeficient ky = 1.017
ky * My / ... 0.001
Koeficient oblike momenta βz = 1.800
Koeficient μz = 0.021
Koeficient kz = 0.997
kz * Mz / ... 0.086
Pogoj 5.51: (0.25 <= 1)

Koeficient nepopolnosti χ_z = 0.436
Nsd/ ... 0.165
Koeficient nepopolnosti χLT = 0.903
Koef.obl.mom.za bočno zvrnitev βM.LT = 1.800
Koeficient μLT = 0.173

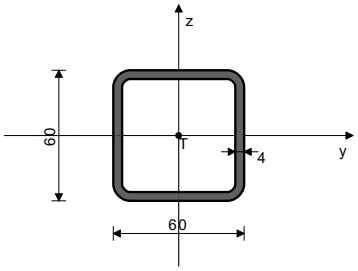
Koeficient	kLT =	0.974
kLT * My / ...		0.001
Koeficient oblike momenta	βz =	1.800
Koeficient	μz =	0.021
Koeficient	kz =	0.997

kz * Mz / ... 0.086
Pogoj 5.52: (0.25 <= 1)

PALICA 24-19

PREČNI PREREZ: HOP [] 60x60x4 [S 235] [Set: 12]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



[mm]

Ax =	8.550 cm2	
Ay =	4.275 cm2	
Az =	4.275 cm2	
Ix =	72.188 cm4	
Iy =	43.550 cm4	
Iz =	43.550 cm4	
Wy =	14.517 cm3	
Wz =	14.517 cm3	
Wy,pl =	18.848 cm3	
Wz,pl =	18.848 cm3	
γM0 =	1.100	
γM1 =	1.100	
γM2 =	1.250	
Anet/A =	0.900	

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB
3. γ=0.02 4. γ=0.02

PALICA IZPOSTAVLJENA CENTRIČNEMU NATEGU
(obtežni primer 3, na 21.3 cm od začetka palice)

Računska osna sila	Nsd =	0.107 kN
Prečna sila v z smeri	Vsd_z =	-0.039 kN
Sistemska dolžina palice	L =	128.00 cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.3 Nateg

Plast.rač.nosilnost bruto prereza	Npl.Rd =	182.66 kN
Mejna rač.nosilnost neto prereza	Nu.Rd =	199.45 kN
Računska nos. na nateg	Nt.Rd =	182.66 kN

Pogoj 5.13: Nsd <= Nt.Rd (0.11 <= 182.66)

5.4.6 Strig

Računska plast.nos.na strig z-z Vpl.Rd = 52.729 kN
Pogoj 5.20: Vsd_z <= Vpl.Rd_z (0.04 <= 52.73)

5.6 LOKALNO IZBOČENJE ZARADI STRIGA
za strig v ravnini z-z

Višina stojine	d =	5.200 cm
Debelina stojine	tw =	0.400 cm
Ni prečnih ojačitev v sredini		
Koeficient izbočenja pri strigu	kτ =	5.340

Ni potrebna kontrola izbočenja zaradi striga
Pogoj: d / tw <= 69 ε (13.00 <= 69.00)

5.7 VNOS KONCENTRIRANIH SIL V STOJINO
5.7.7 Uklon pasnice v smeri stojine

Koeficient(razred pasnice 1)	k =	0.300
Površina stojine	Aw =	2.400 cm2
Površina tlač.pasnice	Afc =	2.400 cm2

Preprečen je uklon pasnice v smeri stojine
Pogoj 5.80: (6.50 <= 268.09)

KONTROLA STRIŽNE NOSILNOSTI
(obtežni primer 3, začetek palice)

Računska osna sila	Nsd =	0.107 kN
Prečna sila v z smeri	Vsd_z =	-0.058 kN
Sistemska dolžina palice	L =	128.00 cm

5.4 NOSILNOST PREČNIH PREREZOV
5.4.6 Strig

Računska plast.nos.na strig z-z Vpl.Rd = 52.729 kN
Pogoj 5.20: Vsd_z <= Vpl.Rd_z (0.06 <= 52.73)

5.6 LOKALNO IZBOČENJE ZARADI STRIGA
za strig v ravnini z-z

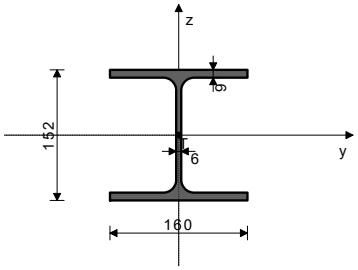
Višina stojine	d =	5.200 cm
Debelina stojine	tw =	0.400 cm
Ni prečnih ojačitev v sredini		
Koeficient izbočenja pri strigu	kτ =	5.340

Ni potrebna kontrola izbočenja zaradi striga
Pogoj: d / tw <= 69 ε (13.00 <= 69.00)

PALICA 41-26

PREČNI PREREZ: IPBl 160 [S 235] [Set: 10]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



[mm]

Ax =	38.800 cm2	
Ay =	25.560 cm2	
Az =	13.240 cm2	
Ix =	12.300 cm4	
Iy =	1670.0 cm4	
Iz =	616.00 cm4	
Wy =	219.74 cm3	
Wz =	77.000 cm3	
Wy,pl =	237.43 cm3	
Wz,pl =	115.20 cm3	
γM0 =	1.100	
γM1 =	1.100	
γM2 =	1.250	
Anet/A =	0.900	

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB
3. γ=0.83 4. γ=0.56

PALICA IZPOSTAVLJENA PRITISKU IN UPOGIBU
(obtežni primer 3, na 540.0 cm od začetka palice)

Računska osna sila	Nsd =	-6.329 kN
Prečna sila v y smeri	Vsd_y =	8.833 kN
Prečna sila v z smeri	Vsd_z =	-17.991 kN
Upogibni moment okoli y osi	Msd_y =	-22.520 kNm
Upogibni moment okoli z osi	Msd_z =	4.168 kNm
Moment torzije	Mt =	0.442 kNm
Sistemska dolžina palice	L =	730.00 cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.4 Tlak

Plastična računska nosilnost	Npl.Rd =	828.91 kN
Računska nosilnost na tlak	Nc.Rd =	828.91 kN

Pogoj 5.16: Nsd <= Nc.Rd (6.33 <= 828.91)

5.4.5 Upogib y-y

Računski plastični moment	Mpl.Rd =	50.725 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	46.944 kNm
Računski elastični moment	Mel.Rd =	46.944 kNm
Računska nosilnost na upogib	Mc.Rd =	50.725 kNm

Pogoj 5.17: Msd_y <= Mc.Rd_y (22.52 <= 50.72)

5.4.5 Upogib z-z

Računski plastični moment	Mpl.Rd =	24.611 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	16.450 kNm
Računski elastični moment	Mel.Rd =	16.450 kNm
Računska nosilnost na upogib	Mc.Rd =	24.611 kNm

Pogoj 5.17: Msd_z <= Mc.Rd_z (4.17 <= 24.61)

5.4.6 Strig

Računska plast.nos.na strig z-z Vpl.Rd = 163.31 kN
Pogoj 5.20: Vsd_z <= Vpl.Rd_z (17.99 <= 163.31)

Računska plast.nos.na strig y-y Vpl.Rd = 315.26 kN
Pogoj 5.20: Vsd_y <= Vpl.Rd_y (8.83 <= 315.26)

5.4.9 Upogib z osno in prečno silo
Ni potrebno zmanjšanje upogibne nosilnosti
Pogoj: Vsd_z <= 50%Vpl.Rd_z i Vsd_y <= 50%Vpl.Rd_y

5.4.8 Upogib in osna sila
Razmerje Msd_y / Mpl.Rd_y 0.444

Razmerje Msd_z / Mpl.Rd_z		0.169
Pogoj 5.36: (0.62 <= 1)		

5.5 NOSILNOST ELEMENTOV
5.5.1 Uklonska nosilnost

Uklonska dolžina y-y	l,y =	730.00 cm
Vztrajnostni radij y-y	i,y =	6.561 cm
Vitkost y-y	λ,y =	111.27
Relativna vitkost y-y	λ_y =	1.185
Uklonska krivulja za os y-y: B	α =	0.340
Koeficient nepopolnosti	χ,y =	0.486
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_y =	403.13 kN
Pogoj 5.45: Nsd <= Nb.Rd_y (6.33 <= 403.13)		

Uklonska dolžina z-z	l,z =	730.00 cm
Vztrajnostni radij z-z	i,z =	3.985 cm
Vitkost z-z	λ,z =	183.21
Relativna vitkost z-z	λ_z =	1.951
Uklonska krivulja za os z-z: C	α =	0.490
Koeficient nepopolnosti	χ,z =	0.205
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_z =	169.66 kN
Pogoj 5.45: Nsd <= Nb.Rd_z (6.33 <= 169.66)		

5.5.2 Bočna zvrnitev upogibnih nosilcev

Koeficient	C1 =	1.285
Koeficient	C2 =	1.562
Koeficient	C3 =	0.753
Koef.ukl.dolžine za uklon	k =	1.000
Koef.ukl.dolžine za vbočenje	kw =	1.000
Koordinata	zg =	0.000 cm
Koordinata	zj =	0.000 cm
Razmak med bočnimi podporami	L =	730.00 cm
Sektorski vztrajnostni moment	Iw =	31410 cm6
Krit.moment bočne zvrnitve	Mcr =	66.434 kNm
Koeficient	βw =	1.000
Koeficient imperf.	αLT =	0.210
Brezdimenz.vitkost	λLT_ =	0.916
Koeficient zmanjšanja	χLT =	0.723
Računska uklonska nosilnost	Mb.Rd =	36.675 kNm
Pogoj 5.48: Msd_y <= Mb.Rd (22.52 <= 36.67)		

5.5.4 Upogib in tlak

Koeficient nepopolnosti	χmin =	0.205
Nsd / ...		0.037
Koeficient oblike momenta	βy =	1.816
Koeficient	μy =	-0.356
Koeficient	ky =	1.005
ky * My / ...		0.446
Koeficient oblike momenta	βz =	1.223
Koeficient	μz =	-2.534
Koeficient	kz =	1.086
kz * Mz / ...		0.184
Pogoj 5.51: (0.67 <= 1)		

Koeficient nepopolnosti	χ_z =	0.205
Nsd/ ...		0.037
Koeficient nepopolnosti	χLT =	0.723
Koef.obl.mom.za bočno zvrnitev	βM.LT =	1.816
Koeficient	μLT =	0.381
Koeficient	kLT =	0.987
kLT * My / ...		0.606
Koeficient oblike momenta	βz =	1.223
Koeficient	μz =	-2.534
Koeficient	kz =	1.086
kz * Mz / ...		0.184
Pogoj 5.52: (0.83 <= 1)		

5.6 LOKALNO IZBOČENJE ZARADI STRIGA
za strig v ravnini z-z

Višina stojine	d =	13.400 cm
Debelina stojine	tw =	0.600 cm
Ni prečnih ojačitev v sredini		
Koeficient izbočenja pri strigu	kτ =	5.340
Ni potrebna kontrola izbočenja zaradi striga		
Pogoj: d / tw <= 69 ε (22.33 <= 69.00)		

5.6.7 Interakcija prečne sile, upogiba in osne sile
za strig v ravnini z-z

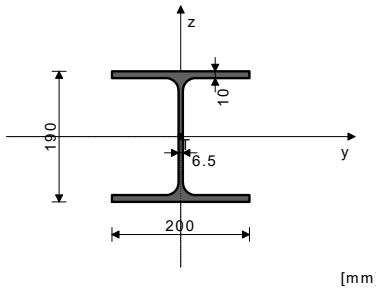
Računski plastični moment pasnic	Mf.Rd =	46.758 kNm
Pogoji 5.66a in 5.66b so izpolnjeni		

5.7 VNOS KONCENTRIRANIH SIL V STOJINO
5.7.7 Uklon pasnice v smeri stojine

Koeficient(razred pasnice 1)	k =	0.300
Površina stojine	Aw =	9.120 cm2
Površina tlač.pasnice	Afc =	14.400 cm2
Prepreč en je uklon pasnice v smeri stojine		
Pogoj 5.80: (22.33 <= 213.35)		

PALICA 40-32
PREČNI PREREZ: IPBl 200 [S 235] [Set: 6]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



Ax =	53.800 cm2	
Ay =	35.750 cm2	
Az =	18.050 cm2	
Ix =	21.100 cm4	
Iy =	3690.0 cm4	
Iz =	1340.0 cm4	
Wy =	388.42 cm3	
Wz =	134.00 cm3	
Wy,pl =	414.15 cm3	
Wz,pl =	200.00 cm3	
γM0 =	1.100	
γM1 =	1.100	
γM2 =	1.250	
Anet/A =	0.900	

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB
3. γ=0.48 4. γ=0.33

PALICA IZPOSTAVLJENA PRITISKU IN UPOGIBU
(obtežni primer 3, na 142.0 cm od začetka palice)

Računska osna sila	Nsd =	-105.29 kN
Prečna sila v y smeri	Vsd_y =	2.838 kN
Prečna sila v z smeri	Vsd_z =	-9.478 kN
Upogibni moment okoli y osi	Msd_y =	-27.826 kNm
Upogibni moment okoli z osi	Msd_z =	-1.434 kNm
Moment torzije	Mt =	0.078 kNm
Sistemska dolžina palice	L =	290.00 cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.4 Tlak

Plastična računska nosilnost	Npl.Rd =	1149.4 kN
Računska nosilnost na tlak	Nc.Rd =	1149.4 kN
Pogoj 5.16: Nsd <= Nc.Rd (105.29 <= 1149.36)		

5.4.5 Upogib y-y

Računski plastični moment	Mpl.Rd =	88.478 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	82.981 kNm
Računski elastični moment	Mel.Rd =	82.981 kNm
Računska nosilnost na upogib	Mc.Rd =	88.478 kNm
Pogoj 5.17: Msd_y <= Mc.Rd_y (27.83 <= 88.48)		

5.4.5 Upogib z-z

Računski plastični moment	Mpl.Rd =	42.727 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	28.627 kNm
Računski elastični moment	Mel.Rd =	28.627 kNm
Računska nosilnost na upogib	Mc.Rd =	42.727 kNm
Pogoj 5.17: Msd_z <= Mc.Rd_z (1.43 <= 42.73)		

5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	222.63 kN
Pogoj 5.20: Vsd_z <= Vpl.Rd_z (9.48 <= 222.63)		

Računska plast.nos.na strig y-y	Vpl.Rd =	440.95 kN
Pogoj 5.20: Vsd_y <= Vpl.Rd_y (2.84 <= 440.95)		

5.4.9 Upogib z osno in prečno silo
Ni potrebno zmanjšanje upogibne nosilnosti
Pogoj: Vsd_z <= 50%Vpl.Rd_z i Vsd_y <= 50%Vpl.Rd_y

5.4.8 Upogib in osna sila

Razmerje Nsd / Npl.Rd		0.092
Razmerje Msd_y / Mpl.Rd_y		0.315
Razmerje Msd_z / Mpl.Rd_z		0.034
Pogoj 5.36: (0.44 <= 1)		

5.5 NOSILNOST ELEMENTOV
5.5.1 Uklonska nosilnost

Uklonska dolžina y-y	l,y =	290.00 cm

Vztrajnostni radij y-y	i,y =	8.282 cm
Vitkost y-y	λ,y =	35.017
Relativna vitkost y-y	λ_y =	0.373
Uklonska krivulja za os y-y: B	α =	0.340
Koeficient nepopolnosti	χ,y =	0.937
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_y =	1076.6 kN

Pogoj 5.45: Nsd <= Nb.Rd_y (105.29 <= 1076.59)

Uklonska dolžina z-z	l,z =	290.00 cm
Vztrajnostni radij z-z	i,z =	4.991 cm
Vitkost z-z	λ,z =	58.108
Relativna vitkost z-z	λ_z =	0.619
Uklonska krivulja za os z-z: C	α =	0.490
Koeficient nepopolnosti	χ,z =	0.774
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_z =	889.80 kN

Pogoj 5.45: Nsd <= Nb.Rd_z (105.29 <= 889.80)

5.5.2 Bočna zvrnitev upogibnih nosilcev

Koeficient	C1 =	1.365
Koeficient	C2 =	0.553
Koeficient	C3 =	1.730
Koef.ukl.dolžine za uklon	k =	1.000
Koef.ukl.dolžine za vbočenje	kw =	1.000
Koordinata	zg =	0.000 cm
Koordinata	zj =	0.000 cm
Razmak med bočnimi podporami	L =	290.00 cm
Sektorski vztrajnostni moment	Iw =	1.08e+5 cm6
Krit.moment bočne zvrnitve	Mcr =	518.30 kNm
Koeficient	βw =	1.000
Koeficient imperf.	αLT =	0.210
Brezdimenz.vitkost	λLT_ =	0.433
Koeficient zmanjšanja	χLT =	0.944
Računska uklonska nosilnost	Mb.Rd =	83.505 kNm

Pogoj 5.48: Msd_y <= Mb.Rd (27.83 <= 83.50)

5.5.4 Upogib in tlak

Koeficient nepopolnosti	χmin =	0.774
Nsd / ...		0.118
Koeficient oblike momenta	βy =	1.510
Koeficient	μy =	-0.299
Koeficient	ky =	1.027
ky * My / ...		0.323
Koeficient oblike momenta	βz =	1.582
Koeficient	μz =	-0.025
Koeficient	kz =	1.003
kz * Mz / ...		0.034

Pogoj 5.51: (0.47 <= 1)

Koeficient nepopolnosti	χ_z =	0.774
Nsd/ ...		0.118
Koeficient nepopolnosti	χLT =	0.944
Koef.obl.mom.za bočno zvrnitev	βM.LT =	1.510
Koeficient	μLT =	-0.010
Koeficient	kLT =	1.001
kLT * My / ...		0.334
Koeficient oblike momenta	βz =	1.582
Koeficient	μz =	-0.025
Koeficient	kz =	1.003
kz * Mz / ...		0.034

Pogoj 5.52: (0.49 <= 1)

5.6 LOKALNO IZBOČENJE ZARADI STRIGA
za strig v ravnini z-z

Višina stojine	d =	17.000 cm
Debelina stojine	tw =	0.650 cm

Ni prečnih ojačitev v sredini

Koeficient izbočenja pri strigu	kτ =	5.340

Ni potrebna kontrola izbočenja zaradi striga

Pogoj: d / tw <= 69 ε (26.15 <= 69.00)

5.6.7 Interakcija prečne sile, upogiba in osne sile
za strig v ravnini z-z

Računski plastični moment pasnic	Mf.Rd =	80.501 kNm

Pogoji 5.66a in 5.66b so izpolnjeni

5.7 VNOS KONCENTRIRANIH SIL V STOJINO
5.7.7 Uklon pasnice v smeri stojine

Koeficient(razred pasnice 1)	k =	0.300
Površina stojine	Aw =	12.350 cm2
Površina tlač.pasnice	Afc =	20.000 cm2

Preprečen je uklon pasnice v smeri stojine

Pogoj 5.80: (26.15 <= 210.66)

KONTROLA STRIŽNE NOSILNOSTI
(obtežni primer 3, na 142.0 cm od začetka palice)

Računska osna sila	Nsd =	-6.606 kN
Prečna sila v y smeri	Vsd_y =	-2.364 kN
Prečna sila v z smeri	Vsd_z =	46.326 kN
Upogibni moment okoli y osi	Msd_y =	-28.277 kNm
Upogibni moment okoli z osi	Msd_z =	2.169 kNm
Moment torzije	Mt =	-0.555 kNm
Sistemska dolžina palice	L =	290.00 cm

5.4 NOSILNOST PREČNIH PREREZOV
5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	222.63 kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (46.33 <= 222.63)

Računska plast.nos.na strig y-y	Vpl.Rd =	440.95 kN

Pogoj 5.20: Vsd_y <= Vpl.Rd_y (2.36 <= 440.95)

5.6 LOKALNO IZBOČENJE ZARADI STRIGA
za strig v ravnini z-z

Višina stojine	d =	17.000 cm
Debelina stojine	tw =	0.650 cm

Ni prečnih ojačitev v sredini

Koeficient izbočenja pri strigu	kτ =	5.340

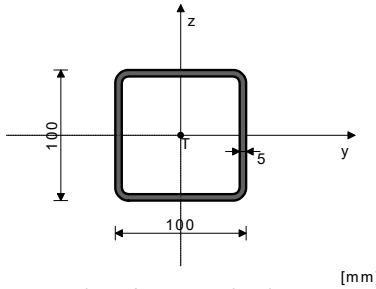
Ni potrebna kontrola izbočenja zaradi striga

Pogoj: d / tw <= 69 ε (26.15 <= 69.00)

PALICA 34-44

PREČNI PREREZ: HOP [] 100x100x5 [S 235] [Set: 8]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



[mm]

Ax =	18.360 cm2	
Ay =	9.180 cm2	
Az =	9.180 cm2	
Ix =	438.99 cm4	
Iy =	271.09 cm4	
Iz =	271.09 cm4	
Wy =	54.218 cm3	
Wz =	54.218 cm3	
Wy,pl =	67.750 cm3	
Wz,pl =	67.750 cm3	
γM0 =	1.100	
γM1 =	1.100	
γM2 =	1.250	
Anet/A =	0.900	

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB
3. γ=0.31 4. γ=0.21

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

Računska osna sila	Nsd =	-26.967 kN
Prečna sila v y smeri	Vsd_y =	-0.170 kN
Prečna sila v z smeri	Vsd_z =	-0.766 kN
Upogibni moment okoli y osi	Msd_y =	2.404 kNm
Upogibni moment okoli z osi	Msd_z =	0.576 kNm
Moment torzije	Mt =	0.093 kNm
Sistemska dolžina palice	L =	314.00 cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.4 Tlak

Plastična računska nosilnost	Npl.Rd =	392.24 kN
Računska nosilnost na tlak	Nc.Rd =	392.24 kN

Pogoj 5.16: Nsd <= Nc.Rd (26.97 <= 392.24)

5.4.5 Upogib y-y

Računski plastični moment	Mpl.Rd =	14.474 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	11.583 kNm
Računski elastični moment	Mel.Rd =	11.583 kNm
Računska nosilnost na upogib	Mc.Rd =	14.474 kNm

Pogoj 5.17: Msd_y <= Mc.Rd_y (2.40 <= 14.47)

5.4.5 Upogib z-z

Računski plastični moment	Mpl.Rd =	14.474 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	11.583 kNm
Računski elastični moment	Mel.Rd =	11.583 kNm

Računska nosilnost na upogib	Mc.Rd =	14.474 kNm
Pogoj 5.17: Msd_z <= Mc.Rd_z (0.58 <= 14.47)		

5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	113.23 kN
Pogoj 5.20: Vsd_z <= Vpl.Rd_z (0.77 <= 113.23)		
Računska plast.nos.na strig y-y	Vpl.Rd =	113.23 kN
Pogoj 5.20: Vsd_y <= Vpl.Rd_y (0.17 <= 113.23)		

5.4.9 Upogib z osno in prečno silo
Ni potrebno zmanjšanje upogibne nosilnosti
Pogoj: Vsd_z <= 50%Vpl.Rd_z i Vsd_y <= 50%Vpl.Rd_y

5.4.8 Upogib in osna sila

Razmerje Nsd / Npl.Rd		0.069
Razmerje Msd_y / Mpl.Rd_y		0.166
Razmerje Msd_z / Mpl.Rd_z		0.040
Pogoj 5.36: (0.27 <= 1)		

5.5 NOSILNOST ELEMENTOV
5.5.1 Uklonska nosilnost

Uklonska dolžina y-y	l,y =	314.00 cm
Vztrajnostni radij y-y	i,y =	3.843 cm
Vitkost y-y	λ,y =	81.716
Relativna vitkost y-y	λ_y =	0.870
Uklonska krivulja za os y-y: B	α =	0.340
Koeficient nepopolnosti	χ,y =	0.680
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_y =	266.82 kN
Pogoj 5.45: Nsd <= Nb.Rd_y (26.97 <= 266.82)		
Uklonska dolžina z-z	l,z =	314.00 cm
Vztrajnostni radij z-z	i,z =	3.843 cm
Vitkost z-z	λ,z =	81.716
Relativna vitkost z-z	λ_z =	0.870
Uklonska krivulja za os z-z: B	α =	0.340
Koeficient nepopolnosti	χ,z =	0.680
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_z =	266.82 kN
Pogoj 5.45: Nsd <= Nb.Rd_z (26.97 <= 266.82)		

5.5.2 Bočna zvrnitev upogibnih nosilcev

Koeficient	C1 =	1.879
Koeficient	C2 =	0.000
Koeficient	C3 =	0.939
Koef.ukl.dolžine za uklon	k =	1.000
Koef.ukl.dolžine za vbočenje	kw =	1.000
Koordinata	zg =	0.000 cm
Koordinata	zj =	0.000 cm
Razmak med bočnimi podporami	L =	314.00 cm
Sektorski vztrajnostni moment	Iw =	0.000 cm6
Krit.moment bočne zvrnitve	Mcr =	844.62 kNm
Koeficient	βw =	1.000
Koeficient imperf.	αLT =	0.210
Brezdimenz.vitkost	λLT_ =	0.137
Koeficient zmanjšanja	χLT =	1.000
Računska uklonska nosilnost	Mb.Rd =	14.474 kNm
Kontrola bočne zvrnitve ni potrebna: λ_LT <= 0.4		

5.5.4 Upogib in tlak

Koeficient nepopolnosti	χmin =	0.680
Nsd / ...		0.101
Koeficient oblike momenta	βy =	1.800
Koeficient	μy =	-0.099
Koeficient	ky =	1.009
ky * My / ...		0.168
Koeficient oblike momenta	βz =	1.751
Koeficient	μz =	-0.184
Koeficient	kz =	1.017
kz * Mz / ...		0.040
Pogoj 5.51: (0.31 <= 1)		
Koeficient nepopolnosti	χ_z =	0.680
Nsd/ ...		0.101
Koeficient nepopolnosti	χLT =	1.000
Koef.obl.mom.za bočno zvrnitev	βM.LT =	1.800
Koeficient	μLT =	0.085
Koeficient	kLT =	0.992
kLT * My / ...		0.165
Koeficient oblike momenta	βz =	1.751
Koeficient	μz =	-0.184
Koeficient	kz =	1.017
kz * Mz / ...		0.040
Pogoj 5.52: (0.31 <= 1)		

5.6 LOKALNO IZBOČENJE ZARADI STRIGA
za strig v ravnini z-z

Višina stojine	d =	9.000 cm
Debelina stojine	tw =	0.500 cm
Ni prečnih ojačitev v sredini		
Koeficient izbočenja pri strigu	kτ =	5.340
Ni potrebna kontrola izbočenja zaradi striga		
Pogoj: d / tw <= 69 ε (18.00 <= 69.00)		

za strig v ravnini y-y

Višina stojine	d =	10.000 cm
Debelina stojine	tw =	0.500 cm
Ni prečnih ojačitev v sredini		
Koeficient izbočenja pri strigu	kτ =	5.340
Ni potrebna kontrola izbočenja zaradi striga		
Pogoj: d / tw <= 69 ε (20.00 <= 69.00)		

5.6.7 Interakcija prečne sile, upogiba in osne sile
za strig v ravnini z-z

Računski plastični moment pasnic	Mf.Rd =	10.631 kNm
Pogoji 5.66a in 5.66b so izpolnjeni		

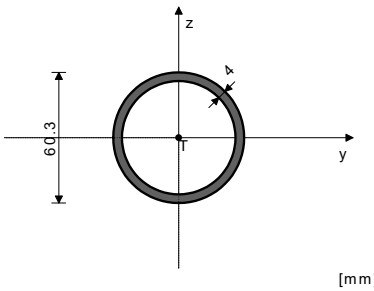
5.7 VNOS KONCENTRIRANIH SIL V STOJINO
5.7.7 Uklon pasnice v smeri stojine

Koeficient(razred pasnice 1)	k =	0.300
Površina stojine	Aw =	5.000 cm2
Površina tlač.pasnice	Afc =	5.000 cm2
Prepročen je uklon pasnice v smeri stojine		
Pogoj 5.80: (9.00 <= 268.09)		

PALICA 43-35

PREČNI PREREZ: Cevasti [S 235] [Set: 7]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



[mm]

	Ax =	7.070 cm2
	Ay =	3.536 cm2
	Az =	3.536 cm2
	Ix =	56.317 cm4
	Iy =	28.170 cm4
	Iz =	28.170 cm4
	Wy =	9.343 cm3
	Wz =	9.343 cm3
	Wy,pl =	12.700 cm3
	Wz,pl =	12.700 cm3
	γM0 =	1.100
	γM1 =	1.100
	γM2 =	1.250
	Anet/A =	0.900

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB
3. γ=0.97 4. γ=0.66

PALICA IZPOSTAVLJENA NATEGU IN UPOGIBU

(obtežni primer 3, začetek palice)

Računska osna sila	Nsd =	121.89 kN
Prečna sila v z smeri	Vsd_z =	0.347 kN
Upogibni moment okoli y osi	Msd_y =	0.434 kNm
Moment torzije	Mt =	0.115 kNm
Sistemska dolžina palice	L =	210.72 cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.3 Nateg

Plast.rač.nosilnost bruto prereza	Npl.Rd =	151.04 kN
Mejna rač.nosilnost neto prereza	Nu.Rd =	164.93 kN
Računska nos. na nateg	Nt.Rd =	151.04 kN
Pogoj 5.13: Nsd <= Nt.Rd (121.89 <= 151.04)		

5.4.5 Upogib y-y

Računski plastični moment	Mpl.Rd =	2.713 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	1.996 kNm
Računski elastični moment	Mel.Rd =	1.996 kNm
Računska nosilnost na upogib	Mc.Rd =	2.713 kNm
Pogoj 5.17: Msd_y <= Mc.Rd_y (0.43 <= 2.71)		

5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	43.610 kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (0.35 <= 43.61)

5.4.9 Upogib z osno in prečno silo
Ni potrebno zmanjšanje upogibne nosilnosti
Pogoj: Vsd_z <= 50%Vpl.Rd_z

5.4.8 Upogib in osna sila

Razmerje Nsd / Npl.Rd		0.807
Razmerje Msd_y / Mpl.Rd_y		0.160

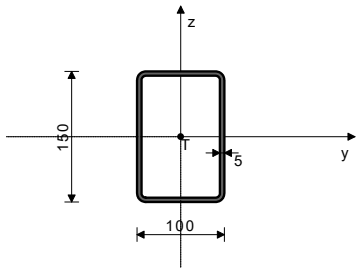
Pogoj 5.36: (0.97 <= 1)

5.5 NOSILNOST ELEMENTOV
5.5.2 Bočna zvrnitev upogibnih nosilcev

Koeficient	C1 =	1.132
Koeficient	C2 =	0.459
Koeficient	C3 =	0.525
Koef.ukl.dolžine za uklon	k =	1.000
Koef.ukl.dolžine za vbočenje	kw =	1.000
Koordinata	zg =	0.000 cm
Koordinata	zj =	0.000 cm
Razmak med bočnimi podporami	L =	210.72 cm
Sektorski vztrajnostni moment	Iw =	0.000 cm6
Krit.moment bočne zvrnitve	Mcr =	87.545 kNm
Koeficient	βw =	1.000
Koeficient imperf.	αLT =	0.210
Brezdimenz.vitkost	λLT_ =	0.185
Koeficient zmanjšanja	χLT =	1.000
Računska uklonska nosilnost	Mb.Rd =	2.713 kNm

PALICA 48-44
PREČNI PREREZ: HOP [] 150x100x5 [S 235] [Set: 9]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



[mm]

Ax =		23.360 cm2
Ay =		9.344 cm2
Az =		14.016 cm2
Ix =		806.74 cm4
Iy =		719.18 cm4
Iz =		384.01 cm4
Wy =		95.891 cm3
Wz =		76.802 cm3
Wy,pl =		121.50 cm3
Wz,pl =		91.500 cm3
γM0 =		1.100
γM1 =		1.100
γM2 =		1.250
Anet/A =		0.900

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB
3. γ=0.21 4. γ=0.14

PALICA IZPOSTAVLJENA PRITISKU IN UPOGIBU
(obtežni primer 3, na 142.0 cm od začetka palice)

Računska osna sila	Nsd =	-2.787 kN
Prečna sila v y smeri	Vsd_y =	-1.704 kN
Prečna sila v z smeri	Vsd_z =	0.562 kN
Upogibni moment okoli y osi	Msd_y =	3.247 kNm
Upogibni moment okoli z osi	Msd_z =	1.552 kNm
Moment torzije	Mt =	-0.876 kNm
Sistemska dolžina palice	L =	162.00 cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.4 Tlak

Plastična računska nosilnost	Npl.Rd =	499.05 kN
Računska nosilnost na tlak	Nc.Rd =	499.05 kN

Pogoj 5.16: Nsd <= Nc.Rd (2.79 <= 499.05)

5.4.5 Upogib y-y

Računski plastični moment	Mpl.Rd =	25.957 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	20.486 kNm
Računski elastični moment	Mel.Rd =	20.486 kNm
Računska nosilnost na upogib	Mc.Rd =	25.957 kNm

Pogoj 5.17: Msd_y <= Mc.Rd_y (3.25 <= 25.96)

5.4.5 Upogib z-z

Računski plastični moment	Mpl.Rd =	19.548 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	16.408 kNm
Računski elastični moment	Mel.Rd =	16.408 kNm
Računska nosilnost na upogib	Mc.Rd =	19.548 kNm

Pogoj 5.17: Msd_z <= Mc.Rd_z (1.55 <= 19.55)

5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	172.88 kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (0.56 <= 172.88)

Računska plast.nos.na strig y-y	Vpl.Rd =	115.25 kN

Pogoj 5.20: Vsd_y <= Vpl.Rd_y (1.70 <= 115.25)

5.4.9 Upogib z osno in prečno silo
Ni potrebno zmanjšanje upogibne nosilnosti
Pogoj: Vsd_z <= 50%Vpl.Rd_z i Vsd_y <= 50%Vpl.Rd_y

5.4.8 Upogib in osna sila

Razmerje Msd_y / Mpl.Rd_y		0.125
Razmerje Msd_z / Mpl.Rd_z		0.079

Pogoj 5.36: (0.21 <= 1)

5.5 NOSILNOST ELEMENTOV
5.5.1 Uklonska nosilnost

Uklonska dolžina y-y	l,y =	162.00 cm
Vztrajnostni radij y-y	i,y =	5.549 cm
Vitkost y-y	λ,y =	29.197
Relativna vitkost y-y	λ_y =	0.311
Uklonska krivulja za os y-y: B	α =	0.340
Koeficient nepopolnosti	χ,y =	0.960
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_y =	479.13 kN

Pogoj 5.45: Nsd <= Nb.Rd_y (2.79 <= 479.13)

Uklonska dolžina z-z	l,z =	162.00 cm
Vztrajnostni radij z-z	i,z =	4.054 cm
Vitkost z-z	λ,z =	39.956
Relativna vitkost z-z	λ_z =	0.426
Uklonska krivulja za os z-z: B	α =	0.340
Koeficient nepopolnosti	χ,z =	0.916
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_z =	457.04 kN

Pogoj 5.45: Nsd <= Nb.Rd_z (2.79 <= 457.04)

5.5.2 Bočna zvrnitev upogibnih nosilcev

Koeficient	C1 =	1.132
Koeficient	C2 =	0.459
Koeficient	C3 =	0.525
Koef.ukl.dolžine za uklon	k =	1.000
Koef.ukl.dolžine za vbočenje	kw =	1.000
Koordinata	zg =	0.000 cm
Koordinata	zj =	0.000 cm
Razmak med bočnimi podporami	L =	162.00 cm
Sektorski vztrajnostni moment	Iw =	0.000 cm6
Krit.moment bočne zvrnitve	Mcr =	1591.3 kNm
Koeficient	βw =	1.000
Koeficient imperf.	αLT =	0.210
Brezdimenz.vitkost	λLT_ =	0.134
Koeficient zmanjšanja	χLT =	1.000
Računska uklonska nosilnost	Mb.Rd =	25.957 kNm

Kontrola bočne zvrnitve ni potrebna: λ_LT <= 0.4

5.5.4 Upogib in tlak

Koeficient nepopolnosti	χmin =	0.916
Nsd / ...		0.006
Koeficient oblike momenta	βy =	1.283
Koeficient	μy =	-0.179
Koeficient	ky =	1.001
ky * My / ...		0.125
Koeficient oblike momenta	βz =	1.705
Koeficient	μz =	-0.060
Koeficient	kz =	1.000
kz * Mz / ...		0.079

Pogoj 5.51: (0.21 <= 1)

Koeficient nepopolnosti	χ_z =	0.916
Nsd/ ...		0.006
Koeficient nepopolnosti	χLT =	1.000
Koef.obl.mom.za bočno zvrnitev	βM.LT =	1.283
Koeficient	μLT =	-0.068
Koeficient	kLT =	1.000
kLT * My / ...		0.125
Koeficient oblike momenta	βz =	1.705
Koeficient	μz =	-0.060
Koeficient	kz =	1.000
kz * Mz / ...		0.079

Pogoj 5.52: (0.21 <= 1)

5.6 LOKALNO IZBOČENJE ZARADI STRIGA

za strig v ravnini z-z		
Višina stojine	d =	14.000 cm
Debelina stojine	tw =	0.500 cm
Ni prečnih ojačitev v sredini		
Koeficient izbočenja pri strigu	k_τ =	5.340
Ni potrebna kontrola izbočenja zaradi striga		
Pogoj: d / tw <= 69 ε (28.00 <= 69.00)		

za strig v ravnini y-y		
Višina stojine	d =	10.000 cm
Debelina stojine	tw =	0.500 cm
Ni prečnih ojačitev v sredini		
Koeficient izbočenja pri strigu	k_τ =	5.340
Ni potrebna kontrola izbočenja zaradi striga		
Pogoj: d / tw <= 69 ε (20.00 <= 69.00)		

5.6.7 Interakcija prečne sile, upogiba in osne sile		
za strig v ravnini z-z		
Računski plastični moment pasnic	Mf.Rd =	16.022 kNm
Pogoji 5.66a in 5.66b so izpolnjeni		

5.7 VNOS KONCENTRIRANIH SIL V STOJINO		
5.7.7 Uklon pasnice v smeri stojine		
Koeficient(razred pasnice 1)	k =	0.300
Površina stojine	Aw =	7.500 cm2
Površina tlač.pasnice	Afc =	5.000 cm2
Preprečen je uklon pasnice v smeri stojine		
Pogoj 5.80: (14.00 <= 328.34)		

KONTROLA STRIŽNE NOSILNOSTI
(obtežni primer 3, začetek palice)

Računska osna sila	Nsd =	0.766 kN
Prečna sila v y smeri	Vsd_y =	0.170 kN
Prečna sila v z smeri	Vsd_z =	-26.356 kN
Upogibni moment okoli z osi	Msd_z =	-0.093 kNm
Moment torzije	Mt =	0.041 kNm
Sistemska dolžina palice	L =	162.00 cm

5.4 NOSILNOST PREČNIH PREREZOV		
5.4.6 Strig		
Računska plast.nos.na strig z-z	Vpl.Rd =	172.88 kN
Pogoj 5.20: Vsd_z <= Vpl.Rd_z (26.36 <= 172.88)		
Računska plast.nos.na strig y-y	Vpl.Rd =	115.25 kN
Pogoj 5.20: Vsd_y <= Vpl.Rd_y (0.17 <= 115.25)		

5.6 LOKALNO IZBOČENJE ZARADI STRIGA		
za strig v ravnini z-z		
Višina stojine	d =	14.000 cm
Debelina stojine	tw =	0.500 cm
Ni prečnih ojačitev v sredini		
Koeficient izbočenja pri strigu	k_τ =	5.340
Ni potrebna kontrola izbočenja zaradi striga		
Pogoj: d / tw <= 69 ε (28.00 <= 69.00)		

za strig v ravnini y-y		
Višina stojine	d =	10.000 cm
Debelina stojine	tw =	0.500 cm
Ni prečnih ojačitev v sredini		
Koeficient izbočenja pri strigu	k_τ =	5.340
Ni potrebna kontrola izbočenja zaradi striga		
Pogoj: d / tw <= 69 ε (20.00 <= 69.00)		

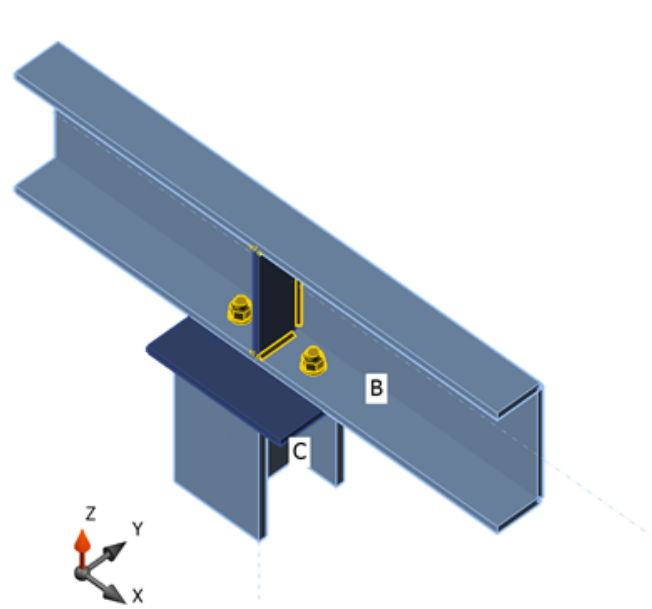
GRADBENI BIRO
Vrvarska pot 1a
1310 Ribnica, Slovenija
T 01 836 90 60
info@zasnova.si
www.zasnova.si

2.5.3.2. Analiza spojev jeklenega stopnišča

- *Analiza spoja steber HEA 140 – prečka C 200*

Beams and columns

Name	Cross-section	β – Direction [°]	γ - Pitch [°]	α - Rotation [°]	Offset ex [mm]	Offset ey [mm]	Offset ez [mm]
B	4 - U200	180,0	0,0	0,0	0	-50	0
C	3 - HEB140	90,0	90,0	0,0	0	0	0



Cross-sections

Name	Material
4 - U200	S 235
3 - HEB140	S 235

Bolts

Name	Bolt assembly	Diameter [mm]	fu [MPa]	Gross area [mm²]
M16 8.8	M16 8.8	16	800,0	201

Load effects (equilibrium not required)

Name	Member	Pos.	X [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
LE1	C	End	0	21,0	17,0	0,0	0,0	0,0	0,0

Check

Summary

Name	Value	Check status
Analysis	100,0%	OK
Plates	0,0 < 5%	OK
Bolts	36,4 < 100%	OK
Welds	72,4 < 100%	OK
Buckling	Not calculated	

Plates

Name	Thickness [mm]	Loads	σ_{Ed} [MPa]	ε_{Pl} [1e-4]	Check status
B-bfl 1	11,5	LE1	235,0	1,4	OK
B-tfl 1	11,5	LE1	52,9	0,0	OK
B-w 1	8,5	LE1	128,1	0,0	OK
C-bfl 1	12,0	LE1	51,0	0,0	OK
C-tfl 1	12,0	LE1	75,1	0,0	OK
C-w 1	7,0	LE1	57,2	0,0	OK
EP1	10,0	LE1	235,1	5,0	OK
STIFF1	8,0	LE1	94,8	0,0	OK

Design data

Material	fy [MPa]	ε_{lim} [1e-4]
S 235	235,0	500,0

Symbol explanation

ε_{Pl}	Strain
σ_{Ed}	Eq. stress

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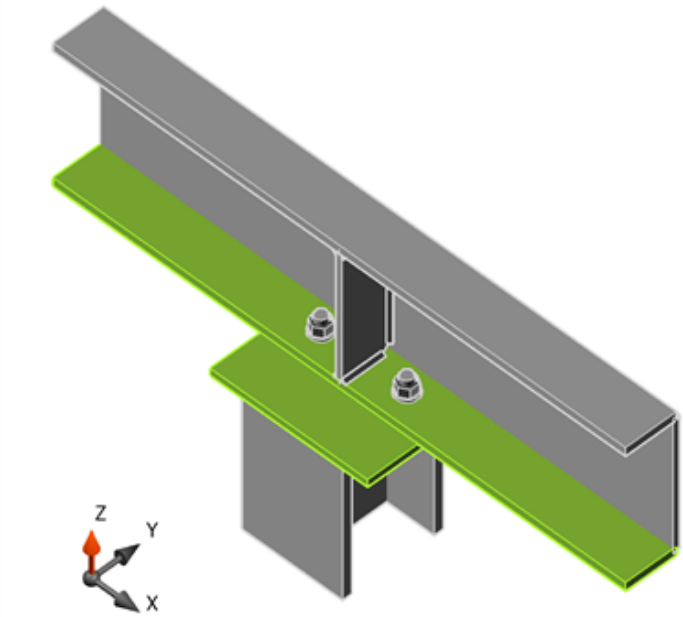
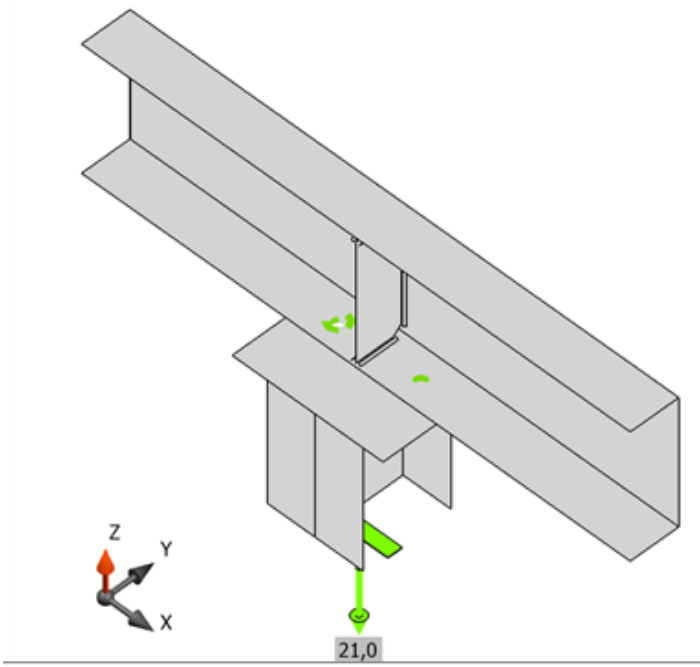
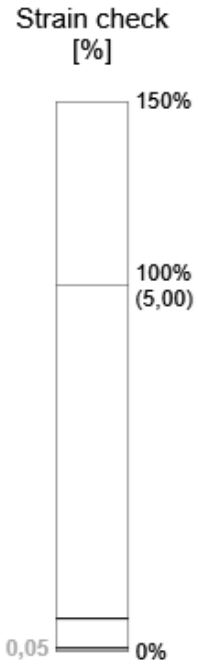
Symbol explanation

ε_{Pl}	Strain
σ_{Ed}	Eq. stress



Overall check, LE1





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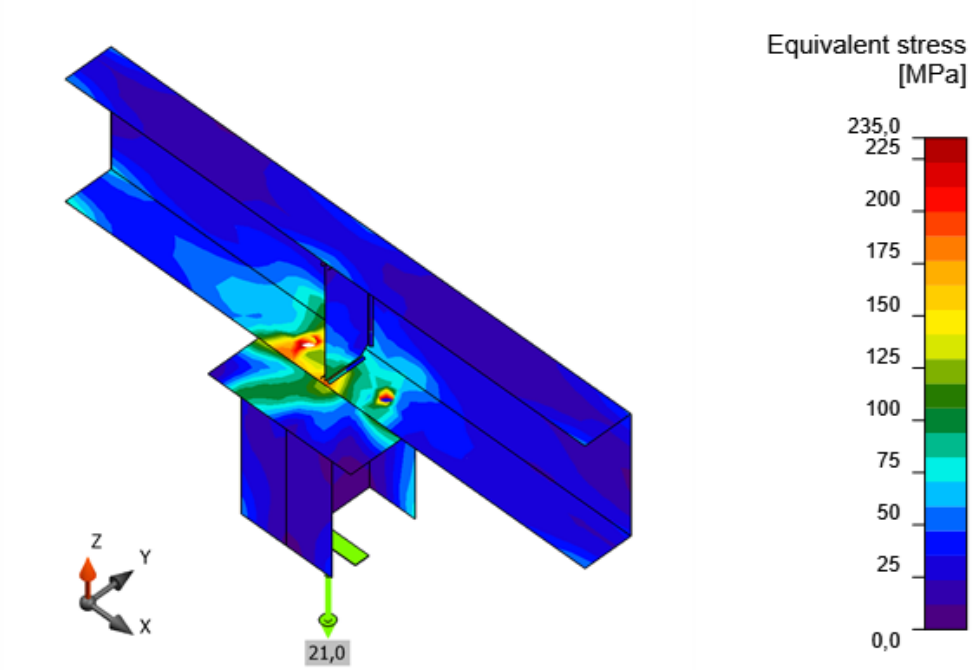
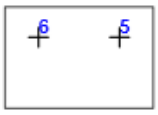
Strain check, LE1



Equivalent stress, LE1

Bolts

	Name	Loads	$F_{t,Ed}$ [kN]	V [kN]	Ut_t [%]	$F_{b,Rd}$ [kN]	Ut_s [%]	Ut_{ts} [%]	Status
	B5	LE1	26,3	9,4	29,1	115,2	15,7	36,4	OK
	B6	LE1	22,1	9,6	24,4	115,2	15,9	33,3	OK

Design data

Name	$F_{t,Rd}$ [kN]	$B_{p,Rd}$ [kN]	$F_{v,Rd}$ [kN]
M16 8.8 - 1	90,4	135,7	60,3

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Symbol explanation

$F_{t,Rd}$	Bolt tension resistance EN 1993-1-8 tab. 3.4
$F_{t,Ed}$	Tension force
$B_{p,Rd}$	Punching shear resistance
V	Resultant of shear forces Vy, Vz in bolt.
$F_{v,Rd}$	Bolt shear resistance EN_1993-1-8 table 3.4
$F_{b,Rd}$	Plate bearing resistance EN 1993-1-8 tab. 3.4
Ut_t	Utilization in tension
Ut_s	Utilization in shear
Ut_{ts}	Utilization in tension and shear EN 1993-1-8 table 3.4

Welds (Plastic redistribution)

Item	Edge	Throat th. [mm]	Length [mm]	Loads	$\sigma_{w,Ed}$ [MPa]	ε_{Pl} [%]	$\sigma_{\perp}$ [MPa]	$\tau_{\parallel}$ [MPa]	$\tau_{\perp}$ [MPa]	Ut [%]	Ut_c [%]	Status
EP1	C-bfl 1	◢5,0	140	LE1	119,0	0,0	63,2	46,5	35,0	33,1	12,1	OK
EP1	C-tfl 1	◢5,0	140	LE1	260,7	0,0	131,8	-76,1	-105,2	72,4	29,3	OK
EP1	C-w 1	◢5,0◣	128	LE1	52,6	0,0	29,4	-1,7	25,1	14,6	10,1	OK
		◢5,0◣	128	LE1	54,6	0,0	23,0	8,6	-27,3	15,2	7,9	OK
B-bfl 1	STIFF1	◢4,0◣	55	LE1	114,9	0,0	63,7	-27,6	47,8	31,9	23,6	OK
		◢4,0◣	55	LE1	86,1	0,0	29,9	9,0	-45,7	23,9	17,3	OK
B-w 1	STIFF1	◢4,0◣	154	LE1	37,1	0,0	1,0	21,4	0,5	10,3	7,1	OK
		◢4,0◣	154	LE1	37,1	0,0	0,9	-21,3	-1,4	10,3	7,0	OK
B-tfl 1	STIFF1	◢4,0◣	55	LE1	28,4	0,0	3,9	-15,6	4,5	7,9	5,3	OK
		◢4,0◣	55	LE1	30,2	0,0	5,7	16,3	-5,1	8,4	6,0	OK

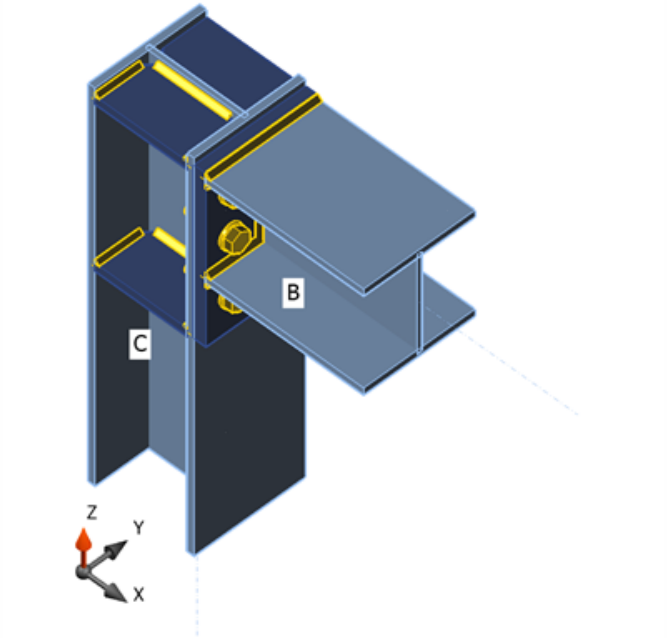
Design data

	β_w [-]	$\sigma_{w,Rd}$ [MPa]	0.9 σ [MPa]
S 235	0,80	360,0	259,2

➢ *Analiza spoja steber HEA 140 – prečka HEA 140*

Beams and columns

Name	Cross-section	β – Direction [°]	γ - Pitch [°]	α - Rotation [°]	Offset ex [mm]	Offset ey [mm]	Offset ez [mm]
C	3 - HEA140	0,0	90,0	0,0	-80	0	0
B	3 - HEA140	0,0	0,0	0,0	0	0	0



Cross-sections

Name	Material
3 - HEA140	S 235
3 - HEA140	S 235

Bolts

Name	Bolt assembly	Diameter [mm]	fu [MPa]	Gross area [mm²]
M16 8.8	M16 8.8	16	800,0	201

Load effects (equilibrium not required)

Name	Member	Pos.	X [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
LE1	B	End	0	0,0	0,0	-17,0	0,0	18,0	0,0

Check

Summary

Name	Value	Check status
Analysis	100,0%	OK
Plates	3,0 < 5%	OK
Bolts	83,9 < 100%	OK
Welds	98,5 < 100%	OK
Buckling	Not calculated	

Plates

Name	Thickness [mm]	Loads	σ_{Ed} [MPa]	ε_{Pl} [1e-4]	Check status
C-bfl 1	8,5	LE1	235,2	8,6	OK
C-tfl 1	8,5	LE1	241,3	299,2	OK
C-w 1	5,5	LE1	237,3	108,3	OK
B-bfl 1	8,5	LE1	219,3	0,0	OK
B-tfl 1	8,5	LE1	208,5	0,0	OK
B-w 1	5,5	LE1	235,1	7,1	OK
EP1	15,0	LE1	235,7	31,0	OK
STIFF1a	10,0	LE1	207,1	0,2	OK
STIFF1b	10,0	LE1	184,5	0,0	OK
STIFF2a	10,0	LE1	64,2	0,0	OK
STIFF2b	10,0	LE1	65,6	0,0	OK
WID1	15,0	LE1	241,0	284,7	OK

Design data

Material	fy [MPa]	ε_{lim} [1e-4]
S 235	235,0	500,0

Symbol explanation

ε_{Pl}	Strain
σ_{Ed}	Eq. stress

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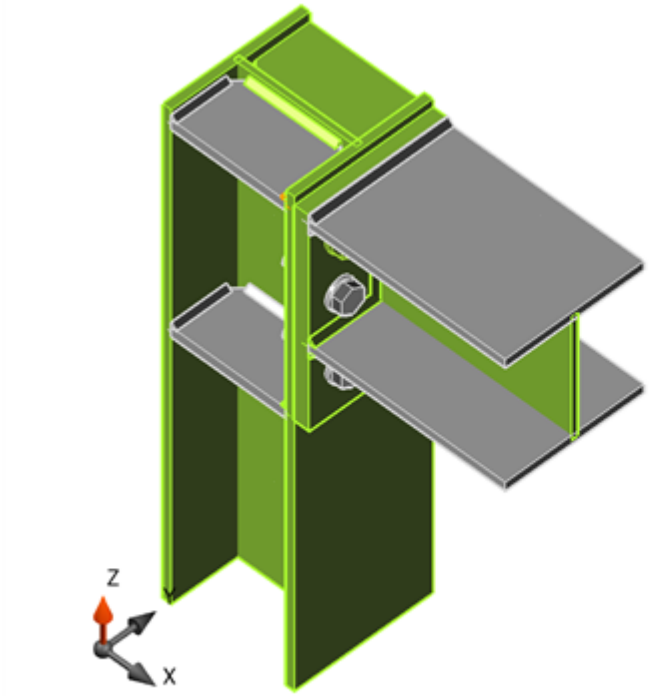
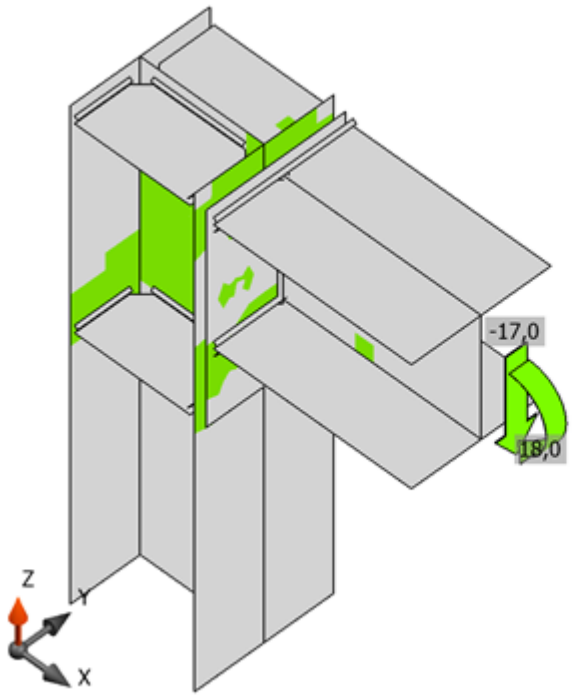
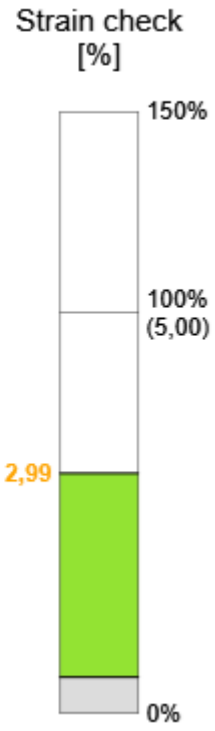


Overall check, LE1





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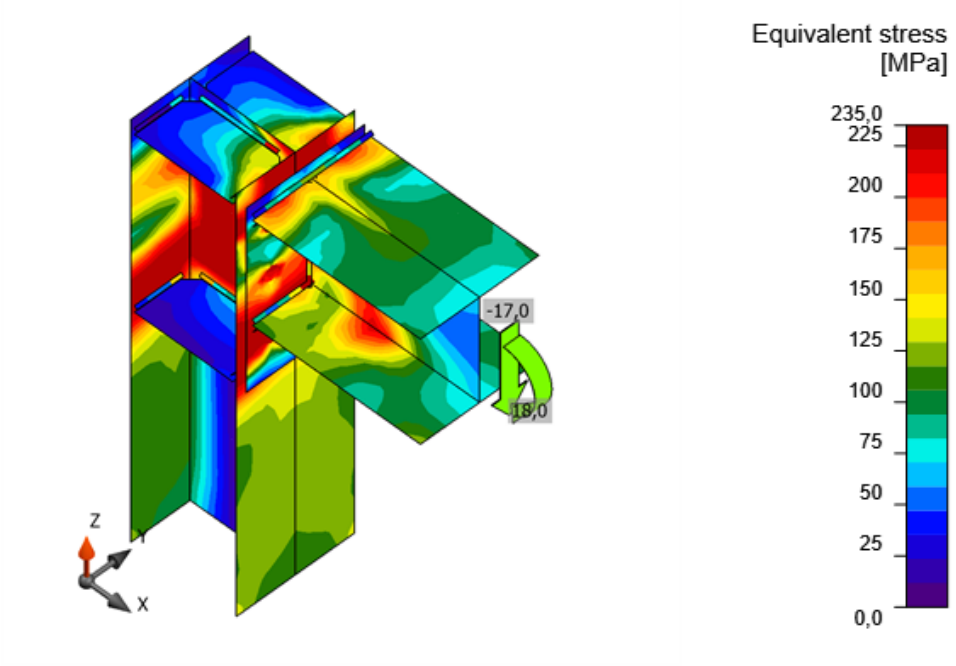
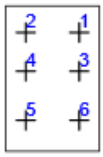


Equivalent stress, LE1

Bolts

	Name	Loads	$F_{t,Ed}$ [kN]	V [kN]	Ut_t [%]	$F_{b,Rd}$ [kN]	Ut_s [%]	Ut_{ts} [%]	Status
	B1	LE1	75,9	3,5	83,9	85,8	5,8	65,7	OK
	B2	LE1	75,8	3,5	83,9	86,4	5,8	65,7	OK
	B3	LE1	29,6	7,1	32,7	80,7	11,8	35,2	OK
	B4	LE1	29,6	7,1	32,8	80,7	11,8	35,2	OK
	B5	LE1	15,4	1,1	17,1	97,9	1,8	14,0	OK
	B6	LE1	15,3	1,1	16,9	97,9	1,8	13,8	OK

Design data

Name	$F_{t,Rd}$ [kN]	$B_{p,Rd}$ [kN]	$F_{v,Rd}$ [kN]
M16 8.8 - 1	90,4	115,4	60,3

Symbol explanation

$F_{t,Rd}$	Bolt tension resistance EN 1993-1-8 tab. 3.4
$F_{t,Ed}$	Tension force
$B_{p,Rd}$	Punching shear resistance
V	Resultant of shear forces Vy, Vz in bolt.
$F_{v,Rd}$	Bolt shear resistance EN_1993-1-8 table 3.4

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$F_{b,Rd}$	Plate bearing resistance EN 1993-1-8 tab. 3.4
Ut_t	Utilization in tension
Ut_s	Utilization in shear
Ut_{ts}	Utilization in tension and shear EN 1993-1-8 table 3.4

Welds (Plastic redistribution)

Item	Edge	Throat th. [mm]	Length [mm]	Loads	$\sigma_{w,Ed}$ [MPa]	ε_{Pl} [%]	$\sigma_{\perp}$ [MPa]	$\tau_{\parallel}$ [MPa]	$\tau_{\perp}$ [MPa]	Ut [%]	Ut_c [%]	Status
EP1	B-bfl 1	◢4,5◣	140	LE1	224,4	0,0	41,7	-77,5	-101,0	62,3	33,5	OK
		◢4,5◣	140	LE1	266,9	0,0	-214,3	57,0	72,0	82,7	34,7	OK
EP1	B-tfl 1	◢4,5◣	140	LE1	121,5	0,0	-43,2	-47,3	-45,4	33,7	21,9	OK
		◢4,5◣	140	LE1	165,4	0,0	102,0	-43,8	-61,1	46,0	37,3	OK
EP1	B-w 1	◢4,0◣	125	LE1	266,0	0,0	131,6	-28,0	130,5	73,9	49,9	OK
		◢4,0◣	125	LE1	265,7	0,0	129,6	28,9	-130,8	73,8	50,0	OK
C-bfl 1	STIFF1a	◢4,0	55	LE1	72,5	0,0	7,1	41,7	-0,3	20,1	8,3	OK
C-w 1	STIFF1a	◢4,0	92	LE1	188,7	0,0	-76,5	-95,7	27,5	52,4	25,0	OK
C-tfl 1	STIFF1a	◢4,0	55	LE1	353,0	0,1	-172,2	147,6	99,3	98,0	77,5	OK
C-bfl 1	STIFF1b	◢4,0	55	LE1	74,4	0,0	0,1	42,3	7,4	20,7	8,7	OK
C-w 1	STIFF1b	◢4,0	92	LE1	222,2	0,0	31,7	-98,3	-80,4	61,7	26,9	OK
C-tfl 1	STIFF1b	◢4,0	55	LE1	354,1	0,9	-4,5	68,5	192,6	98,4	77,2	OK
C-bfl 1	STIFF2a	◢4,0	55	LE1	148,9	0,0	-62,1	-66,7	-40,7	41,4	21,0	OK
C-w 1	STIFF2a	◢4,0	92	LE1	165,0	0,0	-43,8	87,4	-28,3	45,8	29,8	OK
C-tfl 1	STIFF2a	◢4,0	55	LE1	341,0	0,0	-128,7	-7,9	-182,1	94,7	42,0	OK
C-bfl 1	STIFF2b	◢4,0	55	LE1	163,8	0,0	-41,3	-67,1	-62,3	45,5	21,2	OK
C-w 1	STIFF2b	◢4,0	92	LE1	171,6	0,0	-28,6	87,3	-43,8	47,7	30,0	OK
C-tfl 1	STIFF2b	◢4,0	55	LE1	331,9	0,0	-201,0	-1,7	-152,5	92,2	42,9	OK
C-tfl 1	WID1	◢6,0◣	70	LE1	354,7	1,3	-113,4	157,4	-113,5	98,5	86,8	OK
		◢6,0◣	70	LE1	354,7	1,3	-113,4	-157,6	113,2	98,5	86,7	OK
B-bfl 1	WID1	◢6,0◣	90	LE1	353,4	0,4	176,3	13,5	176,3	98,2	72,3	OK
		◢6,0◣	90	LE1	353,4	0,4	176,3	-13,5	-176,3	98,2	72,3	OK

Design data

	β_w [-]	$\sigma_{w,Rd}$ [MPa]	0.9 σ [MPa]
S 235	0,80	360,0	259,2

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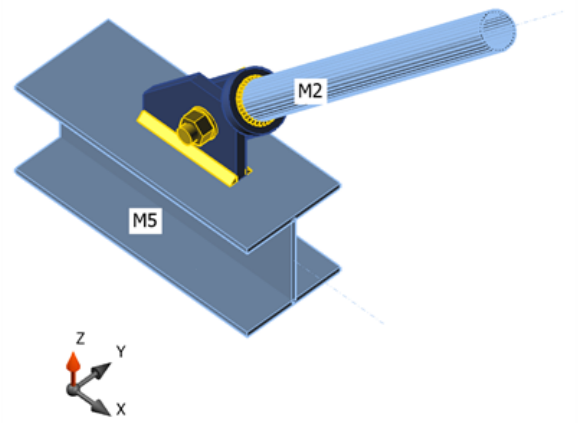
➢ *Analiza spoja prečke HEA 140 – prečke HEA 160*

Spoj se izvede z 4 x M16 (8.8.) vijaki

➢ *Analiza spoja prečka HEA 200 – diagonala CEV 60.3.x4*

Beams and columns

Name	Cross-section	β – Direction [°]	γ - Pitch [°]	α - Rotation [°]	Offset ex [mm]	Offset ey [mm]	Offset ez [mm]
M5	1 - CON1(HEA200)	0,0	0,0	0,0	0	0	0
M2	6 - RO63.5X4	0,0	-45,0	0,0	200	0	-100



Cross-sections

Name	Material
1 - CON1(HEA200)	S 235
6 - RO63.5X4	S 235

Bolts

Name	Bolt assembly	Diameter [mm]	fu [MPa]	Gross area [mm²]
M30 8.8	M30 8.8	30	800,0	707

Load effects (equilibrium not required)

Name	Member	Pos.	X [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
LE1	M2	End	0	122,0	0,0	0,0	0,0	0,0	0,0

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Check

Summary

Name	Value	Check status
Analysis	100,0%	OK
Plates	0,2 < 5%	OK
Bolts	65,9 < 100%	OK
Welds	71,2 < 100%	OK
Buckling	Not calculated	

Plates

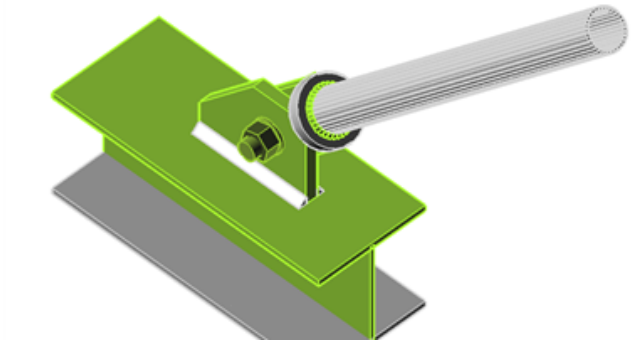
Name	Thickness [mm]	Loads	σ_{Ed} [MPa]	ε_{Pl} [1e-4]	Check status
M5-bfl 1	10,0	LE1	122,8	0,0	OK
M5-tfl 1	10,0	LE1	235,2	9,6	OK
M5-w 1	6,5	LE1	235,2	7,4	OK
M2	4,0	LE1	208,8	0,0	OK
CPL1a	20,0	LE1	235,4	21,3	OK
CPL1b	20,0	LE1	59,3	0,0	OK
CPL1c	20,0	LE1	205,2	1,5	OK

Design data

Material	fy [MPa]	ε_{lim} [1e-4]
S 235	235,0	500,0

Symbol explanation

ε_{Pl}	Strain
σ_{Ed}	Eq. stress



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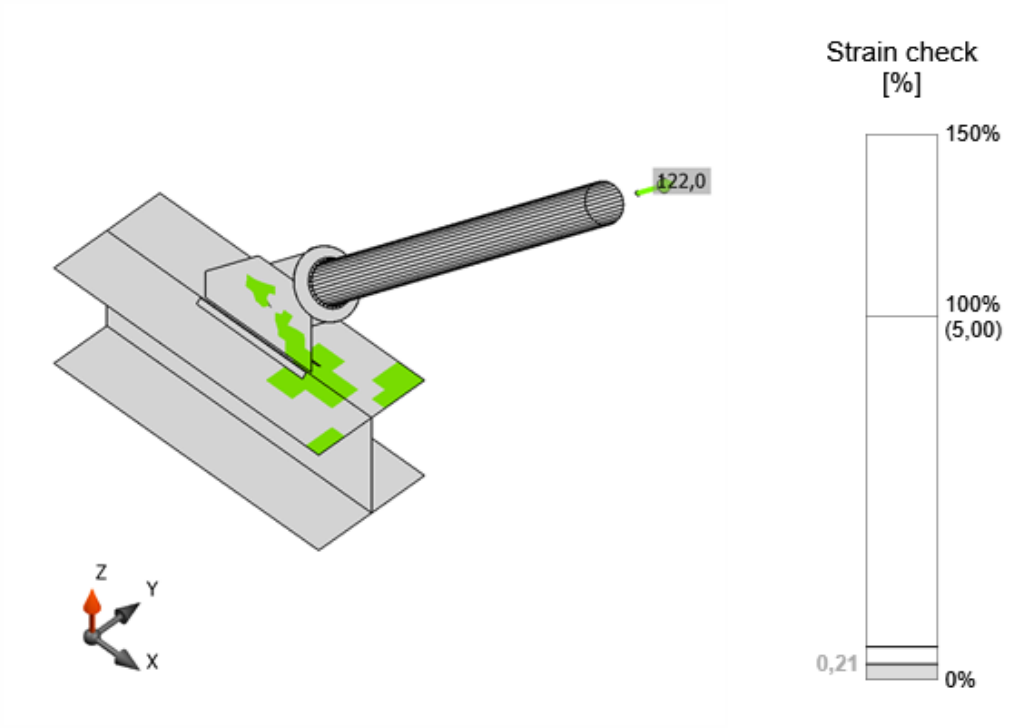
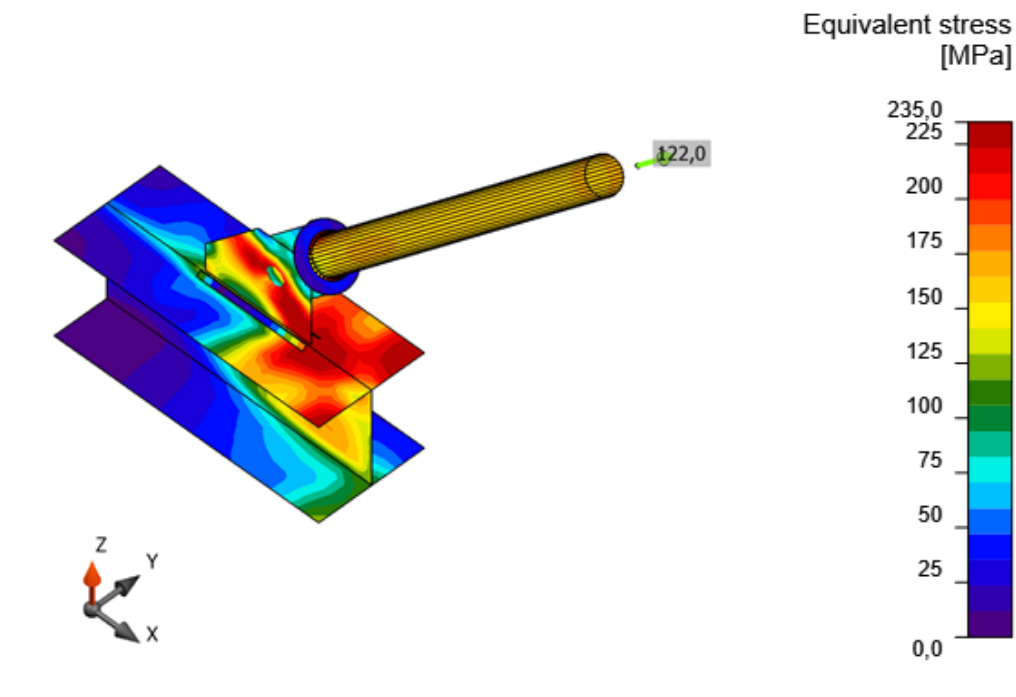
Overall check, LE1



Strain check, LE1



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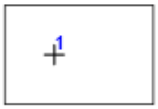
Bolts

	Name	Loads	$F_{t,Ed}$ [kN]	V [kN]	Ut_t [%]	$F_{b,Rd}$ [kN]	Ut_s [%]	Ut_{ts} [%]	Status
	B1	LE1	41,8	122,0	12,9	218,2	56,6	65,9	OK

Design data

Name	$F_{t,Rd}$ [kN]	$B_{p,Rd}$ [kN]	$F_{v,Rd}$ [kN]
M30 8.8 - 1	323,1	526,6	215,4

Symbol explanation

$F_{t,Rd}$	Bolt tension resistance EN 1993-1-8 tab. 3.4
$F_{t,Ed}$	Tension force
$B_{p,Rd}$	Punching shear resistance
V	Resultant of shear forces Vy, Vz in bolt.
$F_{v,Rd}$	Bolt shear resistance EN_1993-1-8 table 3.4
$F_{b,Rd}$	Plate bearing resistance EN 1993-1-8 tab. 3.4
Ut_t	Utilization in tension
Ut_s	Utilization in shear
Ut_{ts}	Utilization in tension and shear EN 1993-1-8 table 3.4

Welds (Plastic redistribution)

Item	Edge	Throat th. [mm]	Length [mm]	Loads	$\sigma_{w,Ed}$ [MPa]	ε_{Pl} [%]	$\sigma_{\perp}$ [MPa]	$\tau_{\parallel}$ [MPa]	$\tau_{\perp}$ [MPa]	Ut [%]	Ut_c [%]	Status
M5-tfl 1	CPL1a	◢10,0◣	200	LE1	181,7	0,0	86,1	-60,6	69,8	50,5	25,9	OK
		◢10,0◣	200	LE1	181,0	0,0	-137,3	65,1	19,9	53,0	16,6	OK
CPL1b	CPL1c	◢8,0	100	LE1	245,7	0,0	126,2	-3,8	121,7	68,3	60,9	OK
CPL1b	M2	◢4,5	187	LE1	256,2	0,0	131,1	-19,9	-125,5	71,2	56,1	OK

Design data

	β_w [-]	$\sigma_{w,Rd}$ [MPa]	0.9 σ [MPa]
S 235	0,80	360,0	259,2

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➢ *Analiza spoja HEA 200 profila v AB steno*

Comment

Spoj HEA 200 na AB steno

Design Specifications

Anchor

Anchor system	fischer Injection system FIS VL
Injection resin	FIS VL 410 C
Fixing element	Threaded rod FIS A M 16 x 130 8.8, zinc plated steel, Property Class 8.8
Calculated anchorage depth	80 mm
Design Data	Anchor design in Concrete according European Technical Assessment ETA-10/0352, Option 1, Issued 13/05/2020

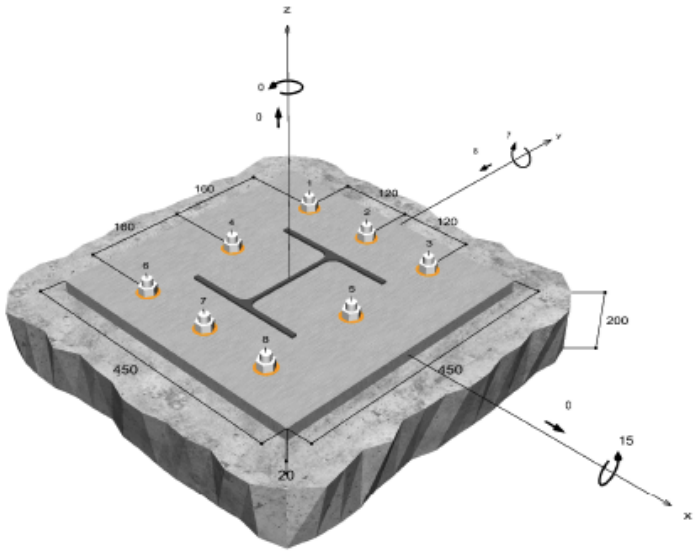


Geometry / Loads / Scale units

mm, kN, kNm

Value of design actions (including partial safety factor for the load)





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Input data

Design method	EN1992-4:2018 bonded fastener
Base material	C25/30, EN 206
Concrete condition	Non-cracked, dry hole
Temperature range	24 °C long term temperature, 40 °C short term temperature
Reinforcement	Normal or no reinforcement. No edge reinforcement
Drilling method	Hammer drilling
Installation type	Push-through installation
Annular gap	Annular gap filled
Type of loading	Permanent-Transient/Static
Base plate location	Base plate flush installed on base material
Base plate geometry	450 mm x 450 mm x 20 mm
Profile type	HEAA 200

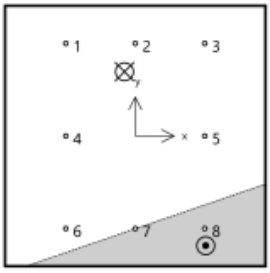
Design actions *)

#	N_{Ed} kN	$V_{Ed,x}$ kN	$V_{Ed,y}$ kN	$M_{Ed,x}$ kNm	$M_{Ed,y}$ kNm	$M_{T,Ed}$ kNm	Type of loading
1	0.00	0.00	-8.00	15.00	7.00	0.00	Permanent-Transient/Static

*) The required partial safety factors for actions are included

Resulting anchor forces

Anchor no.	Tensile action kN	Shear Action kN	Shear Action x kN	Shear Action y kN
1	13.63	1.00	0.00	-1.00
2	12.08	1.00	0.00	-1.00
3	10.52	1.00	0.00	-1.00
4	7.60	1.00	0.00	-1.00
5	4.49	1.00	0.00	-1.00
6	1.56	1.00	0.00	-1.00
7	0.01	1.00	0.00	-1.00
8	0.00	1.00	0.00	-1.00



max. concrete compressive strain : 0.16 ‰
max. concrete compressive stress : 5.1 N/mm²
Resulting tensile actions : 49.89 kN , X/Y position (-19 / 111)
Resulting compression actions : 49.89 kN , X/Y position (122 / -190)

Resistance to tension loads

Proof	Action kN	Capacity kN	Utilisation β_N %
Steel failure *	13.63	84.00	16.2
Combined pull-out and concrete cone failure	49.89	57.82	86.3
Concrete cone failure	49.89	53.90	**92.6**

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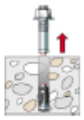
Steel failure

$$N_{Ed} \leq \frac{N_{Rk,s}}{\gamma_{Ms}} \quad (N_{Rd,s})$$

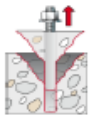


$N_{Rk,s}$ kN	γ_{Ms}	$N_{Rd,s}$ kN	N_{Ed} kN	$\beta_{N,s}$ %
126.00	1.50	84.00	13.63	16.2

Anchor no.	$\beta_{N,s}$ %	Group N°	Decisive Beta
1	16.2	1	$\beta_{N,s;1}$
2	14.4	2	$\beta_{N,s;2}$
3	12.5	3	$\beta_{N,s;3}$
4	9.0	4	$\beta_{N,s;4}$
5	5.3	5	$\beta_{N,s;5}$
6	1.9	6	$\beta_{N,s;6}$
7	0.0	7	$\beta_{N,s;7}$
8	0.0	8	$\beta_{N,s;8}$

Combined pull-out and concrete cone failure

$$N_{Ed} \leq \frac{N_{Rk,p}}{\gamma_{Mp}} \quad (N_{Rd,p})$$



$$N_{Rk,p} = N^0_{Rk,p} \cdot \frac{A_{p,N}}{A^0_{p,N}} \cdot \Psi_{s,Np} \cdot \Psi_{g,Np} \cdot \Psi_{ec,Np} \cdot \Psi_{re,Np} \quad \text{Eq. (7.13)}$$

$$N_{Rk,p} = 42.22kN \cdot \frac{249{,}597mm^2}{57{,}600mm^2} \cdot 1.000 \cdot 1.000 \cdot 0.569 \cdot 1.000 = 104.08kN$$

$$N^0_{Rk,p} = \Psi_{sus} \cdot \pi \cdot d \cdot h_{ef} \cdot \tau_{Rk} = 1.00 \cdot \pi \cdot 16mm \cdot 80mm \cdot 10.5N/mm^2 = 42.22kN \quad \text{Eq. (7.14)}$$

$$\Psi_{sus} = 1.00 \quad \text{Eq. (7.14a)}$$

$$\alpha_{sus} = 0.00 \leq \Psi^0_{sus} = 0.60$$

$$s_{cr,Np} = min\left(7.3 \cdot d \cdot \left(\Psi_{sus} \cdot \tau_{Rk,ucr}\right)^{0.5};\ 3 \cdot h_{ef}\right) \quad \text{Eq. (7.15)}$$

$$s_{cr,Np} = min\left(7.3 \cdot 16mm \cdot \left(1.00 \cdot 10.0N/mm^2\right)^{0.5};\ 3 \cdot 80mm\right) = 240mm$$

$$c_{cr,Np} = \frac{s_{cr,Np}}{2} = \frac{240mm}{2} = 120mm \quad \text{Eq. (7.16)}$$

$$\Psi_{s,Np} = min\left(1;\ 0.7 + 0.3 \cdot \frac{c}{c_{cr,Np}}\right) = min\left(1;\ 0.7 + 0.3 \cdot \frac{\infty}{120mm}\right) = 1.000 \leq 1 \quad \text{Eq. (7.20)}$$

$$\Psi_{g,Np} = max\left(1;\ \Psi^0_{g,Np} - \sqrt{\frac{s}{s_{cr,Np}}} \cdot \left(\Psi^0_{g,Np} - 1\right)\right) = 1.000 - \sqrt{\frac{140mm}{240mm}} \cdot \left(1.000 - 1\right) = 1.000 \geq 1 \quad \text{Eq. (7.17)}$$

$$\Psi^0_{g,Np} = max\left(1;\ \sqrt{n} - \left(\sqrt{n} - 1\right) \cdot \left(\frac{\tau_{Rk}}{\tau_{Rk,c}}\right)^{1.5}\right) \quad \text{Eq. (7.18)}$$

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$$\Psi^0_{g,Np} = max\left(1;\ \sqrt{7} - \left(\sqrt{7} - 1\right) \cdot \left(\frac{10.5N/mm^2}{9.8N/mm^2}\right)^{1.5}\right) = 1.000 \geq 1$$

$$\tau_{Rk,c} = \frac{k_3}{\pi \cdot d}\sqrt{h_{ef} \cdot f_{ck}} = \frac{11}{3.14 \cdot 16mm}\sqrt{80mm \cdot 25.0N/mm^2} = 9.8N/mm^2 \qquad \text{Eq. (7.19)}$$

$$\Psi_{ec,Np} = \frac{1}{1 + \frac{2e_n}{s_{cr,Np}}} = \Psi_{ec,Npx} \cdot \Psi_{ec,Npy} = 0.987 \cdot 0.576 = 0.569 \leq 1 \qquad \text{Eq. (7.21)}$$

$$\Psi_{ec,Npx} = \frac{1}{1 + \frac{2 \cdot 2mm}{240mm}} = 0.987 \leq 1 \qquad \Psi_{ec,Npy} = \frac{1}{1 + \frac{2 \cdot 88mm}{240mm}} = 0.576 \leq 1$$

$$\Psi_{re,Np} = 1.000 \qquad \text{Eq. (7.5)}$$

$N_{Rk,p}$ kN	γ_{Mp}	$N_{Rd,p}$ kN	N_{Ed} kN	$\beta_{N,p}$ %
104.08	1.80	57.82	49.89	86.3

Anchor no.	$\beta_{N,p}$ %	Group N°	Decisive Beta
1, 2, 3, 4, 5, 6, 7	86.3	1	$\beta_{N,p;1}$

Concrete cone failure



$$N_{Ed} \leq \frac{N_{Rk,c}}{\gamma_{Mc}} \quad (N_{Rd,c})$$

$$N_{Rk,c} = N^0_{Rk,c} \cdot \frac{A_{c,N}}{A^0_{c,N}} \cdot \Psi_{s,N} \cdot \Psi_{re,N} \cdot \Psi_{ec,N} \cdot \Psi_{M,N} \qquad \text{Eq. (7.1)}$$

$$N_{Rk,c} = 39.35kN \cdot \frac{249,597mm^2}{57,600mm^2} \cdot 1.000 \cdot 1.000 \cdot 0.569 \cdot 1.000 = 97.01kN$$

$$N^0_{Rk,c} = k_1 \cdot \sqrt{f_{ck}} \cdot h_{ef}^{1.5} = 11.0 \cdot \sqrt{25.0N/mm^2} \cdot \left(80mm\right)^{1.5} = 39.35kN \qquad \text{Eq. (7.2)}$$

$$\Psi_{s,N} = min\left(1;\ 0.7 + 0.3 \cdot \frac{c}{c_{cr,N}}\right) = min\left(1;\ 0.7 + 0.3 \cdot \frac{\infty}{120mm}\right) = 1.000 \leq 1 \qquad \text{Eq. (7.4)}$$

$$\Psi_{re,N} = 1.000 \qquad \text{Eq. (7.5)}$$

$$\Psi_{ec,N} = \frac{1}{1 + \frac{2e_n}{s_{cr,N}}} \Rightarrow \Psi_{ec,Nx} \cdot \Psi_{ec,Ny} = 0.987 \cdot 0.576 = 0.569 \leq 1 \qquad \text{Eq. (7.6)}$$

$$\Psi_{ec,Nx} = \frac{1}{1 + \frac{2 \cdot 2mm}{240mm}} = 0.987 \leq 1 \qquad \Psi_{ec,Ny} = \frac{1}{1 + \frac{2 \cdot 88mm}{240mm}} = 0.576 \leq 1$$

$$\Psi_{M,N} = 1.00 \geq 1 \qquad \text{Eq. (7.7)}$$

$N_{Rk,c}$ kN	γ_{Mc}	$N_{Rd,c}$ kN	N_{Ed} kN	$\beta_{N,c}$ %
97.01	1.80	53.90	49.89	92.6

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Anchor no.	$\beta_{N,c}$ %	Group N°	Decisive Beta
1, 2, 3, 4, 5, 6, 7	92.6	1	$\beta_{N,c;1}$

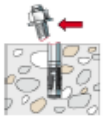
Resistance to shear loads

Proof	Action kN	Capacity kN	Utilisation β_V %
Steel failure without lever arm *	1.00	50.40	2.0
Concrete pry-out failure	8.00	204.06	3.9

* Most unfavourable anchor

Steel failure without lever arm

$$V_{Ed} \leq \frac{V_{Rk,s}}{\gamma_{Ms}} \quad (V_{Rd,s})$$



$$V_{Rk,s} = k_7 \cdot V^0_{Rk,s} = 1.00 \cdot 63.00kN = 63.00kN$$

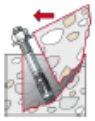
Eq. (7.35)/(7.36)

$V_{Rk,s}$ kN	γ_{Ms}	$V_{Rd,s}$ kN	V_{Ed} kN	β_{Vs} %
63.00	1.25	50.40	1.00	2.0

Anchor no.	β_{Vs} %	Group N°	Decisive Beta
1	2.0	1	$\beta_{Vs;1}$
2	2.0	2	$\beta_{Vs;2}$
3	2.0	3	$\beta_{Vs;3}$
4	2.0	4	$\beta_{Vs;4}$
5	2.0	5	$\beta_{Vs;5}$
6	2.0	6	$\beta_{Vs;6}$
7	2.0	7	$\beta_{Vs;7}$
8	2.0	8	$\beta_{Vs;8}$

Concrete pry-out failure

$$V_{Ed} \leq \frac{V_{Rk,cp}}{\gamma_{Mc}} \quad (V_{Rd,cp})$$



$$V_{Rk,cp} = k_8 \cdot N_{Rk,c} = 2 \cdot 183.65kN = 367.31kN$$

Eq. (7.39c)

$$N_{Rk,c} = N^0_{Rk,c} \cdot \frac{A_{c,N}}{A^0_{c,N}} \cdot \Psi_{s,N} \cdot \Psi_{re,N} \cdot \Psi_{ec,N} \cdot \Psi_{M,N}$$

Eq. (7.1)

$$N_{Rk,c} = 39.35kN \cdot \frac{268,797mm^2}{57,600mm^2} \cdot 1.000 \cdot 1.000 \cdot 1.000 \cdot 1.000 = 183.65kN$$

$$N^0_{Rk,c} = k_1 \cdot \sqrt{f_{ck}} \cdot h_{ef}^{1.5} = 11 \cdot \sqrt{25.0N/mm^2} \cdot \left(80mm\right)^{1.5} = 39.35kN \quad \text{Eq. (7.2)}$$

$$\Psi_{s,N} = min\left(1;\ 0.7 + 0.3 \cdot \frac{c}{c_{cr,N}}\right) = min\left(1;\ 0.7 + 0.3 \cdot \frac{\infty}{120mm}\right) = 1.000 \leq 1 \quad \text{Eq. (7.4)}$$

$$\Psi_{re,N} = 1.000 \quad \text{Eq. (7.5)}$$

$$\Psi_{ec,N} = \frac{1}{1 + \frac{2e_n}{s_{cr,N}}} \Rightarrow \Psi_{ec,Nx} \cdot \Psi_{ec,Ny} = 1.000 \cdot 1.000 = 1.000 \leq 1 \quad \text{Eq. (7.6)}$$

$$\Psi_{M,N} = 1.00 \geq 1 \quad \text{Eq. (7.7)}$$

$V_{Rk,cp}$ kN	γ_{Mcp}	$V_{Rd,cp}$ kN	V_{Ed} kN	$\beta_{V,cp}$ %
367.31	1.80	204.06	8.00	3.9

Anchor no.	$\beta_{V,cp}$ %	Group N°	Decisive Beta
1, 2, 3, 4, 5, 6, 7, 8	3.9	1	$\beta_{V,cp;1}$

Utilization of tension and shear loads

Tension loads	Utilisation βN %
Steel failure *	16.2
Combined pull-out and concrete cone failure	86.3
Concrete cone failure	**92.6**

Shear Loads	Utilisation βV %
Steel failure without lever arm *	2.0
Concrete pry-out failure	**3.9**

* Most unfavourable anchor

Resistance to combined tensile and shear loads

Utilisation steel

$$\beta_{N,s} = \beta_{N,s;1} = 0.16 \leq 1$$
$$\beta_{V,s} = \beta_{Vs;1} = 0.02 \leq 1$$
$$\beta_N^2 + \beta_V^2 = \beta_{N,s;1}^2 + \beta_{Vs;1}^2 = 0.03 \leq 1 \quad \text{Eq. (7.55)}$$

Utilisation concrete

$$\beta_{N,c} = \beta_{N,c;1} = 0.93 \leq 1$$
$$\beta_{V,cp} = \beta_{V,cp;1} = 0.04 \leq 1$$
$$\frac{\beta_N + \beta_V}{1.2} = \frac{\beta_{N,c;1} + \beta_{V,cp;1}}{1.2} = 0.80 \leq 1 \quad \text{Eq. (7.57)}$$

Proof successful

Information concerning the anchor plate

Base plate details

Plate thickness specified by user without proof — t = 20 mm

Profile type — HEAA 200

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Installation data

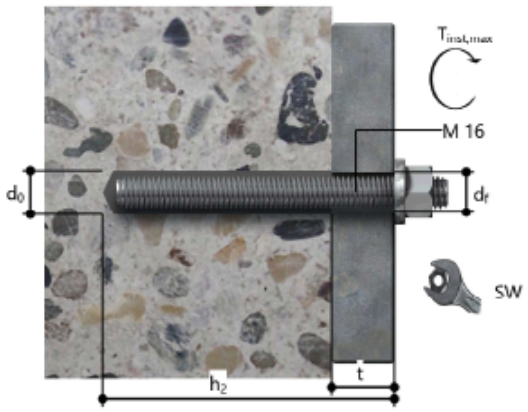
Anchor

Anchor system	**fischer Injection system FIS VL**	
Injection resin	FIS VL 410 C (other cartridge sizes available)	Art.-No. 539463
Fixing element	Threaded rod FIS A M 16 x 130 8.8, zinc plated steel, Property Class 8.8	Art.-No. 519400
Accessories	FIS MR Plus	Art.-No. 545853
	Dispenser FIS AC	Art.-No. 96497
	Compressed-air cleaning tool	Art.-No. 93286
	compressed air (oil-free), min. 6 bar	By job site.
	Cleaning brush BS 16/18	Art.-No. 78181
	SDS Plus-V II 18/150/200	Art.-No. 531836
Alternative cartdriges	FIS VL 300 T	Art.-No. 539461
	The shown cartdriges are alternative to the highlighted one above with the same approval number.	



Installation details

Thread diameter	M 16
Drill hole diameter	d_0 = 18 mm
Drill hole depth	h_2 = 100 mm
Calculated anchorage depth	h_{ef} = 80 mm
Drilling method	Hammer drilling
Drill hole cleaning	4 times blowing, 4 times brushing, 4 times blowing required activities according the given instruction in the approval
Installation type	Push-through installation
Annular gap	Annular gap filled
Maximum torque	$T_{inst,max}$ = 60.0 Nm
Socket size	24 mm
Base plate thickness	t = 20 mm
Total fixing thickness Tfix,max	t_{fix} = 20 mm
Volume of resin per drill hole	12 ml/6 scale divisions



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Base plate details

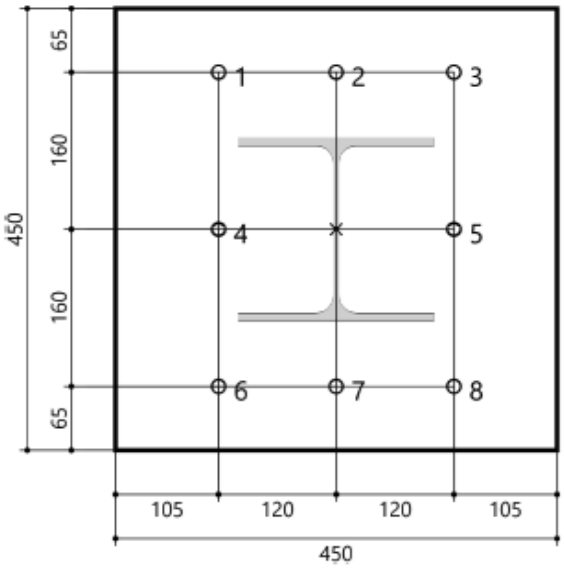
Base plate material	Not available
Base plate thickness	t = 20 mm
Clearance hole in base plate	d_f=20 mm

Attachment

Profile type	HEAA 200

Anchor coordinates

Anchor no.	x mm	y mm
1	-119.997	160
2	0	160
3	119.997	160
4	-119.997	0
5	119.997	0
6	-119.997	-160
7	0	-160
8	119.997	-160



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➢ *Analiza spoja diagonale cevi na ab konstrukcijo*

Comment

Spoj diagonale na steno

Design Specifications

Anchor

Anchor system	fischer Injection system FIS VL
Injection resin	FIS VL 410 C
Fixing element	Threaded rod FIS A M 16 x 250 8.8, zinc plated steel, Property Class 8.8
Calculated anchorage depth	162 mm
Design Data	Anchor design in Concrete according European Technical Assessment ETA-10/0352, Option 1, Issued 13/05/2020



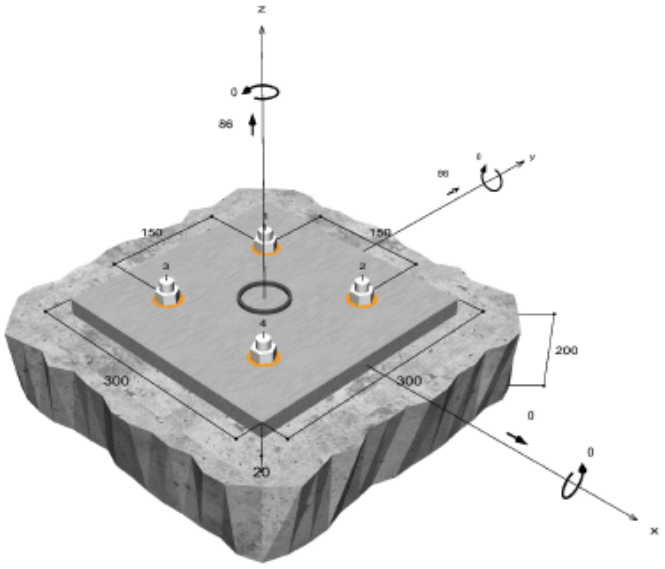
Geometry / Loads / Scale units

mm, kN, kNm

Value of design actions (including

partial safety factor for the load)





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Input data

Design method	EN1992-4:2018 bonded fastener
Base material	C25/30, EN 206
Concrete condition	Non-cracked, dry hole
Temperature range	24 °C long term temperature, 40 °C short term temperature
Reinforcement	Normal or no reinforcement. No edge reinforcement
Drilling method	Hammer drilling
Installation type	Push-through installation
Annular gap	Annular gap filled
Type of loading	Permanent-Transient/Static
Base plate location	Base plate flush installed on base material
Base plate geometry	300 mm x 300 mm x 20 mm
Profile type	Round tube (60,3 x 4)

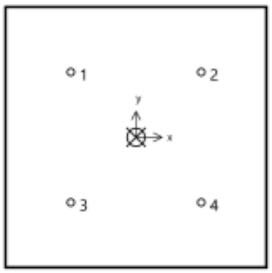
Design actions *)

#	N_{Ed} kN	$V_{Ed,x}$ kN	$V_{Ed,y}$ kN	$M_{Ed,x}$ kNm	$M_{Ed,y}$ kNm	$M_{T,Ed}$ kNm	Type of loading
1	86.00	0.00	86.00	0.00	0.00	0.00	Permanent-Transient/Static

*) The required partial safety factors for actions are included

Resulting anchor forces

Anchor no.	Tensile action kN	Shear Action kN	Shear Action x kN	Shear Action y kN
1	21.50	21.50	0.00	21.50
2	21.50	21.50	0.00	21.50
3	21.50	21.50	0.00	21.50
4	21.50	21.50	0.00	21.50



max. concrete compressive strain :	0.00 ‰
max. concrete compressive stress :	0.0 N/mm²
Resulting tensile actions :	86.00 kN , X/Y position (0 / 0)
Resulting compression actions :	0.00 kN , X/Y position (0 / 0)

Resistance to tension loads

Proof	Action kN	Capacity kN	Utilisation β_N %
Steel failure *	21.50	84.00	25.6
Combined pull-out and concrete cone failure	86.00	105.73	**81.3**
Concrete cone failure	86.00	107.90	79.7

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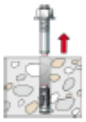
Steel failure

$$N_{Ed} \leq \frac{N_{Rk,s}}{\gamma_{Ms}} \quad (\mathbf{N_{Rd,s}})$$

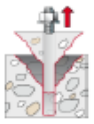


$N_{Rk,s}$ kN	γ_{Ms}	$N_{Rd,s}$ kN	N_{Ed} kN	$\beta_{N,s}$ %
126.00	1.50	84.00	21.50	25.6

Anchor no.	$\beta_{N,s}$ %	Group N°	Decisive Beta
1	25.6	1	$\beta_{N,s;1}$
2	25.6	2	$\beta_{N,s;2}$
3	25.6	3	$\beta_{N,s;3}$
4	25.6	4	$\beta_{N,s;4}$

Combined pull-out and concrete cone failure

$$N_{Ed} \leq \frac{N_{Rk,p}}{\gamma_{Mp}} \quad (\mathbf{N_{Rd,p}})$$



$$N_{Rk,p} = N^0_{Rk,p} \cdot \frac{A_{p,N}}{A^0_{p,N}} \cdot \Psi_{s,Np} \cdot \Psi_{g,Np} \cdot \Psi_{ec,Np} \cdot \Psi_{re,Np} \qquad \text{Eq. (7.13)}$$

$$N_{Rk,p} = 85.50kN \cdot \frac{269{,}361mm^2}{136{,}161mm^2} \cdot 1.000 \cdot 1.125 \cdot 1.000 \cdot 1.000 = 190.31kN$$

$$N^0_{Rk,p} = \Psi_{sus} \cdot \pi \cdot d \cdot h_{ef} \cdot \tau_{Rk} = 1.00 \cdot \pi \cdot 16mm \cdot 162mm \cdot 10.5N/mm^2 = 85.50kN \qquad \text{Eq. (7.14)}$$

$$\Psi_{sus} = 1.00 \qquad \text{Eq. (7.14a)}$$

$$\alpha_{sus} = 0.00 \leq \Psi^0_{sus} = 0.60$$

$$s_{cr,Np} = min\left(7.3 \cdot d \cdot \left(\Psi_{sus} \cdot \tau_{Rk,ucr}\right)^{0.5};\ 3 \cdot h_{ef}\right) \qquad \text{Eq. (7.15)}$$

$$s_{cr,Np} = min\left(7.3 \cdot 16mm \cdot \left(1.00 \cdot 10.0N/mm^2\right)^{0.5};\ 3 \cdot 162mm\right) = 369mm$$

$$c_{cr,Np} = \frac{S_{cr,Np}}{2} = \frac{369mm}{2} = 185mm \qquad \text{Eq. (7.16)}$$

$$\Psi_{s,Np} = min\left(1;\ 0.7 + 0.3 \cdot \frac{c}{c_{cr,Np}}\right) = min\left(1;\ 0.7 + 0.3 \cdot \frac{\infty}{185mm}\right) = 1.000 \leq 1 \qquad \text{Eq. (7.20)}$$

$$\Psi_{g,Np} = \Psi^0_{g,Np} - \sqrt{\frac{s}{s_{cr,Np}}} \cdot \left(\Psi^0_{g,Np} - 1\right) = 1.345 - \sqrt{\frac{150mm}{369mm}} \cdot \left(1.345 - 1\right) = 1.125 \geq 1 \qquad \text{Eq. (7.17)}$$

$$\Psi^0_{g,Np} = \sqrt{n} - \left(\sqrt{n} - 1\right) \cdot \left(\frac{\tau_{Rk}}{\tau_{Rk,c}}\right)^{1.5} \qquad \text{Eq. (7.18)}$$

$$\Psi^0_{g,Np} = \sqrt{4} - \left(\sqrt{4} - 1\right) \cdot \left(\frac{10.5N/mm^2}{13.9N/mm^2}\right)^{1.5} = 1.345 \geq 1$$

$$\tau_{Rk,c} = \frac{k_3}{\pi \cdot d}\sqrt{h_{ef} \cdot f_{ck}} = \frac{11}{3.14 \cdot 16mm}\sqrt{162mm \cdot 25.0N/mm^2} = 13.9N/mm^2 \qquad \text{Eq. (7.19)}$$

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$$\Psi_{ec,Np} = \frac{1}{1+\frac{2e_n}{s_{cr,Np}}} = \Psi_{ec,Npx} \cdot \Psi_{ec,Npy} = 1.000 \cdot 1.000 = 1.000 \leq 1$$ Eq. (7.21)

$$\Psi_{ec,Npx} = \frac{1}{1+\frac{2 \cdot 0mm}{369mm}} = 1.000 \leq 1 \qquad \Psi_{ec,Npy} = \frac{1}{1+\frac{2 \cdot 0mm}{369mm}} = 1.000 \leq 1$$

$$\Psi_{re,Np} = 1.000$$ Eq. (7.5)

$N_{Rk,p}$ kN	γ_{Mp}	$N_{Rd,p}$ kN	N_{Ed} kN	$\beta_{N,p}$ %
190.31	1.80	105.73	86.00	81.3

Anchor no.	$\beta_{N,p}$ %	Group N°	Decisive Beta
1, 2, 3, 4	81.3	1	$\beta_{N,p;1}$

Concrete cone failure



$$N_{Ed} \leq \frac{N_{Rk,c}}{\gamma_{Mc}} \quad (N_{Rd,c})$$

$$N_{Rk,c} = N^0_{Rk,c} \cdot \frac{A_{c,N}}{A^0_{c,N}} \cdot \Psi_{s,N} \cdot \Psi_{re,N} \cdot \Psi_{ec,N} \cdot \Psi_{M,N}$$ Eq. (7.1)

$$N_{Rk,c} = 113.41kN \cdot \frac{404,496mm^2}{236,196mm^2} \cdot 1.000 \cdot 1.000 \cdot 1.000 \cdot 1.000 = 194.21kN$$

$$N^0_{Rk,c} = k_1 \cdot \sqrt{f_{ck}} \cdot h_{ef}^{1.5} = 11.0 \cdot \sqrt{25.0N/mm^2} \cdot \left(162mm\right)^{1.5} = 113.41kN$$ Eq. (7.2)

$$\Psi_{s,N} = min\left(1;\ 0.7+0.3 \cdot \frac{c}{c_{cr,N}}\right) = min\left(1;\ 0.7+0.3 \cdot \frac{\infty}{243mm}\right) = 1.000 \leq 1$$ Eq. (7.4)

$$\Psi_{re,N} = 1.000$$ Eq. (7.5)

$$\Psi_{ec,N} = \frac{1}{1+\frac{2e_n}{s_{cr,N}}} \Rightarrow \Psi_{ec,Nx} \cdot \Psi_{ec,Ny} = 1.000 \cdot 1.000 = 1.000 \leq 1$$ Eq. (7.6)

$$\Psi_{ec,Nx} = \frac{1}{1+\frac{2 \cdot 0mm}{486mm}} = 1.000 \leq 1 \qquad \Psi_{ec,Ny} = \frac{1}{1+\frac{2 \cdot 0mm}{486mm}} = 1.000 \leq 1$$

$$\Psi_{M,N} = 1.00 \geq 1$$ Eq. (7.7)

$N_{Rk,c}$ kN	γ_{Mc}	$N_{Rd,c}$ kN	N_{Ed} kN	$\beta_{N,c}$ %
194.21	1.80	107.90	86.00	79.7

Anchor no.	$\beta_{N,c}$ %	Group N°	Decisive Beta
1, 2, 3, 4	79.7	1	$\beta_{N,c;1}$

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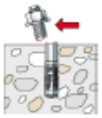
Resistance to shear loads

Proof	Action kN	Capacity kN	Utilisation β_V %
Steel failure without lever arm *	21.50	50.40	**42.7**
Concrete pry-out failure	86.00	211.46	40.7

* Most unfavourable anchor

Steel failure without lever arm

$$V_{Ed} \leq \frac{V_{Rk,s}}{\gamma_{Ms}} \qquad (V_{Rd,s})$$



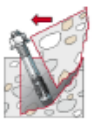
$$V_{Rk,s} = k_7 \cdot V^0_{Rk,s} = 1.00 \cdot 63.00kN = 63.00kN$$ Eq. (7.35)/(7.36)

$V_{Rk,s}$ kN	γ_{Ms}	$V_{Rd,s}$ kN	V_{Ed} kN	β_{Vs} %
63.00	1.25	50.40	21.50	42.7

Anchor no.	β_{Vs} %	Group N°	Decisive Beta
1	42.7	1	$\beta_{Vs;1}$
2	42.7	2	$\beta_{Vs;2}$
3	42.7	3	$\beta_{Vs;3}$
4	42.7	4	$\beta_{Vs;4}$

Concrete pry-out failure

$$V_{Ed} \leq \frac{V_{Rk,cp}}{\gamma_{Mc}} \qquad (V_{Rd,cp})$$



$$V_{Rk,cp} = k_8 \cdot N_{Rk,p} = 2 \cdot 190.31kN = 380.63kN$$ Eq. (7.39c)

$$N_{Rk,p} = N^0_{Rk,p} \cdot \frac{A_{p,N}}{A^0_{p,N}} \cdot \Psi_{s,Np} \cdot \Psi_{g,Np} \cdot \Psi_{ec,Np} \cdot \Psi_{re,Np}$$ Eq. (7.13)

$$N_{Rk,p} = 85.50kN \cdot \frac{269,361mm^2}{136,161mm^2} \cdot 1.000 \cdot 1.125 \cdot 1.000 \cdot 1.000 = 190.31kN$$

$$N^0_{Rk,p} = \Psi_{sus} \cdot \pi \cdot d \cdot h_{ef} \cdot \tau_{Rk} = 1.00 \cdot \pi \cdot 16mm \cdot 162mm \cdot 10.5N/mm^2 = 85.50kN$$ Eq. (7.14)

$$\Psi_{sus} = 1.00$$ Eq. (7.14a)

$$\alpha_{sus} = 0.00 \leq \Psi^0_{sus} = 0.60$$

$$s_{cr,Np} = min\left(7.3 \cdot d \cdot \left(\Psi_{sus} \cdot \tau_{Rk,ucr}\right)^{0.5};\ 3 \cdot h_{ef}\right)$$ Eq. (7.15)

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$$s_{cr,Np} = min\left(7.3 \cdot 16mm \cdot \left(1.00 \cdot 10.0N/mm^2\right)^{0.5};\ 3 \cdot 162mm\right) = 369mm$$

$$c_{cr,Np} = \frac{S_{cr,Np}}{2} = \frac{369mm}{2} = 185mm \qquad \text{Eq. (7.16)}$$

$$\Psi_{s,Np} = min\left(1;\ 0.7 + 0.3 \cdot \frac{c}{c_{cr,Np}}\right) = min\left(1;\ 0.7 + 0.3 \cdot \frac{\infty}{185mm}\right) = 1.000 \le 1 \qquad \text{Eq. (7.20)}$$

$$\Psi_{g,Np} = \Psi^0_{g,Np} - \sqrt{\frac{s}{s_{cr,Np}}} \cdot \left(\Psi^0_{g,Np} - 1\right) \qquad \text{Eq. (7.17)}$$

$$\Psi_{g,Np} = 1.345 - \sqrt{\frac{150mm}{369mm}} \cdot \left(1.345 - 1\right) = 1.125 \ge 1$$

$$\Psi^0_{g,Np} = \sqrt{n} - \left(\sqrt{n} - 1\right) \cdot \left(\frac{\tau_{Rk}}{\tau_{Rk,c}}\right)^{1.5} \qquad \text{Eq. (7.18)}$$

$$\Psi^0_{g,Np} = \sqrt{4} - \left(\sqrt{4} - 1\right) \cdot \left(\frac{10.5N/mm^2}{13.9N/mm^2}\right)^{1.5} = 1.345 \ge 1$$

$$\tau_{Rk,c} = \frac{k_3}{\pi \cdot d}\sqrt{h_{ef} \cdot f_{ck}} = \frac{11}{3.14 \cdot 16mm}\sqrt{162mm \cdot 25.0N/mm^2} = 13.9N/mm^2 \qquad \text{Eq. (7.19)}$$

$$\Psi_{ec,Np} = \frac{1}{1 + \frac{2e_n}{s_{cr,Np}}} = \Psi_{ec,Npx} \cdot \Psi_{ec,Npy} = 1.000 \cdot 1.000 = 1.000 \le 1 \qquad \text{Eq. (7.21)}$$

$$\Psi_{re,Np} = 1.000 \qquad \text{Eq. (7.5)}$$

$V_{Rk,cp}$ kN	γ_{Mcp}	$V_{Rd,cp}$ kN	V_{Ed} kN	$\beta_{V,cp}$ %
380.63	1.80	211.46	86.00	40.7

Anchor no.	$\beta_{V,cp}$ %	Group N°	Decisive Beta
1, 2, 3, 4	40.7	1	$\beta_{V,cp;1}$

Utilization of tension and shear loads

Tension loads	Utilisation βN %
Steel failure *	25.6
Combined pull-out and concrete cone failure	**81.3**
Concrete cone failure	79.7

Shear Loads	Utilisation βV %
Steel failure without lever arm *	**42.7**
Concrete pry-out failure	40.7

* Most unfavourable anchor

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Resistance to combined tensile and shear loads

Utilisation steel

$$\beta_{N,s} = \beta_{N,s;1} = 0.26 \leq 1$$
$$\beta_{V,s} = \beta_{Vs;1} = 0.43 \leq 1$$
$$\beta_N^2 + \beta_V^2 = \beta_{N,s;1}^2 + \beta_{Vs;1}^2 = 0.25 \leq 1 \quad \text{Eq. (7.55)}$$

Utilisation concrete



Proof successful

$$\beta_{N,p} = \beta_{N,p;1} = 0.81 \leq 1$$
$$\beta_{V,cp} = \beta_{V,cp;1} = 0.41 \leq 1$$
$$\beta_N^{1.5} + \beta_V^{1.5} = \beta_{N,p;1}^{1.5} + \beta_{V,cp;1}^{1.5} = 0.99 \leq 1 \quad \text{Eq. (7.56)}$$

Information concerning the anchor plate

Base plate details

Plate thickness specified by user without proof	t = 20 mm
Profile type	Round tube (60,3 x 4)

Technical remarks

The transmission of the anchor loads to the supports of the concrete member shall be shown for the ultimate limit state and the serviceability limit state; for this purpose, the normal verifications shall be carried out under due consideration of the actions introduced by the anchors. For these verifications the additional provisions given in the current design method shall be taken into account.
As a pre-condition the anchor plate is assumed to be flat when subjected to the actions. Therefore, the plate (if present) must be sufficiently stiff. The C-Fix anchor plate design is based on a proof of stresses and does not allow a statement about the stiffness of the plate. The proof of the necessary stiffness is not carried out by C-Fix.

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Installation data

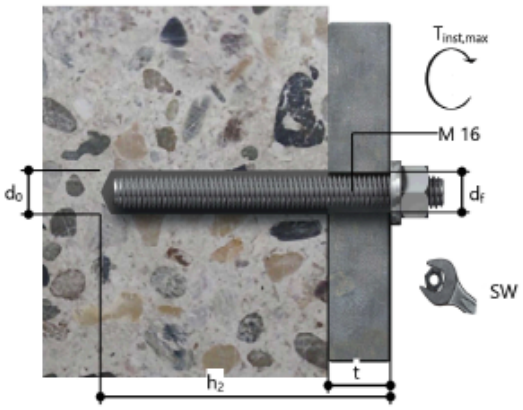
Anchor

Anchor system	**fischer Injection system FIS VL**	
Injection resin	FIS VL 410 C (other cartridge sizes available)	Art.-No. 539463
Fixing element	Threaded rod FIS A M 16 x 250 8.8, zinc plated steel, Property Class 8.8	Art.-No. 517940
Accessories	FIS MR Plus	Art.-No. 545853
	FIS Extension tube 9mm	Art.-No. 48983
	Dispenser FIS AC	Art.-No. 96497
	Compressed-air cleaning tool	Art.-No. 93286
	compressed air (oil-free), min. 6 bar	By job site.
	BSD 18	Art.-No. 1493
	SDS Chuck with internal thread M8	Art.-No. 530332
	Quattric II 18/200/250	Art.-No. 549956
Alternative cartdriges	FIS VL 300 T	Art.-No. 539461
	The shown cartdriges are alternative to the highlighted one above with the same approval number.	



Installation details

Thread diameter	M 16
Drill hole diameter	d_0 = 18 mm
Drill hole depth	h_2 = 182 mm
Calculated anchorage depth	h_{ef} = 162 mm
Drilling method	Hammer drilling
Drill hole cleaning	4 times blowing, 4 times brushing, 4 times blowing required activities according the given instruction in the approval
Installation type	Push-through installation
Annular gap	Annular gap filled
Maximum torque	$T_{inst,max}$ = 60.0 Nm
Socket size	24 mm
Base plate thickness	t = 20 mm
Total fixing thickness Tfix,max	t_{fix} = 20 mm
Volume of resin per drill hole	22 ml/11 scale divisions



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Base plate details

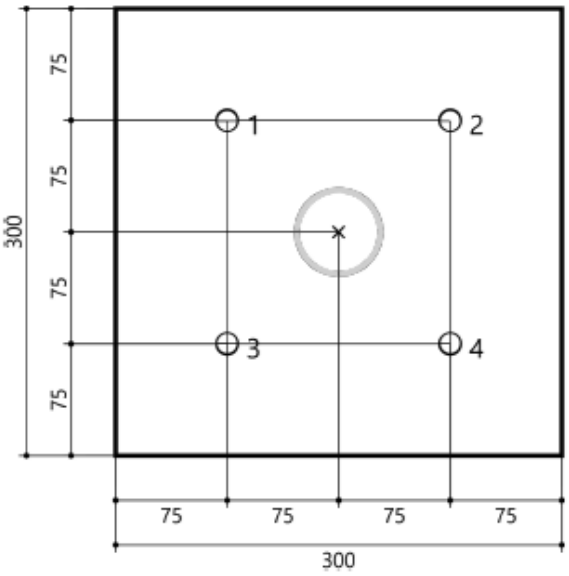
Base plate material	Not available
Base plate thickness	t = 20 mm
Clearance hole in base plate	d_f=20 mm

Attachment

Profile type	Round tube (60,3 x 4)

Anchor coordinates

Anchor no.	x mm	y mm
1	-75	75
2	75	75
3	-75	-75
4	75	-75



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➢ *Analiza spoja HEA140 na temeljno ploščo*

Comment

Spoj stebra HEA140 na temeljno ploščo

Design Specifications

Anchor

Anchor system	fischer Injection system FIS VL
Injection resin	FIS VL 410 C
Fixing element	Threaded rod FIS A M 16 x 130 8.8, zinc plated steel, Property Class 8.8
Calculated anchorage depth	80 mm
Design Data	Anchor design in Concrete according European Technical Assessment ETA-10/0352, Option 1, Issued 13/05/2020

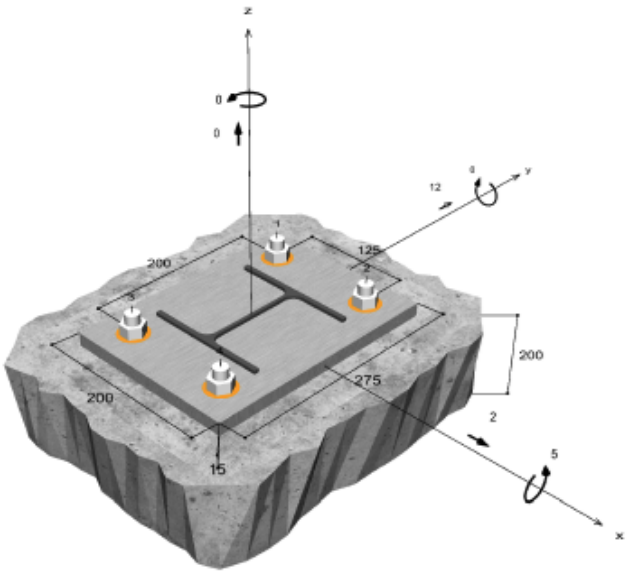


Geometry / Loads / Scale units

mm, kN, kNm



Value of design actions (including partial safety factor for the load)



Not drawn to scale

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Input data

Design method	EN1992-4:2018 bonded fastener
Base material	C25/30, EN 206
Concrete condition	Non-cracked, dry hole
Temperature range	24 °C long term temperature, 40 °C short term temperature
Reinforcement	Normal or no reinforcement. No edge reinforcement
Drilling method	Hammer drilling
Installation type	Push-through installation
Annular gap	Annular gap filled
Type of loading	Permanent-Transient/Static
Base plate location	Base plate flush installed on base material
Base plate geometry	200 mm x 275 mm x 15 mm
Profile type	HEAA 140

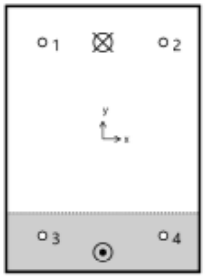
Design actions *)

#	N_{Ed} kN	$V_{Ed,x}$ kN	$V_{Ed,y}$ kN	$M_{Ed,x}$ kNm	$M_{Ed,y}$ kNm	$M_{T,Ed}$ kNm	Type of loading
1	0.00	2.00	12.00	5.00	0.00	0.00	Permanent-Transient/Static

*) The required partial safety factors for actions are included

Resulting anchor forces

Anchor no.	Tensile action kN	Shear Action kN	Shear Action x kN	Shear Action y kN
1	11.51	3.04	0.50	3.00
2	11.51	3.04	0.50	3.00
3	0.00	3.04	0.50	3.00
4	0.00	3.04	0.50	3.00



max. concrete compressive strain :	0.12	‰
max. concrete compressive stress :	3.8	N/mm²
Resulting tensile actions :	23.02	kN , X/Y position (0 / 100)
Resulting compression actions :	23.02	kN , X/Y position (0 / -117)

Resistance to tension loads

Proof	Action kN	Capacity kN	Utilisation β_N %
Steel failure *	11.51	84.00	13.7
Combined pull-out and concrete cone failure	23.02	35.67	64.5
Concrete cone failure	23.02	33.25	**69.2**

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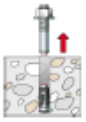
Steel failure

$$N_{Ed} \leq \frac{N_{Rk,s}}{\gamma_{Ms}} \quad (\mathbf{N_{Rd,s}})$$

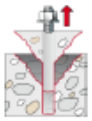


$N_{Rk,s}$ kN	γ_{Ms}	$N_{Rd,s}$ kN	N_{Ed} kN	$\beta_{N,s}$ %
126.00	1.50	84.00	11.51	13.7

Anchor no.	$\beta_{N,s}$ %	Group N°	Decisive Beta
1	13.7	1	$\beta_{N,s;1}$
2	13.7	2	$\beta_{N,s;2}$
3	0.0	3	$\beta_{N,s;3}$
4	0.0	4	$\beta_{N,s;4}$

Combined pull-out and concrete cone failure

$$N_{Ed} \leq \frac{N_{Rk,p}}{\gamma_{Mp}} \quad (\mathbf{N_{Rd,p}})$$



$$N_{Rk,p} = N^0_{Rk,p} \cdot \frac{A_{p,N}}{A^0_{p,N}} \cdot \Psi_{s,Np} \cdot \Psi_{g,Np} \cdot \Psi_{ec,Np} \cdot \Psi_{re,Np} \qquad \text{Eq. (7.13)}$$

$$N_{Rk,p} = 42.22kN \cdot \frac{87{,}600mm^2}{57{,}600mm^2} \cdot 1.000 \cdot 1.000 \cdot 1.000 \cdot 1.000 = 64.21kN$$

$$N^0_{Rk,p} = \Psi_{sus} \cdot \pi \cdot d \cdot h_{ef} \cdot \tau_{Rk} = 1.00 \cdot \pi \cdot 16mm \cdot 80mm \cdot 10.5N/mm^2 = 42.22kN \qquad \text{Eq. (7.14)}$$

$$\Psi_{sus} = 1.00 \qquad \text{Eq. (7.14a)}$$

$$\alpha_{sus} = 0.00 \leq \Psi^0_{sus} = 0.60$$

$$s_{cr,Np} = min\left(7.3 \cdot d \cdot \left(\Psi_{sus} \cdot \tau_{Rk,ucr}\right)^{0.5};\ 3 \cdot h_{ef}\right) \qquad \text{Eq. (7.15)}$$

$$s_{cr,Np} = min\left(7.3 \cdot 16mm \cdot \left(1.00 \cdot 10.0N/mm^2\right)^{0.5};\ 3 \cdot 80mm\right) = 240mm$$

$$c_{cr,Np} = \frac{S_{cr,Np}}{2} = \frac{240mm}{2} = 120mm \qquad \text{Eq. (7.16)}$$

$$\Psi_{s,Np} = min\left(1;\ 0.7 + 0.3 \cdot \frac{c}{c_{cr,Np}}\right) = min\left(1;\ 0.7 + 0.3 \cdot \frac{\infty}{120mm}\right) = 1.000 \leq 1 \qquad \text{Eq. (7.20)}$$

$$\Psi_{g,Np} = max\left(1;\ \Psi^0_{g,Np} - \sqrt{\frac{s}{s_{cr,Np}}} \cdot \left(\Psi^0_{g,Np} - 1\right)\right) = 1.000 - \sqrt{\frac{125mm}{240mm}} \cdot \left(1.000 - 1\right) = 1.000 \geq 1 \qquad \text{Eq. (7.17)}$$

$$\Psi^0_{g,Np} = max\left(1;\ \sqrt{n} - \left(\sqrt{n} - 1\right) \cdot \left(\frac{\tau_{Rk}}{\tau_{Rk,c}}\right)^{1.5}\right) \qquad \text{Eq. (7.18)}$$

$$\Psi^0_{g,Np} = max\left(1;\ \sqrt{2} - \left(\sqrt{2} - 1\right) \cdot \left(\frac{10.5N/mm^2}{9.8N/mm^2}\right)^{1.5}\right) = 1.000 \geq 1$$

$$\tau_{Rk,c} = \frac{k_3}{\pi \cdot d}\sqrt{h_{ef} \cdot f_{ck}} = \frac{11}{3.14 \cdot 16mm}\sqrt{80mm \cdot 25.0N/mm^2} = 9.8N/mm^2 \qquad \text{Eq. (7.19)}$$

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$$\Psi_{ec,Np} = \frac{1}{1+\frac{2e_N}{s_{cr,Np}}} = \Psi_{ec,Npx} \cdot \Psi_{ec,Npy} = 1.000 \cdot 1.000 = 1.000 \leq 1$$ Eq. (7.21)

$$\Psi_{ec,Npx} = \frac{1}{1+\frac{2 \cdot 0mm}{240mm}} = 1.000 \leq 1 \qquad \Psi_{ec,Npy} = \frac{1}{1+\frac{2 \cdot 0mm}{240mm}} = 1.000 \leq 1$$

$$\Psi_{re,Np} = 1.000$$ Eq. (7.5)

$N_{Rk,p}$ kN	γ_{Mp}	$N_{Rd,p}$ kN	N_{Ed} kN	$\beta_{N,p}$ %
64.21	1.80	35.67	23.02	64.5

Anchor no.	$\beta_{N,p}$ %	Group N°	Decisive Beta
1, 2	64.5	1	$\beta_{N,p;1}$

Concrete cone failure



$$N_{Ed} \leq \frac{N_{Rk,c}}{\gamma_{Mc}} \quad (N_{Rd,c})$$

$$N_{Rk,c} = N^0_{Rk,c} \cdot \frac{A_{c,N}}{A^0_{c,N}} \cdot \Psi_{s,N} \cdot \Psi_{re,N} \cdot \Psi_{ec,N} \cdot \Psi_{M,N}$$ Eq. (7.1)

$$N_{Rk,c} = 39.35kN \cdot \frac{87,600mm^2}{57,600mm^2} \cdot 1.000 \cdot 1.000 \cdot 1.000 \cdot 1.000 = 59.85kN$$

$$N^0_{Rk,c} = k_1 \cdot \sqrt{f_{ck}} \cdot h_{ef}^{1.5} = 11.0 \cdot \sqrt{25.0N/mm^2} \cdot \left(80mm\right)^{1.5} = 39.35kN$$ Eq. (7.2)

$$\Psi_{s,N} = min\left(1;\ 0.7+0.3 \cdot \frac{c}{c_{cr,N}}\right) = min\left(1;\ 0.7+0.3 \cdot \frac{\infty}{120mm}\right) = 1.000 \leq 1$$ Eq. (7.4)

$$\Psi_{re,N} = 1.000$$ Eq. (7.5)

$$\Psi_{ec,N} = \frac{1}{1+\frac{2e_N}{s_{cr,N}}} \Rightarrow \Psi_{ec,Nx} \cdot \Psi_{ec,Ny} = 1.000 \cdot 1.000 = 1.000 \leq 1$$ Eq. (7.6)

$$\Psi_{ec,Nx} = \frac{1}{1+\frac{2 \cdot 0mm}{240mm}} = 1.000 \leq 1 \qquad \Psi_{ec,Ny} = \frac{1}{1+\frac{2 \cdot 0mm}{240mm}} = 1.000 \leq 1$$

$$\Psi_{M,N} = 1.00 \geq 1$$ Eq. (7.7)

$N_{Rk,c}$ kN	γ_{Mc}	$N_{Rd,c}$ kN	N_{Ed} kN	$\beta_{N,c}$ %
59.85	1.80	33.25	23.02	69.2

Anchor no.	$\beta_{N,c}$ %	Group N°	Decisive Beta
1, 2	69.2	1	$\beta_{N,c;1}$

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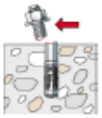
Resistance to shear loads

Proof	Action kN	Capacity kN	Utilisation β_V %
Steel failure without lever arm *	3.04	50.40	6.0
Concrete pry-out failure	12.17	121.92	**10.0**

* Most unfavourable anchor

Steel failure without lever arm



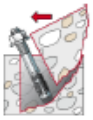
$$V_{Ed} \leq \frac{V_{Rk,s}}{\gamma_{Ms}} \quad (V_{Rd,s})$$

$$V_{Rk,s} = k_7 \cdot V^0_{Rk,s} = 1.00 \cdot 63.00kN = 63.00kN$$ Eq. (7.35)/ (7.36)

$V_{Rk,s}$ kN	γ_{Ms}	$V_{Rd,s}$ kN	V_{Ed} kN	β_{Vs} %
63.00	1.25	50.40	3.04	6.0

Anchor no.	β_{Vs} %	Group N°	Decisive Beta
1	6.0	1	$\beta_{Vs;1}$
2	6.0	2	$\beta_{Vs;2}$
3	6.0	3	$\beta_{Vs;3}$
4	6.0	4	$\beta_{Vs;4}$

Concrete pry-out failure



$$V_{Ed} \leq \frac{V_{Rk,cp}}{\gamma_{Mc}} \quad (V_{Rd,cp})$$

$$V_{Rk,cp} = k_8 \cdot N_{Rk,c} = 2 \cdot 109.73kN = 219.46kN$$ Eq. (7.39c)

$$N_{Rk,c} = N^0_{Rk,c} \cdot \frac{A_{c,N}}{A^0_{c,N}} \cdot \Psi_{s,N} \cdot \Psi_{re,N} \cdot \Psi_{ec,N} \cdot \Psi_{M,N}$$ Eq. (7.1)

$$N_{Rk,c} = 39.35kN \cdot \frac{160{,}600mm^2}{57{,}600mm^2} \cdot 1.000 \cdot 1.000 \cdot 1.000 \cdot 1.000 = 109.73kN$$

$$N^0_{Rk,c} = k_1 \cdot \sqrt{f_{ck}} \cdot h_{ef}^{1.5} = 11 \cdot \sqrt{25.0N/mm^2} \cdot \left(80mm\right)^{1.5} = 39.35kN$$ Eq. (7.2)

$$\Psi_{s,N} = min\left(1;\ 0.7 + 0.3 \cdot \frac{c}{c_{cr,N}}\right) = min\left(1;\ 0.7 + 0.3 \cdot \frac{\infty}{120mm}\right) = 1.000 \leq 1$$ Eq. (7.4)

$$\Psi_{re,N} = 1.000$$ Eq. (7.5)

$$\Psi_{ec,N} = \frac{1}{1+\frac{2e_N}{s_{cr,N}}} \Rightarrow \Psi_{ec,Nx} \cdot \Psi_{ec,Ny} = 1.000 \cdot 1.000 = 1.000 \leq 1$$ Eq. (7.6)

$$\Psi_{M,N} = 1.00 \geq 1$$ Eq. (7.7)

$V_{Rk,cp}$ kN	γ_{Mcp}	$V_{Rd,cp}$ kN	V_{Ed} kN	$\beta_{V,cp}$ %
219.46	1.80	121.92	12.17	10.0

Anchor no.	$\beta_{V,cp}$ %	Group N°	Decisive Beta
1, 2, 3, 4	10.0	1	$\beta_{V,cp;1}$

Utilization of tension and shear loads

Tension loads	Utilisation βN %
Steel failure *	13.7
Combined pull-out and concrete cone failure	64.5
Concrete cone failure	**69.2**

Shear Loads	Utilisation βV %
Steel failure without lever arm *	6.0
Concrete pry-out failure	**10.0**

* Most unfavourable anchor

Resistance to combined tensile and shear loads

Utilisation steel

$$\beta_{N,s} = \beta_{N,s;1} = 0.14 \leq 1$$
$$\beta_{V,s} = \beta_{Vs;1} = 0.06 \leq 1$$
$$\beta_N^2 + \beta_V^2 = \beta_{N,s;1}^2 + \beta_{Vs;1}^2 = 0.02 \leq 1$$ Eq. (7.55)

Utilisation concrete

$$\beta_{N,c} = \beta_{N,c;1} = 0.69 \leq 1$$
$$\beta_{V,cp} = \beta_{V,cp;1} = 0.10 \leq 1$$
$$\beta_N^{1.5} + \beta_V^{1.5} = \beta_{N,c;1}^{1.5} + \beta_{V,cp;1}^{1.5} = 0.61 \leq 1$$ Eq. (7.56)

Proof successful

Information concerning the anchor plate

Base plate details

Plate thickness specified by user without proof — t = 15 mm

Profile type — HEAA 140

Technical remarks

The transmission of the anchor loads to the supports of the concrete member shall be shown for the ultimate limit state and the serviceability limit state; for this purpose, the normal verifications shall be carried out under due consideration of the actions introduced by the anchors. For these verifications the additional provisions given in the current design method shall be taken into account.
As a pre-condition the anchor plate is assumed to be flat when subjected to the actions. Therefore, the plate (if present) must be sufficiently stiff. The C-Fix anchor plate design is based on a proof of stresses and does not allow a statement about the stiffness of the plate. The proof of the necessary stiffness is not carried out by C-Fix.

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Installation data

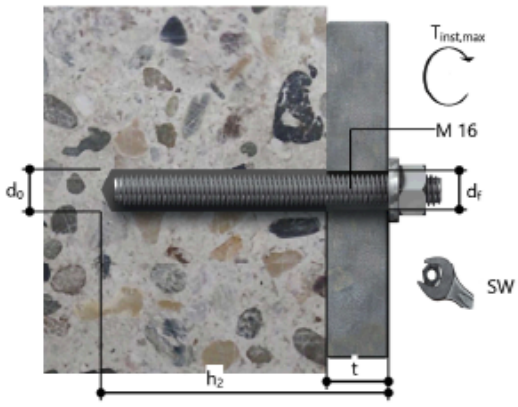
Anchor

Anchor system	**fischer Injection system FIS VL**	
Injection resin	FIS VL 410 C (other cartridge sizes available)	Art.-No. 539463
Fixing element	Threaded rod FIS A M 16 x 130 8.8, zinc plated steel, Property Class 8.8	Art.-No. 519400
Accessories	FIS MR Plus	Art.-No. 545853
	Dispenser FIS AC	Art.-No. 96497
	Compressed-air cleaning tool	Art.-No. 93286
	compressed air (oil-free), min. 6 bar	By job site.
	Cleaning brush BS 16/18	Art.-No. 78181
	SDS Plus-V II 18/150/200	Art.-No. 531836
Alternative cartdriges	FIS VL 300 T The shown cartdriges are alternative to the highlighted one above with the same approval number.	Art.-No. 539461



Installation details

Thread diameter	M 16
Drill hole diameter	d_0 = 18 mm
Drill hole depth	h_2 = 95 mm
Calculated anchorage depth	h_{ef} = 80 mm
Drilling method	Hammer drilling
Drill hole cleaning	4 times blowing, 4 times brushing, 4 times blowing required activities according the given instruction in the approval
Installation type	Push-through installation
Annular gap	Annular gap filled
Maximum torque	$T_{inst,max}$ = 60.0 Nm
Socket size	24 mm
Base plate thickness	t = 15 mm
Total fixing thickness Tfix,max	t_{fix} = 15 mm
Volume of resin per drill hole	12 ml/6 scale divisions



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Base plate details

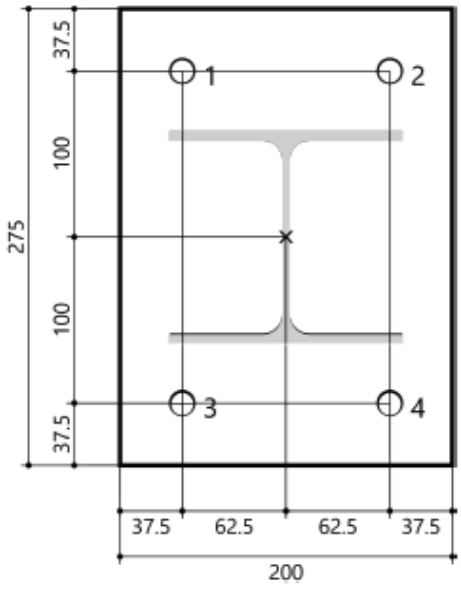
Base plate material	Not available
Base plate thickness	t = 15 mm
Clearance hole in base plate	d_f=20 mm

Attachment

Profile type	HEAA 140

Anchor coordinates

Anchor no.	x mm	y mm
1	-62.5	100
2	62.5	100
3	-62.5	-100
4	62.5	-100



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2.5.4. Analiza prostora za odpadke POZ-800

Glej prilogo:

Vhodni podatki - Konstrukcija

Tabele materialov

No	Naziv materiala	E[kN/m2]	μ	γ[kN/m3]	αt[1/C]	Em[kN/m2]	μm
1	C 25/30	3.100e+7	0.20	25.00	1.000e-5	3.100e+7	0.20

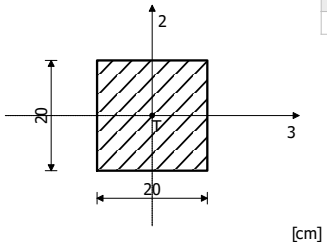
Seti plošč

No	d[m]	e[m]	Material	Tip preračuna	Ortotropija	E2[kN/m2]	G[kN/m2]	α
<1>	0.200	0.100	1	Tanka plošča	Izotropna			
<2>	0.200	0.100	1	Tanka plošča	Izotropna			
<3>	0.200	0.100	1	Tanka plošča	Izotropna			

Seti gred

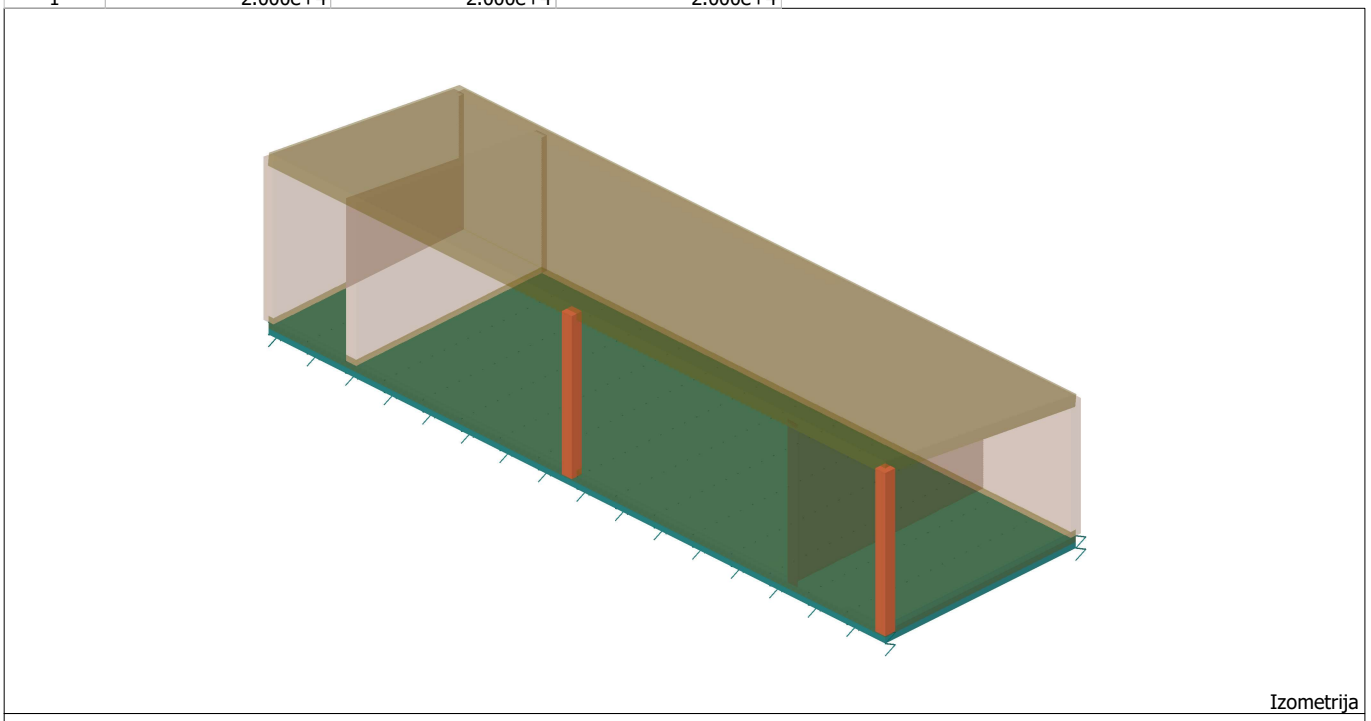
Set: 1 Prerez: b/d=20/20, Fiktivna ekscentričnost

Mat.	A1	A2	A3	I1	I2	I3
1 - C 25/30	4.000e-2	3.333e-2	3.333e-2	2.253e-4	1.333e-4	1.333e-4

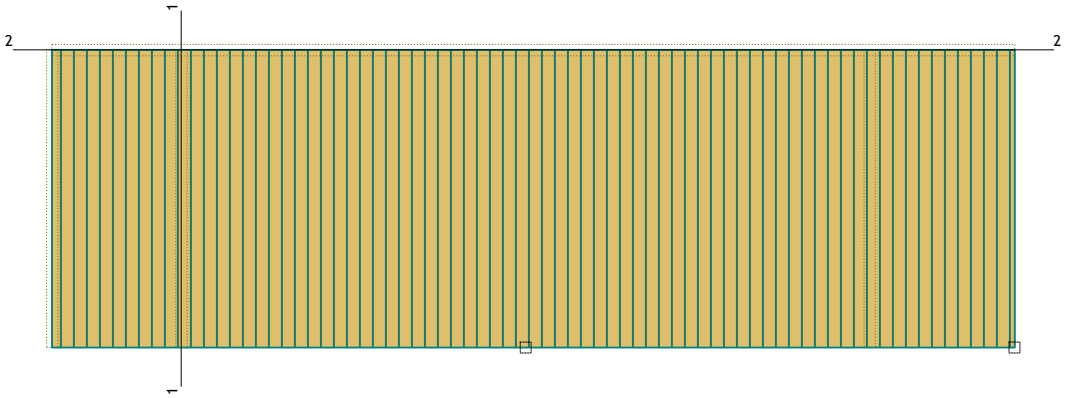


Seti površinskih podpor

Set	K,R1	K,R2	K,R3
1	2.000e+4	2.000e+4	2.000e+4



Izometrija



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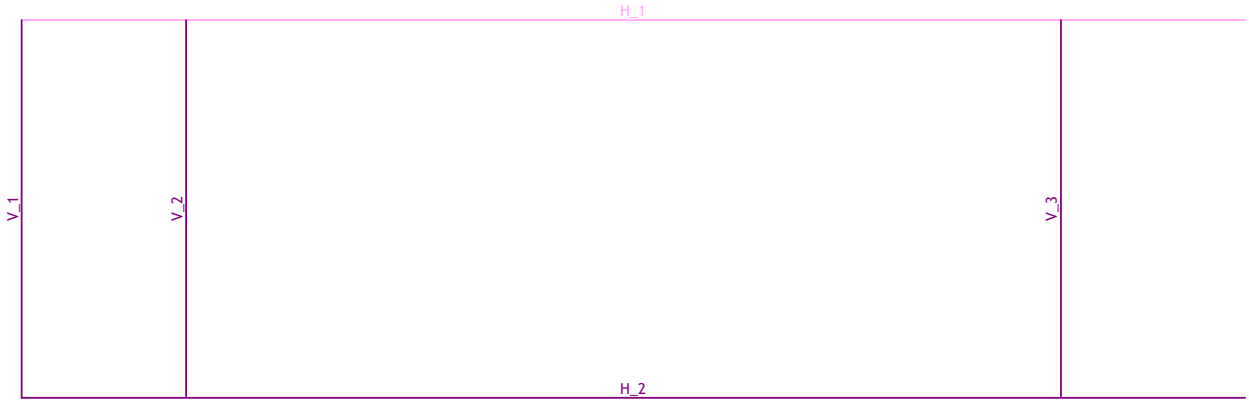
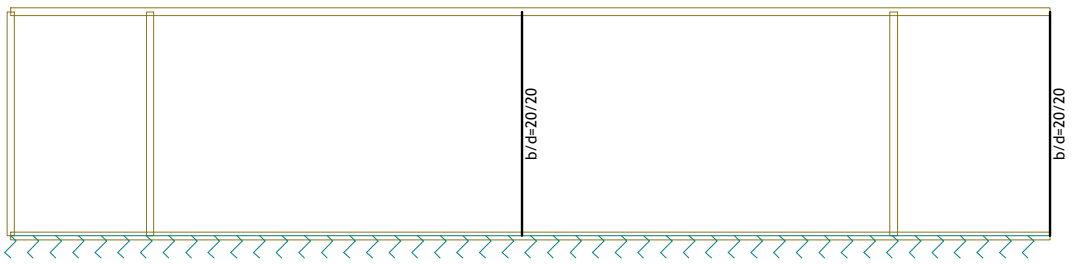
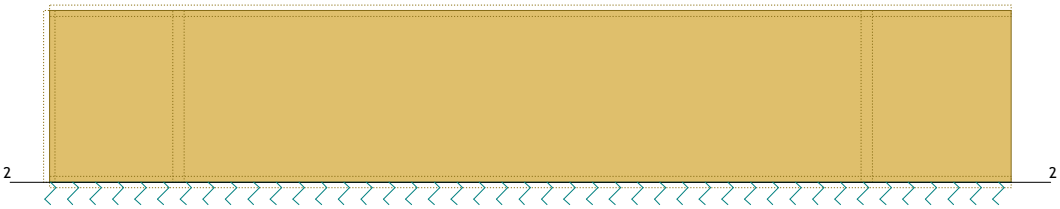


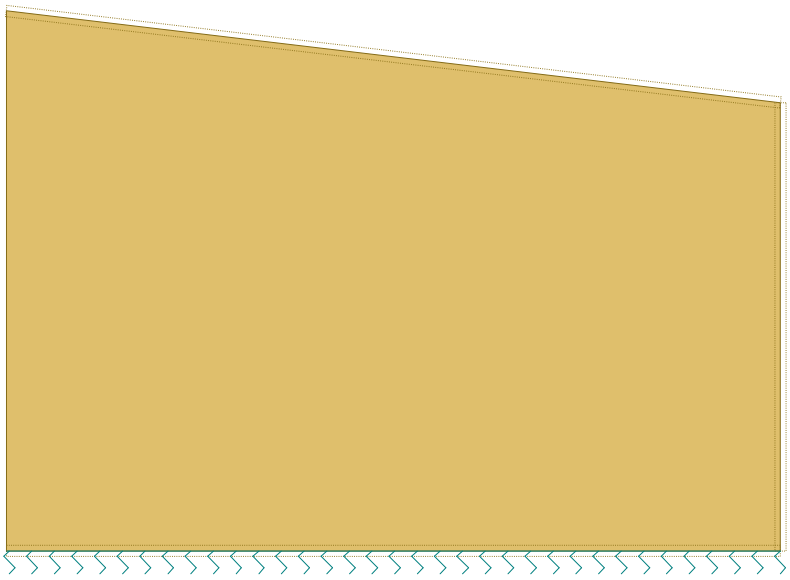
Dispozicija okvirjev



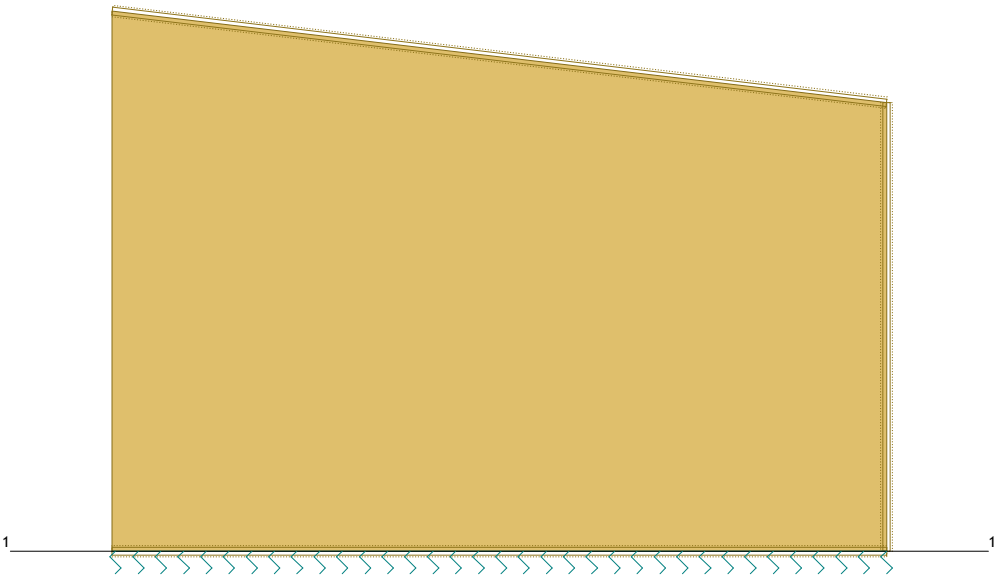
Okvir: H_2



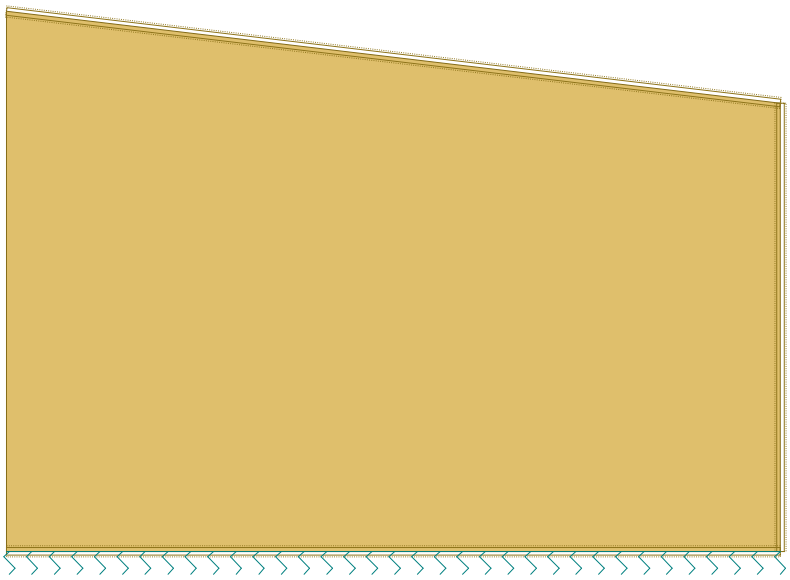
Okvir: H_1



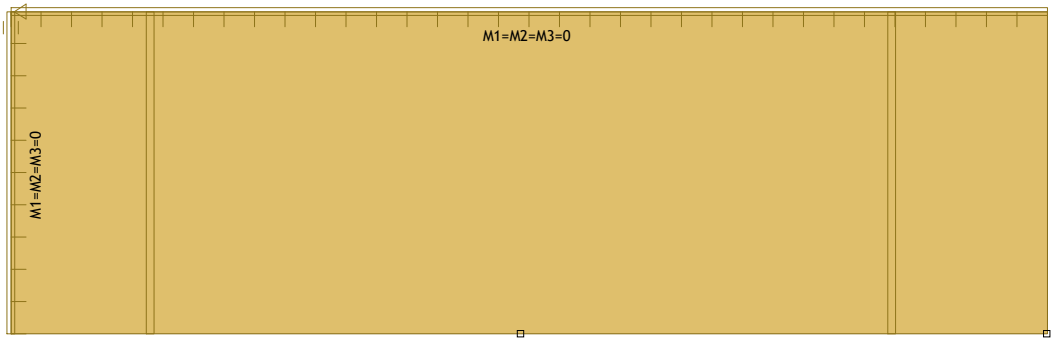
Okvir: V_1



Okvir: V_2



Okvir: V_3



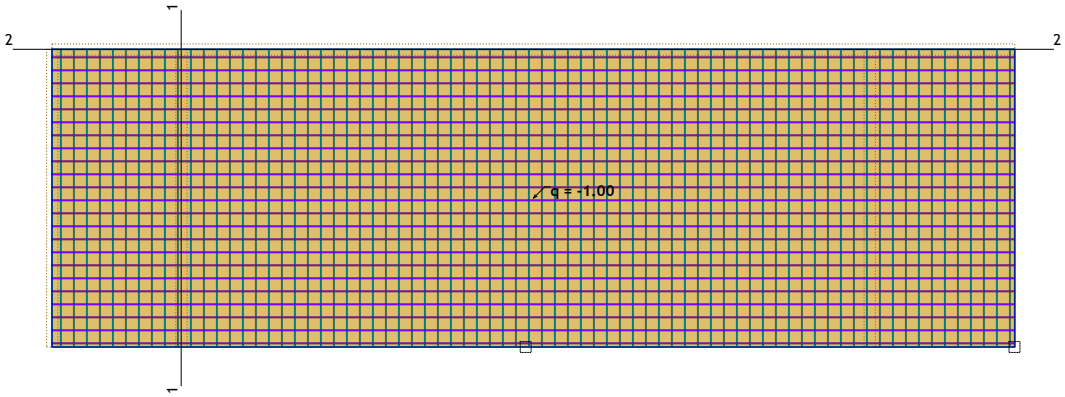
Pogled: Streha

Vhodni podatki - Obtežba

Lista obtežnih primerov

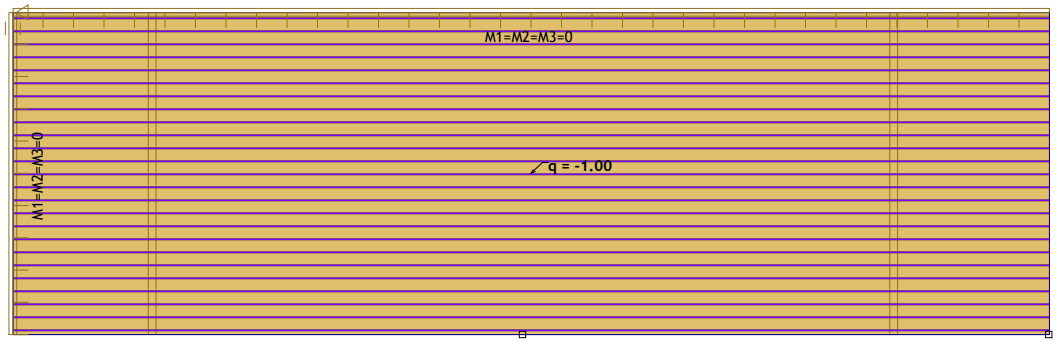
LC	Naziv	LC	Naziv
1	Lastna teža (g)	8	Komb.: 1.35xI+1.5xIII
2	Koristna teža	9	Komb.: 1.35xI+1.5xII
3	Sneg	10	Komb.: I+1.5xIII
4	Komb.: 1.35xI+1.5xII+1.5xIII	11	Komb.: I+1.5xII
5	Komb.: I+1.5xII+1.5xIII	12	Komb.: 1.35xI
6	Komb.: 1.35xI+1.5xII+0.75xIII	13	Komb.: I
7	Komb.: I+1.5xII+0.75xIII		

Obt. 1: Lastna teža (g)



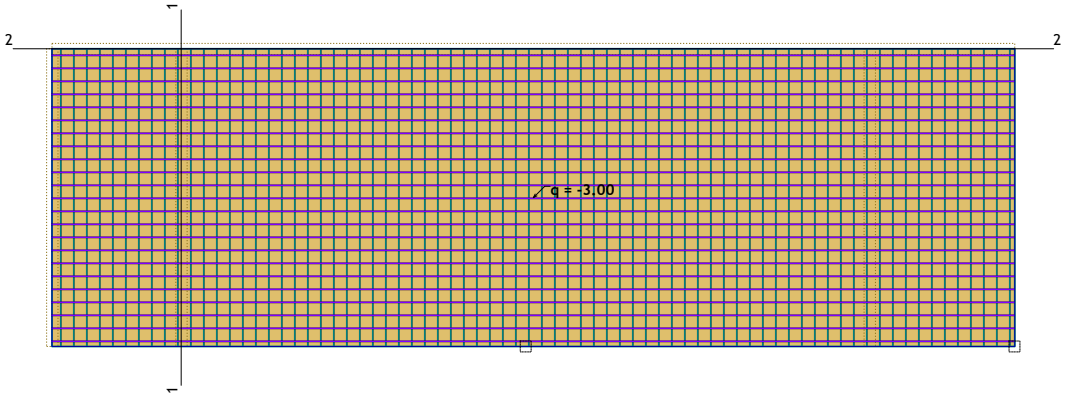
Nivo: [0.00 m]

Obt. 1: Lastna teža (g)



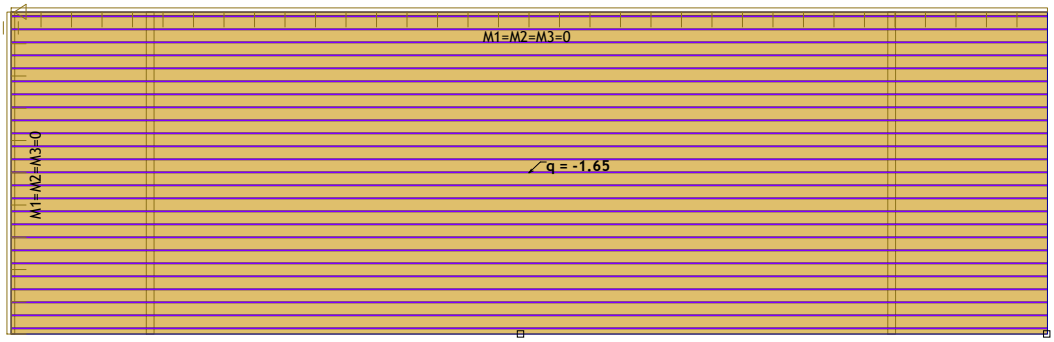
Pogled: Streha

Obt. 2: Koristna teža



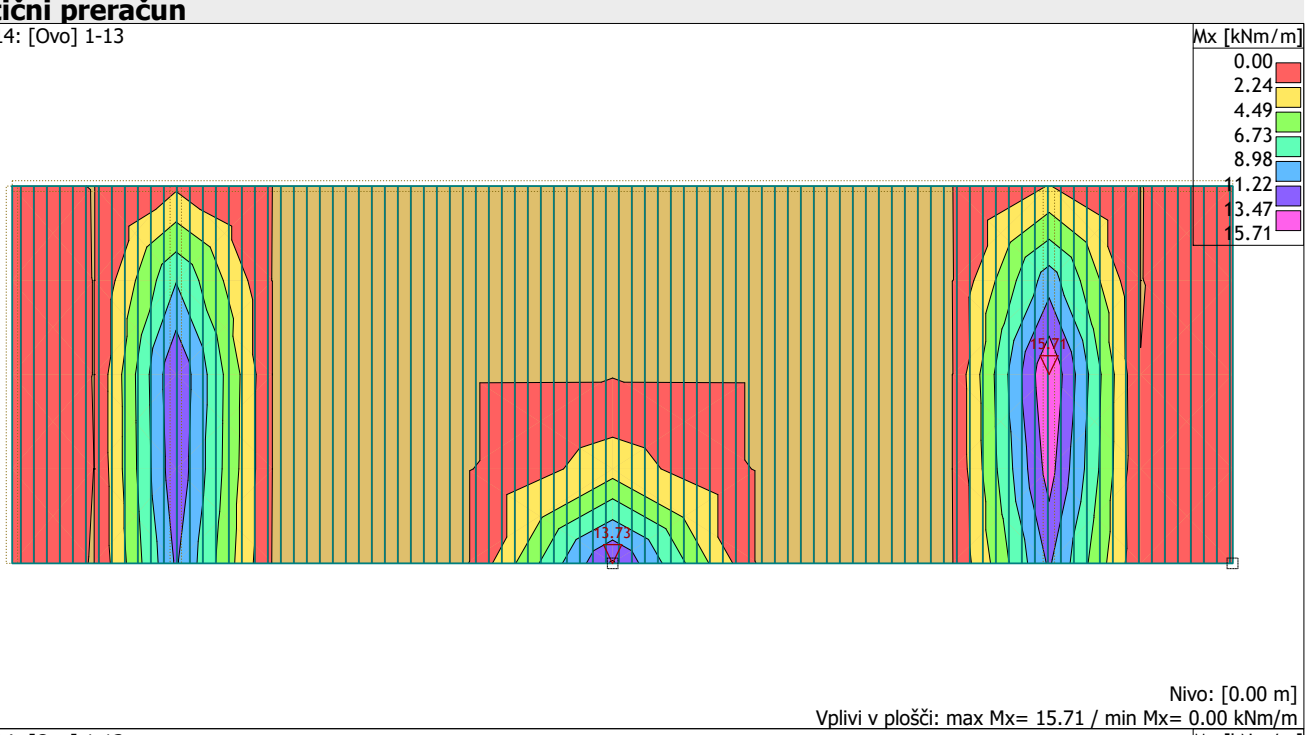
Nivo: [0.00 m]

Obt. 3: Sneg



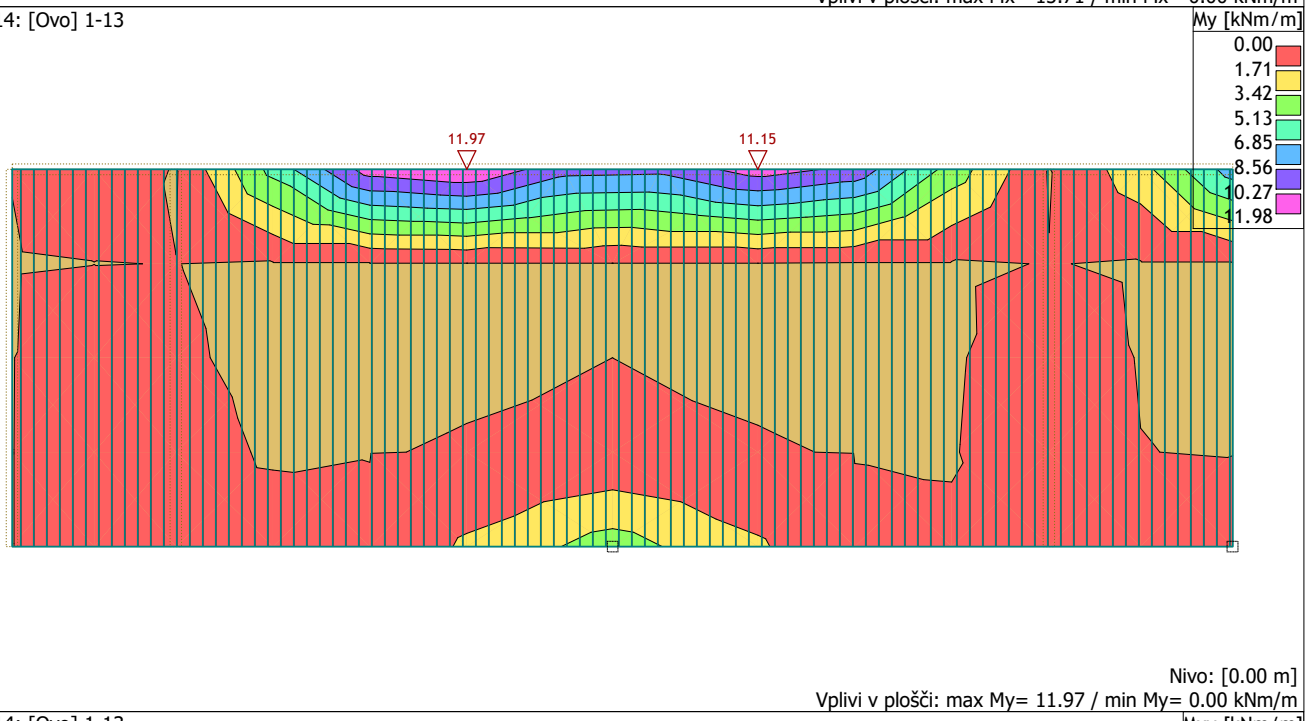
Pogled: Streha

Obt. 14: [Ovo] 1-13



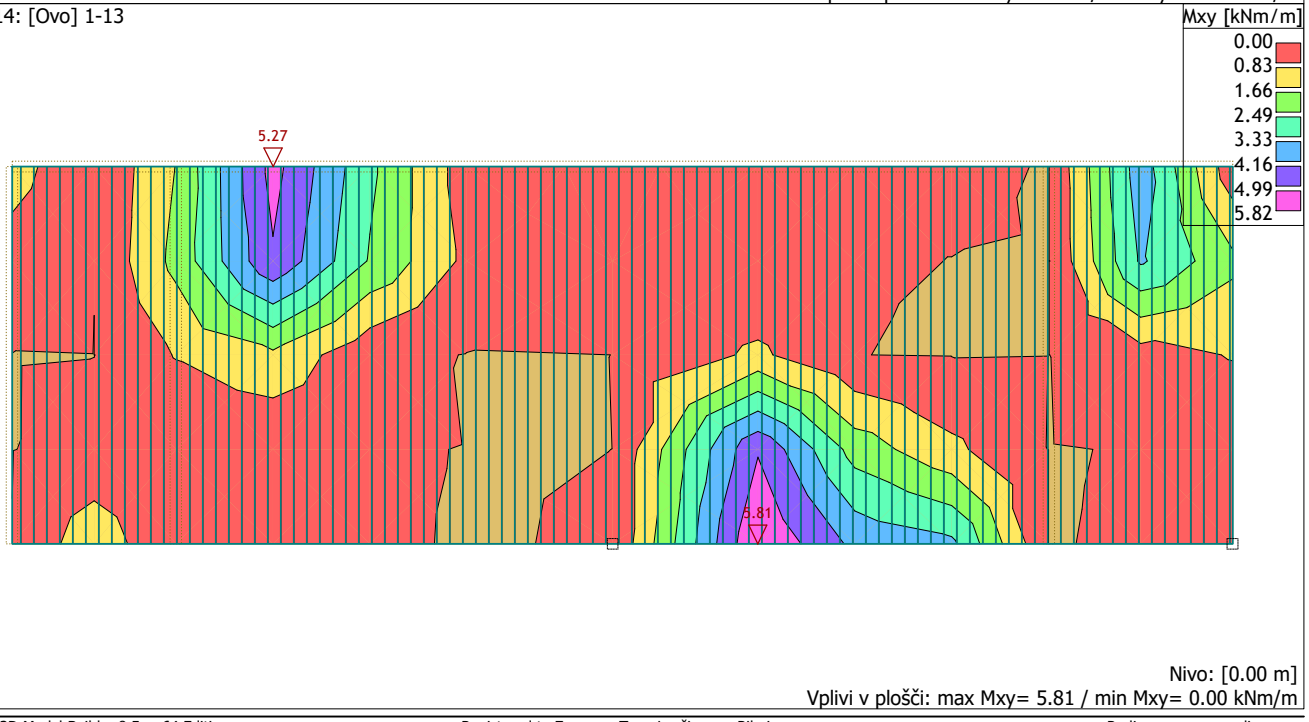
Nivo: [0.00 m]
Vplivi v plošči: max Mx= 15.71 / min Mx= 0.00 kNm/m

Obt. 14: [Ovo] 1-13



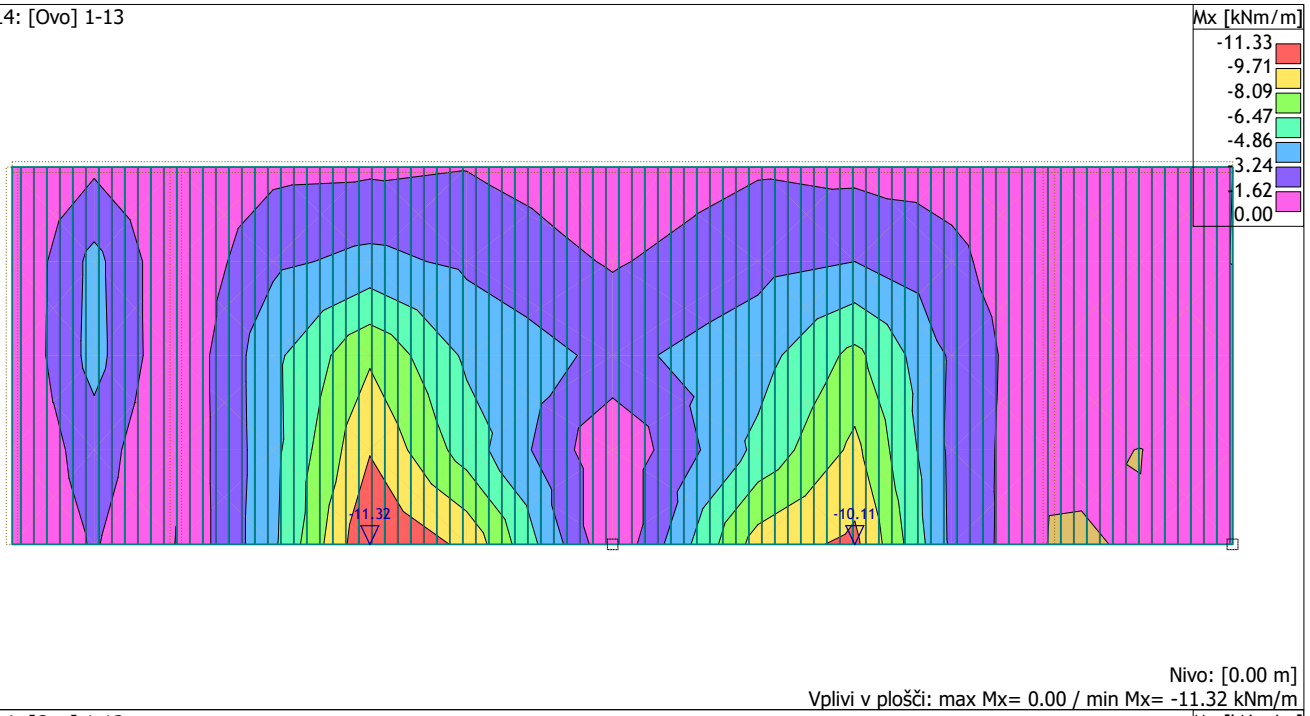
Nivo: [0.00 m]
Vplivi v plošči: max My= 11.97 / min My= 0.00 kNm/m

Obt. 14: [Ovo] 1-13



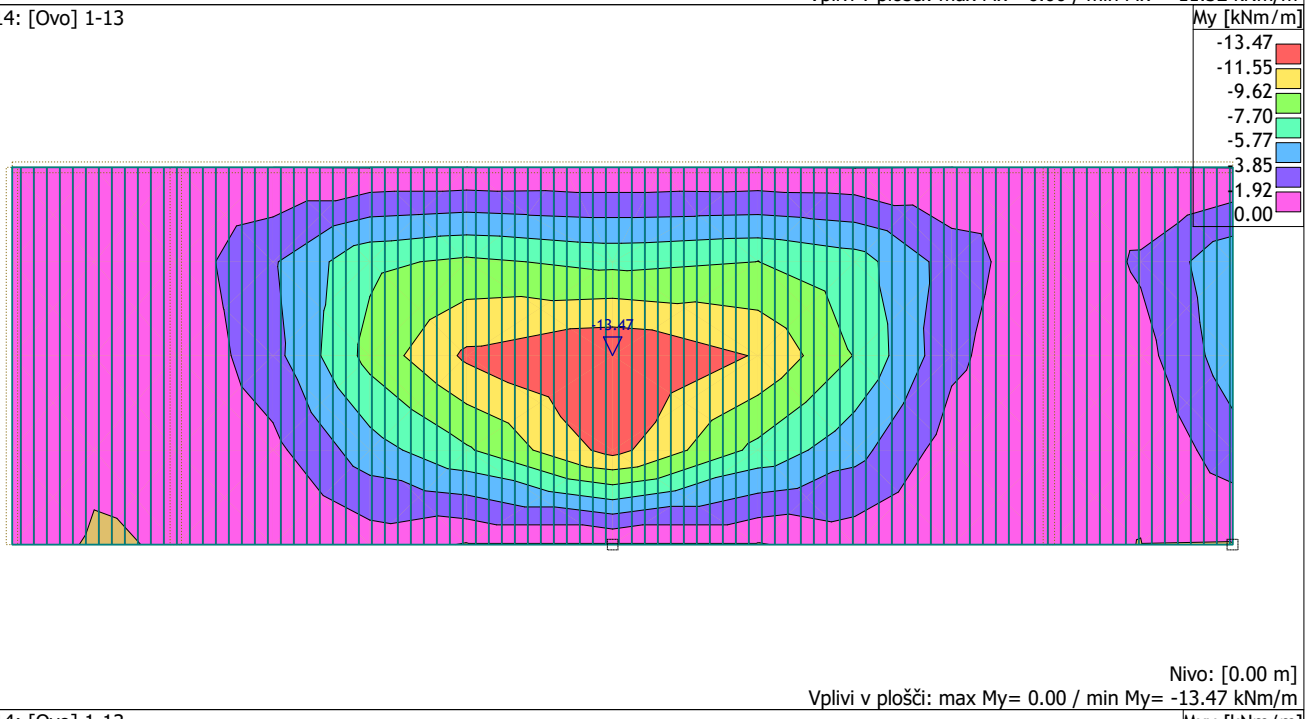
Nivo: [0.00 m]
Vplivi v plošči: max Mxy= 5.81 / min Mxy= 0.00 kNm/m

Obt. 14: [Ovo] 1-13



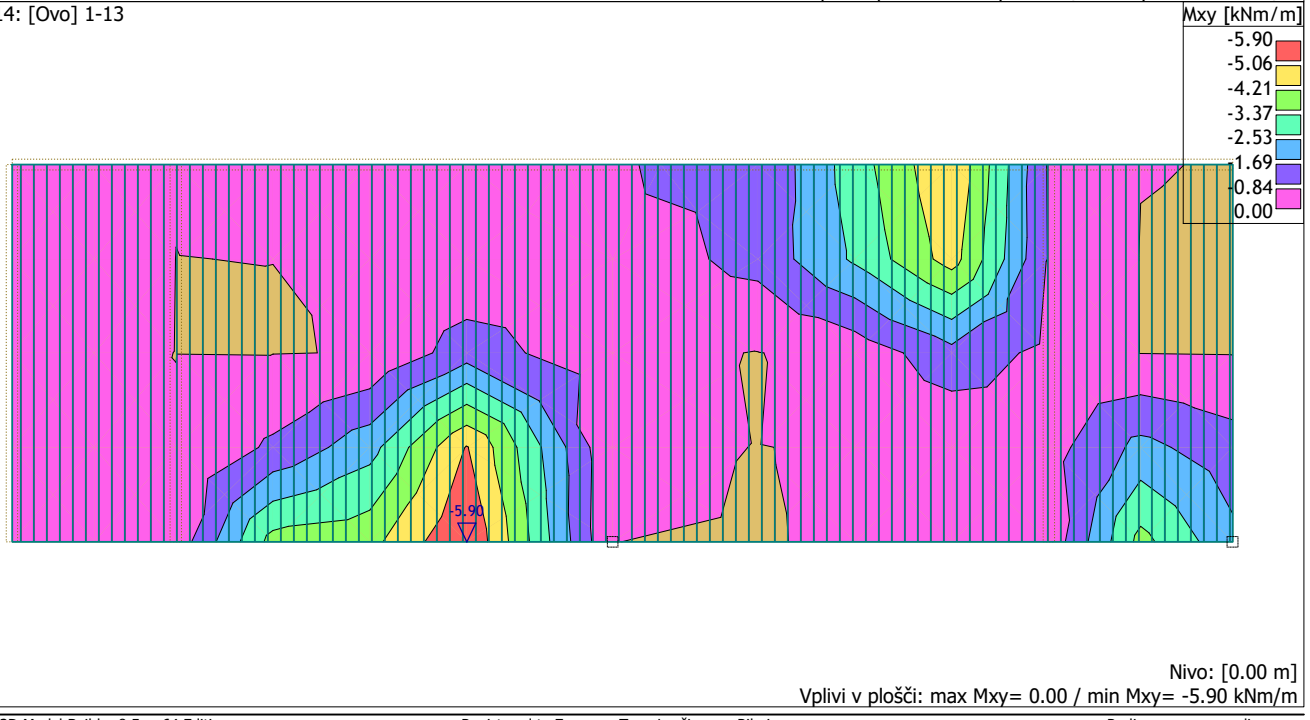
Nivo: [0.00 m]
Vplivi v plošči: max Mx= 0.00 / min Mx= -11.32 kNm/m

Obt. 14: [Ovo] 1-13



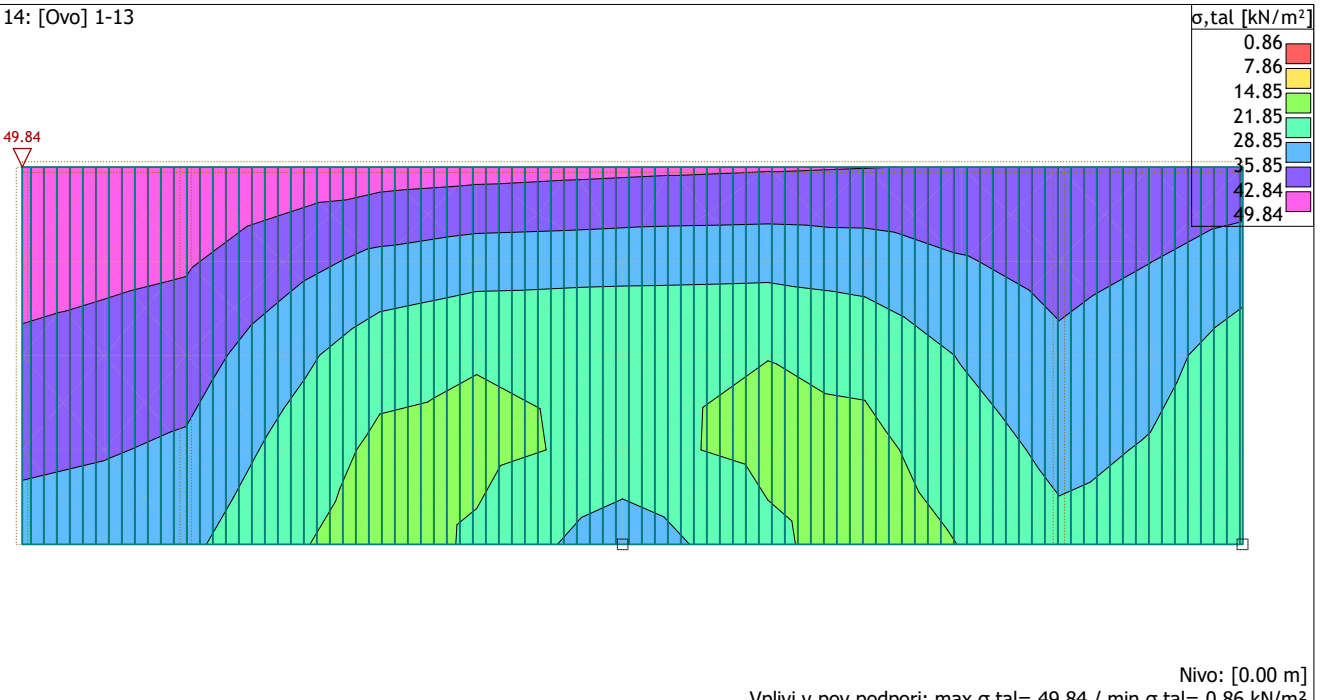
Nivo: [0.00 m]
Vplivi v plošči: max My= 0.00 / min My= -13.47 kNm/m

Obt. 14: [Ovo] 1-13



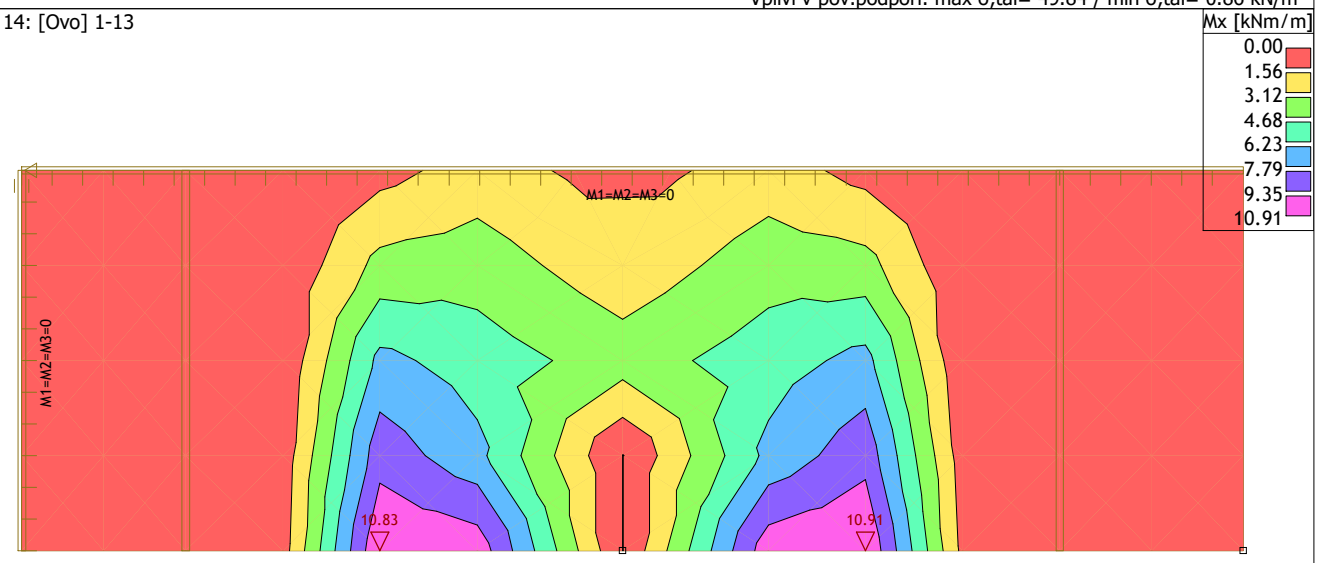
Nivo: [0.00 m]
Vplivi v plošči: max Mxy= 0.00 / min Mxy= -5.90 kNm/m

Obt. 14: [Ovo] 1-13



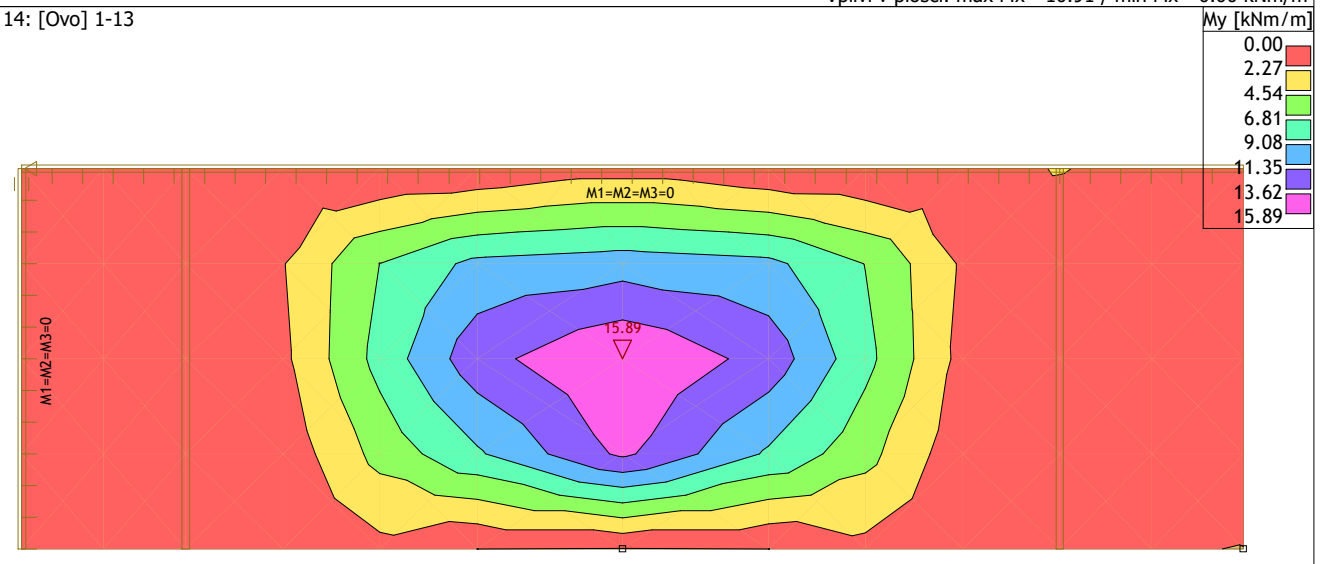
Nivo: [0.00 m]
Vplivi v pov.podpori: max σ,tal= 49.84 / min σ,tal= 0.86 kN/m²

Obt. 14: [Ovo] 1-13



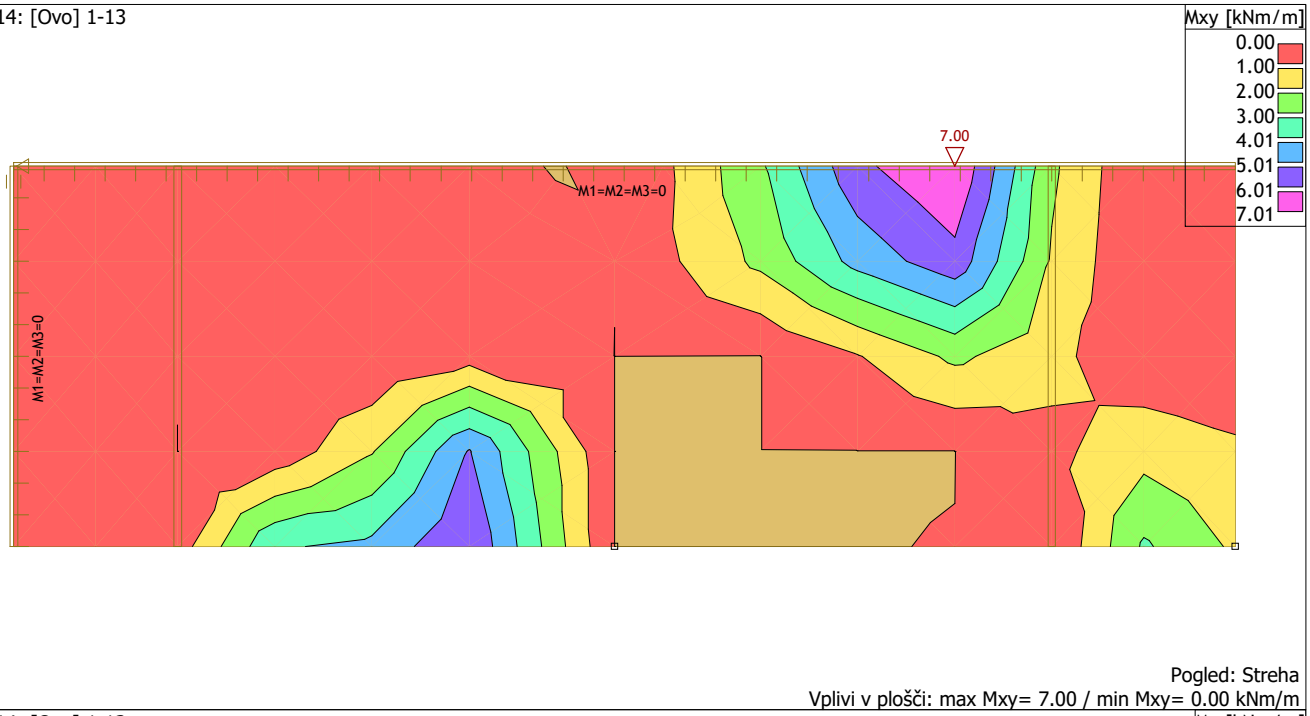
Pogled: Streha
Vplivi v plošči: max Mx= 10.91 / min Mx= 0.00 kNm/m

Obt. 14: [Ovo] 1-13



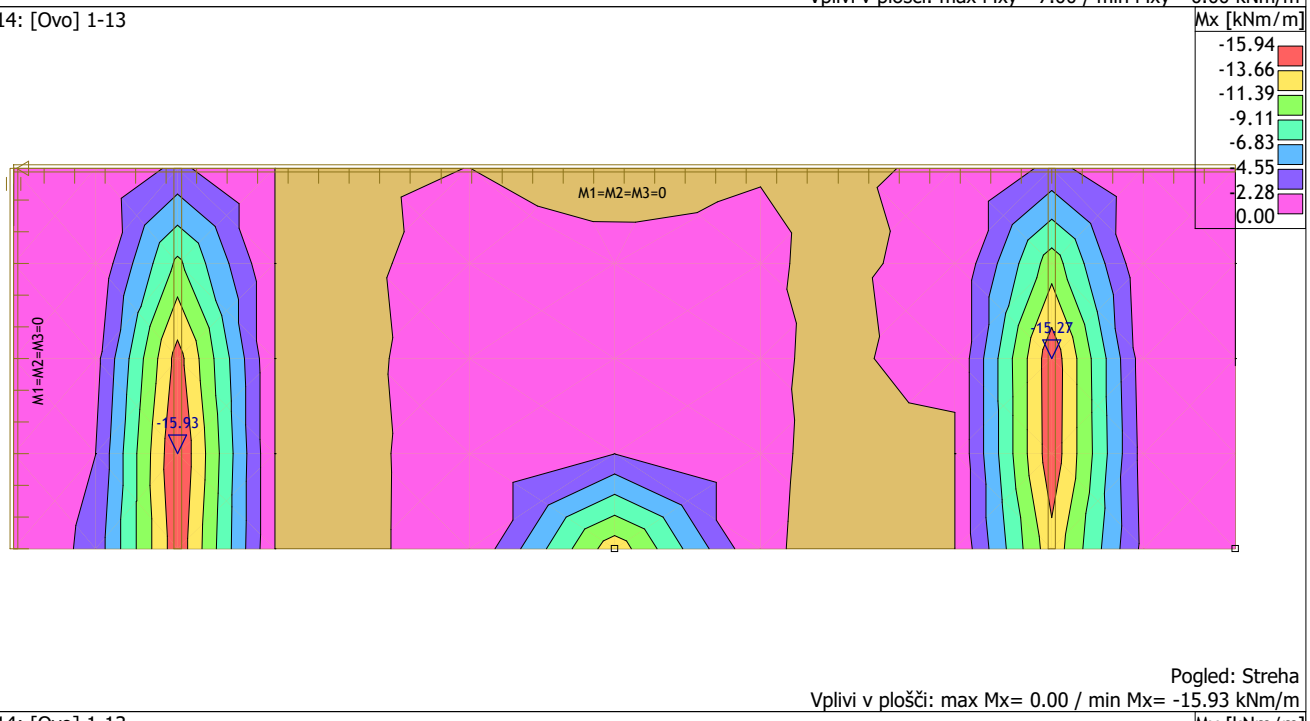
Pogled: Streha
Vplivi v plošči: max My= 15.89 / min My= 0.00 kNm/m

Obt. 14: [Ovo] 1-13



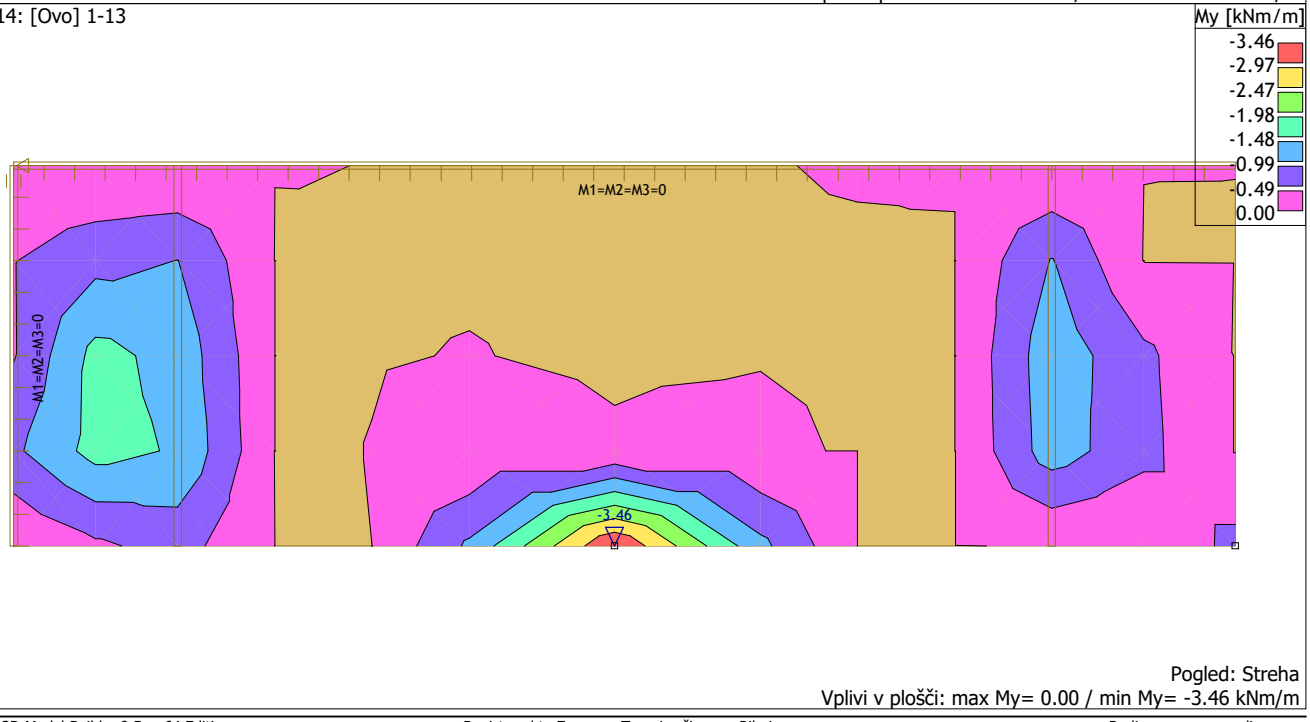
Pogled: Streha
Vplivi v plošči: max Mxy= 7.00 / min Mxy= 0.00 kNm/m

Obt. 14: [Ovo] 1-13



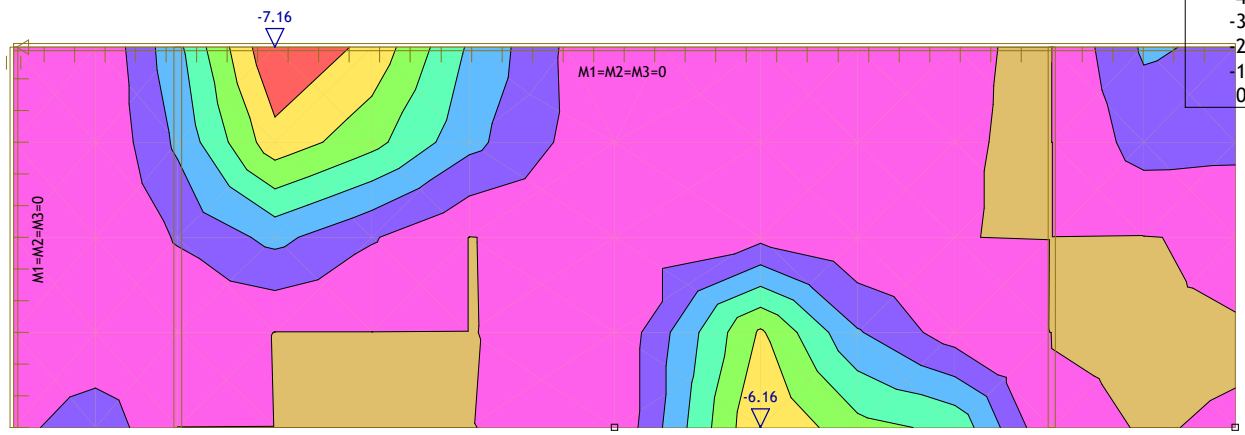
Pogled: Streha
Vplivi v plošči: max Mx= 0.00 / min Mx= -15.93 kNm/m

Obt. 14: [Ovo] 1-13



Pogled: Streha
Vplivi v plošči: max My= 0.00 / min My= -3.46 kNm/m

Obt. 14: [Ovo] 1-13

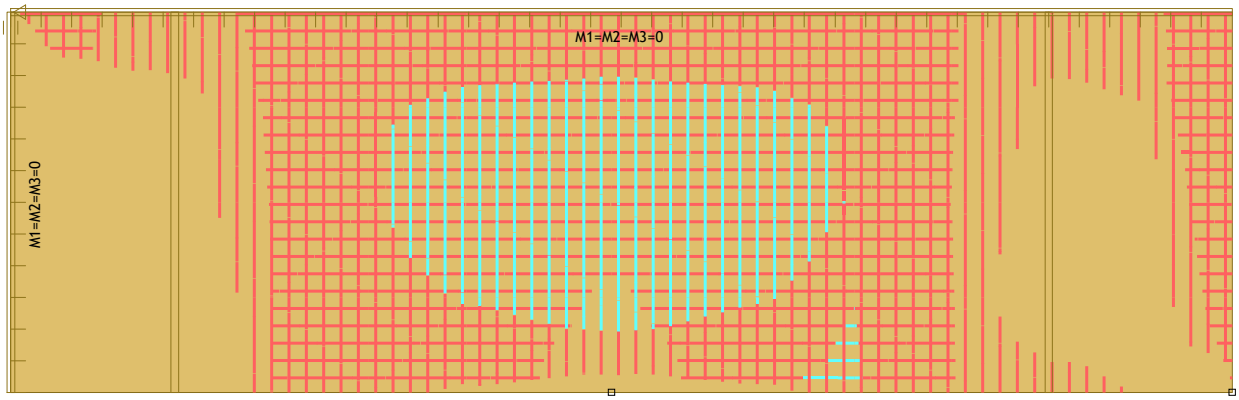


Pogled: Streha
Vplivi v plošči: max Mxy= 0.00 / min Mxy= -7.16 kNm/m

Dimenzioniranje (beton)

Merodajna obtežba: Kompletna shema
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=3.00 cm

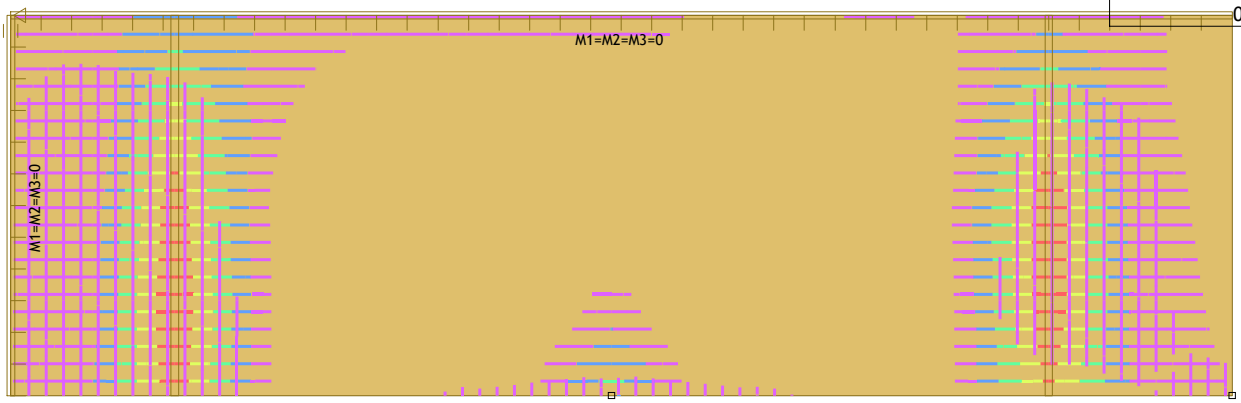
Aa - sp.cona [cm²/m]
0.00
1.13
2.25



Pogled: Streha
Aa - sp.cona - max Aa,s= 2.24 cm²/m

Merodajna obtežba: Kompletna shema
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=3.00 cm

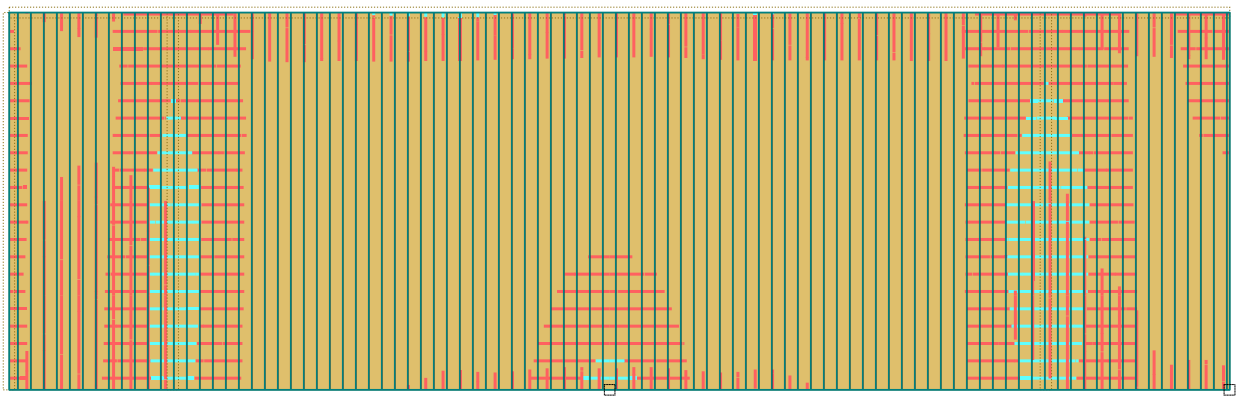
Aa - zg.cona [cm²/m]
-2.04
-1.63
-1.22
-0.82
-0.41
0.00



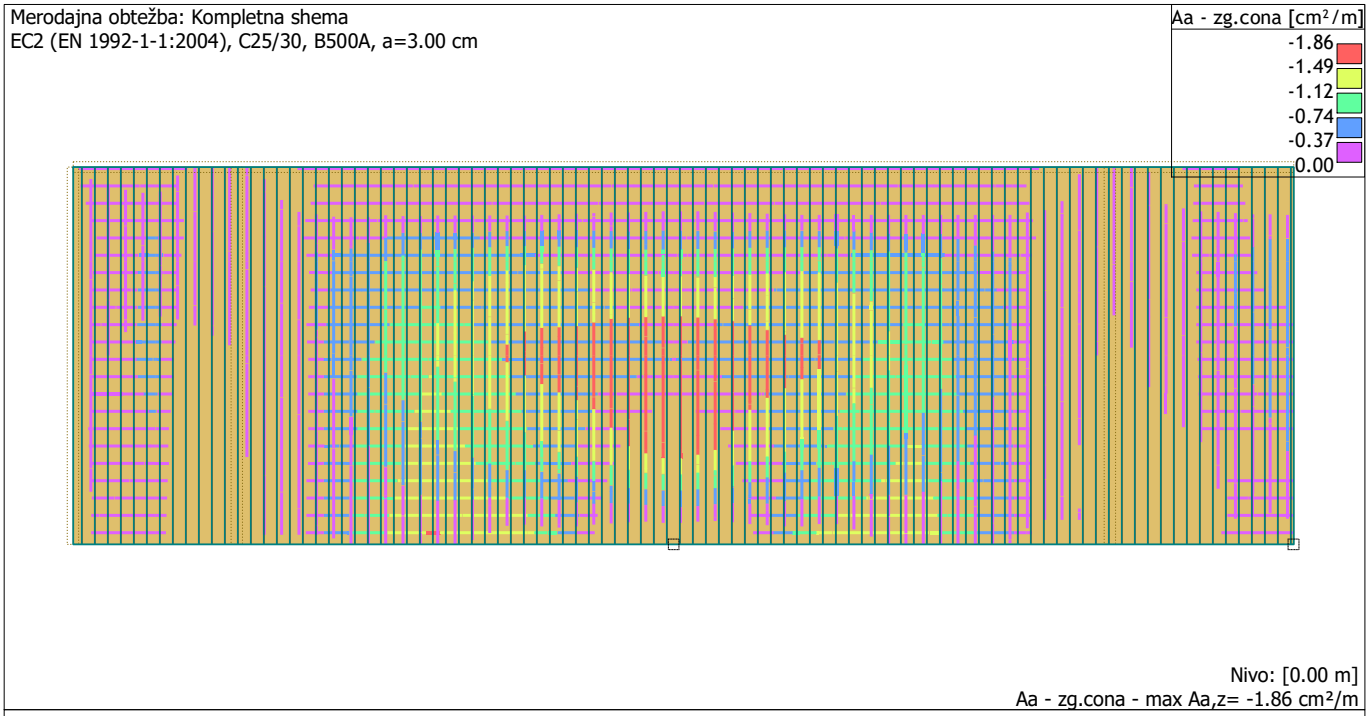
Pogled: Streha
Aa - zg.cona - max Aa,z= -2.03 cm²/m

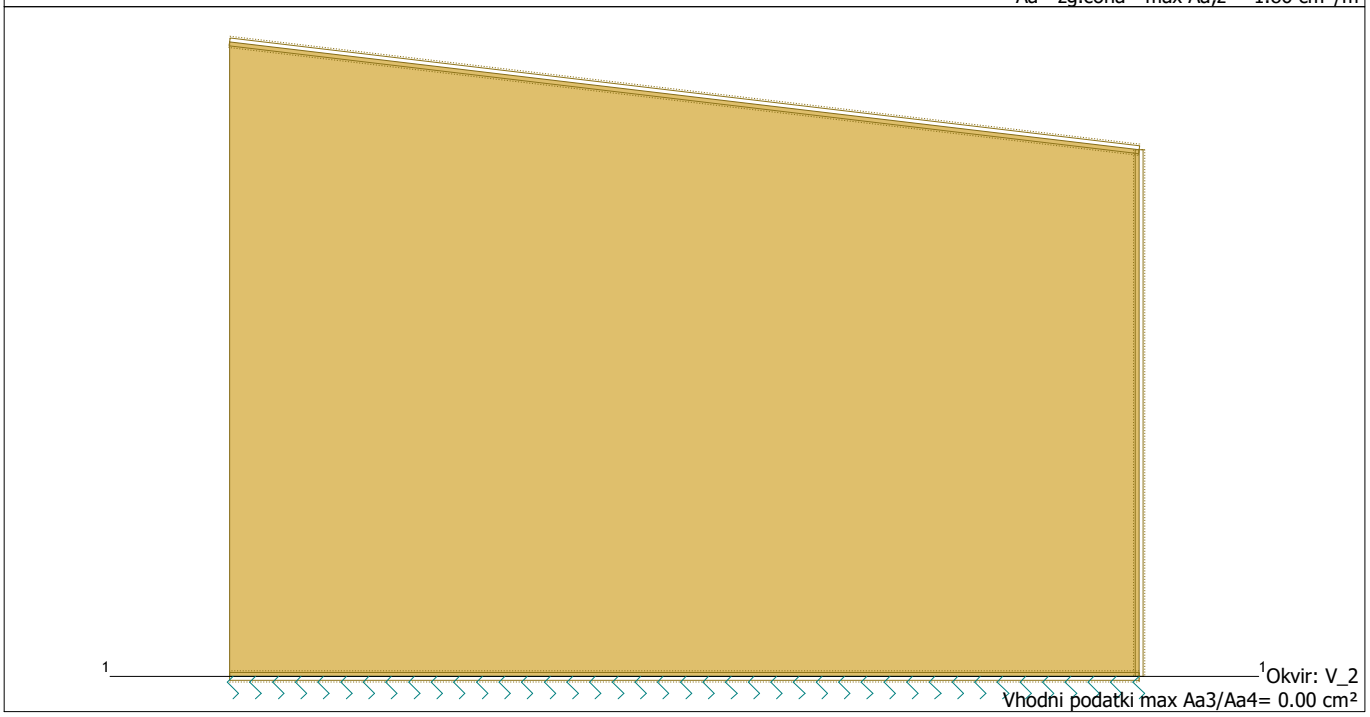
Merodajna obtežba: Kompletna shema
EC2 (EN 1992-1-1:2004), C25/30, B500A, a=3.00 cm

Aa - sp.cona [cm²/m]
0.00
1.03
2.05



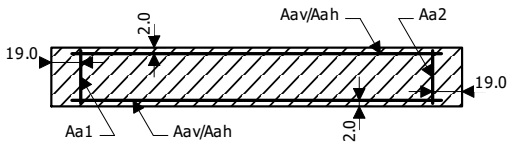
Nivo: [0.00 m]
Aa - sp.cona - max Aa,s= 2.04 cm²/m





Okvir: V_2

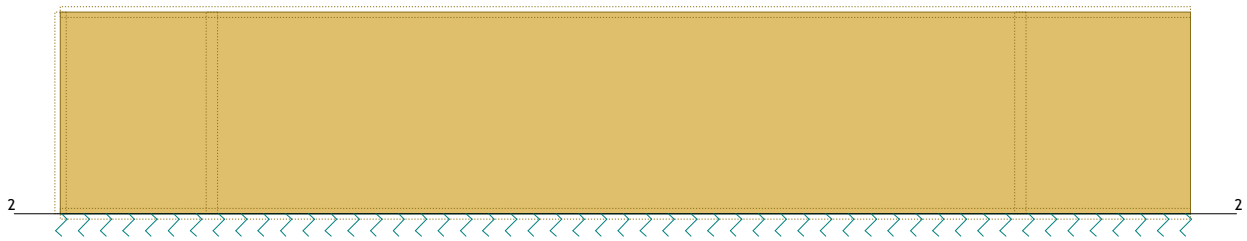
Prerez 1 - 1 (Z=0.00m)
EC2 (EN 1992-1-1:2004)
C25/30 (γC = 1.50, γS = 1.15) [SP]
Vogalna armatura B500C
Vzdolžna armatura B500C
Kompletna obtežna shema



b/d = 20/380 cm Ab = 7600 cm²

Merodajna kombinacija za upogib:
1.35xI+1.50xII+1.50xIII
Merodajna kombinacija za strig:
1.35xI+1.50xIII
Med = 41.24 kNm
Ned = -195.84 kN
Ved = -8.42 kN (Vrd,max = 2924.10 kN)

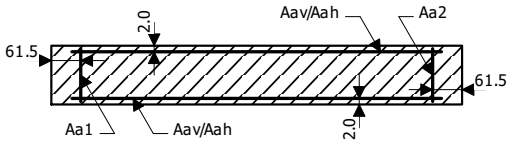
Aa1 = 0.00 cm² (min:11.40)
Aa2 = 0.00 cm² (min:11.40)
Aav = ±0.00 cm²/m (min:±1.50)
Aah = ±0.03 cm²/m (min:±2.00)



Okvir: H_1
Vhodni podatki max Aa3/Aa4= 0.00 cm²

Okvir: H_1

Prerez 1 - 1 (Z=0.00m)
EC2 (EN 1992-1-1:2004)
C25/30 (γC = 1.50, γS = 1.15) [SP]
Vogalna armatura B500C
Vzdolžna armatura B500C
Kompletna obtežna shema



b/d = 20/1230 cm Ab = 24600 cm²

Merodajna kombinacija za upogib:
1.35xI+1.50xII+1.50xIII
Merodajna kombinacija za strig:
1.35xI

Med =	31.30 kNm	
Ned =	-330.21 kN	
Ved =	4.98 kN	(Vrd,max = 9464.85 kN)
Aa1 =	0.00 cm²	(min:36.90)
Aa2 =	0.00 cm²	(min:36.90)
Aav =	±0.00 cm²/m	(min:±1.50)
Aah =	±0.01 cm²/m	(min:±2.00)

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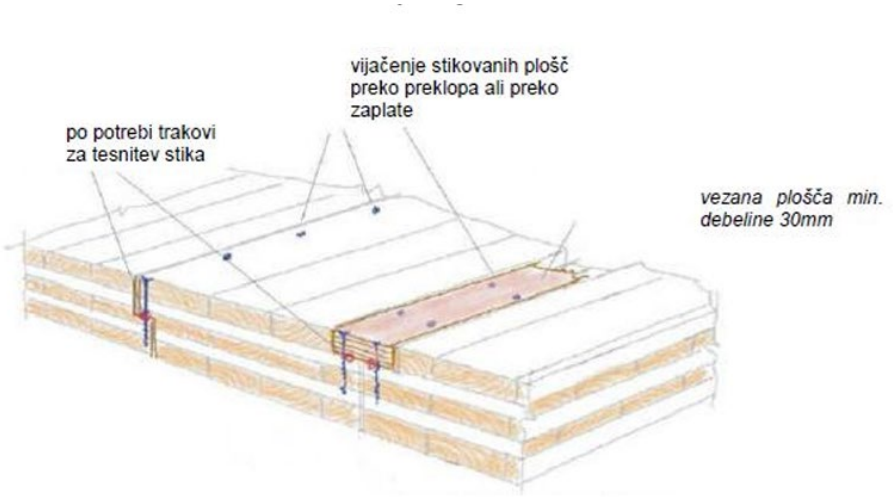
2.5.5. Analiza vmesnega lesenega dela POZ-900

- *Splošna navodila za gradnjo z CLT ploščami*

Vmesni del je izveden iz lesenih CLT plošč. Požarna odpornost R60.

- *Navodila za spajanje CLT plošč:*

1. Spoj medetažnih plošč med seboj:



Plošče se med seboj stikajo s čelnim stikom in so medsebojno križno vijačene z vijaki. Stropne plošče se med seboj povežejo tako, da se na stikih plošč naredi utor 30/100mm, v katerega se vstavi vezano ploščo debeline 30/200mm. Ki jo v obe strani zabijemo z rebrastimi žeblji (npr. rebrasti kompresorski žeblji z okroglo glave, vroče cinkani, tip SN91RK 90, premer stebla 3,1mm in dolžine 90mm), v rastru na 6cm.

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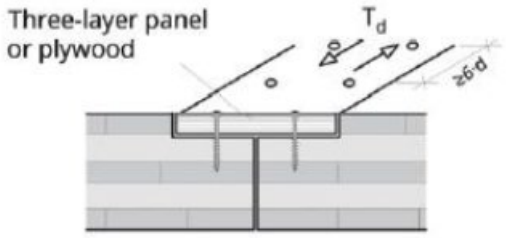
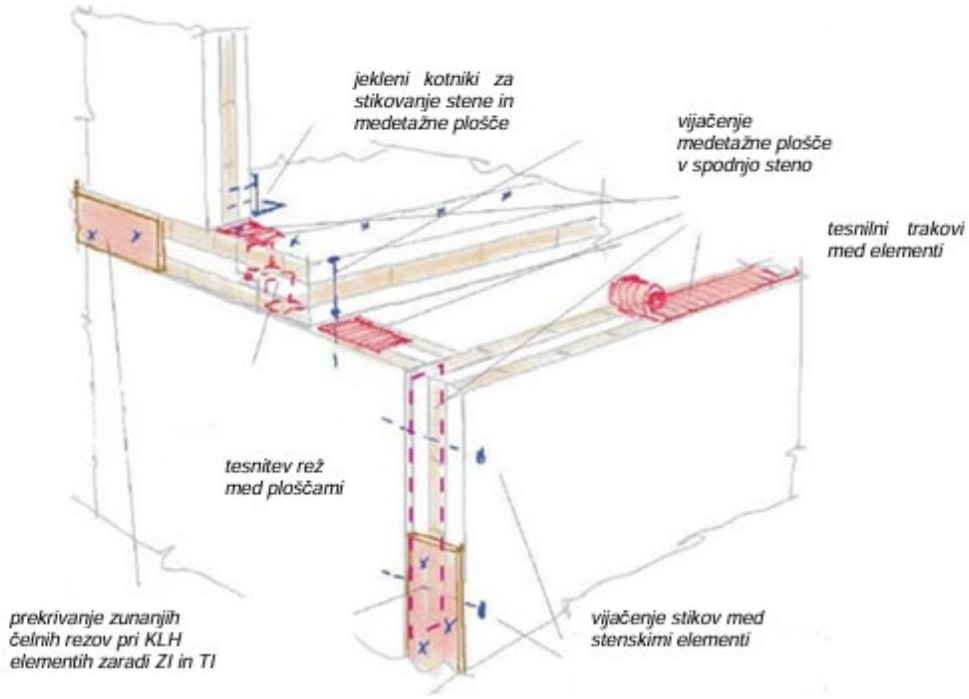


2. Spoj stene v vogalu in medetaže:



Spajanje vogala in medetaže uporaba HBS 12 x 320mm vijake na razmaku 15 cm.

Vzdolžno spajanje sten, kjer zaradi tehnološkega razloga ne mora bit stena iz enega kosa, se izvede z zasekom 100/100mm, zasek se medsebojno vijači z vijaki HBS 10 x 140 /10cm.

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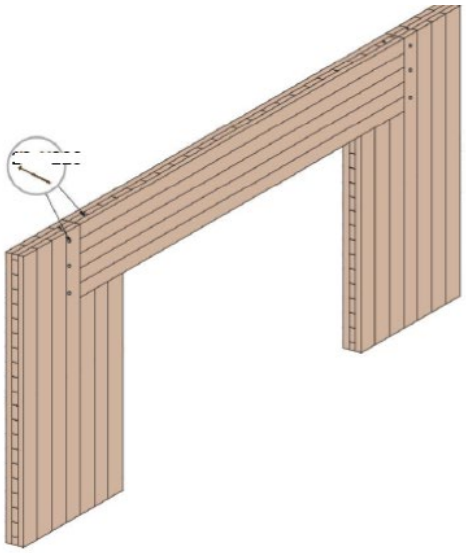
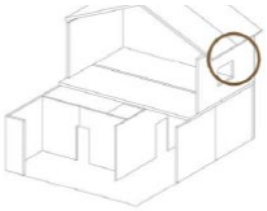
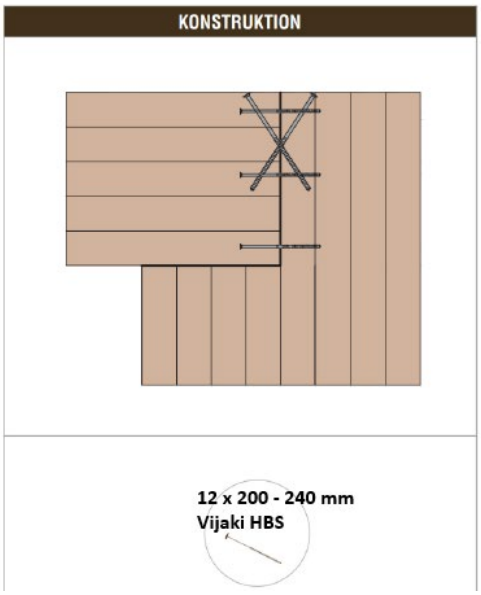
3. Spajanje preklad / nosilcev na steno









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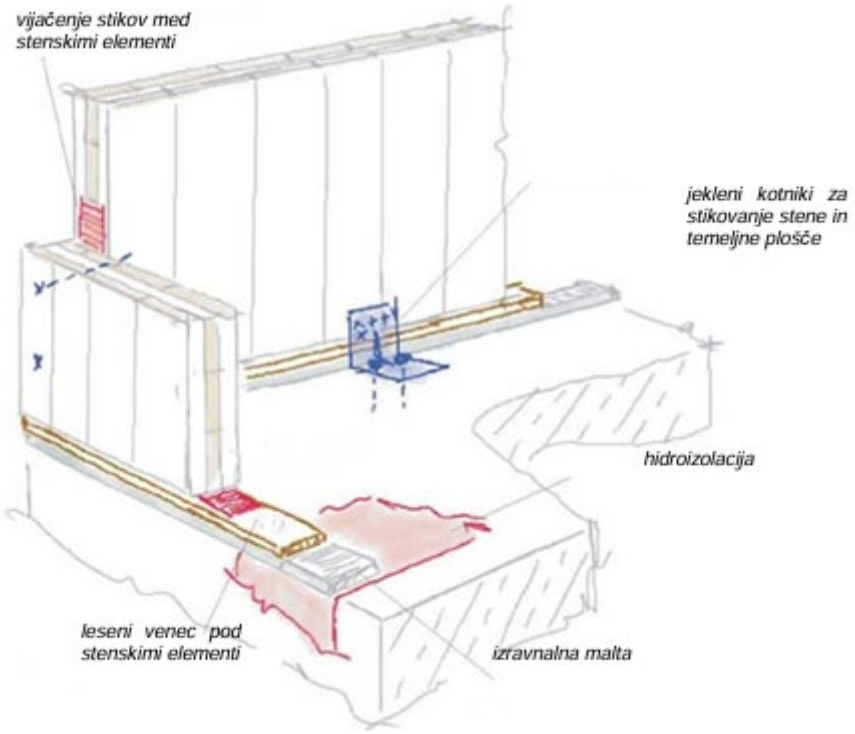
4. Strižno sidranje v AB Ploščo

ZA strižno sidranje CLT sten z AB ploščo se uporabi strižne kotnike TTS240, ki se jih v beton sidra skozi luknjo z EPO-PIX plus M16 x 160 (8.8.), v steno pa se kotnik polno vijači ali žeblja. Kotniki prikazani na grafični podlogi.

5. Natezno sidranje v AB ploščo

Na začetku in koncu vsake stene, na križanju in ob odprtinah, se ob vsakem stebru vgradi tipski kotnik za prenos nateznih napetosti WHT 440 – s WHTW 50 podložko, polno žeblja, sidranje z EPO-PIX plus M16 x 190 (8.8.)



6. Strižno sidranje sten c medetažne plošče

Za medsebojno strižno spajanje stropnih plošč in sten, se uporabijo kotniki TTS 240. Spojiti je treba spodnje stene s stropom, prav tako kot zgornje stene s tlemi.

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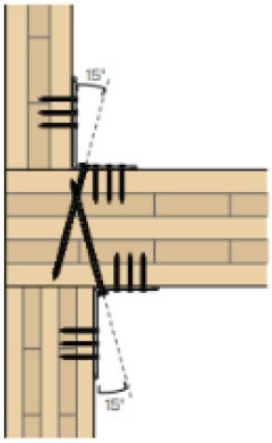

7. Natezno sidranje sten v medetažne lesene plošče

Na začetku na koncu vsake stene, križanju sten in ob odprtinah, se vgradijo tipski kotniki za prenos nateznih napetosti WHT 440 – s WHTW 50 podložko, polno žeblja, sidranje z M16 (8.8.) čez medetažno konstrukcijo. Kotnike WHT se namesti tako nad medetažno ploščo kot pod njo in se jih medsebojno poveže z navojno palico.

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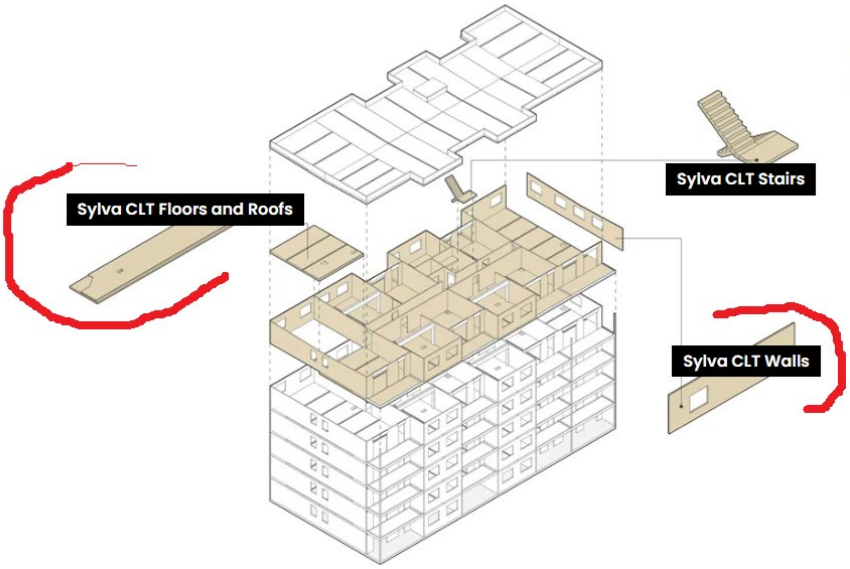
8. Uporabljen material



Thickness [mm]	Type [-]	Layers [-]	Variant [mm]						
			L	C	L	C	L	C	L
60	L3s	3	20	20	20				
70	L3s	3	20	30	20				
80	L3s	3	20	40	20				
90	L3s	3	30	30	30				
100	L3s	3	30	40	30				
110	L3s	3	40	30	40				
120	L3s	3	40	40	40				
100	L5s	5	20	20	20	20	20		
120	L5s	5	30	20	20	20	30		
120	L5s	5	30	20	20	20	30		
140	L5s	5	40	20	20	20	40		
150	L5s	5	40	20	30	20	40		
160	L5s	5	40	20	40	20	40		
160	L5s-2*	5	60	40	60				
180	L5s	5	40	30	40	30	40		
200	5Ls	5	40	40	40	40	40		
160	L5s-2*	5	60	40	60				
180	L7s	7	30	20	30	20	30	20	30
180	L7s	7	30	20	30	20	30	20	30
200	L7s	7	20	40	20	40	20	40	20
240	L7s	7	30	40	30	40	30	40	30

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Prikaz tipov CLT plošč

Mechanical properties according to European Technical Assessment ETA-12/0281

Out-of-plane loading			Strength classes CL26E11.8	CL36E14.7
Modulus of elasticity	parallel to the boards' grain direction	$E_{0,mean}$	11,800 N/mm²	14,700 N/mm²
Modulus of elasticity	Perpendicular to the boards' grain direction	$E_{90,mean}$	370 N/mm²	
Modulus of shear	parallel to the boards' grain direction	$G_{090,mean}$	690 N/mm²	
Rolling shear modulus	Perpendicular to the boards' grain direction	$G_{9090,mean}$	50 N/mm²	
Bending strength	parallel to the boards' grain direction	$f_{m,k}$	26.40 N/mm²	36 N/mm²
Tensile strength	Perpendicular to the boards' grain direction	$f_{t,90,k}$	0.12 N/mm²	
Compressive strength	Perpendicular to the boards' grain direction	$f_{c,90,k}$	2.50 N/mm²	
Shear strength	parallel to the boards' grain direction	$f_{v,090,k}$	4.00 N/mm²	
Rolling shear strength		$f_{v,k}$	1.50 N/mm²	
In-plane loading				
Modulus of elasticity	parallel to the boards' grain direction	$E_{0,mean}$	11,600 N/mm²	14,700 N/mm²
Modulus of shear	parallel to the boards' grain direction	$G_{090,mean}$	250 N/mm²	
Bending strength	parallel to the boards' grain direction	$f_{m,k}$	24.00 N/mm²	34.50 N/mm²
Tensile strength	parallel to the boards' grain direction	$f_{t,90,k}$	14.00 N/mm²	19.50 N/mm²
Compressive strength	parallel to the boards' grain direction	$f_{c,90,k}$	21.00 N/mm²	24.50 N/mm²
Shear strength	parallel to the boards' grain direction	$f_{v,090,k}$	4.0 N/mm²	
Density				
Characteristic density		ρ_k	385 kg/m³	430 kg/m³
Mean density		ρ_{mean}	420 kg/m³	480 kg/m³

The above-stated mechanical properties are identical to the ones declared in ETA-12/0281.

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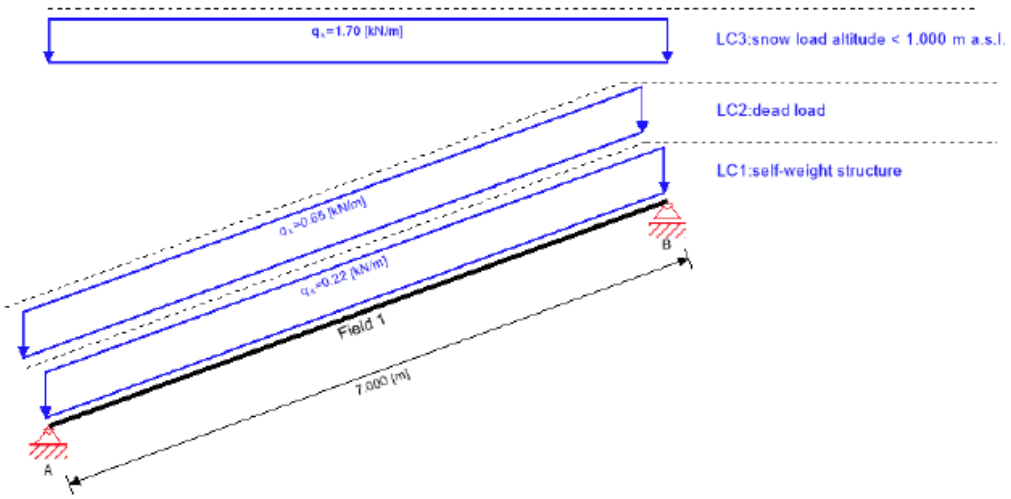
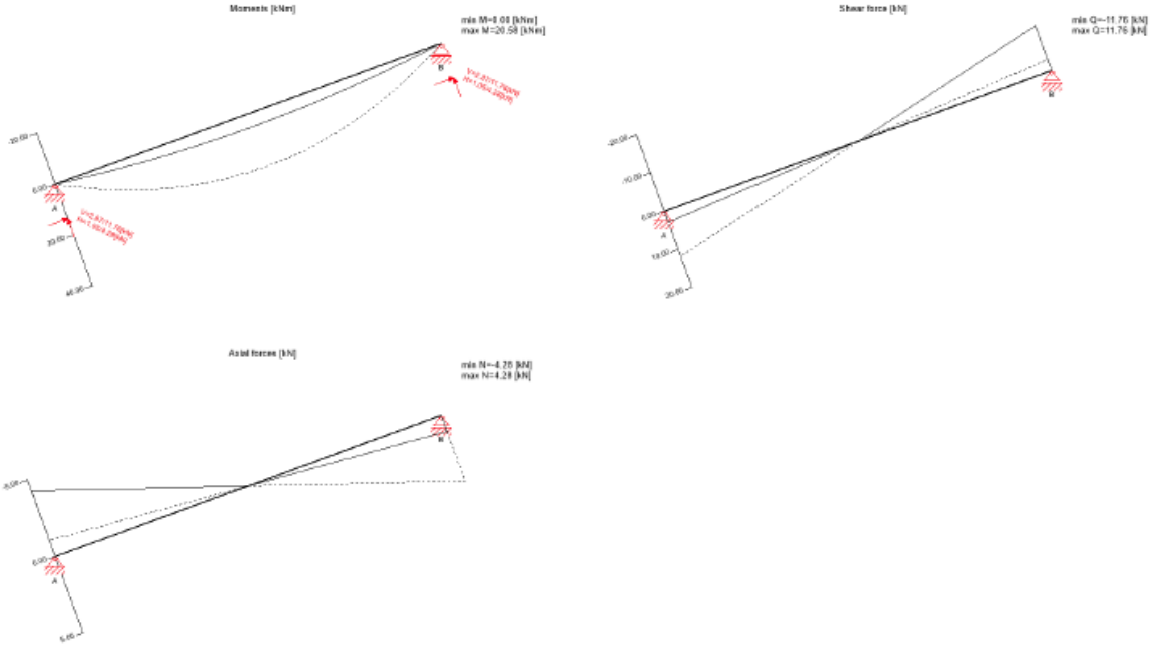
2.5.5.1. Analiza strešne konstrukcije špirovec nad nadstropjem POZ-901 dim 16/28cm (GL24)

System



Section: Wooden beam 16/28; **Material**: GL 24h; **Service class**: service class 1; **Fire resistance class**: R 0

Utilization 93 %



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Flexural stress analysis						53%
$M_{y,d}$ =	20.58	kNm	$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm	$f_{m,k,z}$ =	24.00	N/mm²	
$N_{t,d}$ =	0.00	kN	$f_{t,0,k}$ =	19.20	N/mm²	
$\sigma_{t,d}$ =	0.00	N/mm²	$f_{t,0,d}$ =	13.82	N/mm²	
$\sigma_{m,y,d}$ =	9.85	N/mm²	$f_{m,y,d}$ =	18.65	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm² <	$f_{m,z,d}$ =	19.01	N/mm²	✓

Shear stress analysis						20%
V_d =	10.82	kN	$f_{v,k}$ =	2.50	N/mm²	
$\tau_{v,d}$ =	0.36	N/mm² <	$f_{v,d}$ =	1.80	N/mm²	✓

Lateral torsional buckling analysis						53%
$M_{y,d}$ =	20.58	kNm	$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm				
$N_{c,d}$ =	0.00	kN	$f_{c,0,k}$ =	24.00	N/mm²	
$\sigma_{c,d}$ =	0.00	N/mm²	$f_{c,0,d}$ =	17.28	N/mm²	
$\sigma_{m,y,d}$ =	9.85	N/mm²	$f_{m,y,d}$ =	18.65	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm² <	$f_{m,z,d}$ =	19.01	N/mm²	✓

Buckling analysis						53%
$M_{y,d}$ =	20.58	kNm	$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm				
$N_{c,d}$ =	0.00	kN	$f_{c,0,k}$ =	24.00	N/mm²	
$\sigma_{c,d}$ =	0.00	N/mm²	$f_{c,0,d}$ =	17.28	N/mm²	
$\sigma_{m,y,d}$ =	9.85	N/mm²	$f_{m,y,d}$ =	18.65	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm² <	$f_{m,z,d}$ =	19.01	N/mm²	✓

w_{inst} = w[char]					92%
Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.6	L/300	23.3	21.6	92%

w_{fin} = w[char] + w[q.p.]*kdef					93%
Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.6	L/250	28.0	26.1	93%

$w_{net,fin}$ = w[q.p.] + w[q.p.]*kdef					52%
Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.6	L/300	23.3	12.2	52%

Support reaction

Load case category	k_{mod}	A_V	A_H	B_V	B_H
			[kN]		
self-weight structure	0.6	0.78	0.00	0.78	0.00
		0.78	0.00	0.78	0.00
dead load	0.6	2.27	0.00	2.27	0.00
		2.27	0.00	2.27	0.00
snow load altitude < 1.000 m a.s.l.	0.9	5.59	0.00	5.59	0.00
		0.00	0.00	0.00	0.00

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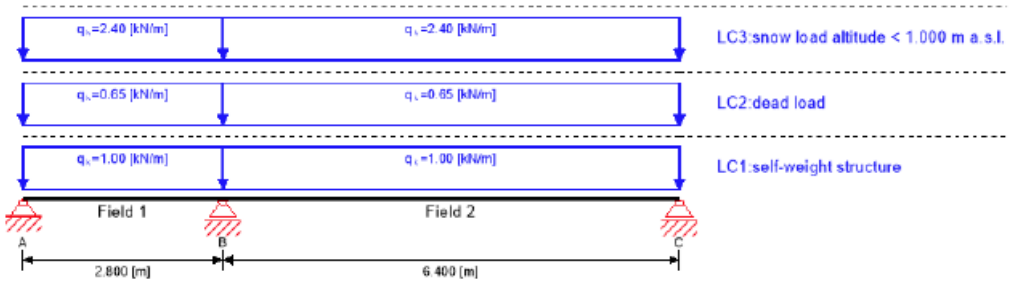
2.5.5.2. Analiza strešne konstrukcije stropa nad nadstropjem POZ-902 CLT 20 L5 (C24)

System

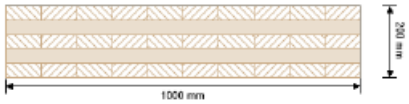


Global utilization ratio 50%

ULS	21%	ULS Fire	9%	SLS	50%	Vibration	0%	Support	-1%

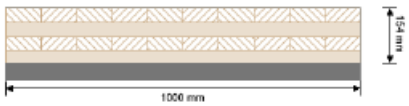
Product data

Section: CLT 200 L5s



Layer	Thickness	Orientation	Material
1	40.0 mm	0°	C24 spruce ETA (2022)
2	40.0 mm	90°	C24 spruce ETA (2022)
3	40.0 mm	0°	C24 spruce ETA (2022)
4	40.0 mm	90°	C24 spruce ETA (2022)
5	40.0 mm	0°	C24 spruce ETA (2022)
t_{CLT}	**200.0 mm**		

Section Fire: CLT 200 L5s



Layer	Thickness	Orientation	Material
1	40.0 mm	0°	C24 spruce ETA (2022)
2	40.0 mm	90°	C24 spruce ETA (2022)
3	40.0 mm	0°	C24 spruce ETA (2022)
4	34.0 mm	90°	C24 spruce ETA (2022)
t_{CLT}	**154.0 mm**		
Time	**60 min**		

Fire resistance class: R 60

Section Fire: CLT 200 L5s

Fire protection layering:
no additional fire protection

k_0	d_0	$d_{char,0,n}$	$d_{ef,n}$	$d_{char,0,v}$	$d_{ef,v}$
[-]	[mm]	[mm]	[mm]	[mm]	[mm]
1	7	39.0	46.0	0.0	0.0

Material values

Material	$f_{m,k}$ [N/mm²]	$f_{t,0,k}$ [N/mm²]	$f_{t,90,k}$ [N/mm²]	$f_{c,0,k}$ [N/mm²]	$f_{c,90,k}$ [N/mm²]	$f_{v,k}$ [N/mm²]	$f_{r,k\ min}$ [N/mm²]	$E_{0,mean}$ [N/mm²]	G_{mean} [N/mm²]	$G_{r,mean}$ [N/mm²]
C24 spruce ETA (2022)	24.00	14.00	0.12	21.00	2.50	4.00	1.25	12,000.00	690.00	50.00

Load

Load case groups

	Load case category	Type	Duration	Kmod	γ_{inf}	γ_{sup}	Ψ_0	Ψ_1	Ψ_2
LC1	self-weight structure	G	permanent	0.6	1	1.35	1	1	1
LC2	dead load	G	permanent	0.6	1	1.35	1	1	1
LC3	snow load altitude < 1.000 m a.s.l.	Q	short term	0.9	0	1.5	0.5	0.2	0

LC1:self-weight structure

continuous load

Field	Load at start [kN/m]
1	1.00
2	1.00

LC2:dead load

continuous load

Field	Load at start [kN/m]
1	0.65

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continuous load	
Field	Load at start [kN/m]
2	0.65

LC3:snow load altitude < 1.000 m a.s.l.

continuous load	
Field	Load at start [kN/m]
1	2.40
2	2.40

ULS Combinations	
	Combination rule
LCO1	1.35/1.00 * LC1 + 1.35/1.00 * LC2
LCO2	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC3

ULS Combinations Fire	
	Combination rule
LCO3	1.00/1.00 * LC1 + 1.00/1.00 * LC2
LCO4	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.00 * LC3

SLS Characteristic Combination	
	Combination rule
LCO5	1.00/1.00 * LC1 + 1.00/1.00 * LC2
LCO6	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * LC3

SLS Quasi-permanent Combination	
	Combination rule
LCO7	1.00/1.00 * LC1 + 1.00/1.00 * LC2
LCO8	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.00 * LC3

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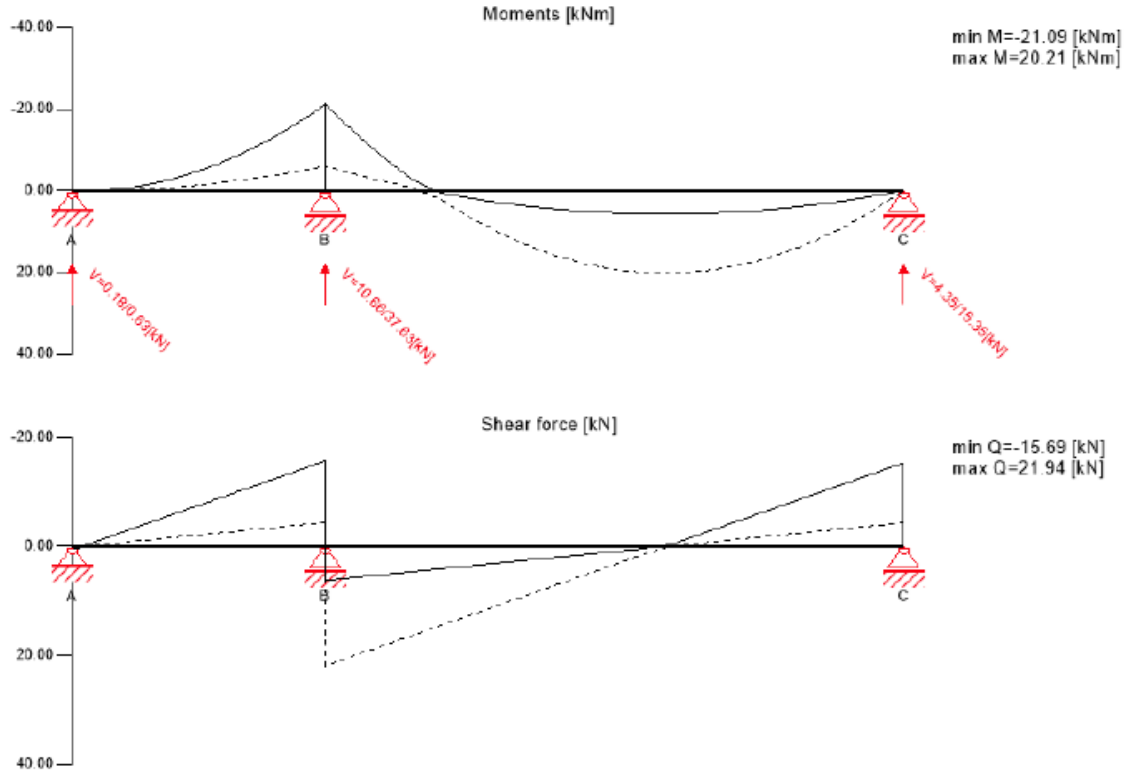
Ultimate limit state (ULS) - design results



ULS Flexural design

Field	Dist.	$f_{m,k}$	γ_m	k_{mod}	$k_{sys,y}$	$f_{m,y,d}$	$M_{y,d}$	$\sigma_{m,y,d}$	Ratio	
	[m]	[N/mm²]	[-]	[-]	[-]	[N/mm²]	[kNm]	[N/mm²]		
1	2.8	24.00	1.25	0.90	1.10	19.01	-21.09	3.99	21%	LCO2
2	0.0	24.00	1.25	0.90	1.10	19.01	-21.09	3.99	21%	LCO2

ULS Shear analysis

Field	Dist.	$f_{v,k}$	γ_m	k_{mod}	$f_{v,d}$	V_d	$\tau_{v,d}$	Ratio	
	[m]	[N/mm²]	[-]	[-]	[N/mm²]	[kN]	[N/mm²]		
1	2.8	4.00	1.25	0.90	2.88	-15.69	0.10	4%	LCO2
2	0.0	4.00	1.25	0.90	2.88	21.94	0.14	5%	LCO2

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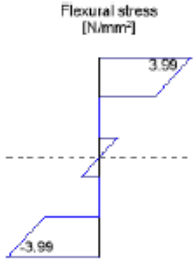
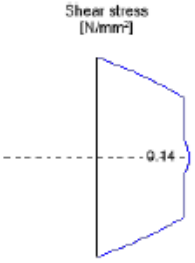
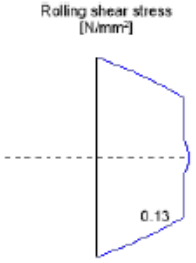
ULS Rolling shear

Field	Dist.	$f_{r,k}$	γ_m	k_{mod}	$f_{r,d}$	V_d	$\tau_{r,d}$	Ratio	
	[m]	[N/mm²]	[-]	[-]	[N/mm²]	[kN]	[N/mm²]		
1	2.8	1.05	1.25	0.90	0.76	-15.69	0.10	13%	LCO2
2	0.0	1.05	1.25	0.90	0.76	21.94	0.13	18%	LCO2

Stress diagram







Flexural stress analysis

$M_{y,d}$ =	-21.09	kNm	$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm	$f_{m,k,z}$ =	24.00	N/mm²	
$N_{t,d}$ =	0.00	kN	γ_m =	1.25	-	
			k_{mod} =	0.90	-	
			$k_{sys,y}$ =	1.10	-	
			$k_{h,m,y}$ =	1.00	-	
			$k_{h,m,z}$ =	1.00	-	
			k_l =	1.00	-	
$\sigma_{t,d}$ =	0.00	N/mm²	$f_{t,0,d}$ =	10.08	N/mm²	
$\sigma_{m,y,d}$ =	3.99	N/mm²	$f_{m,y,d}$ =	19.01	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm² <	$f_{m,z,d}$ =	0.00	N/mm² ✓	

Utilization ratio 21%

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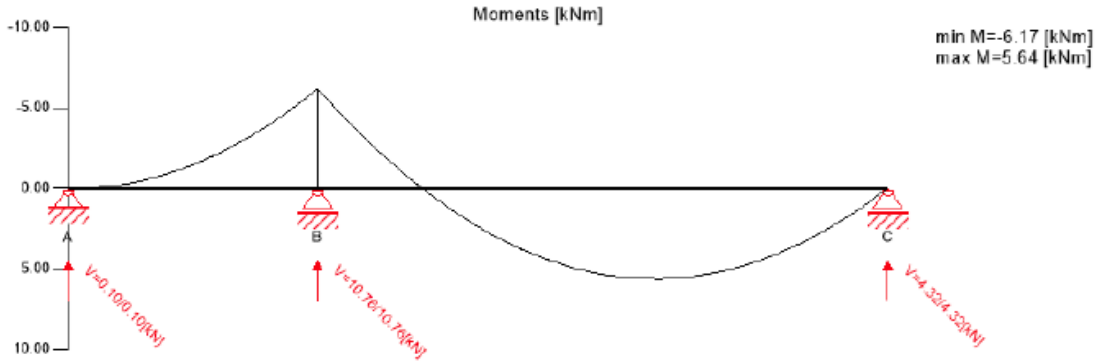
Shear stress analysis							
V_d =	21.94	kN		$f_{v,k}$ =	4.00	N/mm²	
				γ_m =	1.25	-	
				k_{mod} =	0.90	-	
				$k_{h,v}$ =	0.00	-	
$\tau_{v,d}$ =	0.14	N/mm²	<	$f_{v,d}$ =	2.88	N/mm²	✓
Utilization ratio							5%

Rolling shear analysis							
V_d =	21.94	kN		$f_{r,k}$ =	1.05	N/mm²	
				γ_m =	1.25	-	
				k_{mod} =	0.90	-	
$\tau_{r,d}$ =	0.13	N/mm²	<	$f_{r,d}$ =	0.76	N/mm²	✓
Utilization ratio							18%

Ultimate limit state (ULS) fire design - results



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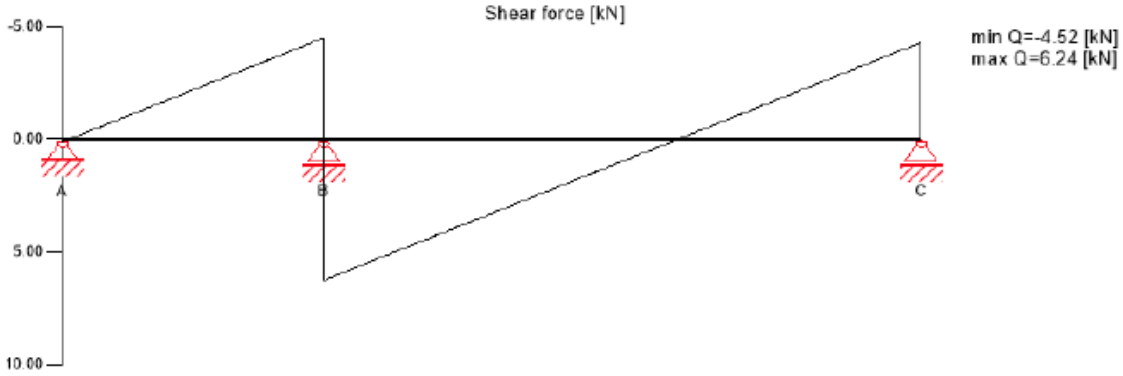
Ultimate limit state (ULS) fire design - results



ULS Fire Flexural design

Field	Dist.	$f_{m,k}$	γ_m	k_{mod}	$k_{sys,y}$	k_fi	$f_{m,y,d}$	$M_{y,d}$	$\sigma_{m,y,d}$	Ratio	
	[m]	[N/mm²]	[-]	[-]	[-]	[-]	[N/mm²]	[kNm]	[N/mm²]		
1	2.8	24.00	1.00	1.00	1.10	1.15	30.36	-6.17	2.67	9%	LCO3
2	0.0	24.00	1.00	1.00	1.10	1.15	30.36	-6.17	2.67	9%	LCO3

ULS Fire Shear analysis

Field	Dist.	$f_{v,k}$	γ_m	k_{mod}	k_fi	$f_{v,d}$	V_d	$\tau_{v,d}$	Ratio	
	[m]	[N/mm²]	[-]	[-]	[-]	[N/mm²]	[kN]	[N/mm²]		
1	2.8	4.00	1.00	1.00	1.15	4.60	-4.52	0.05	1%	LCO3
2	0.0	4.00	1.00	1.00	1.15	4.60	6.24	0.07	2%	LCO3

ULS Fire Rolling shear

Field	Dist.	$f_{r,k}$	γ_m	k_{mod}	k_fi	$f_{r,d}$	V_d	$\tau_{r,d}$	Ratio	
	[m]	[N/mm²]	[-]	[-]	[-]	[N/mm²]	[kN]	[N/mm²]		
1	2.8	1.05	1.00	1.00	1.15	1.21	-4.52	0.05	4%	LCO3
2	0.0	1.05	1.00	1.00	1.15	1.21	6.24	0.07	6%	LCO3

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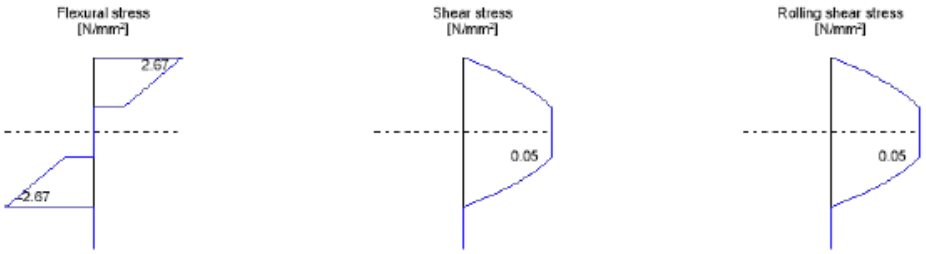
Stress diagram



Flexural stress analysis Fire

$M_{y,d}$ =	-6.17	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm		$f_{m,k,z}$ =	24.00	N/mm²	
$N_{t,d}$ =	0.00	kN		γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				$k_{sys,y}$ =	1.10	-	
				$k_{h,m,y}$ =	1.00	-	
				$k_{h,m,z}$ =	1.00	-	
				k_i =	1.00	-	
				k_e =	1.15	-	
$\sigma_{t,d}$ =	0.00	N/mm²		$f_{t,0,d}$ =	16.10	N/mm²	
$\sigma_{m,y,d}$ =	2.67	N/mm²		$f_{m,y,d}$ =	30.36	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	0.00	N/mm²	✓

Utilization ratio 9%

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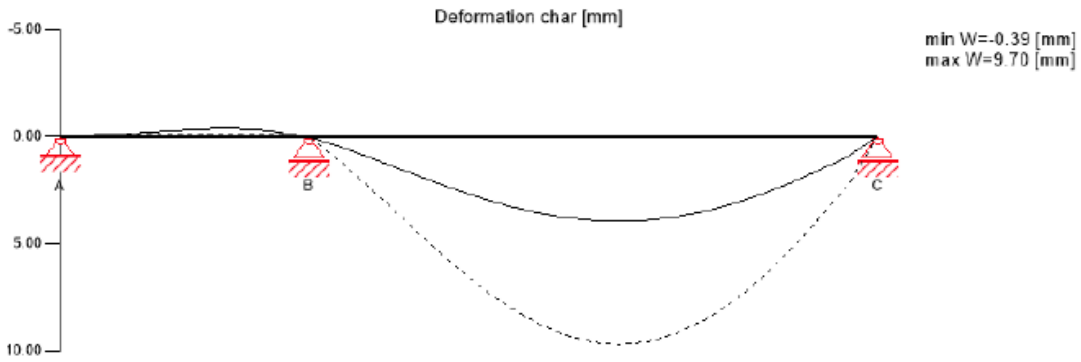
Shear stress analysis Fire							
V_d =	6.24	kN		$f_{v,k}$ =	4.00	N/mm²	
				γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				$k_{h,v}$ =	0.00	-	
				k_e =	1.15	-	
$\tau_{v,d}$ =	0.07	N/mm²	<	$f_{v,d}$ =	4.60	N/mm²	✓
Utilization ratio							**2%**

Rolling shear analysis Fire							
V_d =	6.24	kN		$f_{r,k}$ =	1.05	N/mm²	
				γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				k_e =	1.15	-	
$\tau_{r,d}$ =	0.07	N/mm²	<	$f_{r,d}$ =	1.21	N/mm²	✓
Utilization ratio							**6%**

Service limit state design (SLS) - design results



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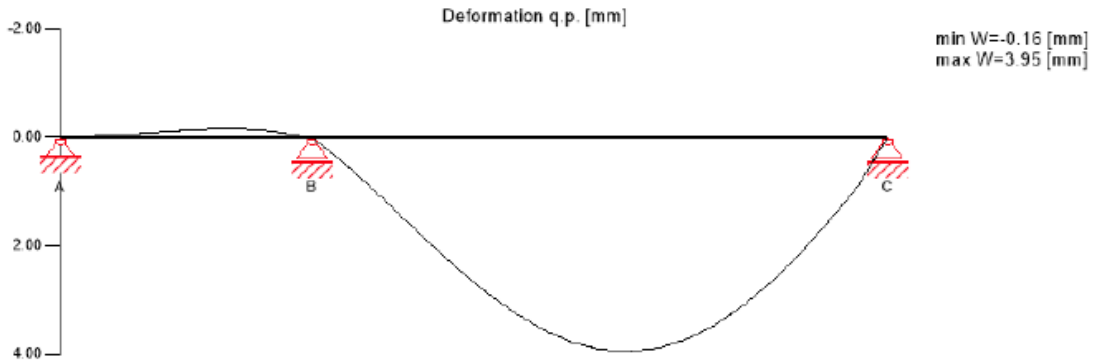
Service limit state design (SLS) - design results



w_{inst} = w[char]

Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.8	L/300	9.3	0.0	0%
2	0.8	L/300	21.3	9.7	45%

w_{fin} = w[char] + w[q.p.]*kdef

Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.8	L/250	11.2	0.0	0%
2	0.8	L/250	25.6	12.9	50%

$w_{net,fin}$ = w[q.p.] + w[q.p.]*kdef

Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.8	L/300	9.3	0.0	0%
2	0.8	L/300	21.3	7.1	33%

Support reaction

Load case category	k_{mod}	A_V	B_V	C_V
			[kN]	
self-weight structure	0.6	0.11	6.46	2.63

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Support reaction				
Load case category	k_{mod}	A_V	B_V	C_V
			[kN]	
		0.11	6.46	2.63
dead load	0.6	0.07	4.20	1.71
		0.07	4.20	1.71
snow load altitude < 1.000 m a.s.l.	0.9	0.26	15.50	6.32
		0.00	0.00	0.00

Reference documents for this analysis	
English title	Description
EN 338	EN 338 - Structural timber ? Strength classes
EN 1995-1-1	EN 1995-1-1 - Eurocode 5: Design of timber structures - Part 1-1: General - Common rules and rules for buildings
ETA-14/0349	European Technical Assessment ETA-14/0349
Expertise Rolling shear - no edge gluing, H.J. Blass	Expertise on Rolling shear for CLT
EN 1995-1-2	EN 1995-1-2 - Eurocode 5 — Design of timber structures — Part 1-2: General — Structural fire design
Technical expertise 122/2011/02: analysis of load bearing capacity and separation performance of CLT elements	Verification of the load bearing capacity and the insulation criterion of CLT structures with Stora Enso CLT
Technical expertise 2434/2012 - BB: failure time tf of gypsum fire boards (GKF) according to ON B 3410	Expertise on failure time tf of gypsum wall fire boards according to ON B3410 and gypsum wall boards type DF according to EN 520
EN 1990	EN 1990 - Eurocode ? Basis of structural design
ÖNorm B 1995-1-1 NA	ÖNORM EN 1995-1-1 - Austria - National Annex – Nationally determined parameters – Eurocode 5: Design of timber structures – Part 1-1: General-Common rules and rules for buildings
ÖNorm B 1995-1-2 NA	ÖNORM EN 1995-1-2 - Austria - National Annex - Eurocode 5: Design of timber structures ? Part 1-2: General ? Structural fire design ? National specifications concerning ÖNORM EN 1995-1-2, national comments and national supplements
Fire safety in timber buildings - technical guildeline for Europe	Fire safety in timber buildings - technical guideline for Europe; publishes by SP Technical Research Institute of Sweden
National specifications concerning ÖNORM EN 1995-1-2, national comments and national supplements, chapter 12	ÖNORM EN 1995-1-2 - National specifications concerning ÖNORM EN 1995-1-2, national comments and national supplements, chapter 12
Expertise Rolling shear, H.J. Blass	Expertise on rolling shear strength and rolling shear modulus of CLT panels

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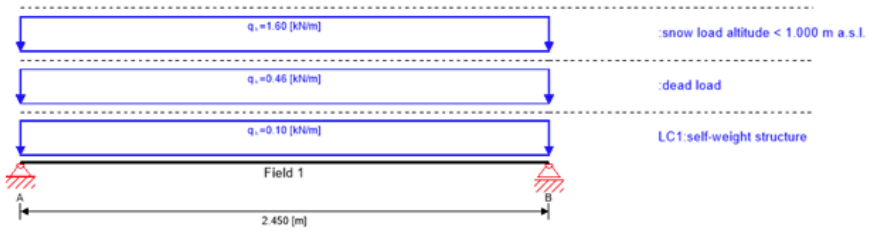
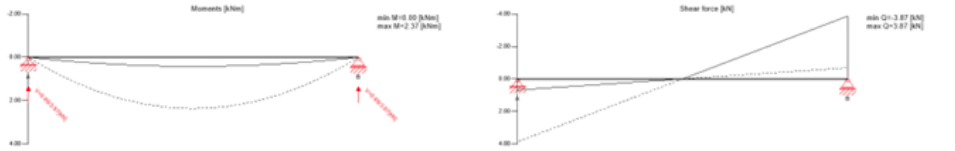
2.5.5.3. Analiza strešne konstrukcije stropa nad nadstropjem – dela nad stopniščem POZ-903 dim 10/20cm (C24)

System



Section: Wooden beam 10/20; **Material**: C24 spruce; **Service class**: service class 1; **Fire resistance class**: R 0

Utilization 21 %



Flexural stress analysis							21%
$M_{y,d}$ =	2.37	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm		$f_{m,k,z}$ =	24.00	N/mm²	
$N_{t,d}$ =	0.00	kN		$f_{t,0,k}$ =	14.00	N/mm²	
$\sigma_{t,d}$ =	0.00	N/mm²		$f_{t,0,d}$ =	9.69	N/mm²	
$\sigma_{m,y,d}$ =	3.55	N/mm²		$f_{m,y,d}$ =	16.62	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	18.02	N/mm²	✓

Shear stress analysis							15%
V_d =	3.23	kN		$f_{v,k}$ =	2.30	N/mm²	
$\tau_{v,d}$ =	0.24	N/mm²	<	$f_{v,d}$ =	1.59	N/mm²	✓

Lateral torsional buckling analysis							21%
$M_{y,d}$ =	2.37	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm					
$N_{c,d}$ =	0.00	kN		$f_{c,0,k}$ =	21.00	N/mm²	
$\sigma_{c,d}$ =	0.00	N/mm²		$f_{c,0,d}$ =	14.54	N/mm²	
$\sigma_{m,y,d}$ =	3.55	N/mm²		$f_{m,y,d}$ =	16.62	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	18.02	N/mm²	✓

Buckling analysis							21%
$M_{y,d}$ =	2.37	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm					
$N_{c,d}$ =	0.00	kN		$f_{c,0,k}$ =	21.00	N/mm²	
$\sigma_{c,d}$ =	0.00	N/mm²		$f_{c,0,d}$ =	14.54	N/mm²	
$\sigma_{m,y,d}$ =	3.55	N/mm²		$f_{m,y,d}$ =	16.62	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	18.02	N/mm²	✓

w_{inst} = w[char] 17%

Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.6	L/300	8.2	1.4	17%

w_{fin} = w[char] + w[q.p.]*kdef 16%

Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.6	L/250	9.8	1.6	16%

$w_{net,fin}$ = w[q.p.] + w[q.p.]*kdef 7%

Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.6	L/300	8.2	0.6	7%

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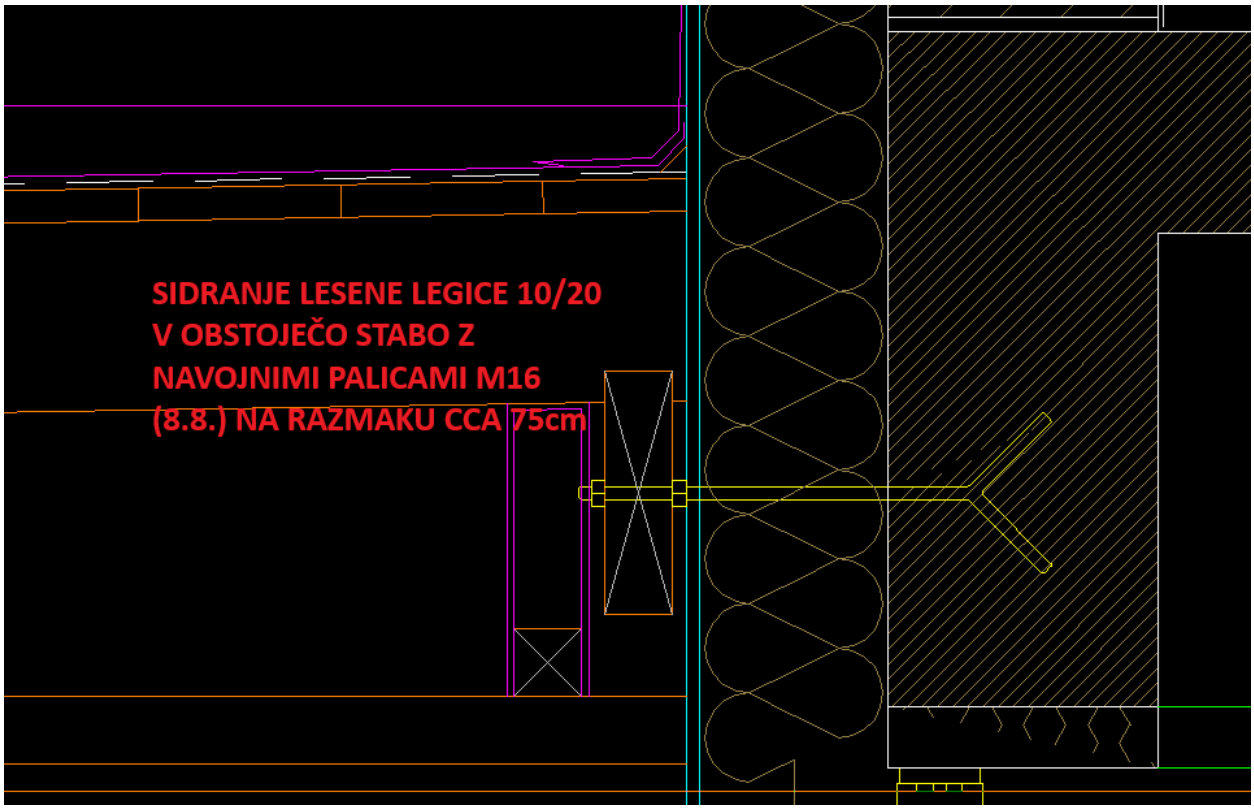
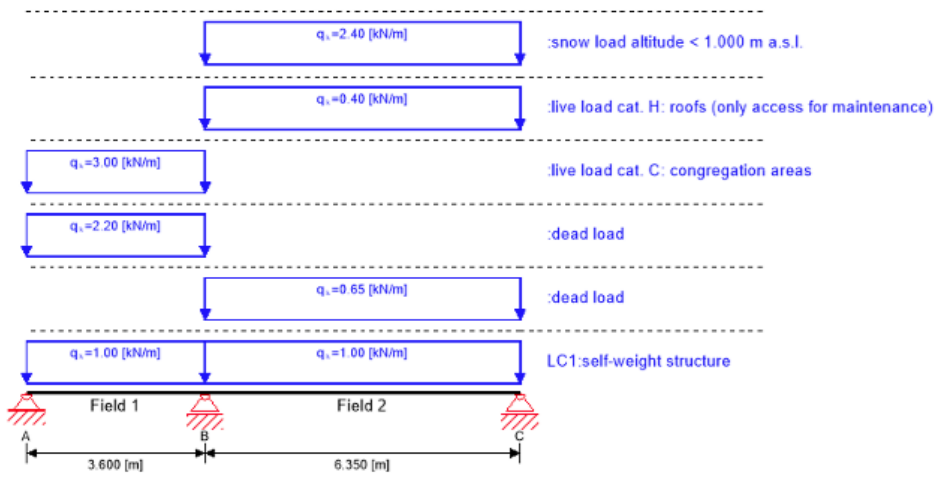
Sidranje stropnikov ravne strehe v obstoječo stavbo.



Princip sidranja – lega, ki se sidra v obstoječo se vgradi v naklonu

2.5.5.4. Analiza strešne/stropne konstrukcije stropa nad pritličjem POZ-904 CLT 20 L5 (C24)

System

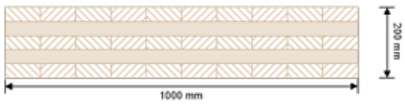


Global utilization ratio 48%

ULS	22%	ULS Fire	11%	SLS	48%	Vibration	0%	Support	-1%

Product data

Section: CLT 200 L5s



Layer	Thickness	Orientation	Material
1	40.0 mm	0°	C24 spruce ETA (2022)
2	40.0 mm	90°	C24 spruce ETA (2022)
3	40.0 mm	0°	C24 spruce ETA (2022)
4	40.0 mm	90°	C24 spruce ETA (2022)
5	40.0 mm	0°	C24 spruce ETA (2022)
t_{CLT}	**200.0 mm**		

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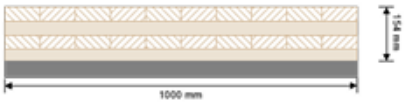
Section Fire: CLT 200 L5s



Layer	Thickness	Orientation	Material
1	40.0 mm	0°	C24 spruce ETA (2022)
2	40.0 mm	90°	C24 spruce ETA (2022)
3	40.0 mm	0°	C24 spruce ETA (2022)
4	34.0 mm	90°	C24 spruce ETA (2022)
t_{CLT}	**154.0 mm**		

Fire resistance class: R 60

Time **60 min**

Fire protection layering:
no additional fire protection

k_0	d_0	$d_{char,0,h}$	$d_{af,h}$	$d_{char,0,v}$	$d_{af,v}$
[-]	[mm]	[mm]	[mm]	[mm]	[mm]
1	7	39.0	46.0	0.0	0.0

Material values

Material	$f_{m,k}$	$f_{t,0,k}$	$f_{t,90,k}$	$f_{c,0,k}$	$f_{c,90,k}$	$f_{v,k}$	$f_{r,k\,min}$	$E_{0,mean}$	G_{mean}	$G_{r,mean}$
	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
C24 spruce ETA (2022)	24.00	14.00	0.12	21.00	2.50	4.00	1.25	12,000.00	690.00	50.00

Load

Load case groups

	Load case category	Type	Duration	Kmod	γ_{inf}	γ_{sup}	Ψ_0	Ψ_1	Ψ_2
LC1	self-weight structure	G	permanent	0.6	1	1.35	1	1	1
	dead load	G	permanent	0.6	1	1.35	1	1	1
	dead load	G	permanent	0.6	1	1.35	1	1	1
	live load cat. C: congregation areas	Q	short term	0.9	0	1.5	0.7	0.7	0.6
	live load cat. H: roofs (only access for maintenance)	Q	short term	0.9	0	1.5	0	0	0
	snow load altitude < 1.000 m a.s.l.	Q	short term	0.9	0	1.5	0.5	0.2	0

LC1:self-weight structure

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continuous load	
Field	Load at start [kN/m]
1	1.00
2	1.00

:dead load

continuous load	
Field	Load at start [kN/m]
2	0.65

:dead load

continuous load	
Field	Load at start [kN/m]
1	2.20

:live load cat. C: congregation areas

continuous load	
Field	Load at start [kN/m]
1	3.00

:live load cat. H: roofs (only access for maintenance)

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continuous load	
Field	Load at start [kN/m]
2	0.40

:snow load altitude < 1.000 m a.s.l.

continuous load	
Field	Load at start [kN/m]
2	2.40

ULS Combinations	
	Combination rule
LCO1	1.35/1.00 * LC1 + 1.35/1.00 * + 1.35/1.00 *
LCO2	1.35/1.00 * LC1 + 1.35/1.00 * + 1.35/1.00 * + 1.50/0.00 *
LCO3	1.35/1.00 * LC1 + 1.35/1.00 * + 1.35/1.00 * + 1.50/0.00 * + 1.50/0.00 * 0.00 *
LCO4	1.35/1.00 * LC1 + 1.35/1.00 * + 1.35/1.00 * + 1.50/0.00 * + 1.50/0.00 * 0.00 * + 1.50/0.00 * 0.50 *
LCO5	1.35/1.00 * LC1 + 1.35/1.00 * + 1.35/1.00 * + 1.50/0.00 *
LCO6	1.35/1.00 * LC1 + 1.35/1.00 * + 1.35/1.00 * + 1.50/0.00 * + 1.50/0.00 * 0.70 *
LCO7	1.35/1.00 * LC1 + 1.35/1.00 * + 1.35/1.00 * + 1.50/0.00 * + 1.50/0.00 * 0.70 * + 1.50/0.00 * 0.50 *
LCO8	1.35/1.00 * LC1 + 1.35/1.00 * + 1.35/1.00 * + 1.50/0.00 *
LCO9	1.35/1.00 * LC1 + 1.35/1.00 * + 1.35/1.00 * + 1.50/0.00 * + 1.50/0.00 * 0.70 *
LCO10	1.35/1.00 * LC1 + 1.35/1.00 * + 1.35/1.00 * + 1.50/0.00 * + 1.50/0.00 * 0.70 * + 1.50/0.00 * 0.00 *

ULS Combinations Fire	
	Combination rule
LCO11	1.00/1.00 * LC1 + 1.00/1.00 * + 1.00/1.00 *
LCO12	1.00/1.00 * LC1 + 1.00/1.00 * + 1.00/1.00 * + 1.00/0.00 * 0.60 *
LCO13	1.00/1.00 * LC1 + 1.00/1.00 * + 1.00/1.00 * + 1.00/0.00 * 0.60 * + 1.00/0.00 * 0.00 *
LCO14	1.00/1.00 * LC1 + 1.00/1.00 * + 1.00/1.00 * + 1.00/0.00 * 0.60 * + 1.00/0.00 * 0.00 * + 1.00/0.00 * 0.00 *

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ULS Combinations Fire	
	Combination rule
LCO15	1.00/1.00 * LC1 + 1.00/1.00 * + 1.00/1.00 * + 1.00/0.00 * 0.00 *
LCO16	1.00/1.00 * LC1 + 1.00/1.00 * + 1.00/1.00 * + 1.00/0.00 * 0.00 * + 1.00/0.00 * 0.60 *
LCO17	1.00/1.00 * LC1 + 1.00/1.00 * + 1.00/1.00 * + 1.00/0.00 * 0.00 * + 1.00/0.00 * 0.60 * + 1.00/0.00 * 0.00 *
LCO18	1.00/1.00 * LC1 + 1.00/1.00 * + 1.00/1.00 * + 1.00/0.00 * 0.00 *
LCO19	1.00/1.00 * LC1 + 1.00/1.00 * + 1.00/1.00 * + 1.00/0.00 * 0.00 * + 1.00/0.00 * 0.60 *
LCO20	1.00/1.00 * LC1 + 1.00/1.00 * + 1.00/1.00 * + 1.00/0.00 * 0.00 * + 1.00/0.00 * 0.60 * + 1.00/0.00 * 0.00 *

SLS Characteristic Combination	
	Combination rule
LCO21	1.00/1.00 * LC1 + 1.00/1.00 * + 1.00/1.00 *
LCO22	1.00/1.00 * LC1 + 1.00/1.00 * + 1.00/1.00 * + 1.00/0.00 * + 1.00/0.00 * 0.00 * + 1.00/0.00 * 0.50 *
LCO23	1.00/1.00 * LC1 + 1.00/1.00 * + 1.00/1.00 * + 1.00/0.00 * + 1.00/0.00 * 0.70 * + 1.00/0.00 * 0.50 *
LCO24	1.00/1.00 * LC1 + 1.00/1.00 * + 1.00/1.00 * + 1.00/0.00 * + 1.00/0.00 * 0.70 * + 1.00/0.00 * 0.00 *

SLS Quasi-permanent Combination	
	Combination rule
LCO25	1.00/1.00 * LC1 + 1.00/1.00 * + 1.00/1.00 *
LCO26	1.00/1.00 * LC1 + 1.00/1.00 * + 1.00/1.00 * + 1.00/0.00 * 0.60 * + 1.00/0.00 * 0.00 * + 1.00/0.00 * 0.00 *
LCO27	1.00/1.00 * LC1 + 1.00/1.00 * + 1.00/1.00 * + 1.00/0.00 * 0.00 * + 1.00/0.00 * 0.60 * + 1.00/0.00 * 0.00 *
LCO28	1.00/1.00 * LC1 + 1.00/1.00 * + 1.00/1.00 * + 1.00/0.00 * 0.00 * + 1.00/0.00 * 0.60 * + 1.00/0.00 * 0.00 *

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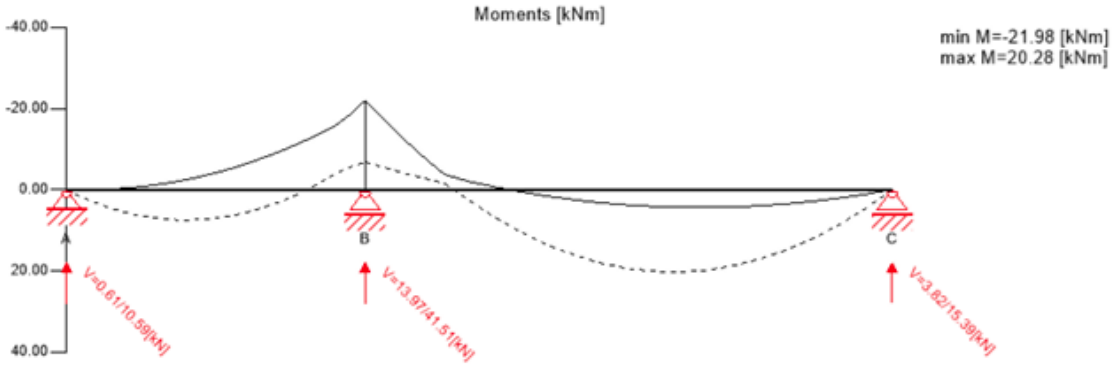
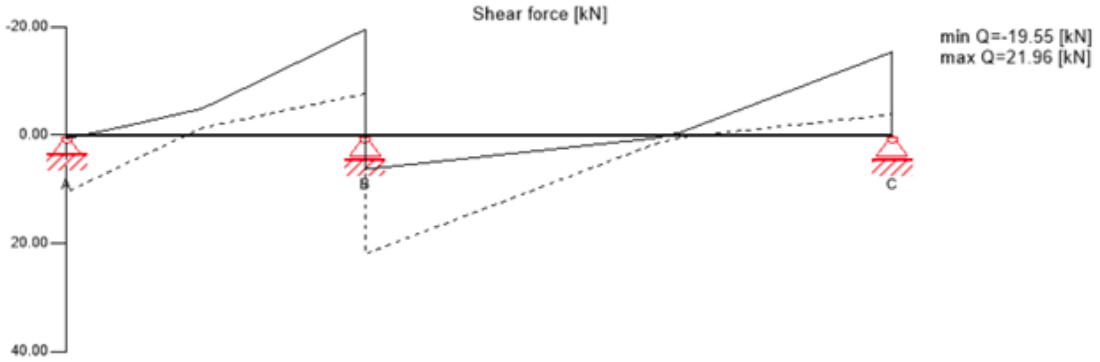
Ultimate limit state (ULS) - design results





ULS Flexural design

Field	Dist.	$f_{m,k}$	γ_m	k_{mod}	$k_{sys,y}$	$f_{m,y,d}$	$M_{y,d}$	$\sigma_{m,y,d}$	Ratio	
	[m]	[N/mm²]	[-]	[-]	[-]	[N/mm²]	[kNm]	[N/mm²]		
1	3.6	24.00	1.25	0.90	1.10	19.01	-21.98	4.16	22%	LCO9
2	0.0	24.00	1.25	0.90	1.10	19.01	-21.98	4.16	22%	LCO9

ULS Shear analysis

Field	Dist.	$f_{v,k}$	γ_m	k_{mod}	$f_{v,d}$	V_d	$\tau_{v,d}$	Ratio	
	[m]	[N/mm²]	[-]	[-]	[N/mm²]	[kN]	[N/mm²]		
1	3.6	4.00	1.25	0.90	2.88	-20.66	0.13	5%	LCO4
2	0.0	4.00	1.25	0.90	2.88	21.96	0.14	5%	LCO9

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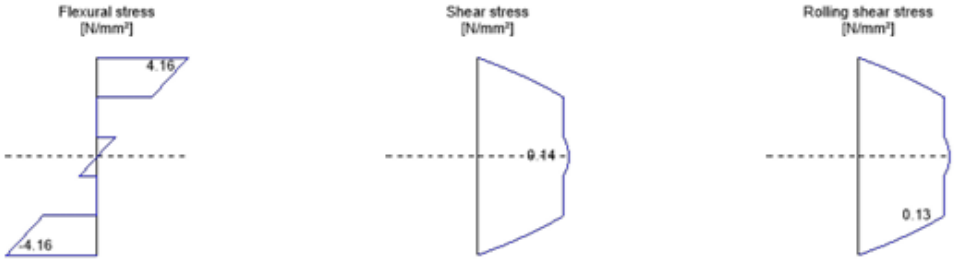
ULS Rolling shear

Field	Dist.	$f_{r,k}$	γ_m	k_{mod}	$f_{r,d}$	V_d	$\tau_{r,d}$	Ratio	
	[m]	[N/mm²]	[-]	[-]	[N/mm²]	[kN]	[N/mm²]		
1	3.6	1.05	1.25	0.90	0.76	-20.66	0.13	17%	LCO4
2	0.0	1.05	1.25	0.90	0.76	21.96	0.13	18%	LCO9

Stress diagram



Flexural stress analysis

$M_{y,d}$ =	-21.98	kNm	$f_{m,k}$ =	24.00	N/mm²
$M_{z,d}$ =	0.00	kNm	$f_{m,k,z}$ =	24.00	N/mm²
$N_{t,d}$ =	0.00	kN	γ_m =	1.25	-
			k_{mod} =	0.90	-
			$k_{sys,y}$ =	1.10	-
			$k_{h,m,y}$ =	1.00	-
			$k_{h,m,z}$ =	1.00	-
			k_l =	1.00	-
$\sigma_{t,d}$ =	0.00	N/mm²	$f_{t,0,d}$ =	10.08	N/mm²
$\sigma_{m,y,d}$ =	4.16	N/mm²	$f_{m,y,d}$ =	19.01	N/mm²
$\sigma_{m,z,d}$ =	0.00	N/mm² <	$f_{m,z,d}$ =	0.00	N/mm² ✓

Utilization ratio 22%

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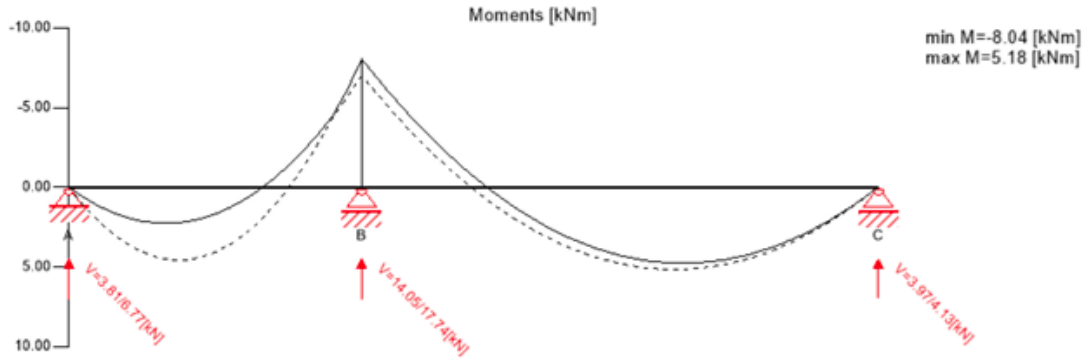
Shear stress analysis							
V_d =	21.96	kN		$f_{v,k}$ =	4.00	N/mm²	
				γ_m =	1.25	-	
				k_{mod} =	0.90	-	
				$k_{h,v}$ =	0.00	-	
$\tau_{v,d}$ =	0.14	N/mm²	<	$f_{v,d}$ =	2.88	N/mm²	✓
Utilization ratio							5%

Rolling shear analysis							
V_d =	21.96	kN		$f_{r,k}$ =	1.05	N/mm²	
				γ_m =	1.25	-	
				k_{mod} =	0.90	-	
$\tau_{r,d}$ =	0.13	N/mm²	<	$f_{r,d}$ =	0.76	N/mm²	✓
Utilization ratio							18%

Ultimate limit state (ULS) fire design - results



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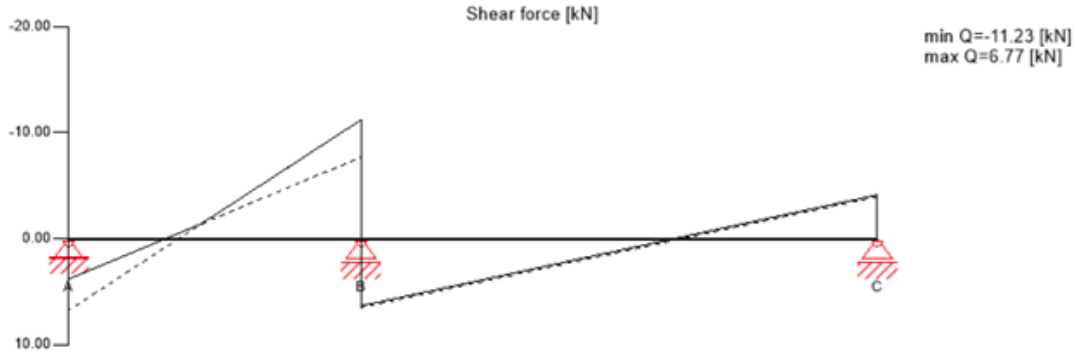
Ultimate limit state (ULS) fire design - results



ULS Fire Flexural design

Field	Dist.	$f_{m,k}$	γ_m	k_{mod}	$k_{sys,y}$	k_{fi}	$f_{m,y,d}$	$M_{y,d}$	$\sigma_{m,y,d}$	Ratio	
	[m]	[N/mm²]	[-]	[-]	[-]	[-]	[N/mm²]	[kNm]	[N/mm²]		
1	3.6	24.00	1.00	1.00	1.10	1.15	30.36	-8.04	3.48	11%	LCO12
2	0.0	24.00	1.00	1.00	1.10	1.15	30.36	-8.04	3.48	11%	LCO12

ULS Fire Shear analysis

Field	Dist.	$f_{v,k}$	γ_m	k_{mod}	k_{fi}	$f_{v,d}$	V_d	$\tau_{v,d}$	Ratio	
	[m]	[N/mm²]	[-]	[-]	[-]	[N/mm²]	[kN]	[N/mm²]		
1	3.6	4.00	1.00	1.00	1.15	4.60	-11.23	0.13	3%	LCO12
2	0.0	4.00	1.00	1.00	1.15	4.60	6.50	0.08	2%	LCO12

ULS Fire Rolling shear

Field	Dist.	$f_{r,k}$	γ_m	k_{mod}	k_{fi}	$f_{r,d}$	V_d	$\tau_{r,d}$	Ratio	
	[m]	[N/mm²]	[-]	[-]	[-]	[N/mm²]	[kN]	[N/mm²]		
1	3.6	1.05	1.00	1.00	1.15	1.21	-11.23	0.13	11%	LCO12
2	0.0	1.05	1.00	1.00	1.15	1.21	6.50	0.08	6%	LCO12

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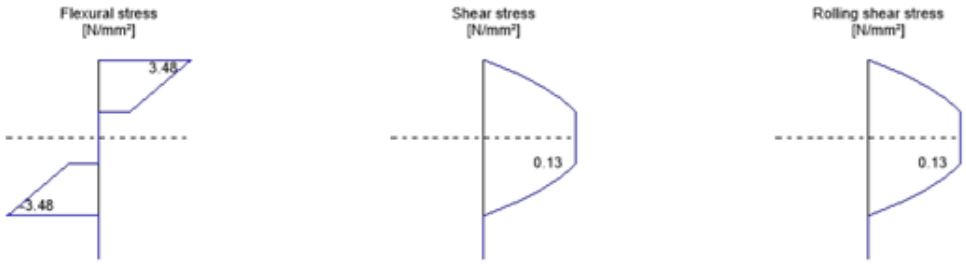
Stress diagram



Flexural stress analysis Fire

$M_{y,d}$ =	-8.04	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm		$f_{m,k,z}$ =	24.00	N/mm²	
$N_{t,d}$ =	0.00	kN		γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				$k_{sys,y}$ =	1.10	-	
				$k_{h,m,y}$ =	1.00	-	
				$k_{h,m,z}$ =	1.00	-	
				k_l =	1.00	-	
				k_n =	1.15	-	
$\sigma_{t,d}$ =	0.00	N/mm²		$f_{t,0,d}$ =	16.10	N/mm²	
$\sigma_{m,y,d}$ =	3.48	N/mm²		$f_{m,y,d}$ =	30.36	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	0.00	N/mm²	✓

Utilization ratio 11%

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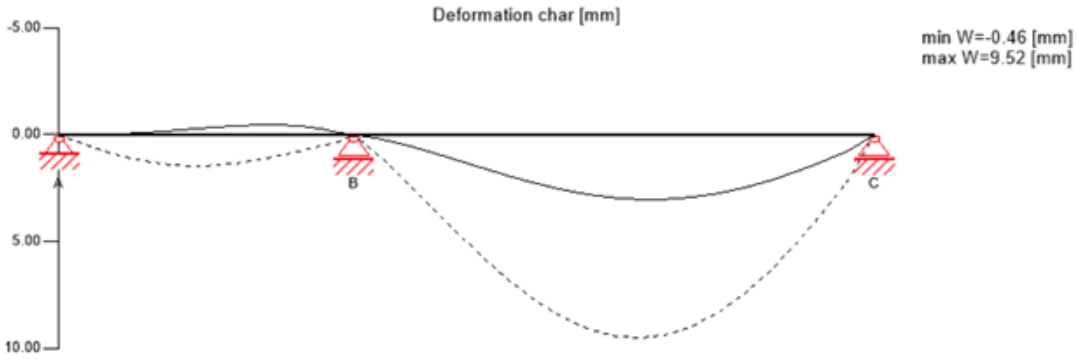
Shear stress analysis Fire							
V_d =	-11.23	kN		$f_{v,k}$ =	4.00	N/mm²	
				γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				$k_{h,v}$ =	0.00	-	
				k_{fi} =	1.15	-	
$\tau_{v,d}$ =	0.13	N/mm²	<	$f_{v,d}$ =	4.60	N/mm²	✓
Utilization ratio							3%

Rolling shear analysis Fire							
V_d =	-11.23	kN		$f_{r,k}$ =	1.05	N/mm²	
				γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				k_{fi} =	1.15	-	
$\tau_{r,d}$ =	0.13	N/mm²	<	$f_{r,d}$ =	1.21	N/mm²	✓
Utilization ratio							11%

Service limit state design (SLS) - design results



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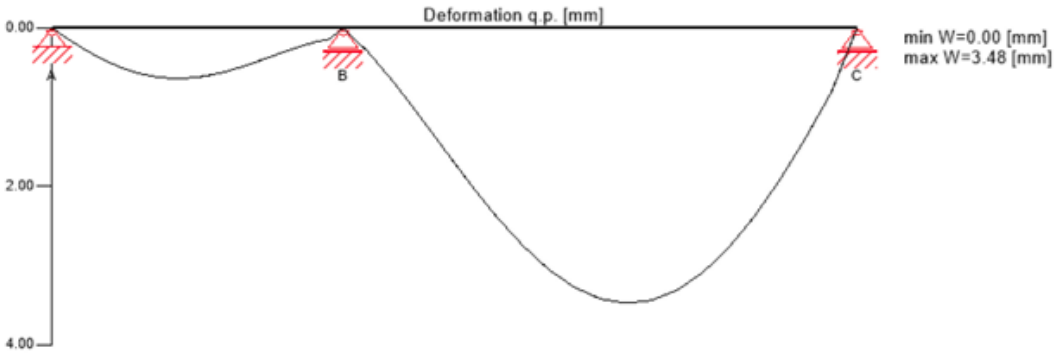
Service limit state design (SLS) - design results



w_{inst} = w[char]

Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.8	L/300	12.0	1.8	15%
2	0.8	L/300	21.2	9.5	45%

w_{fin} = w[char] + w[q.p.]*kdef

Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.8	L/250	14.4	2.9	20%
2	0.8	L/250	25.4	12.3	48%

$w_{net,fin}$ = w[q.p.] + w[q.p.]*kdef

Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.8	L/300	12.0	2.4	20%
2	0.8	L/300	21.2	6.3	30%

Support reaction

Load case category	k_{mod}	A_V	B_V	C_V
			[kN]	
self-weight structure	0.6	0.80	6.55	2.61

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Support reaction				
Load case category	k_{mod}	A_V	B_V	C_V
			[kN]	
		0.80	6.55	2.61
dead load	0.6	-0.55	2.93	1.75
		-0.55	2.93	1.75
dead load	0.6	3.62	4.49	-0.19
		3.62	4.49	-0.19
live load cat. C: congregation areas	0.9	4.94	6.13	0.00
		0.00	0.00	-0.26
live load cat. H: roofs (only access for maintenance)	0.9	0.00	1.80	1.08
		-0.34	0.00	0.00
snow load altitude < 1.000 m a.s.l.	0.9	0.00	10.81	6.46
		-2.04	0.00	0.00

Reference documents for this analysis	
English title	Description
EN 338	EN 338 - Structural timber ? Strength classes
EN 1995-1-1	EN 1995-1-1 - Eurocode 5: Design of timber structures - Part 1-1: General - Common rules and rules for buildings
ETA-14/0349	European Technical Assessment ETA-14/0349
Expertise Rolling shear - no edge gluing, H.J. Blass	Expertise on Rolling shear for CLT
EN 1995-1-2	EN 1995-1-2 - Eurocode 5 — Design of timber structures — Part 1-2: General — Structural fire design
Technical expertise 122/2011/02: analysis of load bearing capacity and separation performance of CLT elements	Verification of the load bearing capacity and the insulation criterion of CLT structures with Stora Enso CLT
Technical expertise 2434/2012 - BB: failure time tf of gypsum fire boards (GKF) according to ON B 3410	Expertise on failure time tf of gypsum wall fire boards according to ON B3410 and gypsum wall boards type DF according to EN 520
EN 1990	EN 1990 - Eurocode ? Basis of structural design
ÖNorm B 1995-1-1 NA	ÖNORM EN 1995-1-1 - Austria - National Annex – Nationally determined parameters – Eurocode 5: Design of timber structures – Part 1-1: General-Common rules and rules for buildings

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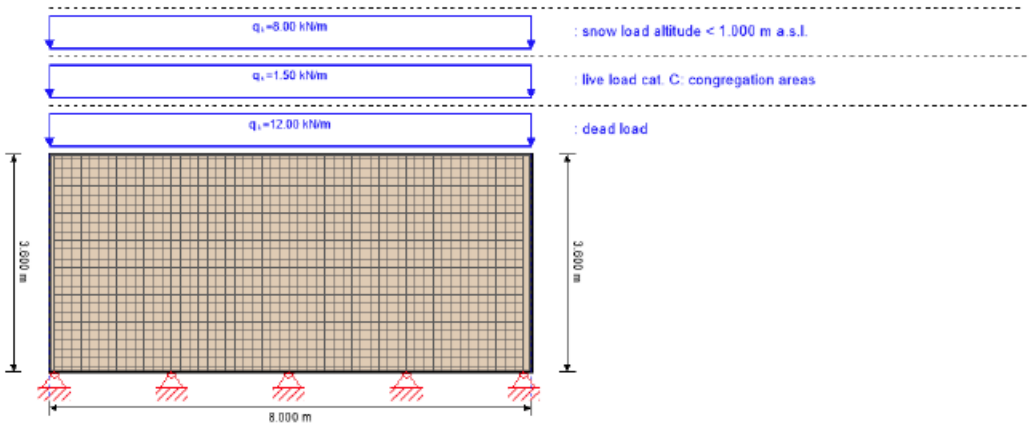
2.5.5.5. Analiza stene v pritličju POZ-905 CLT 20 L5 (C24)

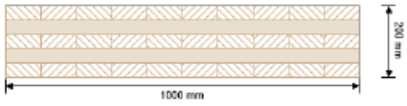
System



Global utilization ratio					28 %
ULS	28 %	ULS Fire	20 %	SLS	2 %

Product data

Section: CLT 200 L5s



Layer	Thickness	Orientation	Material
1	40.0 mm	0°	C24 spruce ETA (2022)
2	40.0 mm	90°	C24 spruce ETA (2022)
3	40.0 mm	0°	C24 spruce ETA (2022)
4	40.0 mm	90°	C24 spruce ETA (2022)
5	40.0 mm	0°	C24 spruce ETA (2022)
t_{CLT}	**200.0 mm**		

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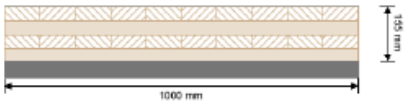
Section Fire: CLT 200 L5s



Layer	Thickness	Orientation	Material
1	40.0 mm	0°	C24 spruce ETA (2022)
2	40.0 mm	90°	C24 spruce ETA (2022)
3	40.0 mm	0°	C24 spruce ETA (2022)
4	35.0 mm	90°	C24 spruce ETA (2022)
t_{CLT}	**155.0 mm**		
Time	**60 min**		

Fire resistance class: R 60

Fire protection layering:
no additional fire protection

k_0 [-]	d_0 [mm]	$d_{char,0,h}$ [mm]	$d_{ef,h}$ [mm]	$d_{char,0,v}$ [mm]	$d_{ef,v}$ [mm]
1	7	38.0	45.0	0.0	0.0

Material values

Material	$f_{m,k}$ [N/mm²]	$f_{t,0,k}$ [N/mm²]	$f_{t,90,k}$ [N/mm²]	$f_{c,0,k}$ [N/mm²]	$f_{c,90,k}$ [N/mm²]	$f_{v,k}$ [N/mm²]	$f_{r,k\ min}$ [N/mm²]	$E_{0,mean}$ [N/mm²]	G_{mean} [N/mm²]	$G_{r,mean}$ [N/mm²]
C24 spruce ETA (2022)	24.00	14.00	0.12	21.00	2.50	4.00	1.25	12,000.00	690.00	50.00

Load

Load case groups

Load case category	Type	Duration	Kmod	γ_{inf}	γ_{sup}	Ψ_0	Ψ_1	Ψ_2
dead load	G	permanen	0.6	1	1.35	1	1	1
live load cat. C: congregation areas	Q	short term	0.9	0	1.5	0.7	0.7	0.6
snow load altitude < 1.000 m a.s.l.	Q	short term	0.9	0	1.5	0.5	0.2	0

:dead load

continuous load

q_k [kN/m]
12

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:live load cat. C: congregation areas
continuous load
q_k
[kN/m]
1.5

:snow load altitude < 1.000 m a.s.l.
continuous load
q_k
[kN/m]
8

ULS Combinations	
	Combination rule
LCO1	1.35/1.00 *
LCO2	1.35/1.00 * + 1.50/0.00 *
LCO3	1.35/1.00 * + 1.50/0.00 * + 1.50/0.00 * 0.50 *
LCO4	1.35/1.00 * + 1.50/0.00 *
LCO5	1.35/1.00 * + 1.50/0.00 * + 1.50/0.00 * 0.70 *

ULS Combinations Fire	
	Combination rule
LCO1	1.00/1.00 *
LCO2	1.00/1.00 * + 1.00/0.00 * 0.60 *
LCO3	1.00/1.00 * + 1.00/0.00 * 0.60 * + 1.00/0.00 * 0.00 *
LCO4	1.00/1.00 * + 1.00/0.00 * 0.00 *
LCO5	1.00/1.00 * + 1.00/0.00 * 0.00 * + 1.00/0.00 * 0.60 *

Ultimate limit state (ULS) - design results

Ultimate limit state (ULS) - design results

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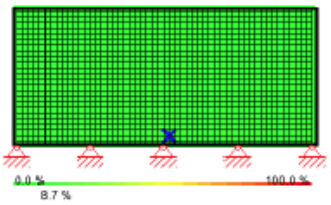
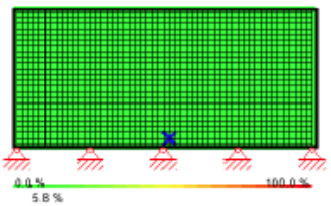
Utilization rate of shear stress in plane on net section



LCO5

Id	X	Z	k_{mod}	$f_{IP,Netto,k}$	Q	$\tau_{IP,Net,d}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
134	4.125	0.225	0.9	3.9	4.40	0.24	9%

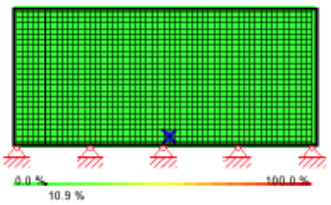
Utilization rate of shear stress in plane of gross section



LCO5

Id	X	Z	k_{mod}	$f_{v,IP,Brutto}$	Q	$\tau_{IP,Gross,d}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
134	4.125	0.225	0.9	3.5	4.40	0.15	6%

Utilization rate of torsional shear stress in face glued surfaces



LCO5

Id	X	Z	k_{mod}	$f_{v,IP,T,k}$	Q	$\tau_{T,Node,d}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
134	4.125	0.225	0.9	2.5	4.40	0.20	11%

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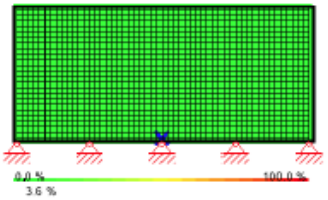
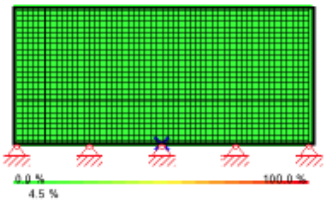
Utilization rate of axial force horizontal



LCO5

Id	X	Z	k_{mod}	$f_{c,0,d}$	$N_{h,max}$	$\sigma_{h,max}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
80	3.975	0.075	0.9	15.12	-6.57	-0.55	4%

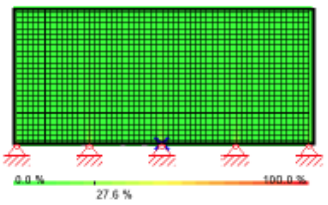
Utilization rate of axial force vertical



LCO5

Id	X	Z	k_{mod}	$f_{c,0,d}$	$N_{v,max}$	$\sigma_{v,max}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
27	3.975	0	0.9	15.12	-58.00	-3.22	5%

Utilization rate for buckling



LCO5

Id	X	Z	l_k	λ_y	β_c	$k_{c,y}$	$f_{c,0,d}$	$\sigma_{c,0,d}$	$\sigma_{m,y,d}$	Ratio
[-]	[m]	[m]	[m]	[-]	[-]	[-]	[N/m	[N/m	[N/m	[%]
27	3.975	0	3.6	54	0.2	0.773	15.12	-3.22	0.00	28%

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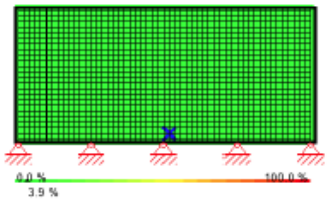
Ultimate limit state (ULS) fire design - results

Ultimate limit state (ULS) - design results

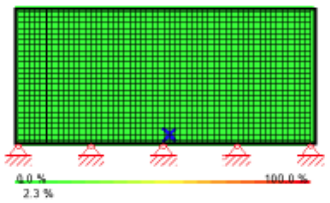
Utilization rate of shear stress in plane on net section



LCO2

Id	X	Z	k_{mod}	$f_{IP,Netto,k}$	Q	$\tau_{IP,Net,d}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
134	4.125	0.225	1	3.9	2.12	0.18	4%

Utilization rate of shear stress in plane of gross section



LCO2

Id	X	Z	k_{mod}	$f_{v,IP,Brutto}$	Q	$\tau_{IP,Gross,d}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
134	4.125	0.225	1	3.5	2.12	0.09	2%

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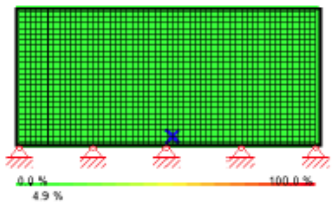
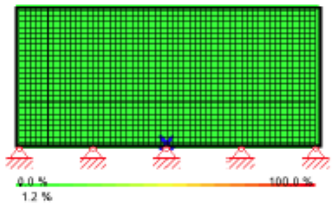
Utilization rate of torsional shear stress in face glued surfaces



LCO2

Id	X	Z	k_{mod}	$f_{v,IP,T,k}$	Q	$\tau_{T,Node,d}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
134	4.125	0.225	1	2.5	2.12	0.14	5%

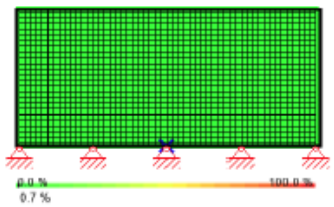
Utilization rate of axial force horizontal



LCO2

Id	X	Z	k_{mod}	$f_{c,0,d}$	$N_{h,max}$	$\sigma_{h,max}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
80	3.975	0.075	1	24.15	-3.27	-0.29	1%

Utilization rate of axial force vertical



LCO2

Id	X	Z	k_{mod}	$f_{c,0,d}$	$N_{v,max}$	$\sigma_{v,max}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
27	3.975	0	1	24.15	-25.02	-2.08	1%

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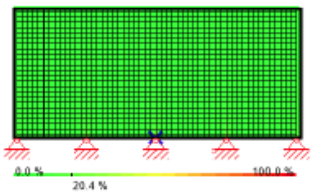
Utilization rate for buckling

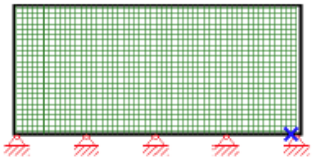


LCO2

Id	X	Z	l_k	$\lambda_{c,y}$	β_c	$k_{c,y}$	$f_{c,0,d}$	$\sigma_{c,0,d}$	$\sigma_{m,y,d}$	Ratio
[-]	[m]	[m]	[m]	[-]	[-]	[-]	[N/m	[N/m	[N/m	[%]
27	3.975	0	3.6	86	0.2	0.423	24.15	-2.08	0.00	20%

Service limit state design (SLS) - design results

Horizontal deformation



LCO3

Id	X	Z	w_{limit}	Limit	$v_{h,max}$	Ratio
[-]	[m]	[m]	[mm]	[mm]	[mm]	[%]
52	7.725	0	12.0	L/300 = 12.0	0.0250	0.2%

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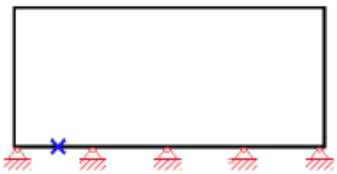
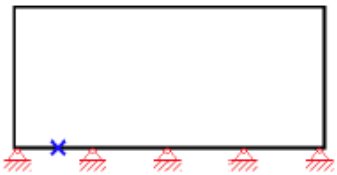
w_{inst} = w[char]



LCO3

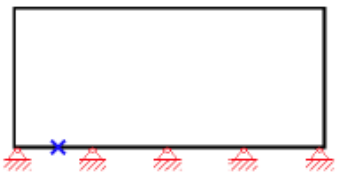
Id	X	Z	K def	L_{ref}	Limit	w limit	w calc.	Ratio
[-]	[m]	[m]		[m]	[-]	[mm]	[mm]	
8	1.125	0	0.8	2.0	1/300	6.7	0.1	2%

w_{fin} = w[char] + w[q.p.]*kdef



Id	X	Z	K def	L_{ref}	Limit	w limit	w calc.	Ratio
[-]	[m]	[m]		[m]	[-]	[mm]	[mm]	
8	1.125	0	0.8	2.0	1/250	8.0	0.2	2%

$w_{net,fin}$ = w[q.p.] + w[q.p.]*kdef



Id	X	Z	K def	L_{ref}	Limit	w limit	w calc.	Ratio
[-]	[m]	[m]		[m]	[-]	[m]	[mm]	
8	1.125	0	0.8	2.0	L/300	6.7	0.1	2%

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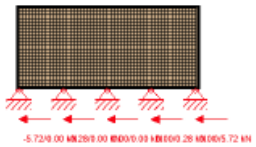
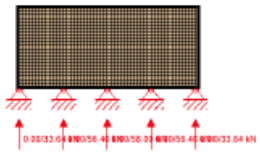
Support reaction

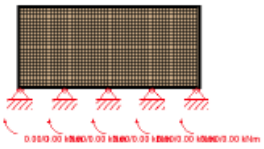
Support reaction horizontal min/max



Support reaction vertical min/max

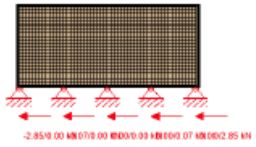


Support reaction moment min/max



Fire Support reaction

Fire Support reaction horizontal min/max



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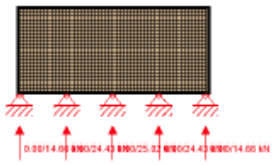
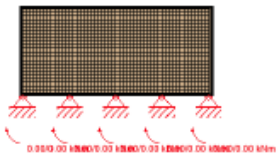
Fire Support reaction vertical min/max



Fire Support reaction moment min/max



Reference documents for this analysis

English title	Description
EN 338	EN 338 - Structural timber ? Strength classes
EN 1995-1-1	EN 1995-1-1 - Eurocode 5: Design of timber structures - Part 1-1: General - Common rules and rules for buildings
ETA-14/0349	European Technical Assessment ETA-14/0349
Expertise Rolling shear - no edge gluing, H.J. Blass	Expertise on Rolling shear for CLT
EN 1995-1-2	EN 1995-1-2 - Eurocode 5 — Design of timber structures — Part 1-2: General — Structural fire design
Technical expertise 122/2011/02: analysis of load bearing capacity and separation performance of CLT elements	Verification of the load bearing capacity and the insulation criterion of CLT structures with Stora Enso CLT
Technical expertise 2434/2012 - BB: failure time tf of gypsum fire boards (GKF) according to ON B 3410	Expertise on failure time tf of gypsum wall fire boards according to ON B3410 and gypsum wall boards type DF according to EN 520
EN 1990	EN 1990 - Eurocode ? Basis of structural design
ÖNorm B 1995-1-1 NA	ÖNORM EN 1995-1-1 - Austria - National Annex – Nationally determined parameters – Eurocode 5: Design of timber structures – Part 1-1: General- Common rules and rules for buildings
ÖNorm B 1995-1-2 NA	ÖNORM EN 1995-1-2 - Austria - National Annex - Eurocode 5: Design of timber structures ? Part 1-2: General ? Structural fire design ? National specifications concerning ÖNORM EN 1995-1-2, national comments and national supplements
Fire safety in timber buildings - technical guildeline for Europe	Fire safety in timber buildings - technical guideline for Europe; publishes by SP Technical Research Institute of Sweden

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2.5.5.6. Analiza stene v nadstropju POZ-906 CLT 20 L5 (C24)

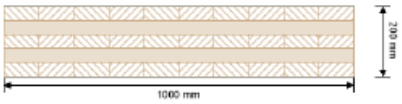
System



Global utilization ratio						66 %
ULS	66 %	ULS Fire	55 %	SLS	5 %	

Product data

Section: CLT 200 L5s



Layer	Thickness	Orientation	Material
1	40.0 mm	0°	C24 spruce ETA (2022)
2	40.0 mm	90°	C24 spruce ETA (2022)
3	40.0 mm	0°	C24 spruce ETA (2022)
4	40.0 mm	90°	C24 spruce ETA (2022)
5	40.0 mm	0°	C24 spruce ETA (2022)
t_{CLT}	**200.0 mm**		

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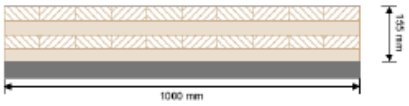
Section Fire: CLT 200 L5s



Layer	Thickness	Orientation	Material
1	40.0 mm	0°	C24 spruce ETA (2022)
2	40.0 mm	90°	C24 spruce ETA (2022)
3	40.0 mm	0°	C24 spruce ETA (2022)
4	35.0 mm	90°	C24 spruce ETA (2022)
t_{CLT}	**155.0 mm**		

Fire resistance class: R 60

Time **60 min**

Fire protection layering:
no additional fire protection

k_0 [-]	d_0 [mm]	$d_{char,0,h}$ [mm]	$d_{ef,h}$ [mm]	$d_{char,0,v}$ [mm]	$d_{ef,v}$ [mm]
1	7	38.0	45.0	0.0	0.0

Material values

Material	$f_{m,k}$ [N/mm²]	$f_{t,0,k}$ [N/mm²]	$f_{t,90,k}$ [N/mm²]	$f_{c,0,k}$ [N/mm²]	$f_{c,90,k}$ [N/mm²]	$f_{v,k}$ [N/mm²]	$f_{r,k\ min}$ [N/mm²]	$E_{0,mean}$ [N/mm²]	G_{mean} [N/mm²]	$G_{r,mean}$ [N/mm²]
C24 spruce ETA (2022)	24.00	14.00	0.12	21.00	2.50	4.00	1.25	12,000.00	690.00	50.00

Load

Load case groups

Load case category	Type	Duration	Kmod	γ_{inf}	γ_{sup}	Ψ_0	Ψ_1	Ψ_2
dead load	G	permanen	0.6	1	1.35	1	1	1
dead load	G	permanen	0.6	1	1.35	1	1	1
snow load altitude < 1.000 m a.s.l.	Q	short term	0.9	0	1.5	0.5	0.2	0

:dead load

continuous load

q_k [kN/m]
35

:dead load

continuous load

q_k [kN/m]
56

load out of plane

q_k [kN/m²]	Direction	Load covers openings
5.56	global	×

:snow load altitude < 1.000 m a.s.l.

continuous load

q_k [kN/m]
19

load out of plane

q_k [kN/m²]	Direction	Load covers openings
8	projective	×

ULS Combinations

	Combination rule
LCO1	1.35/1.00 * + 1.35/1.00 *
LCO2	1.35/1.00 * + 1.35/1.00 * + 1.50/0.00 *

ULS Combinations Fire

	Combination rule
LCO1	1.00/1.00 * + 1.00/1.00 *
LCO2	1.00/1.00 * + 1.00/1.00 * + 1.00/0.00 * 0.00 *

Ultimate limit state (ULS) - design results

Ultimate limit state (ULS) - design results

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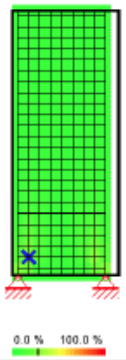
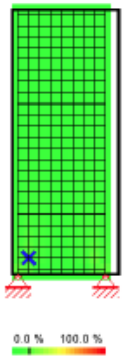
Utilization rate of shear stress in plane on net section



LCO1

Id	X	Z	k_{mod}	$f_{IP,Netto,k}$	Q	$\tau_{IP,Net,d}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
20	0.225	0.225	0.6	3.9	9.22	0.51	27%

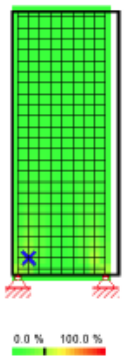
Utilization rate of shear stress in plane of gross section



LCO1

Id	X	Z	k_{mod}	$f_{v,IP,Brutto}$	Q	$\tau_{IP,Gross,d}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
20	0.225	0.225	0.6	3.5	9.22	0.31	18%

Utilization rate of torsional shear stress in face glued surfaces



LCO1

Id	X	Z	k_{mod}	$f_{v,IP,T,k}$	Q	$\tau_{T,Node,d}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
20	0.225	0.225	0.6	2.5	9.22	0.41	34%

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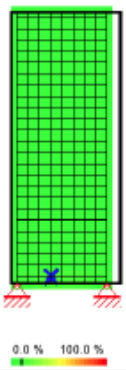
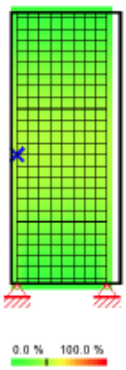
Utilization rate of axial force horizontal



LCO1

Id	X	Z	k_{mod}	$f_{t,0,d}$	$N_{h,max}$	$\sigma_{h,max}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
13	0.525	0.075	0.6	6.72	8.64	0.72	11%

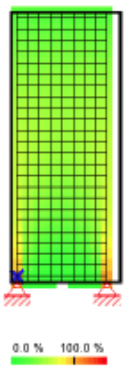
Utilization rate of axial force vertical



LCO2

Id	X	Z	k_{mod}	$f_{c,0,d}$	$N_{v,max}$	$\sigma_{v,max}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
109	0.075	1.725	0.9	15.12	-32.04	-1.78	36%

Utilization rate for buckling



LCO1

Id	X	Z	l_k	λ_y	β_c	$k_{c,y}$	$f_{c,0,d}$	$\sigma_{c,0,d}$	$\sigma_{m,y,d}$	Ratio
[-]	[m]	[m]	[m]	[-]	[-]	[-]	[N/n	[N/n	[N/n	[%]
10	0.075	0.075	3.6	54	0.2	0.773	10.08	-4.98	0.19	66%

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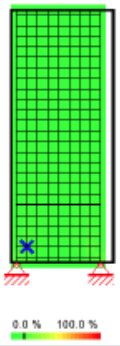
Ultimate limit state (ULS) fire design - results

Ultimate limit state (ULS) - design results

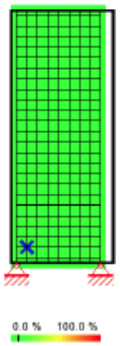
Utilization rate of shear stress in plane on net section



LCO1

Id	X	Z	k_{mod}	$f_{IP,Netto,k}$	Q	$\tau_{IP,Net,d}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
20	0.225	0.225	1	3.9	7.77	0.65	14%

Utilization rate of shear stress in plane of gross section



LCO1

Id	X	Z	k_{mod}	$f_{v,IP,Brutto}$	Q	$\tau_{IP,Gross,d}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
20	0.225	0.225	1	3.5	7.77	0.33	8%

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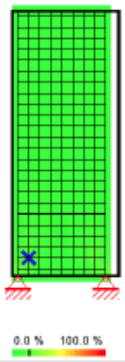
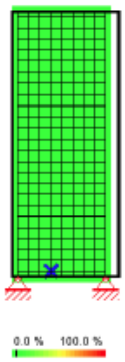
Utilization rate of torsional shear stress in face glued surfaces



LCO1

Id	X	Z	k_{mod}	$f_{v,IP,T,k}$	Q	$\tau_{T,Node,d}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
20	0.225	0.225	1	2.5	7.77	0.52	18%

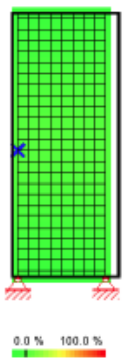
Utilization rate of axial force horizontal



LCO1

Id	X	Z	k_{mod}	$f_{t,0,d}$	$N_{h,max}$	$\sigma_{h,max}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
13	0.525	0.075	1	16.1	7.39	0.66	4%

Utilization rate of axial force vertical



LCO1

Id	X	Z	k_{mod}	$f_{c,0,d}$	$N_{v,max}$	$\sigma_{v,max}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
109	0.075	1.725	1	24.15	-17.59	-1.47	14%

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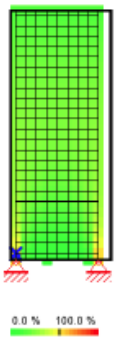
Utilization rate for buckling

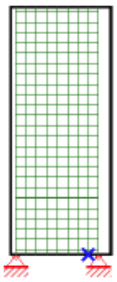


LCO1

Id	X	Z	l_k	λ_y	β_c	$k_{c,y}$	$f_{c,0,d}$	$\sigma_{c,0,d}$	$\sigma_{m,y,d}$	Ratio
[-]	[m]	[m]	[m]	[-]	[-]	[-]	[N/m	[N/m	[N/m	[%]
10	0.075	0.075	3.6	86	0.2	0.423	24.15	-5.54	0.32	55%

Service limit state design (SLS) - design results

Horizontal deformation



LCO2

Id	X	Z	w_{limit}	Limit	$v_{h,max}$	Ratio
[-]	[m]	[m]	[mm]	[mm]	[mm]	[%]
8	1.125	0	12.0	L/300 = 12.0	0.0651	0.5%

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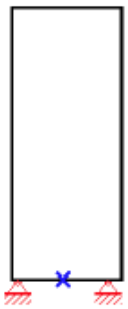
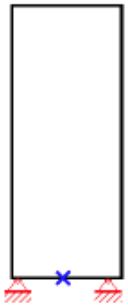
w_{inst} = w[char]



LCO2

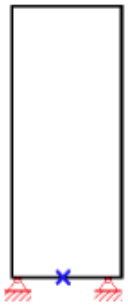
Id	X	Z	K def	L_{ref}	Limit	w limit	w calc.	Ratio
[-]	[m]	[m]		[m]	[-]	[mm]	[mm]	
5	0.675	0	0.8	2.9	1/300	9.7	0.3	3%

w_{fin} = w[char] + w[q.p.]*kdef



Id	X	Z	K def	L_{ref}	Limit	w limit	w calc.	Ratio
[-]	[m]	[m]		[m]	[-]	[mm]	[mm]	
5	0.675	0	0.8	2.9	1/250	11.7	0.5	4%

$w_{net,fin}$ = w[q.p.] + w[q.p.]*kdef



Id	X	Z	K def	L_{ref}	Limit	w limit	w calc.	Ratio
[-]	[m]	[m]		[m]	[-]	[m]	[mm]	
5	0.675	0	0.8	2.9	L/300	9.7	0.4	5%

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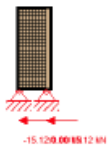
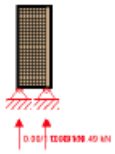
Support reaction

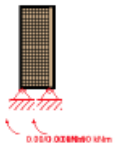
Support reaction horizontal min/max



Support reaction vertical min/max

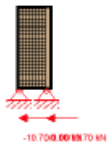


Support reaction moment min/max



Fire Support reaction

Fire Support reaction horizontal min/max



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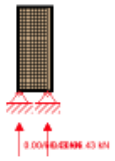
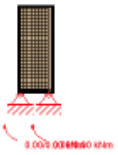
Fire Support reaction vertical min/max



Fire Support reaction moment min/max



Reference documents for this analysis

English title	Description
EN 338	EN 338 - Structural timber ? Strength classes
EN 1995-1-1	EN 1995-1-1 - Eurocode 5: Design of timber structures - Part 1-1: General - Common rules and rules for buildings
ETA-14/0349	European Technical Assessment ETA-14/0349
Expertise Rolling shear - no edge gluing, H.J. Blass	Expertise on Rolling shear for CLT
EN 1995-1-2	EN 1995-1-2 - Eurocode 5 — Design of timber structures — Part 1-2: General — Structural fire design
Technical expertise 122/2011/02: analysis of load bearing capacity and separation performance of CLT elements	Verification of the load bearing capacity and the insulation criterion of CLT structures with Stora Enso CLT
Technical expertise 2434/2012 - BB: failure time tf of gypsum fire boards (GKF) according to ON B 3410	Expertise on failure time tf of gypsum wall fire boards according to ON B3410 and gypsum wall boards type DF according to EN 520
EN 1990	EN 1990 - Eurocode ? Basis of structural design
ÖNorm B 1995-1-1 NA	ÖNORM EN 1995-1-1 - Austria - National Annex – Nationally determined parameters – Eurocode 5: Design of timber structures – Part 1-1: General-Common rules and rules for buildings
ÖNorm B 1995-1-2 NA	ÖNORM EN 1995-1-2 - Austria - National Annex - Eurocode 5: Design of timber structures ? Part 1-2: General ? Structural fire design ? National specifications concerning ÖNORM EN 1995-1-2, national comments and national supplements
Fire safety in timber buildings - technical guildeline for Europe	Fire safety in timber buildings - technical guideline for Europe; publishes by SP Technical Research Institute of Sweden

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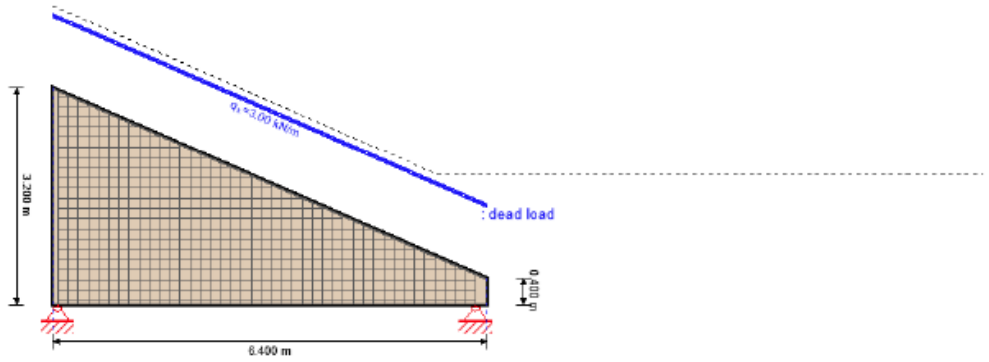
2.5.5.7. Analiza stene v podstrešju POZ-907 CLT 20 L5 (C24)

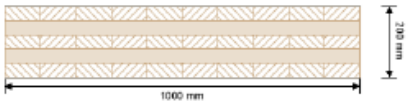
System



Global utilization ratio						88 %
ULS	88 %	ULS Fire	40 %	SLS	13 %	

Product data

Section: CLT 200 L5s



Layer	Thickness	Orientation	Material
1	40.0 mm	0°	C24 spruce ETA (2022)
2	40.0 mm	90°	C24 spruce ETA (2022)
3	40.0 mm	0°	C24 spruce ETA (2022)
4	40.0 mm	90°	C24 spruce ETA (2022)
5	40.0 mm	0°	C24 spruce ETA (2022)
t_{CLT}	**200.0 mm**		

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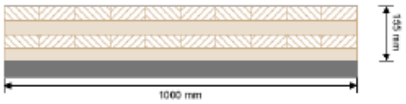
Section Fire: CLT 200 L5s



Layer	Thickness	Orientation	Material
1	40.0 mm	0°	C24 spruce ETA (2022)
2	40.0 mm	90°	C24 spruce ETA (2022)
3	40.0 mm	0°	C24 spruce ETA (2022)
4	35.0 mm	90°	C24 spruce ETA (2022)
t_{CLT}	**155.0 mm**		
Time	**60 min**		

Fire resistance class: R 60

Fire protection layering:
no additional fire protection

k_0	d_0	$d_{char,0,h}$	$d_{ef,h}$	$d_{char,0,v}$	$d_{ef,v}$
[-]	[mm]	[mm]	[mm]	[mm]	[mm]
1	7	38.0	45.0	0.0	0.0

Material values

Material	$f_{m,k}$	$f_{t,0,k}$	$f_{t,90,k}$	$f_{c,0,k}$	$f_{c,90,k}$	$f_{v,k}$	$f_{r,k\ min}$	$E_{0,mean}$	G_{mean}	$G_{r,mean}$
	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
C24 spruce ETA (2022)	24.00	14.00	0.12	21.00	2.50	4.00	1.25	12,000.00	690.00	50.00

Load

Load case groups

Load case category	Type	Duration	Kmod	γ_{inf}	γ_{sup}	Ψ_0	Ψ_1	Ψ_2
dead load	G	permanen	0.6	1	1.35	1	1	1
snow load altitude < 1.000 m a.s.l.	Q	short term	0.9	0	1.5	0.5	0.2	0

:dead load

continuous load

q_k
[kN/m]
3

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:dead load

load out of plane

q_k [kN/m²]	Direction	Load covers openings
20	global	×

:snow load altitude < 1.000 m a.s.l.

continuous load

q_k [kN/m]
5

load out of plane

q_k [kN/m²]	Direction	Load covers openings
24	projective	×

ULS Combinations

	Combination rule
LCO1	1.35/1.00 *
LCO2	1.35/1.00 * + 1.50/0.00 *

ULS Combinations Fire

	Combination rule
LCO1	1.00/1.00 *
LCO2	1.00/1.00 * + 1.00/0.00 * 0.00 *

Ultimate limit state (ULS) - design results

Ultimate limit state (ULS) - design results

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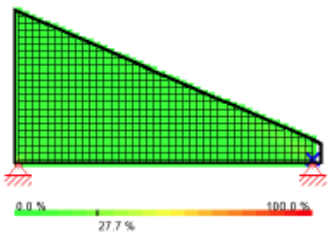
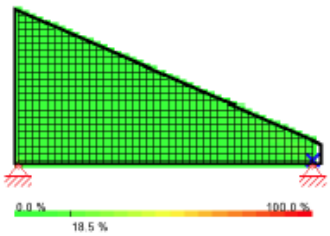
Utilization rate of shear stress in plane on net section



LCO2

Id	X	Z	k_{mod}	$f_{v,IP,Netto,k}$	Q	$\tau_{IP,Net,d}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
84	6.225	0.075	0.9	3.9	-14.01	0.78	28%

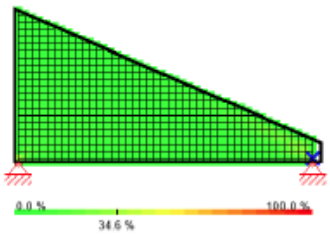
Utilization rate of shear stress in plane of gross section



LCO2

Id	X	Z	k_{mod}	$f_{v,IP,Brutto}$	Q	$\tau_{IP,Gross,d}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
84	6.225	0.075	0.9	3.5	-14.01	0.47	19%

Utilization rate of torsional shear stress in face glued surfaces



LCO2

Id	X	Z	k_{mod}	$f_{v,IP,T,k}$	Q	$\tau_{T,Node,d}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
84	6.225	0.075	0.9	2.5	-14.01	0.62	35%

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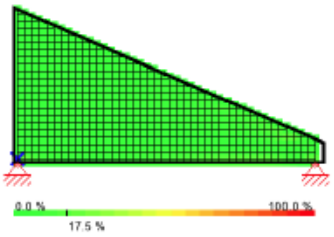
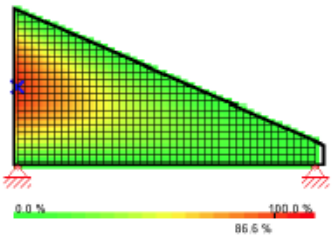
Utilization rate of axial force horizontal



LCO2

Id	X	Z	k_{mod}	$f_{c,0,d}$	$N_{h,max}$	$\sigma_{h,max}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
43	0.075	0.075	0.9	15.12	-31.67	-2.64	17%

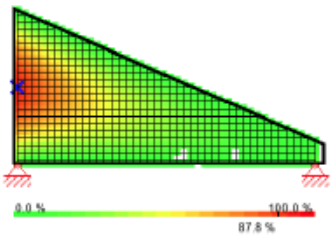
Utilization rate of axial force vertical



LCO2

Id	X	Z	k_{mod}	$f_{c,0,d}$	$N_{v,max}$	$\sigma_{v,max}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
463	0.075	1.575	0.9	15.12	-2.75	-0.15	87%

Utilization rate for buckling



LCO2

Id	X	Z	l_k	λ_y	β_c	$k_{c,y}$	$f_{c,0,d}$	$\sigma_{c,0,d}$	$\sigma_{m,y,d}$	Ratio
[-]	[m]	[m]	[m]	[-]	[-]	[-]	[N/n	[N/n	[N/n	[%]
463	0.075	1.575	3.167	48	0.2	0.838	15.12	-0.15	14.96	88%

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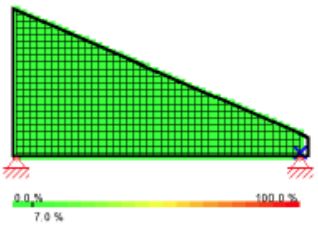
Ultimate limit state (ULS) fire design - results

Ultimate limit state (ULS) - design results

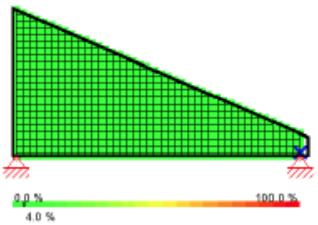
Utilization rate of shear stress in plane on net section



LCO1

Id	X	Z	k_{mod}	$f_{IP,Netto,k}$	Q	$\tau_{IP,Net,d}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
84	6.225	0.075	1	3.9	-3.75	0.31	7%

Utilization rate of shear stress in plane of gross section



LCO1

Id	X	Z	k_{mod}	$f_{v,IP,Brutto}$	Q	$\tau_{IP,Gross,d}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
84	6.225	0.075	1	3.5	-3.75	0.16	4%

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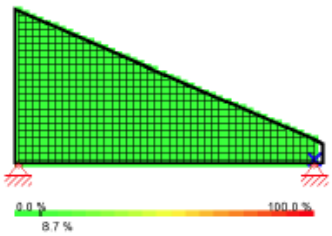
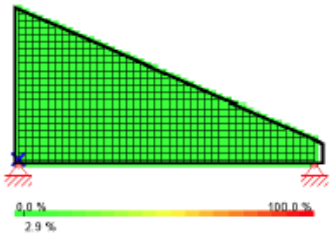
Utilization rate of torsional shear stress in face glued surfaces



LCO1

Id	X	Z	k_{mod}	$f_{v,IP,T,k}$	Q	$\tau_{T,Node,d}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
84	6.225	0.075	1	2.5	-3.75	0.25	9%

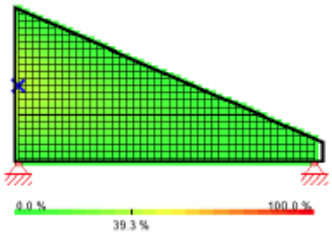
Utilization rate of axial force horizontal



LCO1

Id	X	Z	k_{mod}	$f_{c,0,d}$	$N_{h,max}$	$\sigma_{h,max}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
43	0.075	0.075	1	24.15	-7.98	-0.71	3%

Utilization rate of axial force vertical



LCO1

Id	X	Z	k_{mod}	$f_{c,0,d}$	$N_{v,max}$	$\sigma_{v,max}$	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
463	0.075	1.575	1	24.15	-0.68	-0.06	39%

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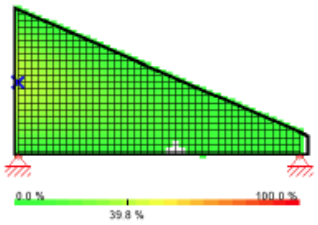
Utilization rate for buckling

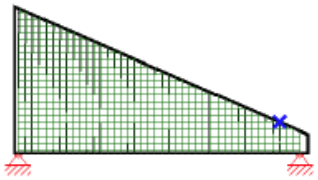


LCO1

Id	X	Z	l_k	λ_y	β_c	$k_{c,y}$	$f_{c,0,d}$	$\sigma_{c,0,d}$	$\sigma_{m,y,d}$	Ratio
[-]	[m]	[m]	[m]	[-]	[-]	[-]	[N/m	[N/m	[N/m	[%]
463	0.075	1.575	3.167	76	0.2	0.52	24.15	-0.06	10.85	40%

Service limit state design (SLS) - design results

Horizontal deformation



LCO2

Id	X	Z	w_{limit}	Limit	$v_{h,max}$	Ratio
[-]	[m]	[m]	[mm]	[mm]	[mm]	[%]
591	5.775	0.6734376	2.2	L/300 = 2.2	0.2891	12.9%

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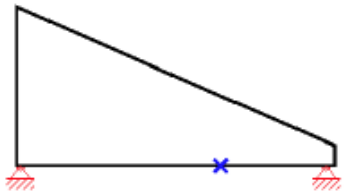
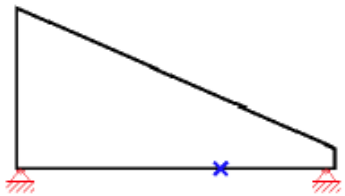
w_{inst} = w[char]



LCO2

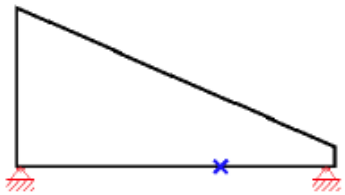
Id	X	Z	K def	L_{ref}	Limit	w limit	w calc.	Ratio
[-]	[m]	[m]		[m]	[-]	[mm]	[mm]	
28	4.125	0	0.8	12.8	1/300	42.7	1.1	3%

w_{fin} = w[char] + w[q.p.]*kdef



Id	X	Z	K def	L_{ref}	Limit	w limit	w calc.	Ratio
[-]	[m]	[m]		[m]	[-]	[mm]	[mm]	
28	4.125	0	0.8	12.8	1/250	51.2	1.4	3%

$w_{net,fin}$ = w[q.p.] + w[q.p.]*kdef



Id	X	Z	K def	L_{ref}	Limit	w limit	w calc.	Ratio
[-]	[m]	[m]		[m]	[-]	[m]	[mm]	
28	4.125	0	0.8	12.8	L/300	42.7	0.7	2%

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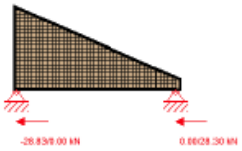
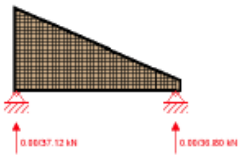
Support reaction

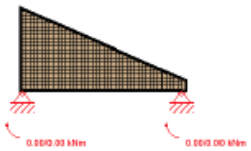
Support reaction horizontal min/max



Support reaction vertical min/max

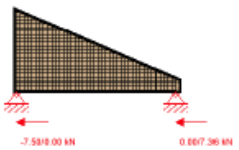


Support reaction moment min/max



Fire Support reaction

Fire Support reaction horizontal min/max



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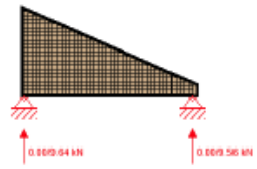
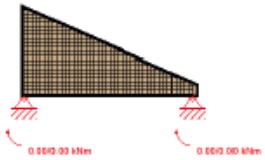
Fire Support reaction vertical min/max



Fire Support reaction moment min/max



Reference documents for this analysis

English title	Description
EN 338	EN 338 - Structural timber ? Strength classes
EN 1995-1-1	EN 1995-1-1 - Eurocode 5: Design of timber structures - Part 1-1: General - Common rules and rules for buildings
ETA-14/0349	European Technical Assessment ETA-14/0349
Expertise Rolling shear - no edge gluing, H.J. Blass	Expertise on Rolling shear for CLT
EN 1995-1-2	EN 1995-1-2 - Eurocode 5 — Design of timber structures — Part 1-2: General — Structural fire design
Technical expertise 122/2011/02: analysis of load bearing capacity and separation performance of CLT elements	Verification of the load bearing capacity and the insulation criterion of CLT structures with Stora Enso CLT
Technical expertise 2434/2012 - BB: failure time tf of gypsum fire boards (GKF) according to ON B 3410	Expertise on failure time tf of gypsum wall fire boards according to ON B3410 and gypsum wall boards type DF according to EN 520
EN 1990	EN 1990 - Eurocode ? Basis of structural design
ÖNorm B 1995-1-1 NA	ÖNORM EN 1995-1-1 - Austria - National Annex – Nationally determined parameters – Eurocode 5: Design of timber structures – Part 1-1: General-Common rules and rules for buildings
ÖNorm B 1995-1-2 NA	ÖNORM EN 1995-1-2 - Austria - National Annex - Eurocode 5: Design of timber structures ? Part 1-2: General ? Structural fire design ? National specifications concerning ÖNORM EN 1995-1-2, national comments and national supplements
Fire safety in timber buildings - technical guildeline for Europe	Fire safety in timber buildings - technical guideline for Europe; publishes by SP Technical Research Institute of Sweden

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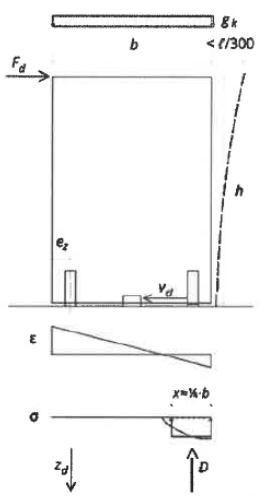
2.5.5.8. Sidranje CLT stene POZ-908

IZRAČUN SIDER PO POZICIJI STENE

POZICIJA STENE: **STENA - S1**

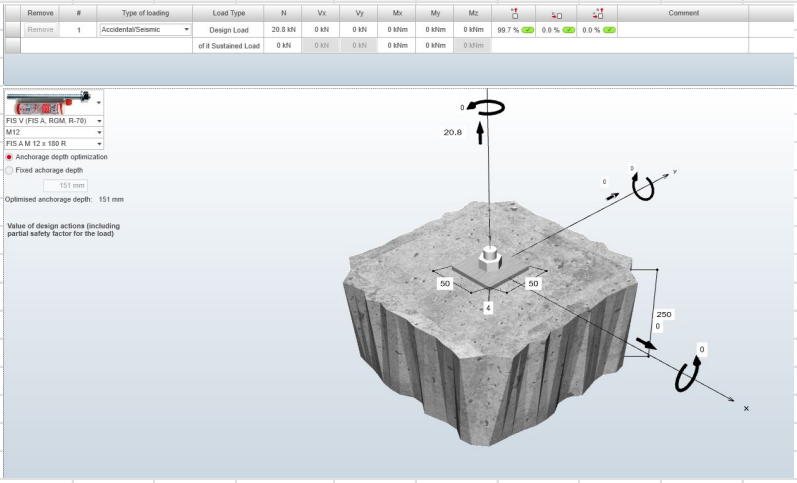


b =	8,85	m	.... Dolžina stena
h =	3,6	m	.... Višina stena
e_z =	0,2	m	.... Razdalja je enaka debelini stene
$G_{Z,k}$ =	8	kN	.... Osna sila
F_d =	85	kN	.... Prečna sila
M_d =	54	kNm	.... Moment
V_d =	4	kN	.... Streižna sila
e =	**6,4375**	m	
Z_d =	**55,83**	kN	

DOLOČITEV KOTNIKOV - NATEZNI SPOJ LES- BETON

NATEZNI KOTNIKI		WHT 440		Žeblji 30 • LBA Ø4,0 • 60		ŠT.SIDER:	2
	$R_{1,d}$ =	78,00	kN >	Z_d =	55,83	kN	***SIDRO USTREZA***

IZRAČUN SIDRA V BETON: FIS V (FIS A, RGM, R-70) FI A M12 x 180 (8.8.)



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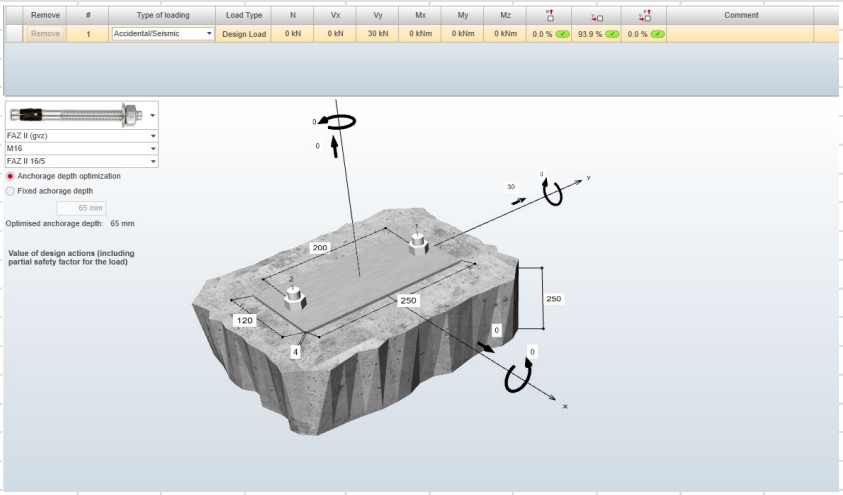
DOLOČITEV KOTNIKOV - STRIŽNII SPOJ LES- BETON									
NATEZNI KOTNIKI			TCN240		Žeblji 36 • LBA Ø4,0 • 60			ŠT.SIDER:	4
	$R_{2/3,d}$ =	102,55	kN >	V_d =	4,00	kN	***SIDRO USTREZA***		

IZRAČUN SIDRA V BETON:	FAZ II M16 x 195 - mehansko sidro



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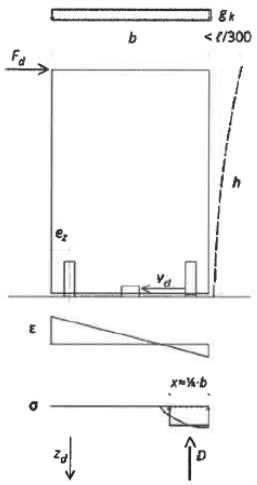
IZRAČUN SIDER PO POZICIJI STENE

POZICIJA STENE: **STENA - S2**

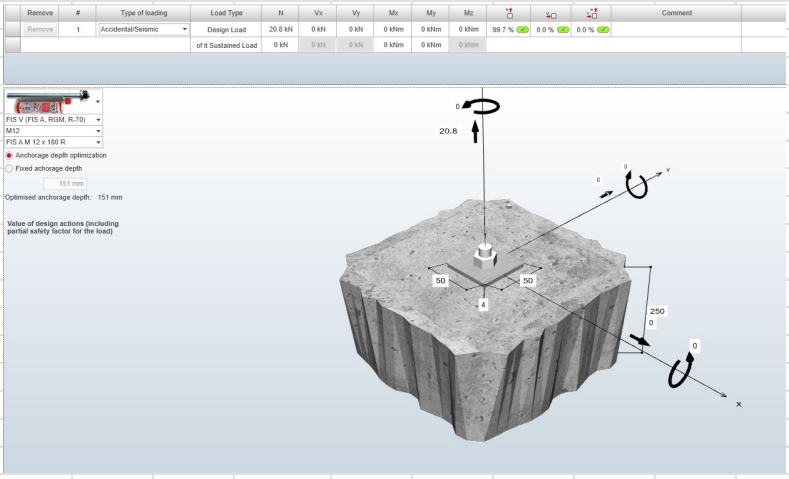


b =	1,45	m	.... Dolžina stena
h =	3,6	m	.... Višina stena
e_z =	0,2	m	.... Razdalja je enaka debelini stene
$G_{Z,k}$ =	90	kN	.... Osna sila
F_d =	18	kN	.... Prečna sila
M_d =	45	kNm	.... Moment
V_d =	29	kN	.... Streižna sila
e =	**0,8875**	m	
Z_d =	**118,72**	kN	

DOLOČITEV KOTNIKOV - NATEZNI SPOJ LES- BETON

NATEZNI KOTNIKI			WHT 440		Žeblji 30 • LBA Ø4,0 • 60		ŠT.SIDER:	4
	$R_{1,d}$ =	156,00	kN >	Z_d =	118,72	kN	***SIDRO USTREZA***	

IZRAČUN SIDRA V BETON: FIS V (FIS A, RGM, R-70) FI A M12 x 180 (8.8.)



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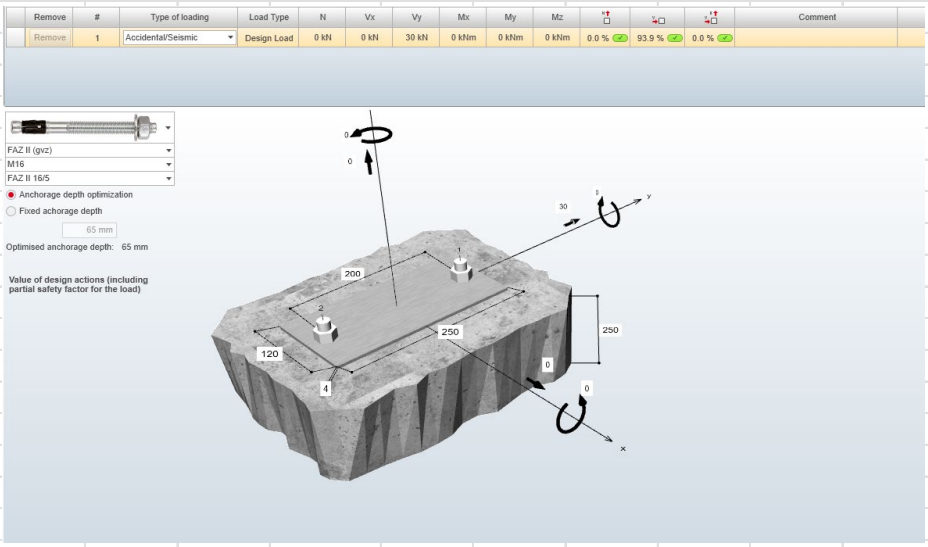
DOLOČITEV KOTNIKOV - STRIŽNII SPOJ LES- BETON								
NATEZNI KOTNIKI			TCN240		Žeblji 36 • LBA Ø4,0 • 60		ŠT.SIDER:	2
	$R_{2/3,d}$ =	51,28	kN >	V_d =	45,00	kN	***SIDRO USTREZA***	

IZRAČUN SIDRA V BETON: FAZ II M16 x 195 - mehansko sidro



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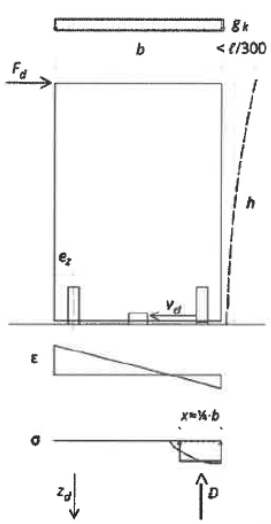
IZRAČUN SIDER PO POZICIJI STENE

POZICIJA STENE: **STENA - S3**

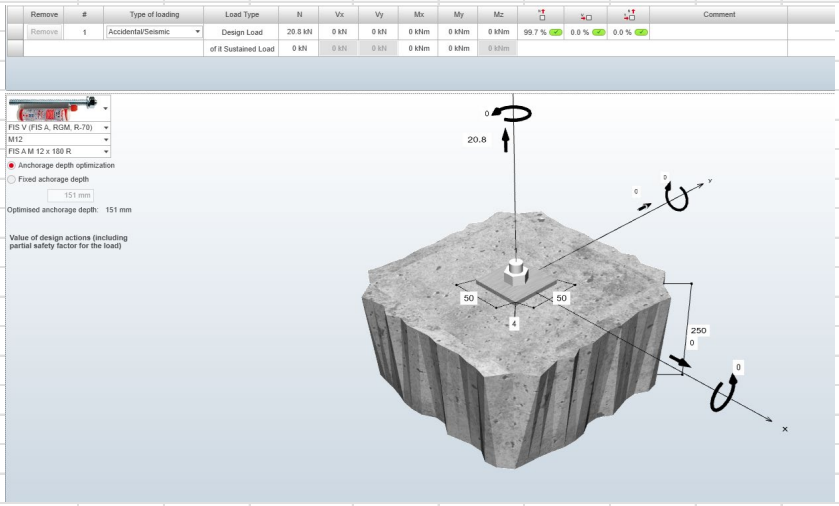


b =	6,4	m	.... Dolžina stena
h =	2,4	m	.... Višina stena
e_z =	0,2	m	.... Razdalja je enaka debelini stene
$G_{Z,k}$ =	55	kN	.... Osna sila
F_d =	34	kN	.... Prečna sila
M_d =	109	kNm	.... Moment
V_d =	34	kN	.... Streižna sila
e =	**4,6**	m	
Z_d =	**39,82**	kN	

DOLOČITEV KOTNIKOV - NATEZNI SPOJ LES- BETON

NATEZNI KOTNIKI			WHT 340		Žeblji 20 • LBA Ø4,0 • 60		ŠT.SIDER:	2
	$R_{1,d}$ =	65,32	kN >	Z_d =	39,82	kN	***SIDRO USTREZA***	

IZRAČUN SIDRA V BETON: FIS V (FIS A, RGM, R-70) FI A M12 x 180 (8.8.)



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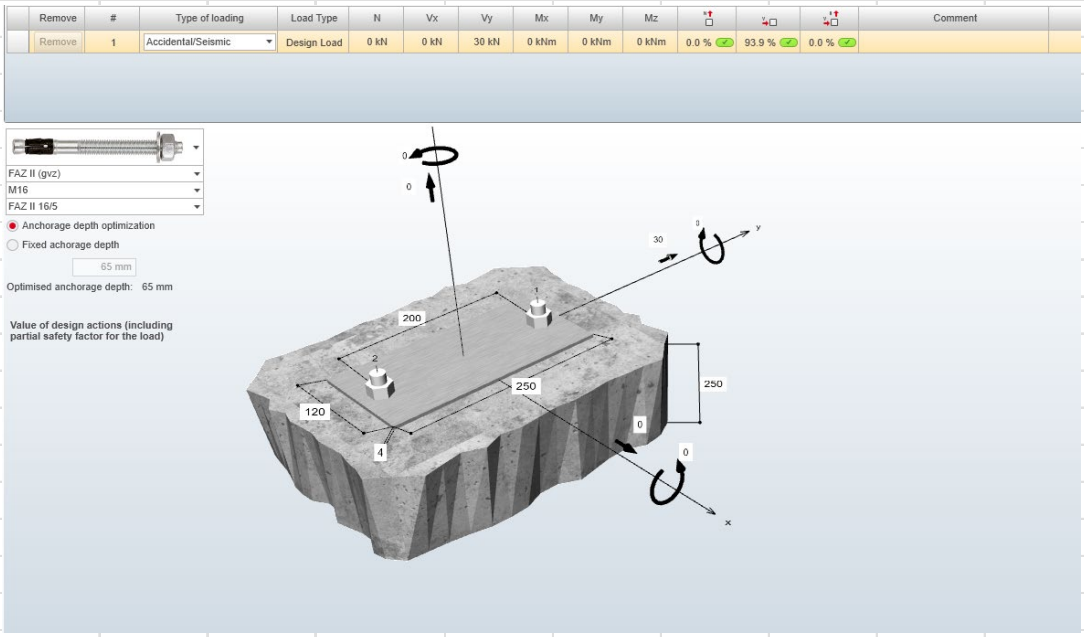
DOLOČITEV KOTNIKOV - STRIŽNII SPOJ LES- BETON

NATEZNI KOTNIKI			TCN240		Žeblji 36 • LBA Ø4,0 • 60		ŠT.SIDER:	2
	$R_{2/3,d}$ =	51,28	kN >	V_d =	34,00	kN	***SIDRO USTREZA***	

IZRAČUN SIDRA V BETON: FAZ II M16 x 195 - mehansko sidro



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2.5.5.9. Dimenzioniranje stebrov dim 20/48 GL24 POZ-910

System

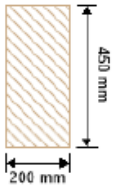




Global utilization ratio				18 %
ULS	18 %	ULS Fire	14 %	

Product data

Section: Wooden beam 20/45



Section width	Section height	Area	Iy	Iz
[cm]	[cm]	[mm²]	[mm⁴]	[mm⁴]
20	45	90,000	1,518,750,000	300,000,000

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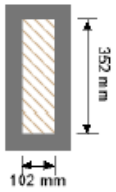
Section Fire: Wooden beam 20/45



Section width	Section height	Area	Iy	Iz
[cm]	[cm]	[mm²]	[mm⁴]	[mm⁴]
10.2	35.2	35,904	370,720,700	31,128,760

Fire resistance class:R 60

Time **60 min**

Fire protection layering : no additional fire protection

k_0	d_0	$d_{char,0,h}$	$d_{ef,h}$	$d_{char,0,v}$	$d_{ef,v}$
[-]	[mm]	[mm]	[mm]	[mm]	[mm]
1	7	42.0	98.0	42.0	98.0

Material values

Material	$f_{m,k}$	$f_{t,0,k}$	$f_{t,90,k}$	$f_{c,0,k}$	$f_{c,90,k}$	$f_{v,k}$	$f_{r,k\ min}$	$E_{0,mean}$	G_{mean}	$E_{0,5}$
	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
GL 24h	24.00	19.20	0.50	24.00	2.50	2.50	1.20	11,500.00	650.00	9,600.00

Load

Load case groups

	Load case category	Type	Duration	Kmod	γ_{inf}	γ_{sup}	Ψ_0	Ψ_1	Ψ_2
LC1	self-weight structure	G	permanen	0.6	1	1.35	1	1	1
LC2	dead load	G	permanen	0.6	1	1.35	1	1	1
LC3	live load cat. C: congregation areas	Q	short term	0.9	0	1.5	0.7	0.7	0.6
LC4	snow load altitude < 1.000 m a.s.l.	Q	short term	0.9	0	1.5	0.5	0.2	0

LC1:self-weight structure

vertical load

P_k	ex. y	ex. z
[kN]	[m]	[m]
1.64	0.00	0.00

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LC2:dead load

point load

x	P_k
[m]	[kN]
0.000	7.00

vertical load

P_k	ex. y	ex. z
[kN]	[m]	[m]
69.00	0.00	0.00

LC3:live load cat. C: congregation areas

point load

x	P_k
[m]	[kN]
0.000	4.00

vertical load

P_k	ex. y	ex. z
[kN]	[m]	[m]
35.00	0.00	0.00

LC4:snow load altitude < 1.000 m a.s.l.

point load

x	P_k
[m]	[kN]
0.000	4.00

vertical load

P_k	ex. y	ex. z
[kN]	[m]	[m]
65.00	0.00	0.00

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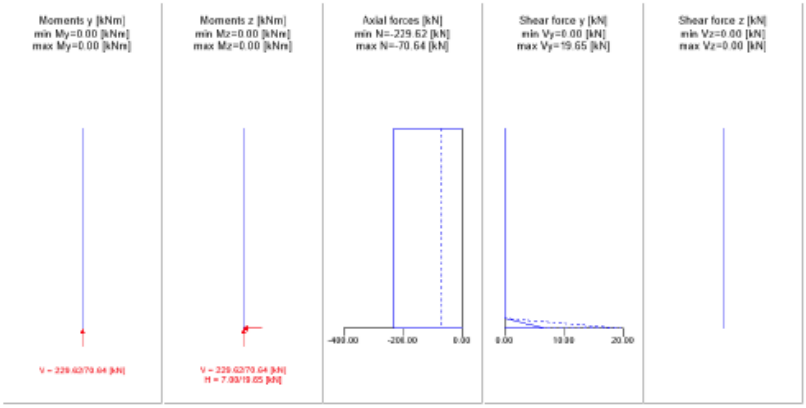
ULS Combinations	
	Combination rule
LCO1	1.35/1.00 * LC1 + 1.35/1.00 * LC2
LCO2	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC3
LCO3	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC3 + 1.50/0.00 * 0.50 * LC4
LCO4	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC4
LCO5	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC4 + 1.50/0.00 * 0.70 * LC3

ULS Combinations Fire	
	Combination rule
LCO1	1.00/1.00 * LC1 + 1.00/1.00 * LC2
LCO2	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.60 * LC3
LCO3	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.60 * LC3 + 1.00/0.00 * 0.00 * LC4
LCO4	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.00 * LC4
LCO5	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.00 * LC4 + 1.00/0.00 * 0.60 * LC3

Ultimate limit state (ULS) - design results



ULS Flexural design													
Dist.	$f_{m,k}$	$f_{c,0,k}$	$f_{t,0,k}$	γ_m	k_{mod}	$k_{sys,z}$	$k_{h,m,y}$	$k_{h,m,z}$	k_l	$f_{m,y,d}$	$f_{m,z,d}$	$f_{t,0,d}$	$f_{c,0,d}$
[m]	[N/mm²]	[N/mm²]	[N/mm²]	[-]	[-]	[-]	[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
0.0	24.00	24.00	19.20	1.25	0.90	1.00	1.03	1.10	1.00	17.78	19.01	13.82	17.28

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$M_{y,d}$ [kNm]	$M_{z,d}$ [kNm]	$N_{c,d}$ [kN]	$N_{t,d}$ [kN]	$\sigma_{m,y,d}$ [N/mm²]	$\sigma_{m,z,d}$ [N/mm²]	$\sigma_{c,d}$ [N/mm²]	$\sigma_{t,d}$ [N/mm²]	Ratio	
0.00	0.00	-229.62	0.00	0.00	0.00	2.55	0.00	15%	LCO5

ULS Shear analysis Y

Dist. [m]	$f_{v,k}$ [N/mm²]	γ_m [-]	k_{mod} [-]	$k_{h,v}$ [-]	$f_{v,d}$ [N/mm²]	V_d [kN]	$\tau_{v,d}$ [N/mm²]	Ratio	
0.0	2.50	1.25	0.90	1.00	1.80	19.65	0.33	18%	LCO5

ULS Shear analysis Z

Dist. [m]	$f_{v,k}$ [N/mm²]	γ_m [-]	k_{mod} [-]	$k_{h,v}$ [-]	$f_{v,d}$ [N/mm²]	V_d [kN]	$\tau_{v,d}$ [N/mm²]	Ratio	
3.65	2.50	1.25	0.90	1.00	1.80	0.00	0.00	0%	LCO5

Flexural stress analysis

$M_{y,d}$ =	0.00	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm		$f_{m,k,z}$ =	24.00	N/mm²	
$N_{c,d}$ =	-229.62	kN		γ_m =	1.25	-	
				k_{mod} =	0.90	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{h,m,y}$ =	1.03	-	
				$k_{h,m,z}$ =	1.10	-	
				k_l =	1.00	-	
$\sigma_{c,d}$ =	2.55	N/mm²		$f_{c,0,d}$ =	17.28	N/mm²	
$\sigma_{m,y,d}$ =	0.00	N/mm²		$f_{m,y,d}$ =	17.78	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	19.01	N/mm²	✓
Utilization ratio							15%

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Shear stress analysis Y							
V_d =	19.65	kN		$f_{v,k}$ =	2.50	N/mm²	
				γ_m =	1.25	-	
				k_{mod} =	0.90	-	
				$k_{h,v}$ =	1.00	-	
$\tau_{v,d}$ =	0.33	N/mm²	<	$f_{v,d}$ =	1.80	N/mm²	✓
Utilization ratio							18%

Shear stress analysis Z							
V_d =	0.00	kN		$f_{v,k}$ =	2.50	N/mm²	
				γ_m =	1.25	-	
				k_{mod} =	0.90	-	
				$k_{h,v}$ =	1.00	-	
$\tau_{v,d}$ =	0.00	N/mm²	<	$f_{v,d}$ =	1.80	N/mm²	✓
Utilization ratio							0%

Shear stress analysis					
$V_{y,d}$ =	0.00	kN	$V_{z,d}$ =	0.00	kN
$f_{v,k}$ =	0.00	N/mm²	γ_m =	1.25	-
$f_{v,d}$ =	0.00	N/mm²	k_{mod} =	0.00	-
$\tau_{v,y,d}$ =	0.00	N/mm²	$\tau_{v,z,d}$ =	0.00	N/mm²
Utilization ratio					0%

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Buckling analysis							
$M_{y,d}$ =	0.00	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm					
$N_{c,d}$ =	-229.62	kN		γ_m =	1.25	-	
				k_{mod} =	0.90	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{sys,z}$ =	1.00	-	
				$k_{h,m,y}$ =	1.03	-	
				$k_{h,m,z}$ =	1.10	-	
$\sigma_{c,d}$ =	2.55	N/mm²		$f_{c,0,d}$ =	17.28	N/mm²	
$\sigma_{m,y,d}$ =	0.00	N/mm²		$f_{m,y,d}$ =	17.78	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	19.01	N/mm²	✓
Utilization ratio							**15%**

Lateral torsional buckling analysis							
$M_{y,d}$ =	0.00	kNm		$f_{m,k}$ =	0.00	N/mm²	
$M_{z,d}$ =	0.00	kNm					
$N_{c,d}$ =	0.00	kN		γ_m =	1.25	-	
				k_{mod} =	0.00	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{h,m,y}$ =	1.03	-	
				$k_{h,m,z}$ =	1.10	-	
				k_l =	1.00	-	
$\sigma_{c,d}$ =	0.00	N/mm²		$f_{c,0,d}$ =	0.00	N/mm²	
$\sigma_{m,y,d}$ =	0.00	N/mm²		$f_{m,y,d}$ =	0.00	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	0.00	N/mm²	✓
Utilization ratio							**0%**

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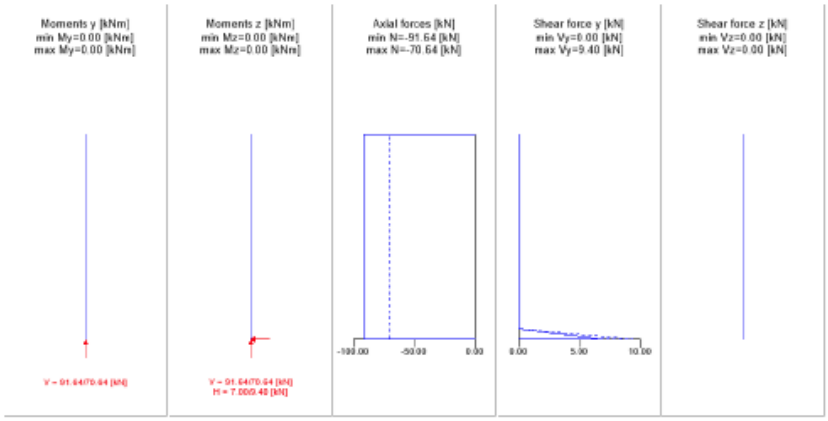
Ultimate limit state (ULS) fire design - results



ULS Fire Flexural design

Dist.	γ_m	k_{mod}	$k_{sys,y}$	k_{fi}	$f_{m,k}$	$f_{m,y,d}$	$f_{t,0,d}$	$f_{c,0,d}$
[m]	[-]	[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
0.0	1.25	0.90	1.00	1.00	24.00	17.78	13.82	17.28

$M_{y,d}$	$N_{c,d}$	$N_{t,d}$	$\sigma_{m,y,d}$	$\sigma_{c,d}$	$\sigma_{t,d}$	Ratio	
[kNm]	[kN]	[kN]	[N/mm²]	[N/mm²]	[N/mm²]		
0.00	-91.64	0.00	0.00	2.55	0.00	9%	LCO2

ULS Fire Shear analysis Y

Dist.	$f_{v,k}$	γ_m	k_{mod}	$k_{sys,y}$	k_{fi}	$f_{v,d}$	V_d	$\tau_{v,d}$	Ratio	
[m]	[N/mm²]	[-]	[-]	[-]	[-]	[N/mm²]	[kN]	[N/mm²]		
0.0	2.50	1.00	1.00	1.00	1.15	2.88	9.40	0.39	14%	LCO2

ULS Fire Shear analysis Z

Dist.	$f_{v,k}$	γ_m	k_{mod}	$k_{sys,y}$	k_{fi}	$f_{v,d}$	V_d	$\tau_{v,d}$	Ratio	
[m]	[N/mm²]	[-]	[-]	[-]	[-]	[N/mm²]	[kN]	[N/mm²]		
3.65	2.50	1.00	1.00	1.00	1.15	2.88	0.00	0.00	0%	LCO5

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Flexural stress analysis Fire							
$M_{y,d}$ =	0.00	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm		$f_{m,k,z}$ =	24.00	N/mm²	
$N_{c,d}$ =	-91.64	kN		γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{h,m,y}$ =	1.05	-	
				$k_{h,m,z}$ =	1.10	-	
				k_l =	1.00	-	
				k_{fi} =	1.15	-	
$\sigma_{c,d}$ =	2.55	N/mm²		$f_{c,0,d}$ =	27.60	N/mm²	
$\sigma_{m,y,d}$ =	0.00	N/mm²		$f_{m,y,d}$ =	29.11	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	30.36	N/mm²	✓
Utilization ratio							9%

Shear stress analysis Y Fire							
V_d =	9.40	kN		$f_{v,k}$ =	2.50	N/mm²	
				γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				$k_{h,v}$ =	1.00	-	
				k_{fi} =	1.15	-	
$\tau_{v,d}$ =	0.39	N/mm²	<	$f_{v,d}$ =	2.88	N/mm²	✓
Utilization ratio							14%

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Shear stress analysis Z Fire							
V_d =	0.00	kN		$f_{v,k}$ =	2.50	N/mm²	
				γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				$k_{h,v}$ =	1.00	-	
				k_{fi} =	1.15	-	
$\tau_{v,d}$ =	0.00	N/mm²	<	$f_{v,d}$ =	2.88	N/mm²	✓
Utilization ratio							0%

Shear stress analysis Fire						
$V_{y,d}$ =	0.00	kN	$V_{z,d}$ =	0.00	kN	
$f_{v,k}$ =	0.00	N/mm²	γ_m =	1.00	-	
			k_{fi} =	1.15	-	
$f_{v,d}$ =	0.00	N/mm²	k_{mod} =	0.00	-	
$\tau_{v,y,d}$ =	0.00	N/mm²	$\tau_{v,z,d}$ =	0.00	N/mm²	
Utilization ratio						0%

Buckling analysis Fire							
$M_{y,d}$ =	0.00	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm					
$N_{c,d}$ =	-91.64	kN		γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{sys,z}$ =	1.00	-	
				$k_{h,m,y}$ =	1.05	-	
				$k_{h,m,z}$ =	1.10	-	
				k_{fi} =	1.15	-	
$\sigma_{c,d}$ =	2.55	N/mm²		$f_{c,0,d}$ =	27.60	N/mm²	
$\sigma_{m,y,d}$ =	0.00	N/mm²		$f_{m,y,d}$ =	29.11	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	30.36	N/mm²	✓
Utilization ratio							10%

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Lateral torsional buckling analysis Fire					
$M_{y,d}$ =	0.00	kNm	$f_{m,k}$ =	0.00	N/mm²
$M_{z,d}$ =	0.00	kNm			
$N_{c,d}$ =	0.00	kN	γ_m =	1.00	-
			k_{mod} =	0.00	-
			$k_{sys,y}$ =	1.00	-
			$k_{h,m,y}$ =	1.05	-
			$k_{h,m,z}$ =	1.10	-
			k_l =	1.00	-
			k_{fi} =	1.15	-
$\sigma_{c,d}$ =	0.00	N/mm²	$f_{c,0,d}$ =	0.00	N/mm²
$\sigma_{m,y,d}$ =	0.00	N/mm²	$f_{m,y,d}$ =	0.00	N/mm²
$\sigma_{m,z,d}$ =	0.00	N/mm² <	$f_{m,z,d}$ =	0.00	N/mm² ✓
Utilization ratio					0%

Support reaction								
Load case category	k_{mod}	A_y	A_z	B_x	B_y	B_z	B_{my}	B_{mz}
		[kN]	[kN]	[kN]	[kN]	[kN]	[kNm]	[kNm]
self-weight structure	0.6	0.00	0.00	1.64	0.00	0.00	0.00	0.00
		0.00	0.00	1.64	0.00	0.00	0.00	0.00
dead load	0.6	0.00	0.00	69.00	7.00	0.00	0.00	0.00
		0.00	0.00	69.00	7.00	0.00	0.00	0.00
live load cat. C: congregation areas	0.9	0.00	0.00	0.00	4.00	0.00	0.00	0.00
		0.00	0.00	35.00	0.00	0.00	0.00	0.00
snow load altitude < 1.000 m a.s.l.	0.9	0.00	0.00	0.00	4.00	0.00	0.00	0.00
		0.00	0.00	65.00	0.00	0.00	0.00	0.00

Reference documents for this analysis	
English title	Description
EN 338	EN 338 - Structural timber ? Strength classes

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Spoj stebra na temeljna tla

DIMENZIONIRANJE LESENEGA SPOJA NA TEMELJE

SPOJI V KONSTRUKCIJI SO DIMENZIONIRANI SKLADNO S STANDARDI:

SIST EN 1992-1-1;2005
SIST EN 1993-1-1;2005
SIST EN 1993-1--8;2005
SIST EN 1998;2005

KONSTRUKCIJEK ZAHTEVE ZA IZVEDBO SPOJEV:

1. Luknje za vijake v lesu smejo imeti njaveč za 1mm večji premer od premera vijaka. Luknje za vijake v jeklenih ploščah smejo imeti najvec 2mm večji prermer od premera vijaka d. V preglednici spodaj so podane dimenzije za posamezne vijake, ki so bili uporabljeni.

VIJAK:	M16	
$d_{0,les}$ =	17	[mm]
$d_{0,jeklo}$ =	18	[mm]

2. Podložke pod glavo in pod matico vijaka morajo imeti premera vsaj 3 xd in debeline vsaj 0,3 x d. Podložke morajo imeti polno naleganje za prenos kontaktne sile.

Premer podložke [mm]	≥	48	mm
Debelina podložke [mm]	≥	4,8	mm

3. Minimalni razmaki med vijaki in minimalne oddaljenosti vijakov od robov se določijo skladno s sliko spodaj.

Razmaki in oddaljenosti od koncev/robov	Kot	Minimalni razmak oziroma oddaljenost od konca/robu
a_1 (vzporedno z vlakni)	$0^\circ \le \alpha \le 360^\circ$	$(4 + \lvert\cos\alpha\rvert)\, d$
a_2 (pravokotno na vlakna)	$0^\circ \le \alpha \le 360^\circ$	$4\, d$
$a_{3,t}$ (obremenjeni konec)	$-90^\circ \le \alpha \le 90^\circ$	max $(7\, d;$ 80 mm)
$a_{3,c}$ (neobremenjeni konec)	$90^\circ \le \alpha < 150^\circ$	max $[(1 + 6 \sin \alpha)\, d;\ 4d]$
	$150^\circ \le \alpha < 210^\circ$	$4\, d$
	$210^\circ \le \alpha \le 270^\circ$	max $[(1 + 6 \sin \alpha)\, d;\ 4d]$
$a_{4,t}$ (obremenjeni rob)	$0^\circ \le \alpha \le 180^\circ$	max $[(2 + 2 \sin \alpha)\, d;\ 3d]$
$a_{4,c}$ (neobremenjeni rob)	$180^\circ \le \alpha \le 360^\circ$	$3\, d$

4. Vijaki in objemke morajo biti pritrjeni tako, da se spojni elementi tesno prilagajo med seboj.

5. V vsakem priključku morata biti vsaj dva vijaka ali več.

6. Uporabljen trdnostni razred 8.8. ali 10.9.

TRDNOSTNI RAZRED VIJAKA	8.8.	10.9.
f_{yb} [N/mm^2]	640	900
f_{ub} [N/mm^2]	800	1000

IZBOR:	8.8.
f_{yb} [N/mm^2]	640
f_{ub} [N/mm^2]	800

7. Izbor lesa oziroma kvalitete pločevine.

IZBOR LESA:	GL24
IZBOR JEKLA:	S 235

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8. Najmanjši in največji razmiki in robne razdalje vijakov, ki jih narekuje velikost lukenj v pločevini oz. debelini pločevine.

Razdalje in razmiki, glej sliko 3.1	Najmanj	Največ [1) 2) 3)]		
		Konstrukcije iz jekel v skladu z EN 10025, razen jekel v skladu z EN 10025-5		Konstrukcije iz jekel v skladu z EN 10025-5
		Jeklo, izpostavljeno vremenskim ali drugim korozivnim vplivom	Jeklo ni izpostavljeno vremenskim ali drugim korozivnim vplivom	Korozijsko nezaščiteno jeklo
Robna razdalja e_1	$1{,}2d_0$	$4t$ + 40 mm		Večje od $8t$ ali 125 mm
Robna razdalja e_2	$1{,}2d_0$	$4t$ + 40 mm		Večje od $8t$ ali 125 mm
Razdalja e_3 v podaljšanih luknjah	$1{,}5d_0$ [4)]			
Razdalja e_4 v podaljšanih luknjah	$1{,}5d_0$ [4)]			
Razmik p_1	$2{,}2d_0$	Manjše od $14t$ ali 200 mm	Manjše od $14t$ ali 200 mm	Manjše od $14t_{min}$ ali 175 mm
Razmik $p_{1,0}$		Manjše od $14t$ ali 200 mm		
Razmik $p_{1,i}$		Manjše od $28t$ ali 400 mm		
Razmik p_2 [5)]	$2{,}4d_0$	Manjše od $14t$ ali 200 mm	Manjše od $14t$ ali 200 mm	Manjše od $14t_{min}$ ali 175 mm

DOLOČITEV PARAMETROV ZA IZRAČUN SPOJEV MED PRIKLJUČNO PLOČEVINO IN LESOM:

SIST EN 1995-1-1:2005; poglavje 8.5.1.1.

$M_{y,Rk} = 0{,}3 \cdot f_{ub} \cdot d^{2,6}$ = 324282 Nmm

SILA VIJAKA DELUJE VZPOREDNO Z LESNIMI VLAKNI ZA VIJAKE DO PREMERA 30mm

$f_{h,0,k} = 0{,}082 \cdot (1\text{-}0{,}01 \cdot d) \cdot \rho_k$ = 26,2 N/mm^2

KARAKTERISTIČNA VTISNA TRDNOST, ČE SILA NA VIJAK DELUJE POD KOTOM α, SIST EN 1995-1-1;2005

KOT α = 90 ° k_{90} = 1,59

$f_{h,\alpha,k} = f_{h,0,k}/(k_{90} \cdot \sin^2\alpha + \cos^2\alpha)$ = 16,5 N/mm^2

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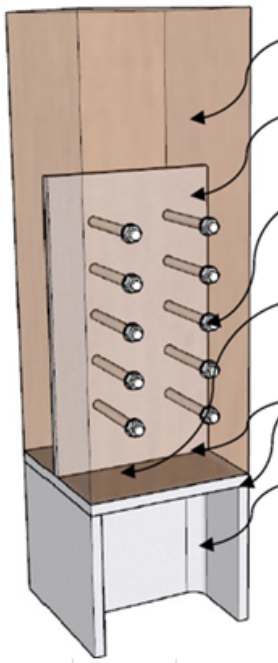
DIMENZIONIRANJE PRIKLJUČKA MES LESNIM STEBROM IN NASTAVKOM I



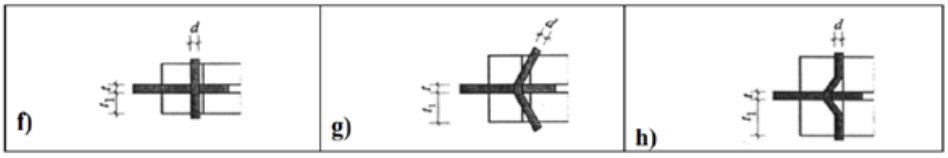
Steber b/h=40/40 cm	t_1 =	192	mm
Priključna pločevina: $h_p/b_p/t_p$ = ___/400/16 mm	600/400/16		
vijakov M16 8.8 v dveh vrstah d=16 mm	**5x2 M 16**		
Priključna pločevina: $h_p/b_p/t_p$ = ___/___/20 mm	180/380/20		
Polnonosilni polnopenetrirani ali kotni zvar: $a \geq 0{,}46 \cdot t$			
Nastavek			
	IPE 360		

OBREMENITEV V NAJBOLJ OBREMENJENEM STEBRU

$N_{ed,G}$ =	223	kN→ VAROVAN SPOJ	278,75	kN	

KONTROLA DVOSTRIŽNEGA PRIKLJUČKA PLOČEVINA - LES

Gre za dvostrižni spoj, kjer je pločevina srednji element. SIST EN 1995-1-1:2005



Porušni mehanizmi dvostrižnega priključka pločevina – les

$$F_{v,Rk} = min \begin{cases} f_{h,0,k} \cdot t_1 \cdot d \\ f_{h,0,k} \cdot t_1 \cdot d \cdot \left[\sqrt{2 + \frac{4 \cdot M_{y,Rk}}{f_{h,0,k} \cdot d \cdot t_1^2}} - 1 \right] \\ 2{,}3 \cdot \sqrt{M_{y,Rk} \cdot f_{h,0,k} \cdot d} \end{cases}$$

		80,41	kN			
$F_{v,Rk}$ = min		66,64	kN	→	26,80	kN
		26,80	kN			

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Karakteristična odpornost enega veznega sredstva v dveh strižnih ravninah: m=							2		
	$F_{v,Rk}$ =	53,61	kN	→ $F_{v,Rd,P}$ =	58,97	kN			
				RAZMAK MED VRSTAMI	a_1 =		80	mm	
IZBEREMO VIJAKE			4	VRST PO 2 VIJAKA		M16			
$n_{ef} = min\left\{ n^{0,9} \cdot \sqrt[4]{\frac{a_1}{13 \cdot d}} \right. =$			4						
			2,74	→	2,742				
Nosilnost obravnavanega priključka za primer maksimalne natezne obremenitve v primeru potresa:									
	$F_{v,Rd,P} \cdot m \cdot n_{ef}$ =		323,41	≥ $N_{ed,max}$ =	278,75	kN			

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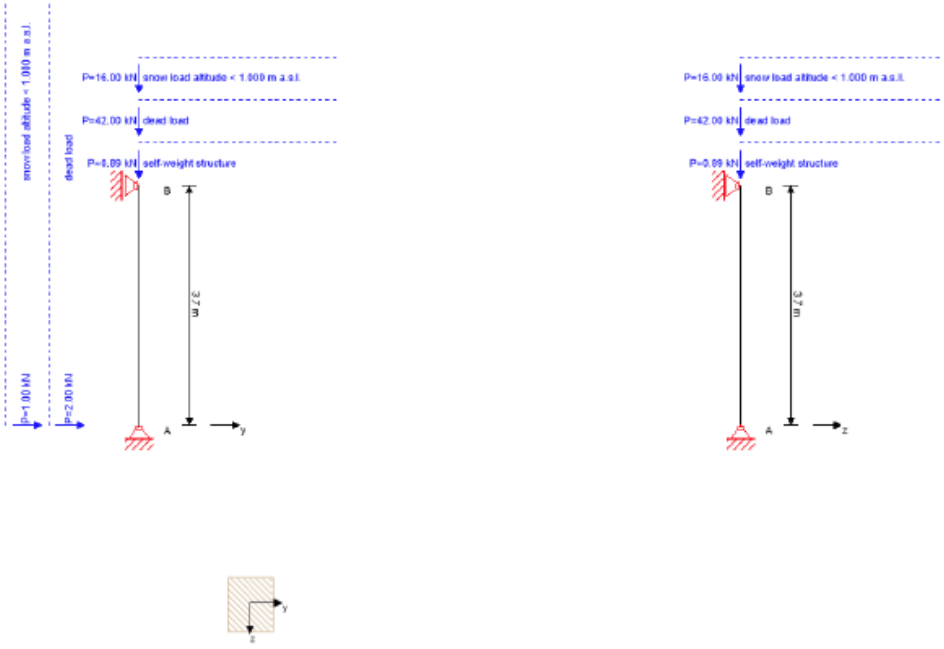
2.5.5.10. Dimenzioniranje stebrov dim 20/24 GL24 POZ-911

System

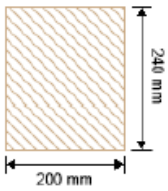


Global utilization ratio 24 %

ULS	12 %	ULS Fire	24 %

Product data

Section: Wooden beam 20/24



Section width	Section height	Area	Iy	Iz
[cm]	[cm]	[mm²]	[mm⁴]	[mm⁴]
20	24	48,000	230,400,000	160,000,000

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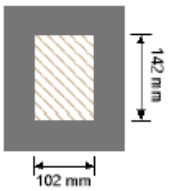
Section Fire: Wooden beam 20/24



Section width	Section height	Area	Iy	Iz
[cm]	[cm]	[mm²]	[mm⁴]	[mm⁴]
10.2	14.2	14,484	24,337,940	12,557,630

Fire resistance class:R 60

Time **60 min**

Fire protection layering : no additional fire protection

k_0	d_0	$d_{char,0,h}$	$d_{ef,h}$	$d_{char,0,v}$	$d_{ef,v}$
[-]	[mm]	[mm]	[mm]	[mm]	[mm]
1	7	42.0	98.0	42.0	98.0

Material values

Material	$f_{m,k}$	$f_{t,0,k}$	$f_{t,90,k}$	$f_{c,0,k}$	$f_{c,90,k}$	$f_{v,k}$	$f_{r,k\ min}$	$E_{0,mean}$	G_{mean}	$E_{0,5}$
	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
GL 24h	24.00	19.20	0.50	24.00	2.50	2.50	1.20	11,500.00	650.00	9,600.00

Load

Load case groups

	Load case category	Type	Duration	Kmod	γ_{inf}	γ_{sup}	Ψ_0	Ψ_1	Ψ_2
LC1	self-weight structure	G	permanen	0.6	1	1.35	1	1	1
LC2	dead load	G	permanen	0.6	1	1.35	1	1	1
LC3	snow load altitude < 1.000 m a.s.l.	Q	short term	0.9	0	1.5	0.5	0.2	0

LC1:self-weight structure

vertical load

P_k	ex. y	ex. z
[kN]	[m]	[m]
0.89	0.00	0.00

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LC2:dead load

point load

x	P_k
[m]	[kN]
0.000	2.00

vertical load

P_k	ex. y	ex. z
[kN]	[m]	[m]
42.00	0.00	0.00

LC3:snow load altitude < 1.000 m a.s.l.

point load

x	P_k
[m]	[kN]
0.000	1.00

vertical load

P_k	ex. y	ex. z
[kN]	[m]	[m]
16.00	0.00	0.00

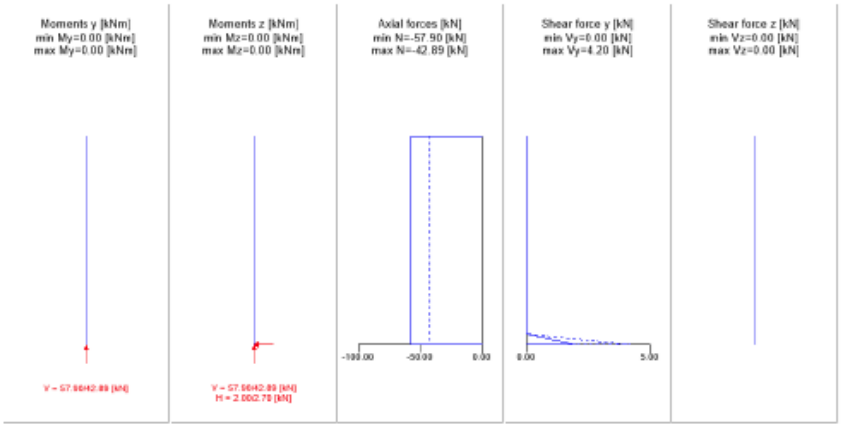
ULS Combinations

	Combination rule
LCO1	1.35/1.00 * LC1 + 1.35/1.00 * LC2
LCO2	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC3

ULS Combinations Fire

	Combination rule
LCO1	1.00/1.00 * LC1 + 1.00/1.00 * LC2
LCO2	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.00 * LC3

Ultimate limit state (ULS) - design results



ULS Flexural design

Dist.	$f_{m,k}$	$f_{c,0,k}$	$f_{t,0,k}$	γ_m	k_{mod}	$k_{sys,z}$	$k_{h,m,y}$	$k_{h,m,z}$	k_l	$f_{m,y,d}$	$f_{m,z,d}$	$f_{t,0,d}$	$f_{c,0,d}$
[m]	[N/mm²]	[N/mm²]	[N/mm²]	[-]	[-]	[-]	[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
0.0	24.00	24.00	19.20	1.25	0.60	1.00	1.10	1.10	1.00	12.63	12.67	9.22	11.52

$M_{y,d}$	$M_{z,d}$	$N_{c,d}$	$N_{t,d}$	$\sigma_{m,y,d}$	$\sigma_{m,z,d}$	$\sigma_{c,d}$	$\sigma_{t,d}$	Ratio	
[kNm]	[kNm]	[kN]	[kN]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]		
0.00	0.00	-57.90	0.00	0.00	0.00	1.21	0.00	10%	LCO1

ULS Shear analysis Y

Dist.	$f_{v,k}$	γ_m	k_{mod}	$k_{h,v}$	$f_{v,d}$	V_d	$\tau_{v,d}$	Ratio	
[m]	[N/mm²]	[-]	[-]	[-]	[N/mm²]	[kN]	[N/mm²]		
0.0	2.50	1.25	0.90	1.00	1.80	4.20	0.13	7%	LCO2

ULS Shear analysis Z

Dist.	$f_{v,k}$	γ_m	k_{mod}	$k_{h,v}$	$f_{v,d}$	V_d	$\tau_{v,d}$	Ratio	
[m]	[N/mm²]	[-]	[-]	[-]	[N/mm²]	[kN]	[N/mm²]		
3.7	2.50	1.25	0.90	1.00	1.80	0.00	0.00	0%	LCO2

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Flexural stress analysis							
$M_{y,d}$ =	0.00	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm		$f_{m,k,z}$ =	24.00	N/mm²	
$N_{c,d}$ =	-57.90	kN		γ_m =	1.25	-	
				k_{mod} =	0.60	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{h,m,y}$ =	1.10	-	
				$k_{h,m,z}$ =	1.10	-	
				k_l =	1.00	-	
$\sigma_{c,d}$ =	1.21	N/mm²		$f_{c,0,d}$ =	11.52	N/mm²	
$\sigma_{m,y,d}$ =	0.00	N/mm²		$f_{m,y,d}$ =	12.63	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	12.67	N/mm²	✓
Utilization ratio							10%

Shear stress analysis Y							
V_d =	4.20	kN		$f_{v,k}$ =	2.50	N/mm²	
				γ_m =	1.25	-	
				k_{mod} =	0.90	-	
				$k_{h,v}$ =	1.00	-	
$\tau_{v,d}$ =	0.13	N/mm²	<	$f_{v,d}$ =	1.80	N/mm²	✓
Utilization ratio							7%

Shear stress analysis Z							
V_d =	0.00	kN		$f_{v,k}$ =	2.50	N/mm²	
				γ_m =	1.25	-	
				k_{mod} =	0.90	-	
				$k_{h,v}$ =	1.00	-	
$\tau_{v,d}$ =	0.00	N/mm²	<	$f_{v,d}$ =	1.80	N/mm²	✓
Utilization ratio							0%

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Shear stress analysis						
$V_{y,d}$ =	0.00	kN		$V_{z,d}$ =	0.00	kN
$f_{v,k}$ =	0.00	N/mm²		γ_m =	1.25	-
$f_{v,d}$ =	0.00	N/mm²		k_{mod} =	0.00	-
$\tau_{v,y,d}$ =	0.00	N/mm²		$\tau_{v,z,d}$ =	0.00	N/mm²
Utilization ratio						0%

Buckling analysis						
$M_{y,d}$ =	0.00	kNm		$f_{m,k}$ =	24.00	N/mm²
$M_{z,d}$ =	0.00	kNm				
$N_{c,d}$ =	-57.90	kN		γ_m =	1.25	-
				k_{mod} =	0.60	-
				$k_{sys,y}$ =	1.00	-
				$k_{sys,z}$ =	1.00	-
				$k_{h,m,y}$ =	1.10	-
				$k_{h,m,z}$ =	1.10	-
$\sigma_{c,d}$ =	1.21	N/mm²		$f_{c,0,d}$ =	11.52	N/mm²
$\sigma_{m,y,d}$ =	0.00	N/mm²		$f_{m,y,d}$ =	12.63	N/mm²
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	12.67	N/mm² ✓
Utilization ratio						12%

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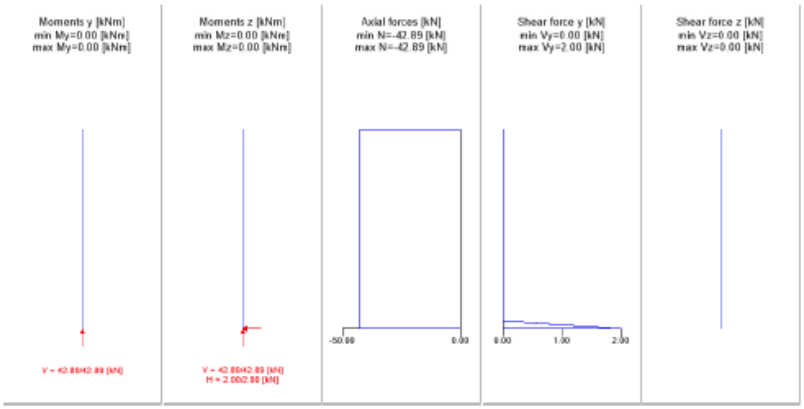
Lateral torsional buckling analysis						
$M_{y,d}$ =	0.00	kNm	$f_{m,k}$ =	0.00	N/mm²	
$M_{z,d}$ =	0.00	kNm				
$N_{c,d}$ =	0.00	kN	γ_m =	1.25	-	
			k_{mod} =	0.00	-	
			$k_{sys,y}$ =	1.00	-	
			$k_{h,m,y}$ =	1.10	-	
			$k_{h,m,z}$ =	1.10	-	
			k_l =	1.00	-	
$\sigma_{c,d}$ =	0.00	N/mm²	$f_{c,0,d}$ =	0.00	N/mm²	
$\sigma_{m,y,d}$ =	0.00	N/mm²	$f_{m,y,d}$ =	0.00	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm² <	$f_{m,z,d}$ =	0.00	N/mm²	✓
Utilization ratio						0%

Ultimate limit state (ULS) fire design - results



ULS Fire Flexural design

Dist.	γ_m	k_{mod}	$k_{sys,y}$	k_{fi}	$f_{m,k}$	$f_{m,y,d}$	$f_{t,0,d}$	$f_{c,0,d}$
[m]	[-]	[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
0.0	1.25	0.60	1.00	1.00	24.00	12.63	9.22	11.52

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$M_{y,d}$ [kNm]	$N_{c,d}$ [kN]	$N_{t,d}$ [kN]	$\sigma_{m,y,d}$ [N/mm²]	$\sigma_{c,d}$ [N/mm²]	$\sigma_{t,d}$ [N/mm²]	Ratio	
0.00	-42.89	0.00	0.00	2.96	0.00	11%	LCO1

ULS Fire Shear analysis Y

Dist. [m]	$f_{v,k}$ [N/mm²]	γ_m [-]	k_{mod} [-]	$k_{sys,y}$ [-]	k_{fi} [-]	$f_{v,d}$ [N/mm²]	V_d [kN]	$\tau_{v,d}$ [N/mm²]	Ratio	
0.0	2.50	1.00	1.00	1.00	1.15	2.88	2.00	0.21	7%	LCO1

ULS Fire Shear analysis Z

Dist. [m]	$f_{v,k}$ [N/mm²]	γ_m [-]	k_{mod} [-]	$k_{sys,y}$ [-]	k_{fi} [-]	$f_{v,d}$ [N/mm²]	V_d [kN]	$\tau_{v,d}$ [N/mm²]	Ratio	
3.7	2.50	1.00	1.00	1.00	1.15	2.88	0.00	0.00	0%	LCO2

Flexural stress analysis Fire

$M_{y,d}$ =	0.00	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm		$f_{m,k,z}$ =	24.00	N/mm²	
$N_{c,d}$ =	-42.89	kN		γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{h,m,y}$ =	1.10	-	
				$k_{h,m,z}$ =	1.10	-	
				k_l =	1.00	-	
				k_{fi} =	1.15	-	
$\sigma_{c,d}$ =	2.96	N/mm²		$f_{c,0,d}$ =	27.60	N/mm²	
$\sigma_{m,y,d}$ =	0.00	N/mm²		$f_{m,y,d}$ =	30.36	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	30.36	N/mm²	✓
Utilization ratio							11%

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Shear stress analysis Y Fire							
V_d =	2.00	kN		$f_{v,k}$ =	2.50	N/mm²	
				γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				$k_{h,v}$ =	1.00	-	
				k_{fi} =	1.15	-	
$\tau_{v,d}$ =	0.21	N/mm²	<	$f_{v,d}$ =	2.88	N/mm²	✓
Utilization ratio							7%

Shear stress analysis Z Fire							
V_d =	0.00	kN		$f_{v,k}$ =	2.50	N/mm²	
				γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				$k_{h,v}$ =	1.00	-	
				k_{fi} =	1.15	-	
$\tau_{v,d}$ =	0.00	N/mm²	<	$f_{v,d}$ =	2.88	N/mm²	✓
Utilization ratio							0%

Shear stress analysis Fire						
$V_{y,d}$ =	0.00	kN	$V_{z,d}$ =	0.00	kN	
$f_{v,k}$ =	0.00	N/mm²	γ_m =	1.00	-	
			k_{fi} =	1.15	-	
$f_{v,d}$ =	0.00	N/mm²	k_{mod} =	0.00	-	
$\tau_{v,y,d}$ =	0.00	N/mm²	$\tau_{v,z,d}$ =	0.00	N/mm²	
Utilization ratio						0%

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Buckling analysis Fire							
$M_{y,d}$ =	0.00	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm					
$N_{c,d}$ =	-42.89	kN		γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{sys,z}$ =	1.00	-	
				$k_{h,m,y}$ =	1.10	-	
				$k_{h,m,z}$ =	1.10	-	
				k_{fi} =	1.15	-	
$\sigma_{c,d}$ =	2.96	N/mm²		$f_{c,0,d}$ =	27.60	N/mm²	
$\sigma_{m,y,d}$ =	0.00	N/mm²		$f_{m,y,d}$ =	30.36	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	30.36	N/mm²	✓
Utilization ratio							24%

Lateral torsional buckling analysis Fire							
$M_{y,d}$ =	0.00	kNm		$f_{m,k}$ =	0.00	N/mm²	
$M_{z,d}$ =	0.00	kNm					
$N_{c,d}$ =	0.00	kN		γ_m =	1.00	-	
				k_{mod} =	0.00	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{h,m,y}$ =	1.10	-	
				$k_{h,m,z}$ =	1.10	-	
				k_l =	1.00	-	
				k_{fi} =	1.15	-	
$\sigma_{c,d}$ =	0.00	N/mm²		$f_{c,0,d}$ =	0.00	N/mm²	
$\sigma_{m,y,d}$ =	0.00	N/mm²		$f_{m,y,d}$ =	0.00	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	0.00	N/mm²	✓
Utilization ratio							0%

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Support reaction						
Load case category	k_{mod}	A_y	A_z	B_x	B_y	B_z
		[kN]	[kN]	[kN]	[kN]	[kN]
self-weight structure	0.6	0.00	0.00	0.89	0.00	0.00
		0.00	0.00	0.89	0.00	0.00
dead load	0.6	0.00	0.00	42.00	2.00	0.00
		0.00	0.00	42.00	2.00	0.00
snow load altitude < 1.000 m a.s.l.	0.9	0.00	0.00	0.00	1.00	0.00
		0.00	0.00	16.00	0.00	0.00

Reference documents for this analysis	
English title	Description
EN 338	EN 338 - Structural timber ? Strength classes
EN 1995-1-1	EN 1995-1-1 - Eurocode 5: Design of timber structures - Part 1-1: General - Common rules and rules for buildings
EN 1995-1-2	EN 1995-1-2 - Eurocode 5 — Design of timber structures — Part 1-2: General — Structural fire design
EN 14080	EN 14080 - Timber Structures - Glued laminated timber and glued solid timber - Requirements
EN 1990	EN 1990 - Eurocode ? Basis of structural design
ÖNorm B 1995-1-1 NA	ÖNORM EN 1995-1-1 - Austria - National Annex – Nationally determined parameters – Eurocode 5: Design of timber structures – Part 1-1: General- Common rules and rules for buildings
ÖNorm B 1995-1-2 NA	ÖNORM EN 1995-1-2 - Austria - National Annex - Eurocode 5: Design of timber structures ? Part 1-2: General ? Structural fire design ? National specifications concerning ÖNORM EN 1995-1-2, national comments and national supplements
Fire safety in timber buildings - technical guildeline for Europe	Fire safety in timber buildings - technical guideline for Europe; publishes by SP Technical Research Institute of Sweden
National specifications concerning ÖNORM EN 1995-1-2, national comments and national supplements, chapter 12	ÖNORM EN 1995-1-2 - National specifications concerning ÖNORM EN 1995-1-2, national comments and national supplements, chapter 12
CERTIFICATE NO. EUFI29-20000564-C	Product certificate
LVL G by Stora Enso_Structural design manual column&beam_ V01	Design manual
ETA 20_0291 LVL G by Stora Enso	Stora Enso - LVL G by Stora Enso

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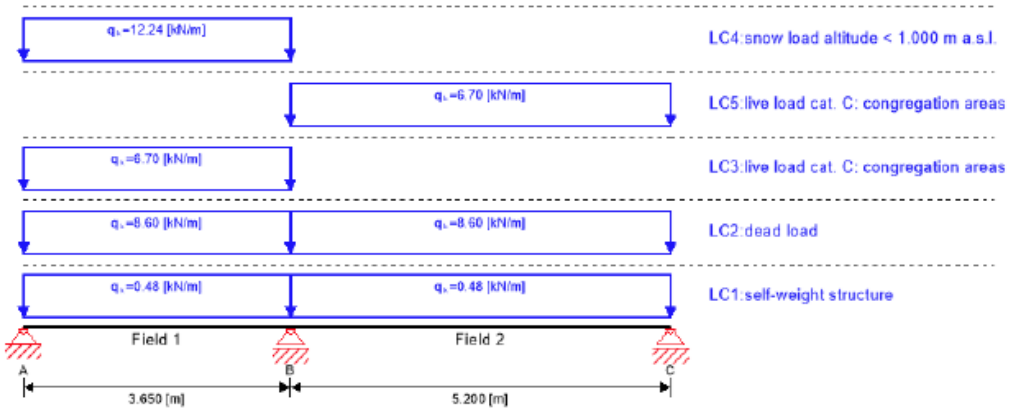
2.5.5.11. Dimenzioniranje nosilcev dim 20/48 GL24 POZ-912

System

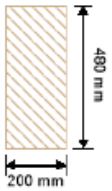


Global utilization ratio 59 %

ULS	ULS Fire	SLS	Vibration	Support	Void
59 %	42 %	31 %	42 %	-1 %	-1 %

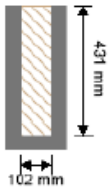
Product data

Section: Wooden beam 20/48



Section width	Section height	Area	Iy	Iz
[cm]	[cm]	[mm²]	[mm⁴]	[mm⁴]
20	48	96,000	1,843,200,000	320,000,000

Section Fire: Wooden beam 20/48



Section width	Section height	Area	Iy	Iz
[cm]	[cm]	[mm²]	[mm⁴]	[mm⁴]
10.2	43.1	43,962	680,535,400	38,115,050

Fire resistance class:R 60 Time **60 min**

Section Fire: Wooden beam 20/48

Fire protection layering : no additional fire protection

k_0	d_0	$d_{char,0,h}$	$d_{ef,h}$	$d_{char,0,v}$	$d_{ef,v}$
[-]	[mm]	[mm]	[mm]	[mm]	[mm]
1	7	42.0	49.0	42.0	98.0

Material values

Material	$f_{m,k}$	$f_{t,0,k}$	$f_{t,90,k}$	$f_{c,0,k}$	$f_{c,90,k}$	$f_{v,k}$	$f_{r,k\ min}$	$E_{0,mean}$	G_{mean}	$E_{0,5}$
	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
GL 24h	24.00	19.20	0.50	24.00	2.50	2.50	1.20	11,500.00	650.00	9,600.00

Load

Load case groups

	Load case category	Type	Duration	Kmod	γ_{inf}	γ_{sup}	Ψ_0	Ψ_1	Ψ_2
LC1	self-weight structure	G	permanent	0.6	1	1.35	1	1	1
LC2	dead load	G	permanent	0.6	1	1.35	1	1	1
LC3	live load cat. C: congregation areas	Q	short term	0.9	0	1.5	0.7	0.7	0.6
LC4	snow load altitude < 1.000 m a.s.l.	Q	short term	0.9	0	1.5	0.5	0.2	0
LC5	live load cat. C: congregation areas	Q	short term	0.9	0	1.5	0.7	0.7	0.6

LC1:self-weight structure

continuous load

Field	Load at start
	[kN/m]
1	0.48
2	0.48

LC2:dead load

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continuous load	
Field	Load at start [kN/m]
1	8.60
2	8.60

LC3:live load cat. C: congregation areas

continuous load	
Field	Load at start [kN/m]
1	6.70

LC4:snow load altitude < 1.000 m a.s.l.

continuous load	
Field	Load at start [kN/m]
1	12.24

LC5:live load cat. C: congregation areas

continuous load	
Field	Load at start [kN/m]
2	6.70

ULS Combinations	
	Combination rule
LCO1	1.35/1.00 * LC1 + 1.35/1.00 * LC2
LCO2	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC3

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ULS Combinations	
	Combination rule
LCO3	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC3 + 1.50/0.00 * 0.50 * LC4
LCO4	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC3 + 1.50/0.00 * 0.50 * LC4 + 1.50/0.00 * 0.70 * LC5
LCO5	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC4
LCO6	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC4 + 1.50/0.00 * 0.70 * LC3
LCO7	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC4 + 1.50/0.00 * 0.70 * LC3 + 1.50/0.00 * 0.70 * LC5
LCO8	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC5
LCO9	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC5 + 1.50/0.00 * 0.70 * LC3
LCO10	1.35/1.00 * LC1 + 1.35/1.00 * LC2 + 1.50/0.00 * LC5 + 1.50/0.00 * 0.70 * LC3 + 1.50/0.00 * 0.50 * LC4

ULS Combinations Fire	
	Combination rule
LCO11	1.00/1.00 * LC1 + 1.00/1.00 * LC2
LCO12	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.60 * LC3
LCO13	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.60 * LC3 + 1.00/0.00 * 0.00 * LC4
LCO14	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.60 * LC3 + 1.00/0.00 * 0.00 * LC4 + 1.00/0.00 * 0.60 * LC5
LCO15	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.00 * LC4
LCO16	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.00 * LC4 + 1.00/0.00 * 0.60 * LC3
LCO17	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.00 * LC4 + 1.00/0.00 * 0.60 * LC3 + 1.00/0.00 * 0.60 * LC5
LCO18	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.60 * LC5
LCO19	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.60 * LC5 + 1.00/0.00 * 0.60 * LC3
LCO20	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.60 * LC5 + 1.00/0.00 * 0.60 * LC3 + 1.00/0.00 * 0.00 * LC4

SLS Characteristic Combination	
	Combination rule
LCO21	1.00/1.00 * LC1 + 1.00/1.00 * LC2
LCO22	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * LC3 + 1.00/0.00 * 0.50 * LC4 + 1.00/0.00 * 0.70 * LC5
LCO23	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * LC4 + 1.00/0.00 * 0.70 * LC3 + 1.00/0.00 * 0.70 * LC5
LCO24	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * LC5 + 1.00/0.00 * 0.70 * LC3 + 1.00/0.00 * 0.50 * LC4

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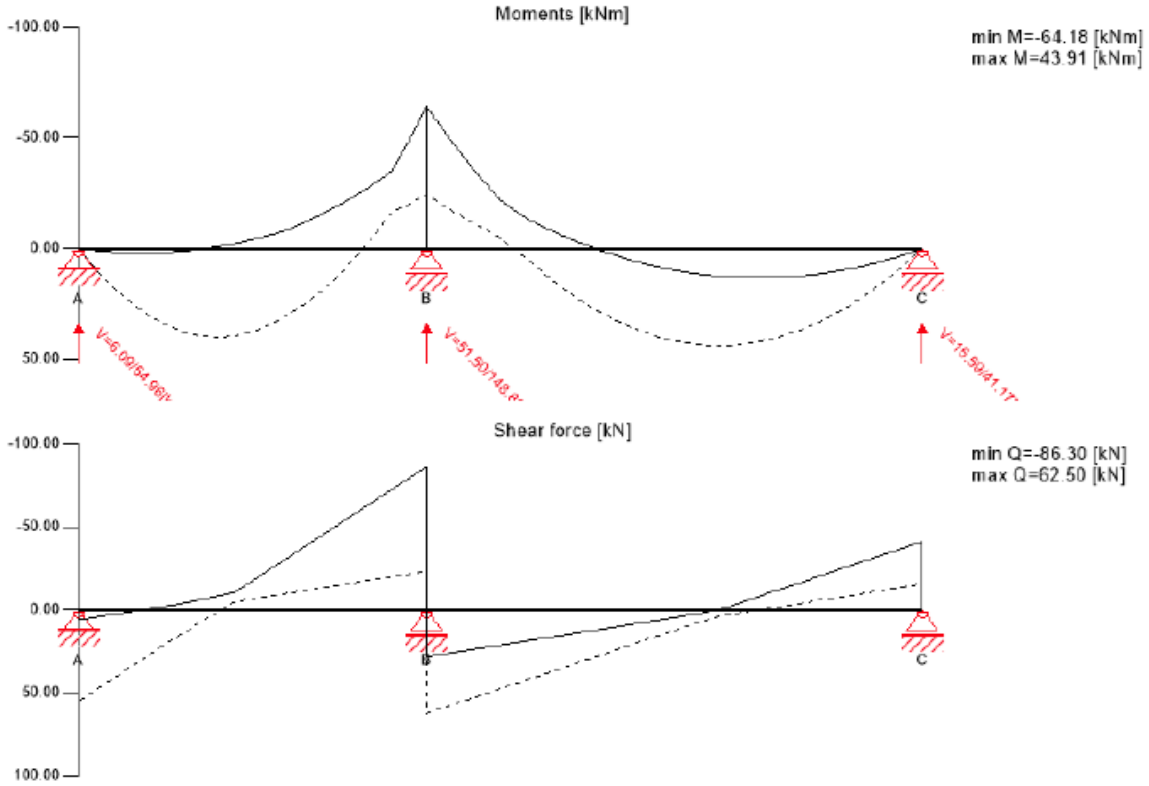
SLS Quasi-permanent Combination

	Combination rule
LCO25	1.00/1.00 * LC1 + 1.00/1.00 * LC2
LCO26	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.60 * LC3 + 1.00/0.00 * 0.00 * LC4 + 1.00/0.00 * 0.60 * LC5
LCO27	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.00 * LC4 + 1.00/0.00 * 0.60 * LC3 + 1.00/0.00 * 0.60 * LC5
LCO28	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.60 * LC5 + 1.00/0.00 * 0.60 * LC3 + 1.00/0.00 * 0.00 * LC4

Ultimate limit state (ULS) - design results



ULS Flexural design

Field	Dist.	$f_{m,k}$	$f_{c,0,k}$	$f_{t,0,k}$	γ_m	k_{mod}	$k_{sys,z}$	$k_{h,m,y}$	$k_{h,m,z}$	k_l	$f_{m,y,d}$	$f_{m,z,d}$	$f_{t,0,d}$	$f_{c,0,d}$
	[m]	[N/mm²]	[N/mm²]	[N/mm²]	[-]	[-]	[-]	[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
1	3.65	24.00	24.00	19.20	1.25	0.90	1.00	1.02	1.10	1.00	17.67	19.01	13.82	17.28
2	0.0	24.00	24.00	19.20	1.25	0.90	1.00	1.02	1.10	1.00	17.67	19.01	13.82	17.28

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Field	$M_{y,d}$ [kNm]	$M_{z,d}$ [kNm]	$N_{c,d}$ [kN]	$N_{t,d}$ [kN]	$\sigma_{m,y,d}$ [N/mm²]	$\sigma_{m,z,d}$ [N/mm²]	$\sigma_{c,d}$ [N/mm²]	$\sigma_{t,d}$ [N/mm²]	Ratio	
1	-64.18	0.00	0.00	0.00	8.36	0.00	0.00	0.00	47%	LCO7
2	-64.18	0.00	0.00	0.00	8.36	0.00	0.00	0.00	47%	LCO7

ULS Shear analysis

Field	Dist. [m]	$f_{v,k}$ [N/mm²]	γ_m [-]	k_{mod} [-]	$k_{h,v}$ [-]	$f_{v,d}$ [N/mm²]	V_d [kN]	$\tau_{v,d}$ [N/mm²]	Ratio	
1	3.17	2.50	1.25	0.90	1.00	1.80	68.23	1.07	59%	LCO7
2	0.48	2.50	1.25	0.90	1.00	1.80	59.57	0.93	52%	LCO10

ULS Buckling design

Field	$M_{y,d}$ [kNm]	$M_{z,d}$ [kNm]	$N_{c,d}$ [kN]	$\sigma_{m,y,d}$ [N/mm²]	$\sigma_{m,z,d}$ [N/mm²]	$\sigma_{c,d}$ [N/mm²]	Ratio	
1	-64.18	0.00	0.00	8.36	0.00	0.00	47%	LCO7
2	-64.18	0.00	0.00	8.36	0.00	0.00	47%	LCO7

ULS Lateral torsional buckling design

Field	$M_{y,d}$ [kNm]	$M_{z,d}$ [kNm]	$N_{c,d}$ [kN]	$\sigma_{m,y,d}$ [N/mm²]	$\sigma_{m,z,d}$ [N/mm²]	$\sigma_{c,d}$ [N/mm²]	Ratio	
1	-64.18	0.00	0.00	8.36	0.00	0.00	47%	LCO7
2	-64.18	0.00	0.00	8.36	0.00	0.00	47%	LCO7

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Flexural stress analysis								
$M_{y,d}$ =	-64.18	kNm		$f_{m,k}$ =	24.00	N/mm²		
$M_{z,d}$ =	0.00	kNm		$f_{m,k,z}$ =	24.00	N/mm²		
$N_{t,d}$ =	0.00	kN		γ_m =	1.25	-		
				k_{mod} =	0.90	-		
				$k_{sys,y}$ =	1.00	-		
				$k_{h,m,y}$ =	1.02	-		
				$k_{h,m,z}$ =	1.10	-		
				k_l =	1.00	-		
$\sigma_{t,d}$ =	0.00	N/mm²		$f_{t,0,d}$ =	13.82	N/mm²		
$\sigma_{m,y,d}$ =	8.36	N/mm²		$f_{m,y,d}$ =	17.67	N/mm²		
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	19.01	N/mm²	✓	
Utilization ratio								47%

Shear stress analysis								
V_d =	68.23	kN		$f_{v,k}$ =	2.50	N/mm²		
				γ_m =	1.25	-		
				k_{mod} =	0.90	-		
				$k_{h,v}$ =	1.00	-		
$\tau_{v,d}$ =	1.07	N/mm²	<	$f_{v,d}$ =	1.80	N/mm²	✓	
Utilization ratio								59%

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Buckling analysis							
$M_{y,d}$ =	-64.18	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm					
$N_{c,d}$ =	0.00	kN		γ_m =	1.25	-	
				k_{mod} =	0.90	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{sys,z}$ =	1.00	-	
				$k_{h,m,y}$ =	1.02	-	
				$k_{h,m,z}$ =	1.10	-	
$\sigma_{c,d}$ =	0.00	N/mm²		$f_{c,0,d}$ =	17.28	N/mm²	
$\sigma_{m,y,d}$ =	8.36	N/mm²		$f_{m,y,d}$ =	17.67	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	19.01	N/mm²	✓
Utilization ratio							47%

Lateral torsional buckling analysis							
$M_{y,d}$ =	-64.18	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm					
$N_{c,d}$ =	0.00	kN		γ_m =	1.25	-	
				k_{mod} =	0.90	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{h,m,y}$ =	1.02	-	
				$k_{h,m,z}$ =	1.10	-	
				k_l =	1.00	-	
$\sigma_{c,d}$ =	0.00	N/mm²		$f_{c,0,d}$ =	17.28	N/mm²	
$\sigma_{m,y,d}$ =	8.36	N/mm²		$f_{m,y,d}$ =	17.67	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	19.01	N/mm²	✓
Utilization ratio							47%

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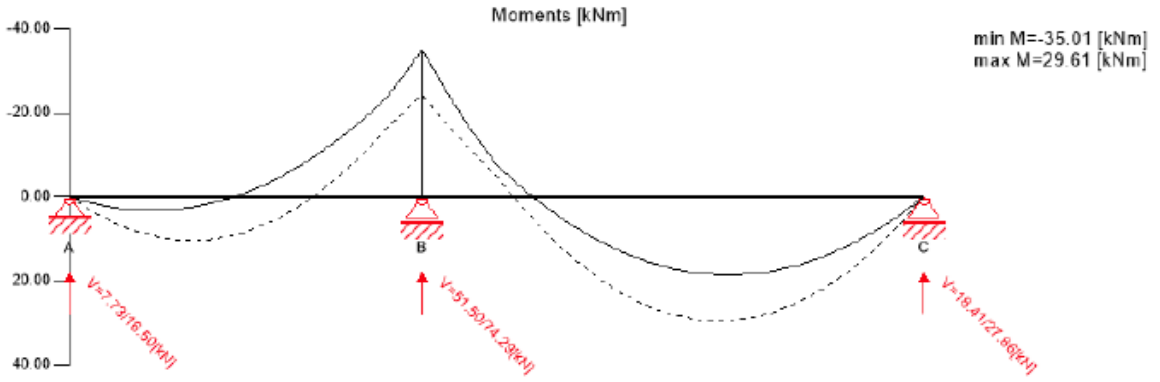
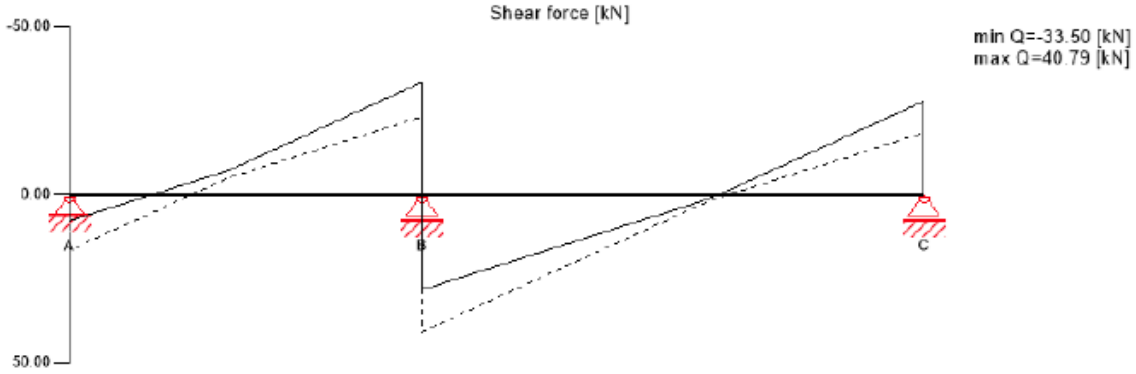
Ultimate limit state (ULS) fire design - results





ULS Fire Flexural design

Field	Dist.	$f_{m,k}$	$f_{c,0,k}$	$f_{t,0,k}$	γ_m	k_{mod}	k_{fi}	$k_{sys,z}$	$k_{h,m,y}$	$k_{h,m,z}$	k_l	$f_{m,y,d}$	$f_{m,z,d}$	$f_{t,0,d}$	$f_{c,0,d}$
	[m]	[N/mm²]	[N/mm²]	[N/mm²]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
1	3.65	24.00	24.00	19.20	1.25	0.90	1.00	1.00	1.02	1.10	1.00	17.67	19.01	13.82	17.28
2	0.0	24.00	24.00	19.20	1.25	0.90	1.00	1.00	1.02	1.10	1.00	17.67	19.01	13.82	17.28

Field	$M_{y,d}$	$M_{z,d}$	$N_{c,d}$	$N_{t,d}$	$\sigma_{m,y,d}$	$\sigma_{m,z,d}$	$\sigma_{c,d}$	$\sigma_{t,d}$	Ratio	
	[kNm]	[kNm]	[kN]	[kN]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]		
1	-64.18	0.00	0.00	0.00	8.36	0.00	0.00	0.00	47%	LCO7
2	-64.18	0.00	0.00	0.00	8.36	0.00	0.00	0.00	47%	LCO7

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ULS Fire Shear analysis

Field	Dist.	$f_{v,k}$	γ_m	k_{mod}	$k_{h,v}$	k_{fi}	$f_{v,d}$	V_d	$\tau_{v,d}$	Ratio	
	[m]	[N/mm²]	[-]	[-]	[-]	[-]	[N/mm²]	[kN]	[N/mm²]		
1	3.22	2.50	1.00	1.00	1.00	1.15	2.88	27.85	0.95	33%	LCO14
2	0.43	2.50	1.00	1.00	1.00	1.15	2.88	35.15	1.20	42%	LCO14

ULS Buckling design

Field	$M_{y,d}$	$M_{z,d}$	$N_{c,d}$	$\sigma_{m,y,d}$	$\sigma_{m,z,d}$	$\sigma_{c,d}$	Ratio	
	[kNm]	[kNm]	[kN]	[N/mm²]	[N/mm²]	[N/mm²]		
1	-35.01	0.00	0.00	11.09	0.00	0.00	39%	LCO14
2	-35.01	0.00	0.00	11.09	0.00	0.00	39%	LCO14

ULS Fire Lateral torsional buckling design

Field	$M_{y,d}$	$M_{z,d}$	$N_{c,d}$	$\sigma_{m,z,d}$	$\sigma_{m,y,d}$	$\sigma_{c,d}$	Ratio	
	[kNm]	[kNm]	[kN]	[N/mm²]	[N/mm²]	[N/mm²]		
1	-35.01	0.00	0.00	0.00	11.09	0.00	39%	LCO14
2	-35.01	0.00	0.00	0.00	11.09	0.00	39%	**LCO14**

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Flexural stress analysis Fire							
$M_{y,d}$ =	-35.01	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm		$f_{m,k,z}$ =	24.00	N/mm²	
$N_{t,d}$ =	0.00	kN		γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{h,m,y}$ =	1.03	-	
				$k_{h,m,z}$ =	1.10	-	
				k_l =	1.00	-	
				k_{fi} =	1.15	-	
$\sigma_{t,d}$ =	0.00	N/mm²		$f_{t,0,d}$ =	22.08	N/mm²	
$\sigma_{m,y,d}$ =	11.09	N/mm²		$f_{m,y,d}$ =	28.53	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	30.36	N/mm²	✓
Utilization ratio							39%

Shear stress analysis Fire							
V_d =	35.15	kN		$f_{v,k}$ =	2.50	N/mm²	
				γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				$k_{h,v}$ =	1.00	-	
				k_{fi} =	1.15	-	
$\tau_{v,d}$ =	1.20	N/mm²	<	$f_{v,d}$ =	2.88	N/mm²	✓
Utilization ratio							42%

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Buckling analysis							
$M_{y,d}$ =	-35.01	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm					
$N_{c,d}$ =	0.00	kN		γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{sys,z}$ =	1.00	-	
				$k_{h,m,y}$ =	1.03	-	
				$k_{h,m,z}$ =	1.10	-	
$\sigma_{c,d}$ =	0.00	N/mm²		$f_{c,0,d}$ =	27.60	N/mm²	
$\sigma_{m,y,d}$ =	11.09	N/mm²		$f_{m,y,d}$ =	28.53	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	30.36	N/mm²	✓
Utilization ratio							39%

Lateral torsional buckling analysis Fire							
$M_{y,d}$ =	-35.01	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm					
$N_{c,d}$ =	0.00	kN		γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{h,m,y}$ =	1.03	-	
				$k_{h,m,z}$ =	1.10	-	
				k_l =	1.00	-	
				k_{fi} =	1.15	-	
$\sigma_{c,d}$ =	0.00	N/mm²		$f_{c,0,d}$ =	27.60	N/mm²	
$\sigma_{m,y,d}$ =	11.09	N/mm²		$f_{m,y,d}$ =	28.53	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	30.36	N/mm²	✓
Utilization ratio							39%

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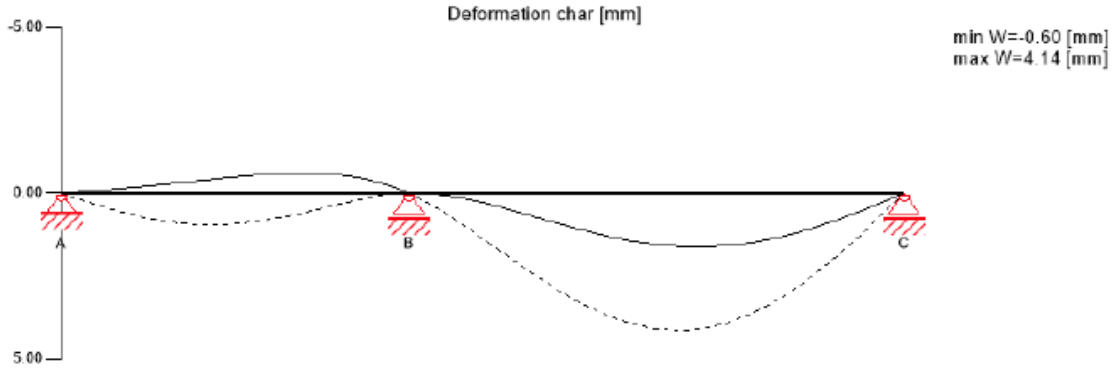
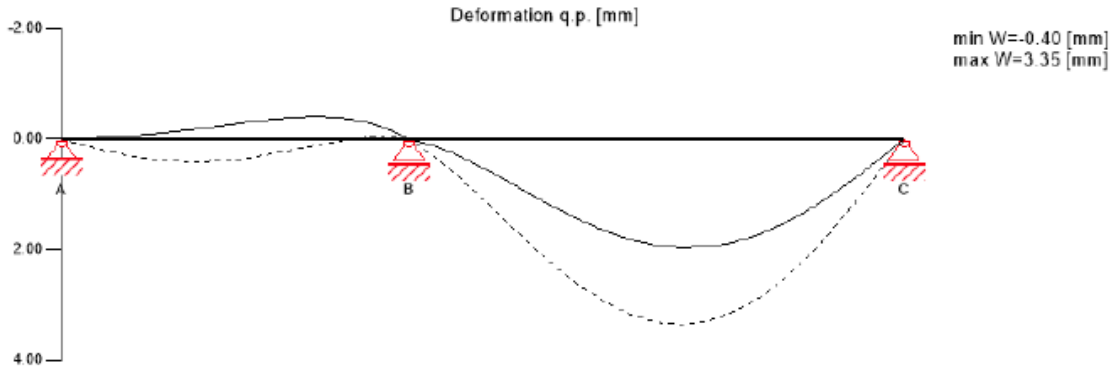
Service limit state design (SLS) - design results





w_{inst} = w[char]

Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.6	L/300	12.2	1.5	12%
2	0.6	L/300	17.3	4.1	24%

w_{fin} = w[char] + w[q.p.]*kdef

Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.6	L/250	14.6	1.7	12%
2	0.6	L/250	20.8	6.1	30%

$w_{net,fin} = w[q.p.] + w[q.p.]*kdef$					
Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.6	L/300	12.2	0.7	5%
2	0.6	L/300	17.3	5.4	31%

Vibration analysis

General

Total mass	∞	[t]
Tributary width	0.0	[m]
Stiffness Longitudinal direction	∞	[kNm²]
Stiffness Cross direction	0.0	[kNm²]
Modal damping	1.0	[%]
α	0.0	[-]
Man weight	0.0	[N]
Modal mass	NaN	[kg]

Analysis

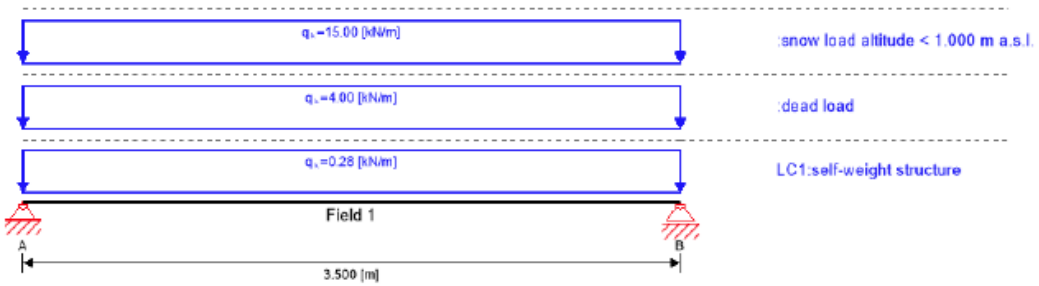
Criterion	Calc.	Class I	Class II	Class I	Class II	Cl. I	Cl. II
Frequency criterion min	10.596 [Hz]	4.5 [Hz]	4.5 [Hz]	42 %	42 %	✓	✓
Frequency criterion	10.596 [Hz]	8.0 [Hz]	6.0 [Hz]	75 %	57 %		
Acceleration criterion	0.0 [m/s²]	0.05 [m/s²]	0.1 [m/s²]	0 %	0 %		
Stiffness criterion	0.0 [mm]	0.25 [mm]	0.5 [mm]	0 %	0 %	✓	✓

Support reaction

Load case category	k_{mod}	A_V	B_V	C_V
			[kN]	
self-weight structure	0.6	0.52	2.72	1.00
		0.52	2.72	1.00
dead load	0.6	9.40	48.77	17.94
		9.40	48.77	17.94
live load cat. C: congregation areas	0.9	10.97	14.37	0.00
		0.00	0.00	-0.88
snow load altitude < 1.000 m a.s.l.	0.9	20.03	26.26	0.00
		0.00	0.00	-1.62
live load cat. C: congregation areas	0.9	0.00	23.62	14.86
		-3.65	0.00	0.00

2.5.5.12. Dimenzioniranje nosilcev dim 20/28 GL24 POZ-913

System

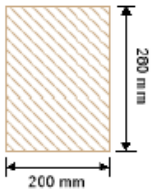


Global utilization ratio 89 %

ULS	ULS Fire	SLS	Vibration	Support	Void
89 %	24 %	77 %	36 %	-1 %	-1 %

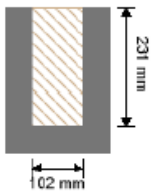
Product data

Section: Wooden beam 20/28



Section width	Section height	Area	Iy	Iz
[cm]	[cm]	[mm²]	[mm⁴]	[mm⁴]
20	28	56,000	365,866,700	186,666,700

Section Fire: Wooden beam 20/28



Section width	Section height	Area	Iy	Iz
[cm]	[cm]	[mm²]	[mm⁴]	[mm⁴]
10.2	23.1	23,562	104,774,300	20,428,250

Fire resistance class:R 60

Time **60 min**

Fire protection layering : no additional fire protection

k_0	d_0	$d_{char,0,h}$	$d_{ef,h}$	$d_{char,0,v}$	$d_{ef,v}$
[-]	[mm]	[mm]	[mm]	[mm]	[mm]
1	7	42.0	49.0	42.0	98.0

Material values

Material	$f_{m,k}$ [N/mm²]	$f_{t,0,k}$ [N/mm²]	$f_{t,90,k}$ [N/mm²]	$f_{c,0,k}$ [N/mm²]	$f_{c,90,k}$ [N/mm²]	$f_{v,k}$ [N/mm²]	$f_{r,k\ min}$ [N/mm²]	$E_{0,mean}$ [N/mm²]	G_{mean} [N/mm²]	$E_{0,5}$ [N/mm²]
GL 24h	24.00	19.20	0.50	24.00	2.50	2.50	1.20	11,500.00	650.00	9,600.00

Load

Load case groups

	Load case category	Type	Duration	Kmod	γ_{inf}	γ_{sup}	Ψ_0	Ψ_1	Ψ_2
LC1	self-weight structure	G	permanent	0.6	1	1.35	1	1	1
	dead load	G	permanent	0.6	1	1.35	1	1	1
	snow load altitude < 1.000 m a.s.l.	Q	short term	0.9	0	1.5	0.5	0.2	0

LC1:self-weight structure

continuous load

Field	Load at start [kN/m]
1	0.28

:dead load

continuous load

Field	Load at start [kN/m]
1	4.00

:snow load altitude < 1.000 m a.s.l.

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continuous load	
Field	Load at start
	[kN/m]
1	15.00

ULS Combinations	
	Combination rule
LCO1	1.35/1.00 * LC1 + 1.35/1.00 *
LCO2	1.35/1.00 * LC1 + 1.35/1.00 * + 1.50/0.00 *

ULS Combinations Fire	
	Combination rule
LCO3	1.00/1.00 * LC1 + 1.00/1.00 *
LCO4	1.00/1.00 * LC1 + 1.00/1.00 * + 1.00/0.00 * 0.00 *

SLS Characteristic Combination	
	Combination rule
LCO5	1.00/1.00 * LC1 + 1.00/1.00 *
LCO6	1.00/1.00 * LC1 + 1.00/1.00 * + 1.00/0.00 *

SLS Quasi-permanent Combination	
	Combination rule
LCO7	1.00/1.00 * LC1 + 1.00/1.00 *
LCO8	1.00/1.00 * LC1 + 1.00/1.00 * + 1.00/0.00 * 0.00 *

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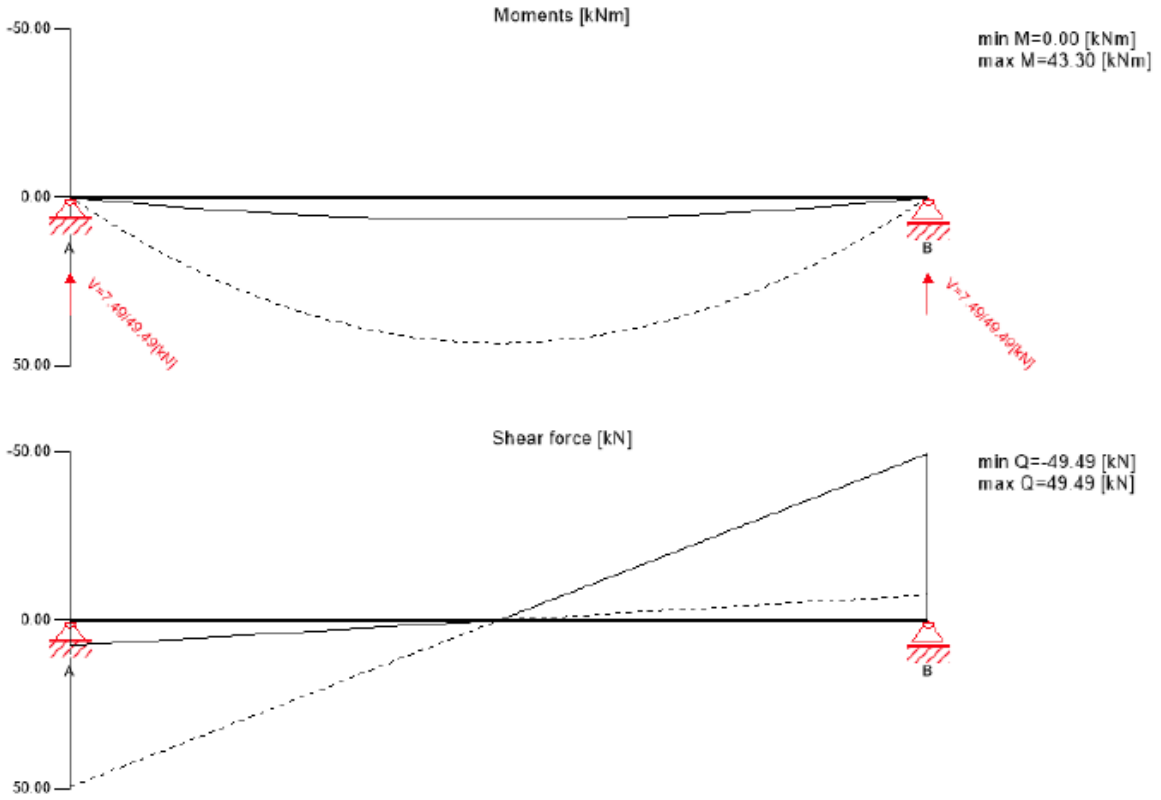
Ultimate limit state (ULS) - design results



ULS Flexural design

Field	Dist.	$f_{m,k}$	$f_{c,0,k}$	$f_{t,0,k}$	γ_m	k_{mod}	$k_{sys,z}$	$k_{h,m,y}$	$k_{h,m,z}$	k_l	$f_{m,y,d}$	$f_{m,z,d}$	$f_{t,0,d}$	$f_{c,0,d}$
	[m]	[N/mm²]	[N/mm²]	[N/mm²]	[-]	[-]	[-]	[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
1	1.75	24.00	24.00	19.20	1.25	0.90	1.00	1.08	1.10	1.00	18.65	19.01	13.82	17.28

Field	$M_{y,d}$	$M_{z,d}$	$N_{c,d}$	$N_{t,d}$	$\sigma_{m,y,d}$	$\sigma_{m,z,d}$	$\sigma_{c,d}$	$\sigma_{t,d}$	Ratio	
	[kNm]	[kNm]	[kN]	[kN]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]		
1	43.30	0.00	0.00	0.00	16.57	0.00	0.00	0.00	89%	LCO2

ULS Shear analysis

Field	Dist.	$f_{v,k}$	γ_m	k_{mod}	$k_{h,v}$	$f_{v,d}$	V_d	$\tau_{v,d}$	Ratio	
	[m]	[N/mm²]	[-]	[-]	[-]	[N/mm²]	[kN]	[N/mm²]		
1	0.28	2.50	1.25	0.90	1.00	1.80	41.57	1.11	62%	LCO2

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ULS Buckling design								
Field	$M_{y,d}$	$M_{z,d}$	$N_{c,d}$	$\sigma_{m,y,d}$	$\sigma_{m,z,d}$	$\sigma_{c,d}$	Ratio	
	[kNm]	[kNm]	[kN]	[N/mm²]	[N/mm²]	[N/mm²]		
1	43.30	0.00	0.00	16.57	0.00	0.00	89%	LCO2

ULS Lateral torsional buckling design								
Field	$M_{y,d}$	$M_{z,d}$	$N_{c,d}$	$\sigma_{m,y,d}$	$\sigma_{m,z,d}$	$\sigma_{c,d}$	Ratio	
	[kNm]	[kNm]	[kN]	[N/mm²]	[N/mm²]	[N/mm²]		
1	43.30	0.00	0.00	16.57	0.00	0.00	89%	LCO2

Flexural stress analysis								
$M_{y,d}$ =	43.30	kNm		$f_{m,k}$ =	24.00	N/mm²		
$M_{z,d}$ =	0.00	kNm		$f_{m,k,z}$ =	24.00	N/mm²		
$N_{t,d}$ =	0.00	kN		γ_m =	1.25	-		
				k_{mod} =	0.90	-		
				$k_{sys,y}$ =	1.00	-		
				$k_{h,m,y}$ =	1.08	-		
				$k_{h,m,z}$ =	1.10	-		
				k_l =	1.00	-		
$\sigma_{t,d}$ =	0.00	N/mm²		$f_{t,0,d}$ =	13.82	N/mm²		
$\sigma_{m,y,d}$ =	16.57	N/mm²		$f_{m,y,d}$ =	18.65	N/mm²		
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	19.01	N/mm²	✓	
Utilization ratio								89%

Shear stress analysis								
V_d =	41.57	kN		$f_{v,k}$ =	2.50	N/mm²		
				γ_m =	1.25	-		
				k_{mod} =	0.90	-		
				$k_{h,v}$ =	1.00	-		
$\tau_{v,d}$ =	1.11	N/mm²	<	$f_{v,d}$ =	1.80	N/mm²	✓	
Utilization ratio								62%

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Buckling analysis							
$M_{y,d}$ =	43.30	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm					
$N_{c,d}$ =	0.00	kN		γ_m =	1.25	-	
				k_{mod} =	0.90	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{sys,z}$ =	1.00	-	
				$k_{h,m,y}$ =	1.08	-	
				$k_{h,m,z}$ =	1.10	-	
$\sigma_{c,d}$ =	0.00	N/mm²		$f_{c,0,d}$ =	17.28	N/mm²	
$\sigma_{m,y,d}$ =	16.57	N/mm²		$f_{m,y,d}$ =	18.65	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	19.01	N/mm²	✓
Utilization ratio							89%

Lateral torsional buckling analysis							
$M_{y,d}$ =	43.30	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm					
$N_{c,d}$ =	0.00	kN		γ_m =	1.25	-	
				k_{mod} =	0.90	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{h,m,y}$ =	1.08	-	
				$k_{h,m,z}$ =	1.10	-	
				k_l =	1.00	-	
$\sigma_{c,d}$ =	0.00	N/mm²		$f_{c,0,d}$ =	17.28	N/mm²	
$\sigma_{m,y,d}$ =	16.57	N/mm²		$f_{m,y,d}$ =	18.65	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	19.01	N/mm²	✓
Utilization ratio							89%

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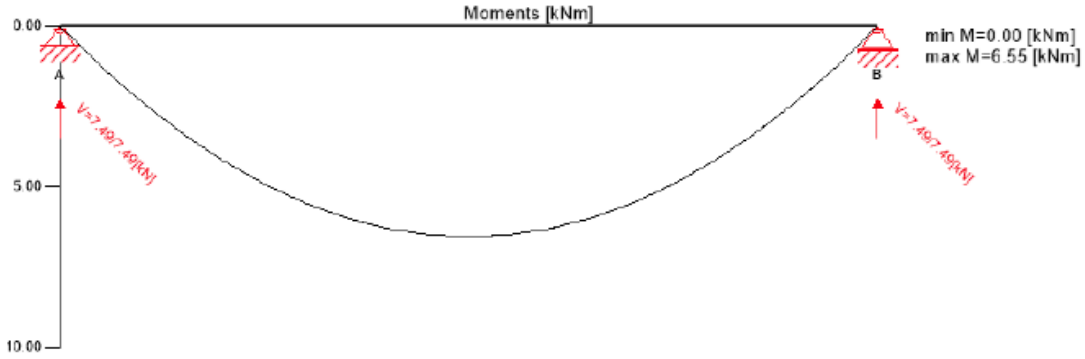
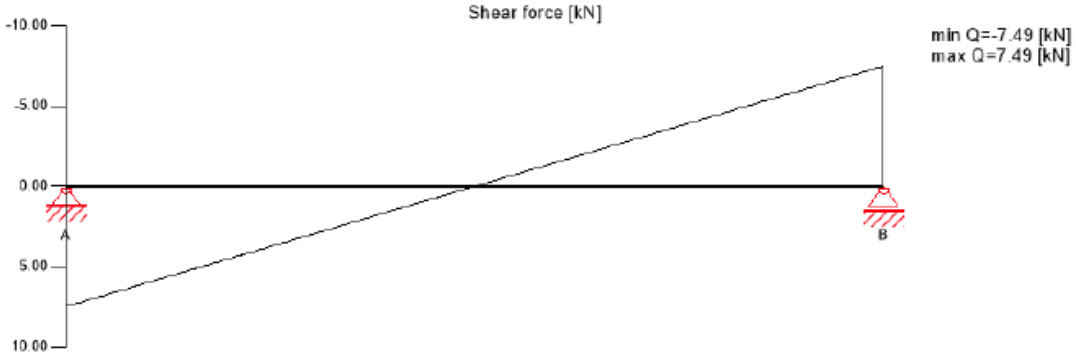
Ultimate limit state (ULS) fire design - results





ULS Fire Flexural design

Field	Dist.	$f_{m,k}$	$f_{c,0,k}$	$f_{t,0,k}$	γ_m	k_{mod}	k_{fi}	$k_{sys,z}$	$k_{h,m,y}$	$k_{h,m,z}$	k_l	$f_{m,y,d}$	$f_{m,z,d}$	$f_{t,0,d}$	$f_{c,0,d}$
	[m]	[N/mm²]	[N/mm²]	[N/mm²]	[-]	[-]	[-]	[-]	[-]	[-]	[-]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
1	1.75	24.00	24.00	19.20	1.25	0.90	1.00	1.00	1.08	1.10	1.00	18.65	19.01	13.82	17.28

Field	$M_{y,d}$	$M_{z,d}$	$N_{c,d}$	$N_{t,d}$	$\sigma_{m,y,d}$	$\sigma_{m,z,d}$	$\sigma_{c,d}$	$\sigma_{t,d}$	Ratio	
	[kNm]	[kNm]	[kN]	[kN]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]		
1	43.30	0.00	0.00	0.00	16.57	0.00	0.00	0.00	89%	LCO2

ULS Fire Shear analysis

Field	Dist.	$f_{v,k}$	γ_m	k_{mod}	$k_{h,v}$	k_{fi}	$f_{v,d}$	V_d	$\tau_{v,d}$	Ratio	
	[m]	[N/mm²]	[-]	[-]	[-]	[-]	[N/mm²]	[kN]	[N/mm²]		
1	0.23	2.50	1.00	1.00	1.00	1.15	2.88	6.50	0.41	14%	LCO3

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ULS Buckling design								
Field	$M_{y,d}$ [kNm]	$M_{z,d}$ [kNm]	$N_{c,d}$ [kN]	$\sigma_{m,y,d}$ [N/mm²]	$\sigma_{m,z,d}$ [N/mm²]	$\sigma_{c,d}$ [N/mm²]	Ratio	
1	6.55	0.00	0.00	7.22	0.00	0.00	24%	LCO3

ULS Fire Lateral torsional buckling design								
Field	$M_{y,d}$ [kNm]	$M_{z,d}$ [kNm]	$N_{c,d}$ [kN]	$\sigma_{m,z,d}$ [N/mm²]	$\sigma_{m,y,d}$ [N/mm²]	$\sigma_{c,d}$ [N/mm²]	Ratio	
1	6.55	0.00	0.00	0.00	7.22	0.00	24%	LCO3

Flexural stress analysis Fire							
$M_{y,d}$ =	6.55	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm		$f_{m,k,z}$ =	24.00	N/mm²	
$N_{t,d}$ =	0.00	kN		γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{h,m,y}$ =	1.10	-	
				$k_{h,m,z}$ =	1.10	-	
				k_l =	1.00	-	
				k_{fi} =	1.15	-	
$\sigma_{t,d}$ =	0.00	N/mm²		$f_{t,0,d}$ =	22.08	N/mm²	
$\sigma_{m,y,d}$ =	7.22	N/mm²		$f_{m,y,d}$ =	30.36	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	30.36	N/mm²	✓
Utilization ratio							24%

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Shear stress analysis Fire							
V_d =	6.50	kN		$f_{v,k}$ =	2.50	N/mm²	
				γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				$k_{h,v}$ =	1.00	-	
				k_{fi} =	1.15	-	
$\tau_{v,d}$ =	0.41	N/mm²	<	$f_{v,d}$ =	2.88	N/mm²	✓
Utilization ratio							**14%**

Buckling analysis							
$M_{y,d}$ =	6.55	kNm		$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm					
$N_{c,d}$ =	0.00	kN		γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				$k_{sys,y}$ =	1.00	-	
				$k_{sys,z}$ =	1.00	-	
				$k_{h,m,y}$ =	1.10	-	
				$k_{h,m,z}$ =	1.10	-	
$\sigma_{c,d}$ =	0.00	N/mm²		$f_{c,0,d}$ =	27.60	N/mm²	
$\sigma_{m,y,d}$ =	7.22	N/mm²		$f_{m,y,d}$ =	30.36	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm²	<	$f_{m,z,d}$ =	30.36	N/mm²	✓
Utilization ratio							**24%**

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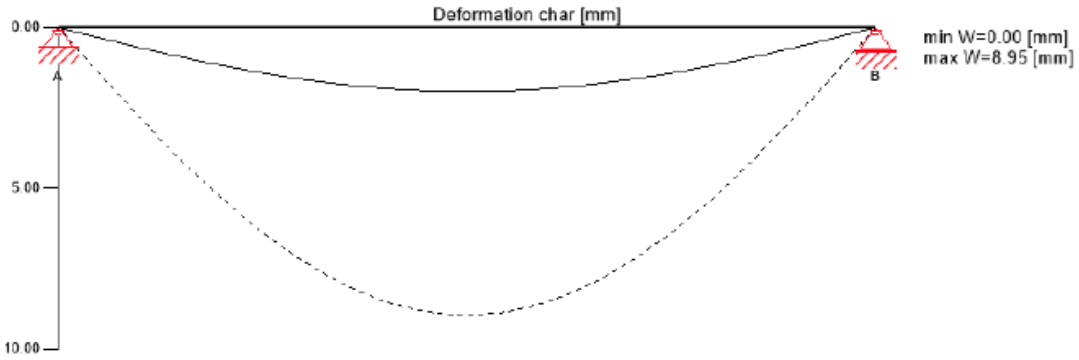
Lateral torsional buckling analysis Fire						
$M_{y,d}$ =	6.55	kNm	$f_{m,k}$ =	24.00	N/mm²	
$M_{z,d}$ =	0.00	kNm				
$N_{c,d}$ =	0.00	kN	γ_m =	1.00	-	
			k_{mod} =	1.00	-	
			$k_{sys,y}$ =	1.00	-	
			$k_{h,m,y}$ =	1.10	-	
			$k_{h,m,z}$ =	1.10	-	
			k_l =	1.00	-	
			k_{fi} =	1.15	-	
$\sigma_{c,d}$ =	0.00	N/mm²	$f_{c,0,d}$ =	27.60	N/mm²	
$\sigma_{m,y,d}$ =	7.22	N/mm²	$f_{m,y,d}$ =	30.36	N/mm²	
$\sigma_{m,z,d}$ =	0.00	N/mm² <	$f_{m,z,d}$ =	30.36	N/mm² ✓	
Utilization ratio						**24%**

Service limit state design (SLS) - design results



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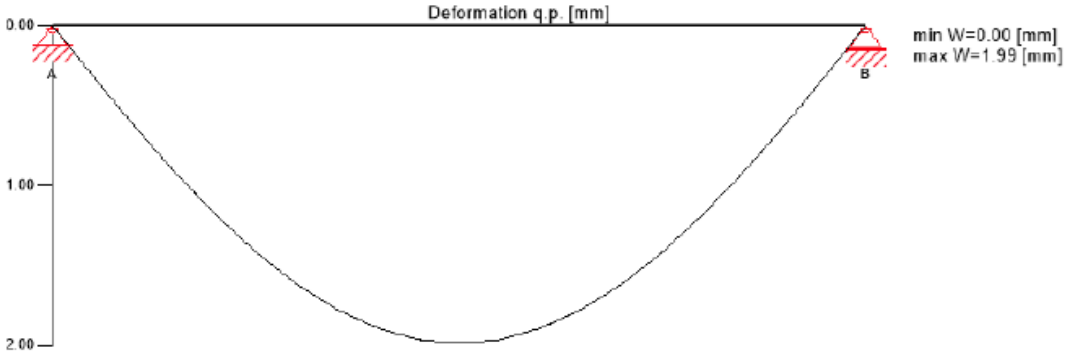
Service limit state design (SLS) - design results



w_{inst} = w[char]

Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.6	L/300	11.7	9.0	77%

w_{fin} = w[char] + w[q.p.]*kdef

Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.6	L/250	14.0	10.1	72%

$w_{net,fin}$ = w[q.p.] + w[q.p.]*kdef

Field	K_{def}	Limit	w_{limit}	$w_{calc.}$	Ratio
		[-]	[mm]	[mm]	
1	0.6	L/300	11.7	3.2	27%

Vibration analysis

General

Total mass	∞	[t]
Tributary width	0.0	[m]
Stiffness Longitudinal direction	∞	[kNm²]
Stiffness Cross direction	0.0	[kNm²]
Modal damping	1.0	[%]
α	0.0	[-]
Man weight	0.0	[N]
Modal mass	NaN	[kg]

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Vibration analysis

Analysis

Criterion	Calc.	Class I	Class II	Class I	Class II	Cl. I	Cl. II
Frequency criterion min	12.596 [Hz]	4.5 [Hz]	4.5 [Hz]	36 %	36 %	✓	✓
Frequency criterion	12.596 [Hz]	8.0 [Hz]	6.0 [Hz]	64 %	48 %		
Acceleration criterion	0.0 [m/s²]	0.05 [m/s²]	0.1 [m/s²]	0 %	0 %		
Stiffness criterion	0.0 [mm]	0.25 [mm]	0.5 [mm]	0 %	0 %	✓	✓

Support reaction

Load case category	k_{mod}	A_V	B_V
		[kN]	
self-weight structure	0.6	0.49	0.49
		0.49	0.49
dead load	0.6	7.00	7.00
		7.00	7.00
snow load altitude < 1.000 m a.s.l.	0.9	26.25	26.25
		0.00	0.00

Reference documents for this analysis

English title	Description
EN 338	EN 338 - Structural timber ? Strength classes
EN 1995-1-1	EN 1995-1-1 - Eurocode 5: Design of timber structures - Part 1-1: General - Common rules and rules for buildings
EN 1995-1-2	EN 1995-1-2 - Eurocode 5 — Design of timber structures — Part 1-2: General — Structural fire design
EN 14080	EN 14080 - Timber Structures - Glued laminated timber and glued solid timber - Requirements
EN 1990	EN 1990 - Eurocode ? Basis of structural design
ÖNorm B 1995-1-1 NA	ÖNORM EN 1995-1-1 - Austria - National Annex – Nationally determined parameters – Eurocode 5: Design of timber structures – Part 1-1: General-Common rules and rules for buildings
ÖNorm B 1995-1-2 NA	ÖNORM EN 1995-1-2 - Austria - National Annex - Eurocode 5: Design of timber structures ? Part 1-2: General ? Structural fire design ? National specifications concerning ÖNORM EN 1995-1-2, national comments and national supplements
ÖNORM EN 1995-1-1_NA, chapter 7.3	ÖNORM EN 1995-1-1 - Austria - National Annex – Nationally determined parameters – Eurocode 5: Design of timber structures – Part 1-1: General-Common rules and rules for buildings; chapter 7.3

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2.5.5.13. Dimenzioniranje ostale konstrukcije vmesnega dela POZ-900

Glej izpis iz programa

2. Načrt gradbeništva

Vhodni podatki - Konstrukcija

Shema nivojev

Naziv	z [m]	h [m]
Nivo (M)	7.30	3.70
Nivo (N)	3.60	3.60

Naziv	z [m]	h [m]
Nivo (P)	0.00	

Tabele materialov

No	Naziv materiala	E[kN/m2]	μ	γ[kN/m3]	αt[1/C]	Em[kN/m2]	μm
1	CLT stene	8.054e+6	0.20	8.80	1.000e-5	8.054e+6	0.20
2	CLT plošče	1.022e+7	0.20	4.20	1.000e-5	8.054e+6	0.20
3	C 25/30	3.100e+7	0.20	25.00	1.000e-5	3.100e+7	0.20
4	Les-Iglavci-Lamelirani	1.100e+7	0.20	5.00	1.000e-5	1.100e+7	0.20

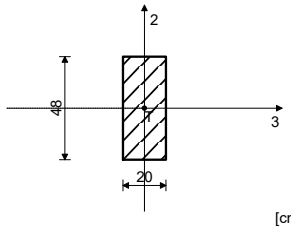
Seti plošč

No	d[m]	e[m]	Material	Tip preračuna	Ortotropija	E2[kN/m2]	G[kN/m2]	α
<1>	0.200	0.100	1	Tanka plošča	Anizotropna	3.636e+6	0.000e+0	90.00
<2>	0.200	0.100	2	Tanka plošča	Anizotropna	0.000e+0	0.000e+0	90.00
<3>	0.200	0.100	2	Tanka plošča	Anizotropna	0.000e+0	0.000e+0	0.00
<4>	0.300	0.150	3	Tanka plošča	Izotropna			

Seti gred

Set: 2 Prerez: b/d=20/48, Fiktivna ekscentričnost

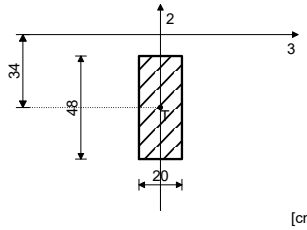
Mat.	A1	A2	A3	I1	I2	I3
4 - Les-Iglavci-L...	9.600e-2	8.000e-2	8.000e-2	9.448e-4	3.200e-4	1.843e-3



[cm]

Set: 3 Prerez: b/d=20/48, Fiktivna ekscentričnost

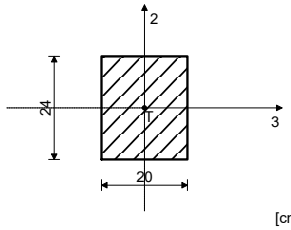
Mat.	A1	A2	A3	I1	I2	I3
4 - Les-Iglavci-L...	9.600e-2	8.000e-2	8.000e-2	9.448e-4	3.200e-4	1.843e-3



[cm]

Set: 4 Prerez: b/d=20/24, Fiktivna ekscentričnost

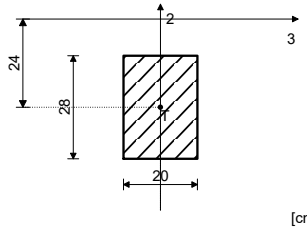
Mat.	A1	A2	A3	I1	I2	I3
4 - Les-Iglavci-L...	4.800e-2	4.000e-2	4.000e-2	3.175e-4	1.600e-4	2.304e-4



[cm]

Set: 5 Prerez: b/d=20/28, Fiktivna ekscentričnost

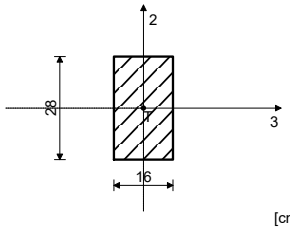
Mat.	A1	A2	A3	I1	I2	I3
4 - Les-Iglavci-L...	5.600e-2	4.667e-2	4.667e-2	4.180e-4	1.867e-4	3.659e-4



[cm]

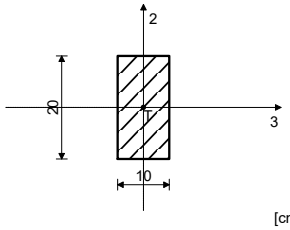
2. Načrt gradbeništva

Set: 6 Prerez: b/d=16/28, Fiktivna ekscentričnost							
	Mat.	A1	A2	A3	I1	I2	I3
	4 - Les-lglavci-L...	4.480e-2	3.733e-2	3.733e-2	2.459e-4	9.557e-5	2.927e-4



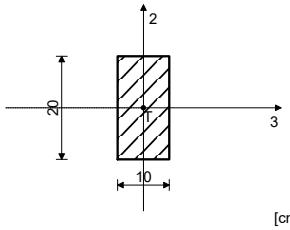
[cm]

Set: 7 Prerez: b/d=10/20, Fiktivna ekscentričnost							
	Mat.	A1	A2	A3	I1	I2	I3
	4 - Les-lglavci-L...	2.000e-2	1.667e-2	1.667e-2	4.578e-5	1.667e-5	6.667e-5



[cm]

Set: 8 Prerez: b/d=10/20, Fiktivna ekscentričnost							
	Mat.	A1	A2	A3	I1	I2	I3
	4 - Les-lglavci-L...	2.000e-2	1.667e-2	1.667e-2	4.578e-5	1.667e-5	6.667e-5

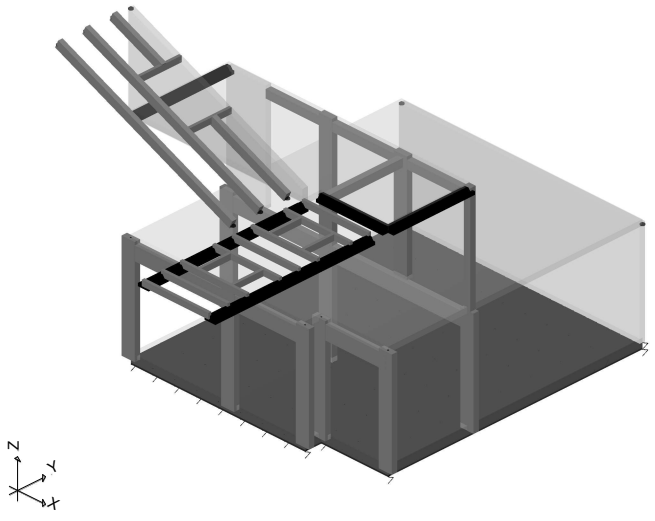


[cm]

Seti površinskih podpor			
Set	K,R1	K,R2	K,R3
1	2.000e+4	2.000e+4	2.000e+4

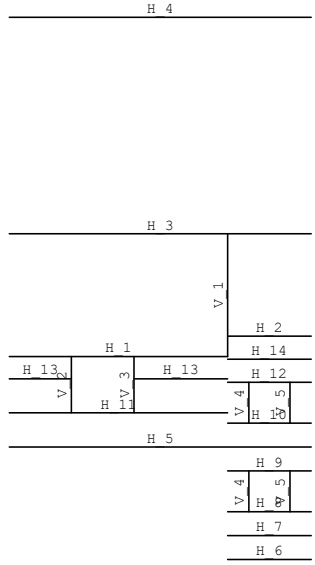
Seti linijskih podpor					
Set	K,R1	K,R2	K,R3	K,M1	Tla [m]
1	1.000e+10	1.000e+10	1.000e+10		

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	1.000e+10				

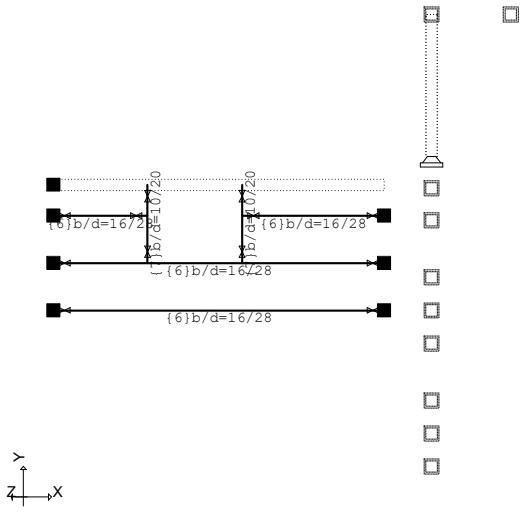


Izometrija

2. Načrt gradbeništva



Dispozicija okvirjev



Pogled: Streha_1

2. Načrt gradbeništva

Vhodni podatki - Obtežba

Lista obtežnih primerov

LC	Naziv
1	Lastna teža (g)
2	Koristna teža
3	Sneg
4	Potres_x (+e)
5	Potres_x (-e)
6	Potres_y (+e)
7	Potres_y (-e)
8	Komb.: 1.35xI+1.05xII+1.5xIII
9	Komb.: 1.35xI+1.5xII+0.75xIII
10	Komb.: I+1.05xII+1.5xIII
11	Komb.: I+1.5xII+0.75xIII
12	Komb.: 1.35xI+1.5xIII
13	Komb.: 1.35xI+1.5xII
14	Komb.: I+0.6xII-1xIV
15	Komb.: I+0.6xII-1xV
16	Komb.: I+0.6xII-1xVI
17	Komb.: I+0.6xII-1xVII
18	Komb.: I+0.6xII+VII
19	Komb.: I+0.6xII+VI

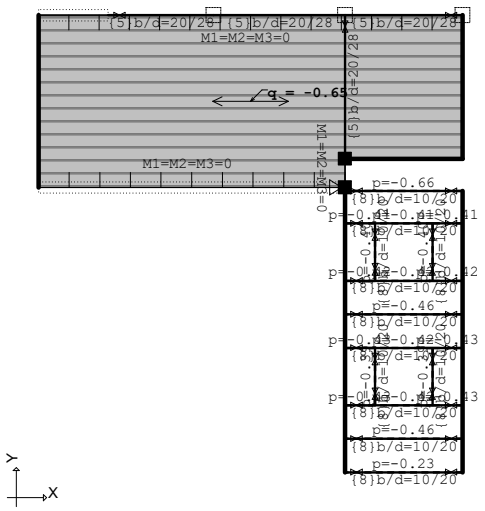
LC	Naziv
20	Komb.: I+0.6xII+V
21	Komb.: I+0.6xII+IV
22	Komb.: I+1.5xIII
23	Komb.: I+1.5xII
24	Komb.: I-1xIV
25	Komb.: I-1xV
26	Komb.: I-1xVI
27	Komb.: I-1xVII
28	Komb.: I+VII
29	Komb.: I+VI
30	Komb.: I+V
31	Komb.: I+IV
32	Komb.: 1.35xI
33	Komb.: I
34	Komb.: I+0.7xII+III
35	Komb.: I+II+0.5xIII
36	Komb.: I+III
37	Komb.: I+II
38	Komb.: I

Seznam obtežnih primerov ovojnic

LC	Naziv
39	[MSN] 8-13,22,23,32
40	[POTRES] 14-21,24-31

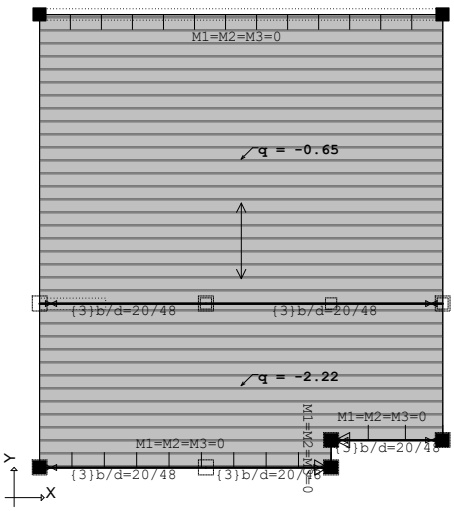
LC	Naziv
41	[MSU] 33-38

Obt. 1: Lastna teža (g)



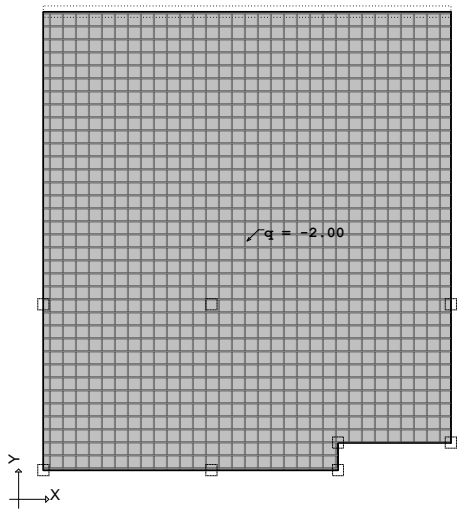
Nivo: Nivo (M) [7.30 m]

Obt. 1: Lastna teža (g)



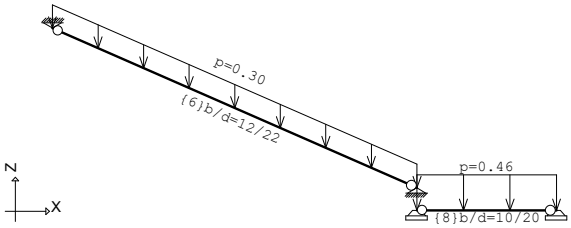
Nivo: Nivo (N) [3.60 m]

Obt. 1: Lastna teža (g)



Nivo: Nivo (P) [0.00 m]

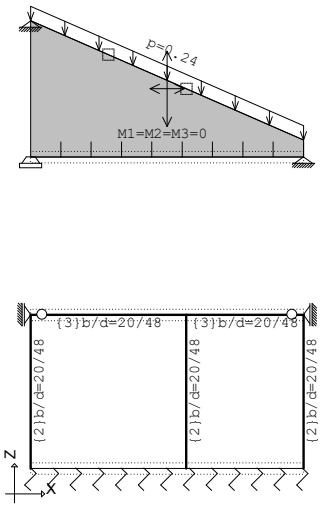
Obt. 1: Lastna teža (g)



Okvir: H_5

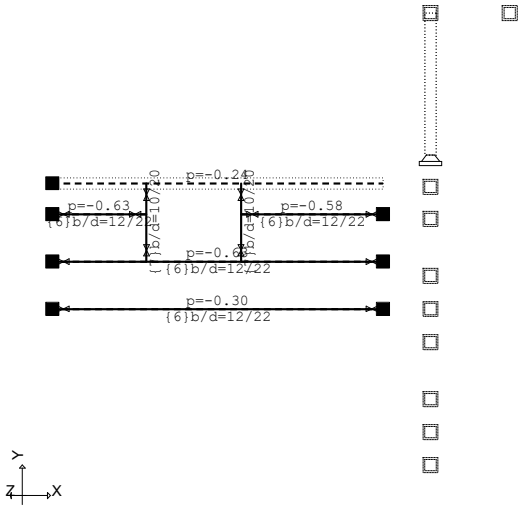
2. Načrt gradbeništva

Obt. 1: Lastna teža (g)



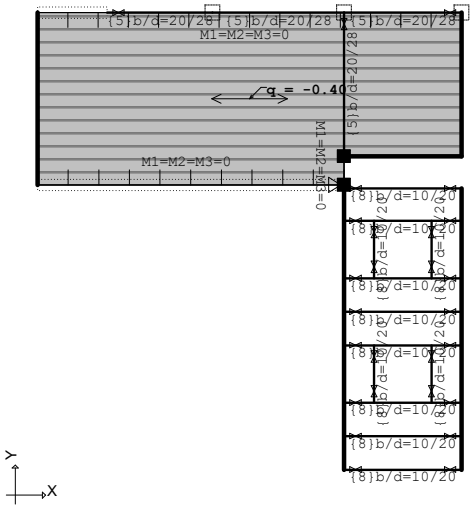
Okvir: H_1

Obt. 1: Lastna teža (g)



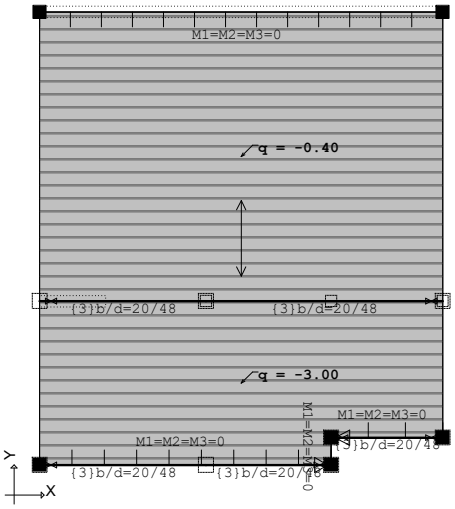
Pogled: Streha_1

Obt. 2: Koristna teža



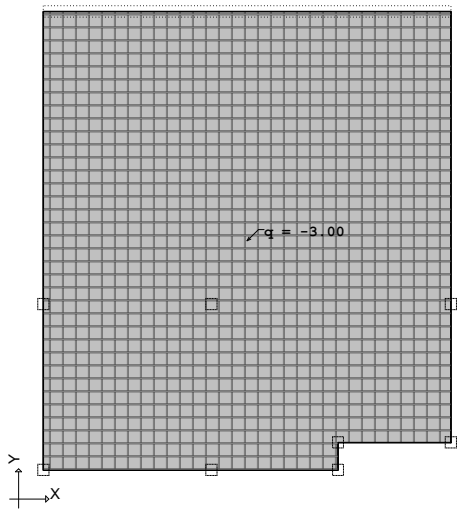
Nivo: Nivo (M) [7.30 m]

Obt. 2: Koristna teža



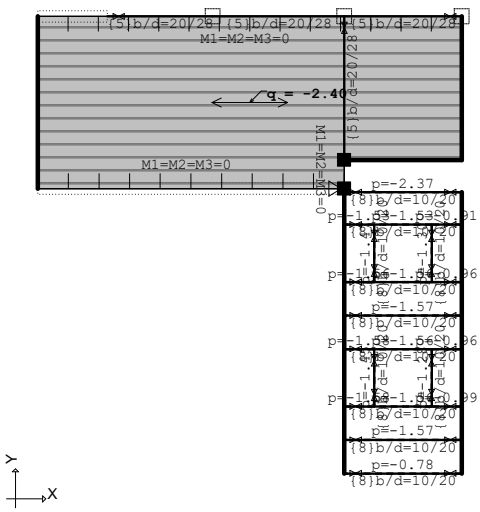
Nivo: Nivo (N) [3.60 m]

Obt. 2: Koristna teža



Nivo: Nivo (P) [0.00 m]

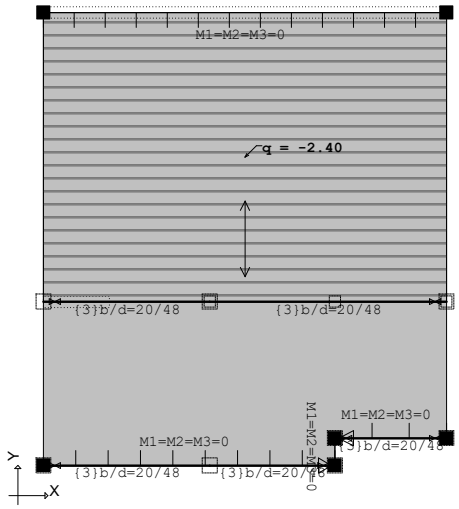
Obt. 3: Sneg



Nivo: Nivo (M) [7.30 m]

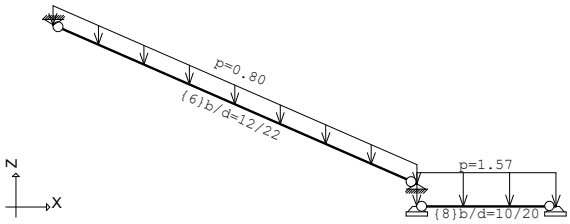
2. Načrt gradbeništva

Obt. 3: Sneg



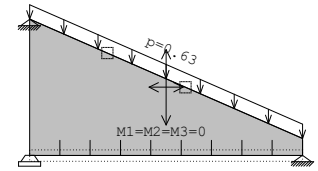
Nivo: Nivo (N) [3.60 m]

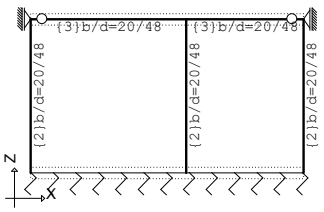
Obt. 3: Sneg



Okvir: H_5

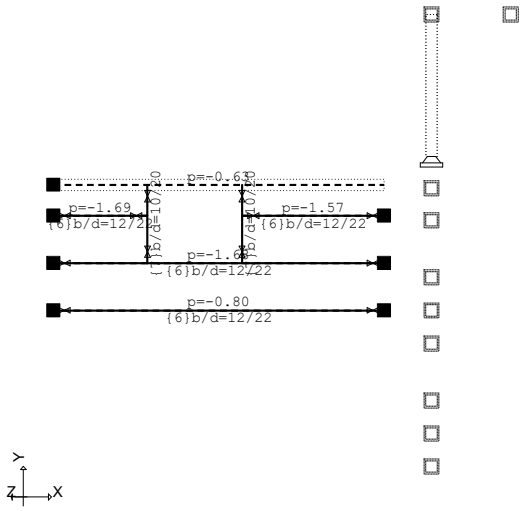
Obt. 3: Sneg





Okvir: H_1

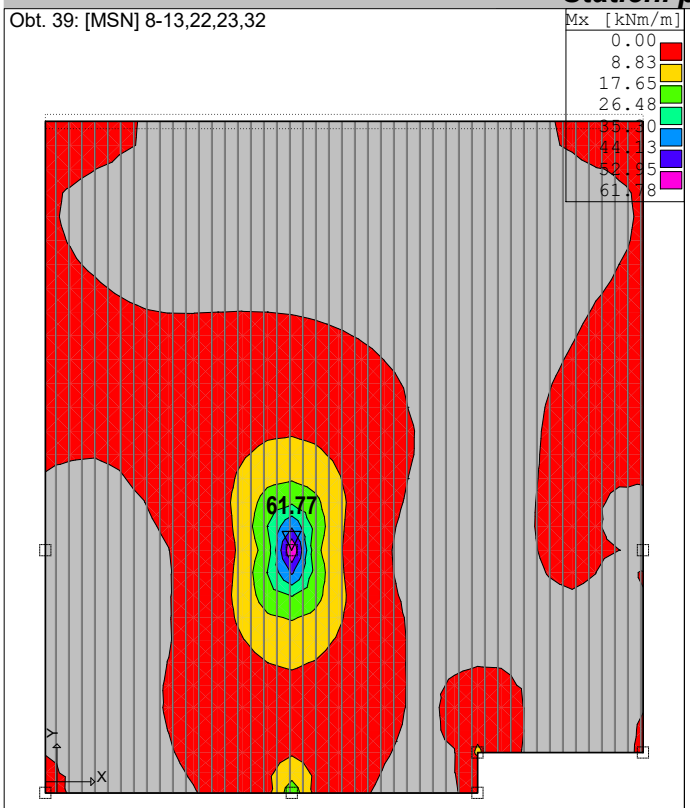
Obt. 3: Sneg

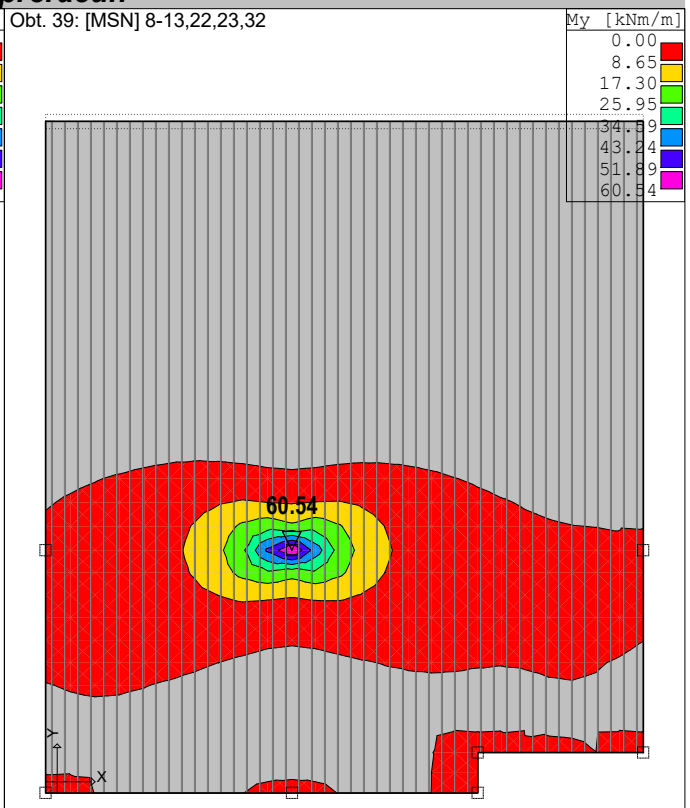


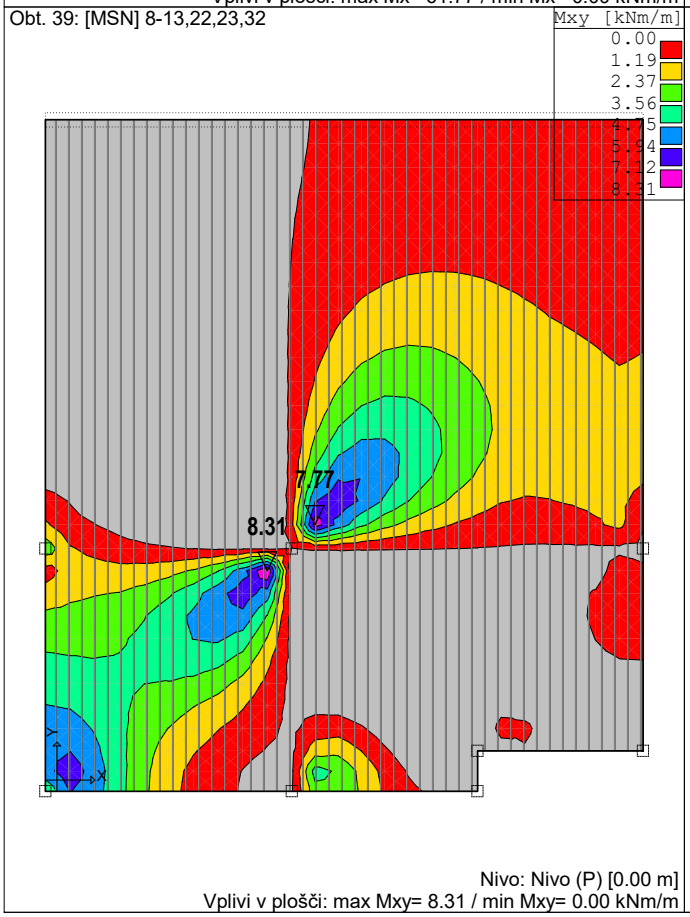
Pogled: Streha_1

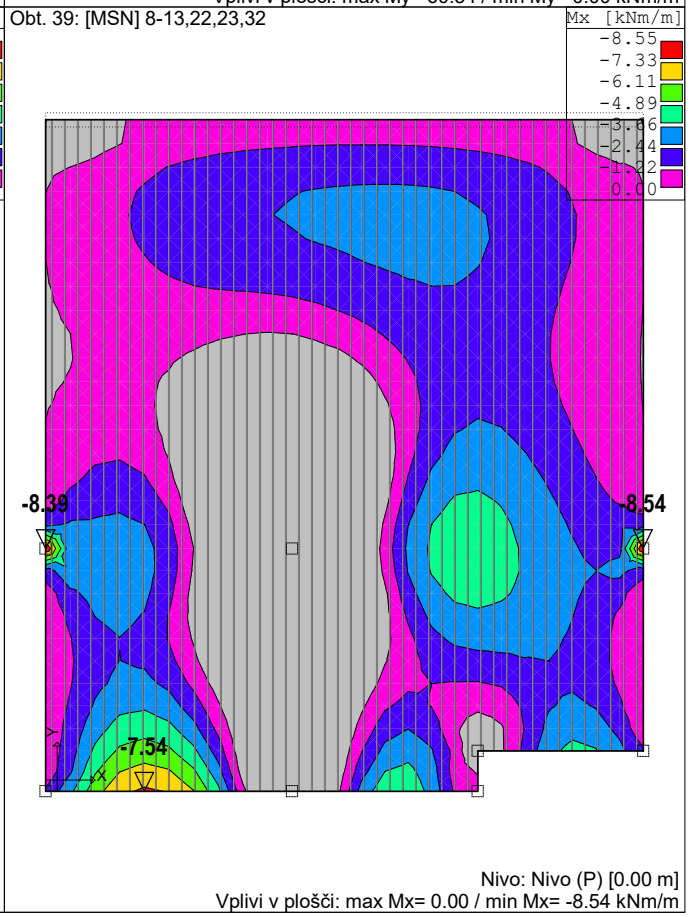
2. Načrt gradbeništva

Statični preračun

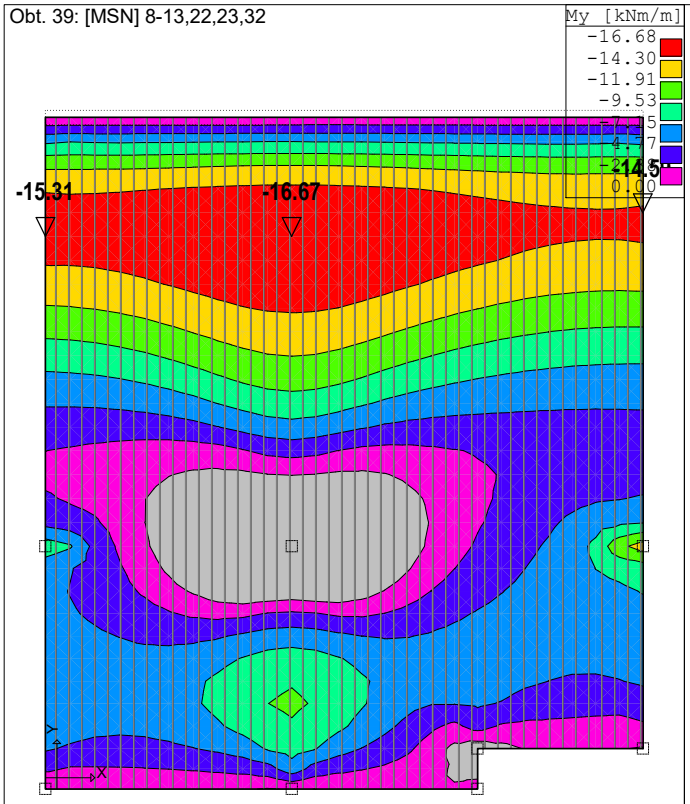


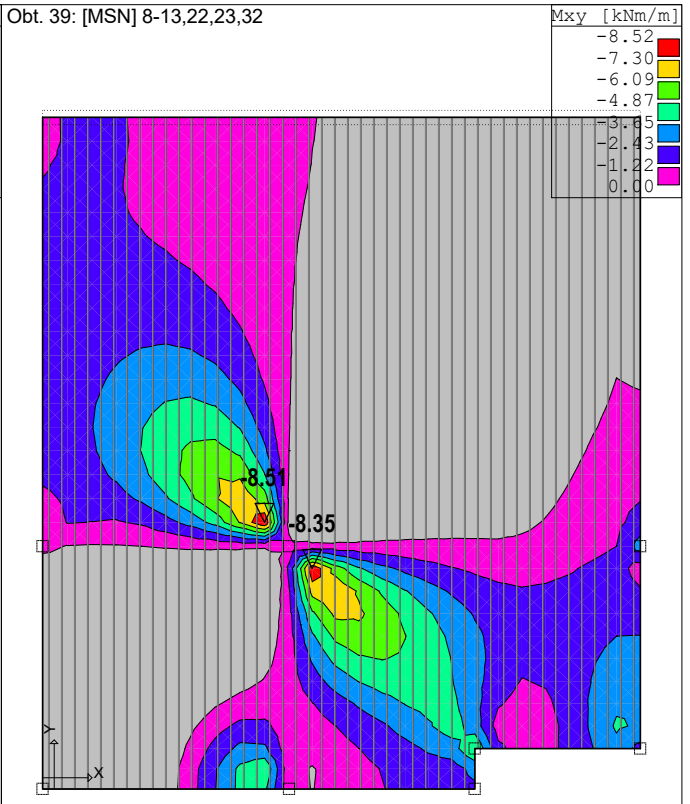


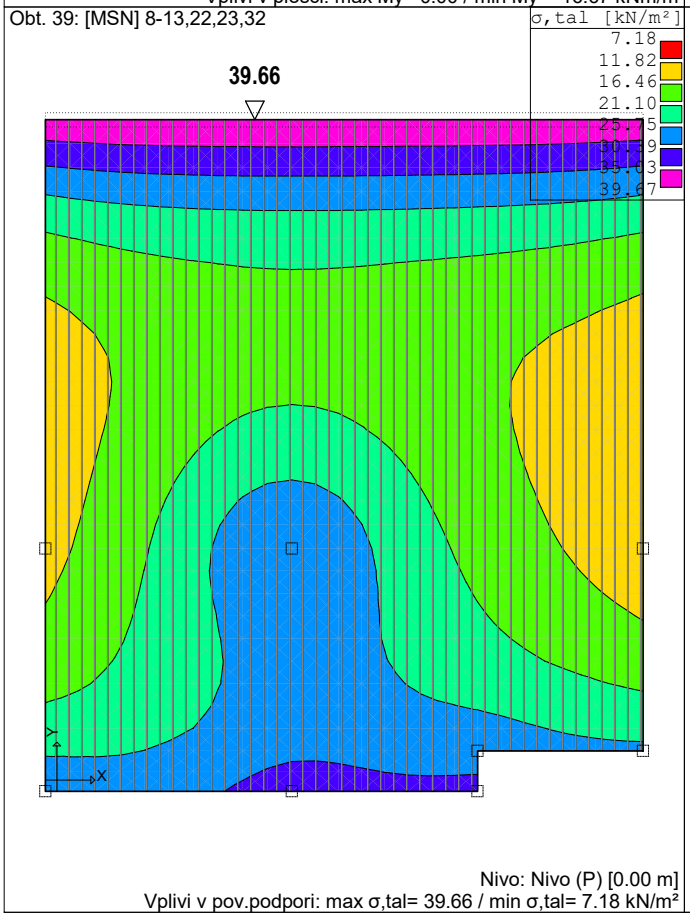


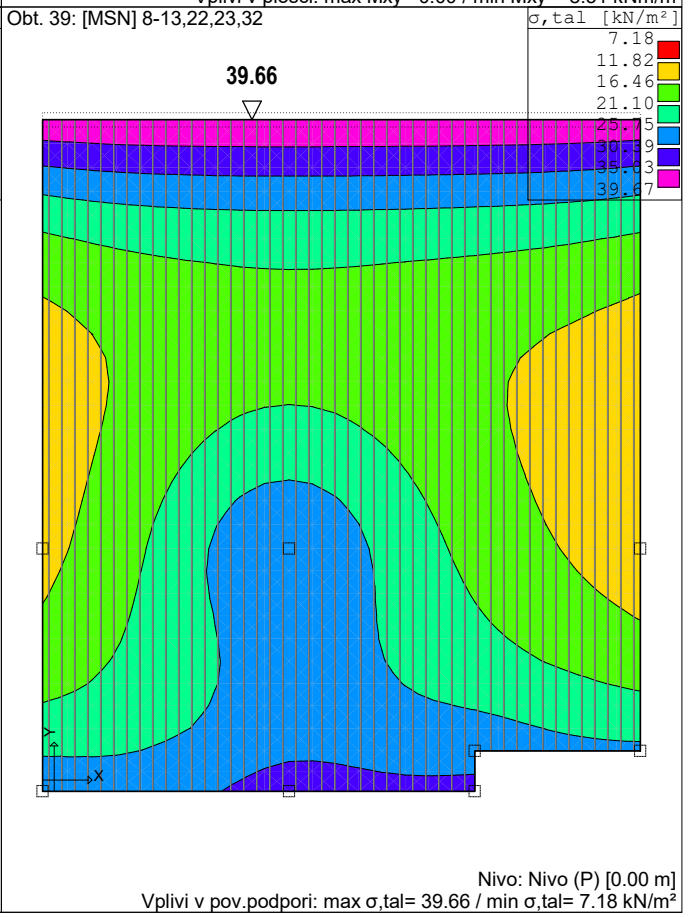


2. Načrt gradbeništva

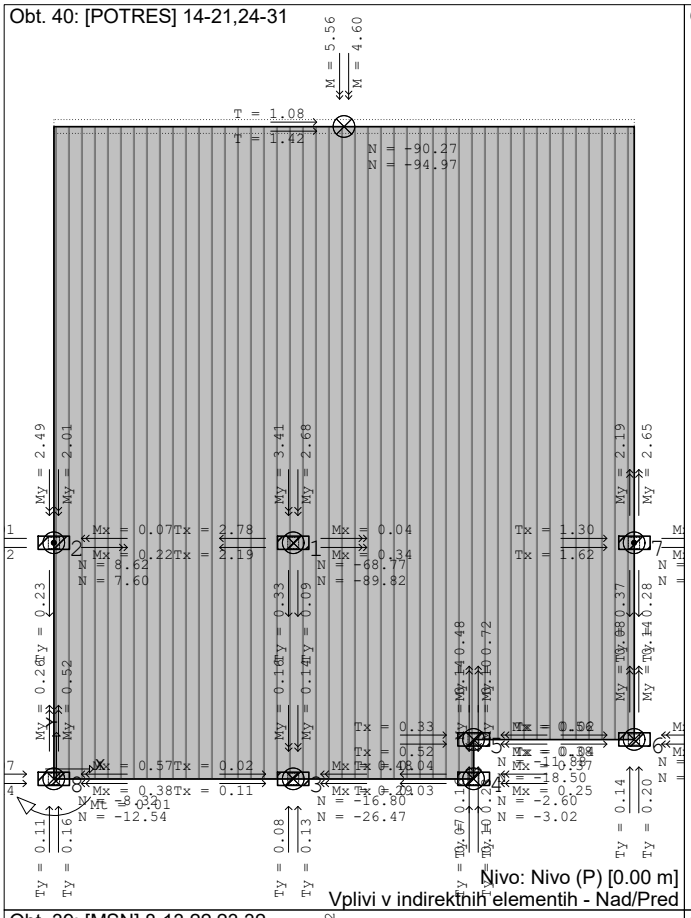


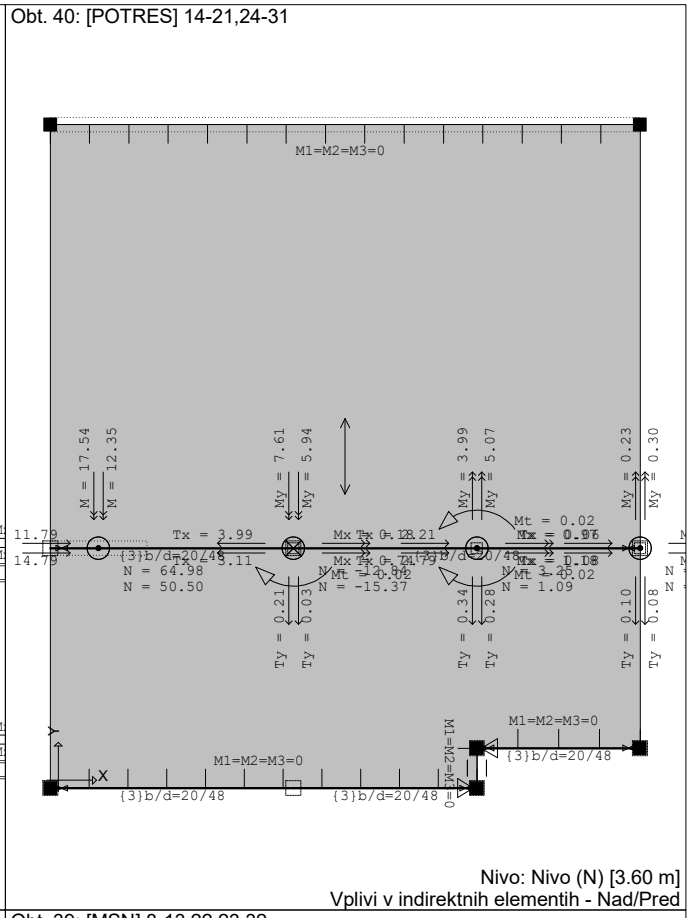


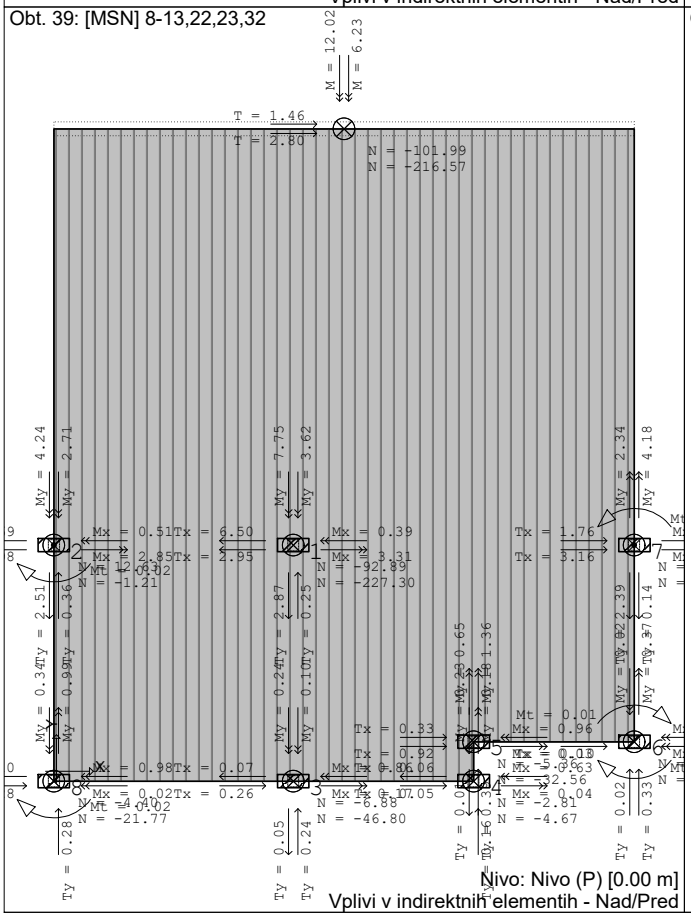


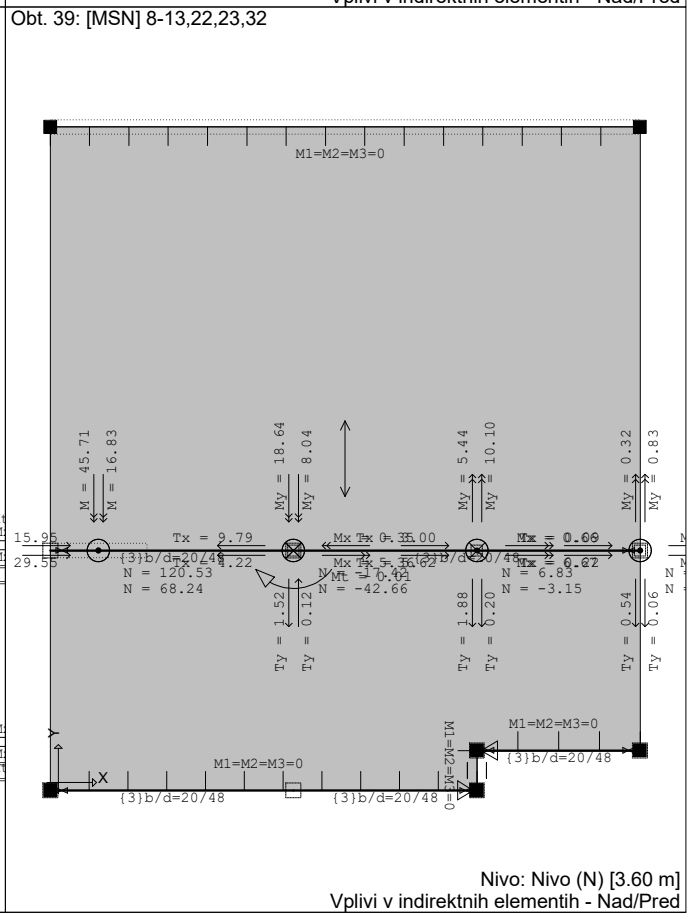


2. Načrt gradbeništva



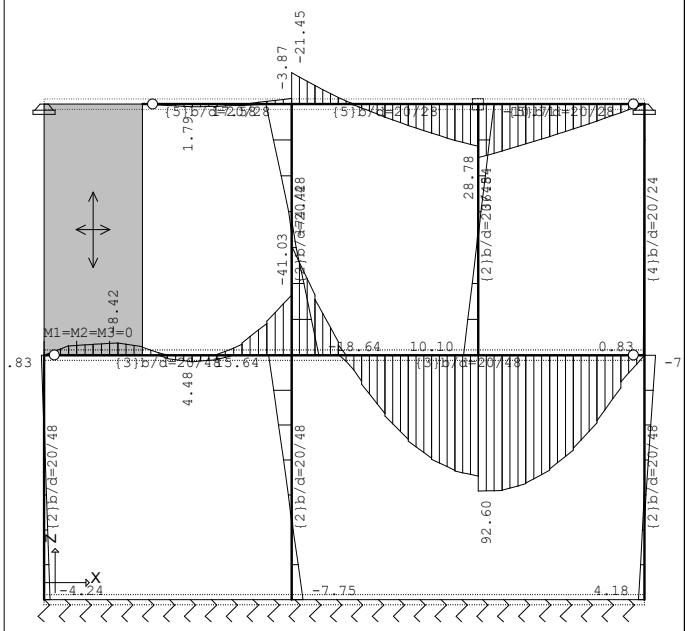






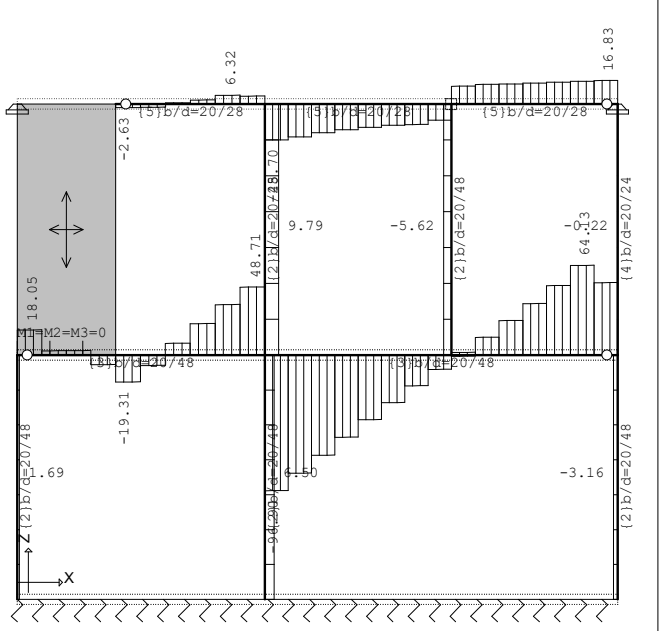
2. Načrt gradbeništva

Obt. 39: [MSN] 8-13,22,23,32



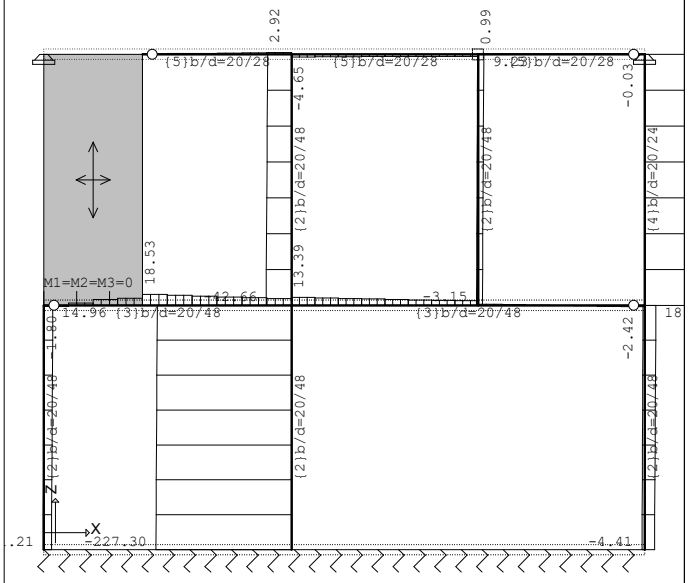
Okvir: H_3
Vplivi v gredi: max M3= 92.60 / min M3= -74.42 kNm

Obt. 39: [MSN] 8-13,22,23,32



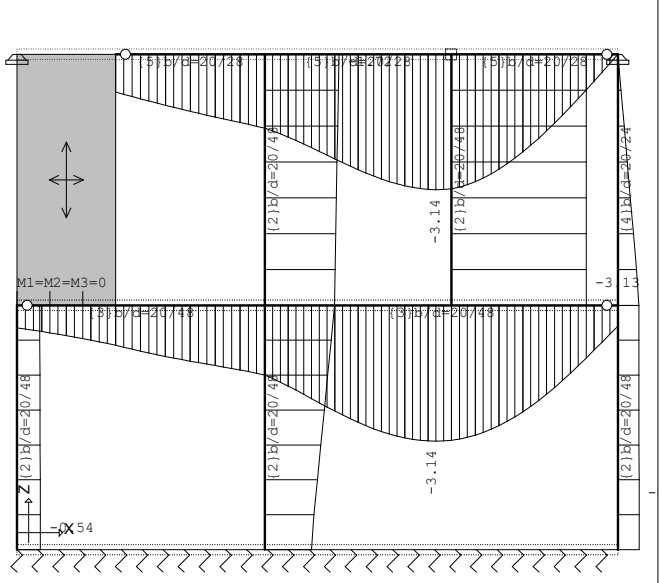
Okvir: H_3
Vplivi v gredi: max T2= 64.13 / min T2= -96.90 kN

Obt. 39: [MSN] 8-13,22,23,32



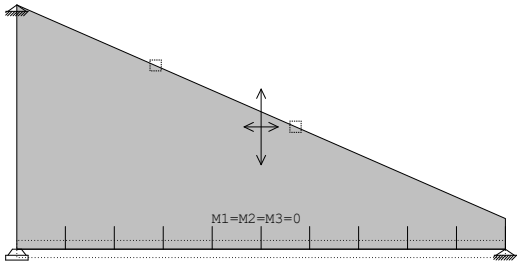
Okvir: H_3
Vplivi v gredi: max N1= 97.98 / min N1= -227.30 kN

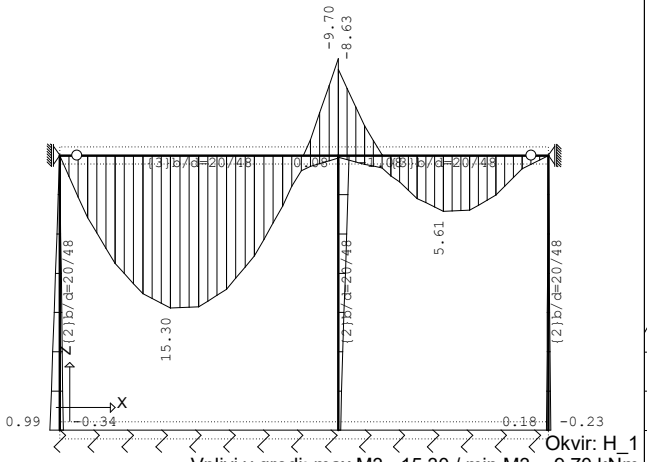
Obt. 41: [MSU] 33-38



Okvir: H_3
Vplivi v gredi: max Zp= -0.00 / min Zp= -3.15 m / 1000

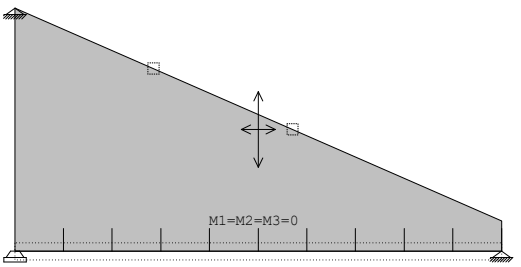
Obt. 39: [MSN] 8-13,22,23,32

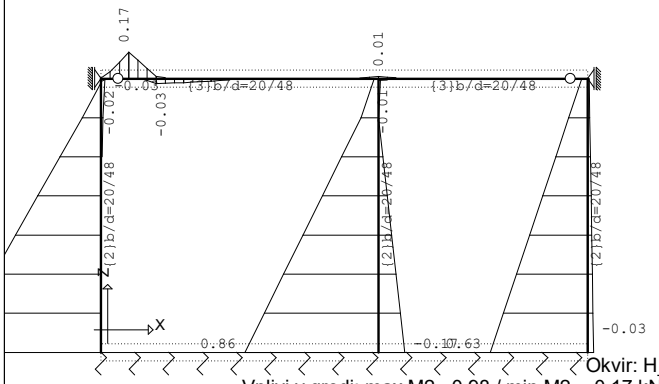




Okvir: H_1
Vplivi v gredi: max M3= 15.30 / min M3= -9.70 kNm

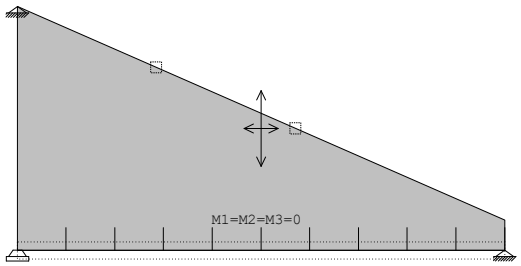
Obt. 39: [MSN] 8-13,22,23,32

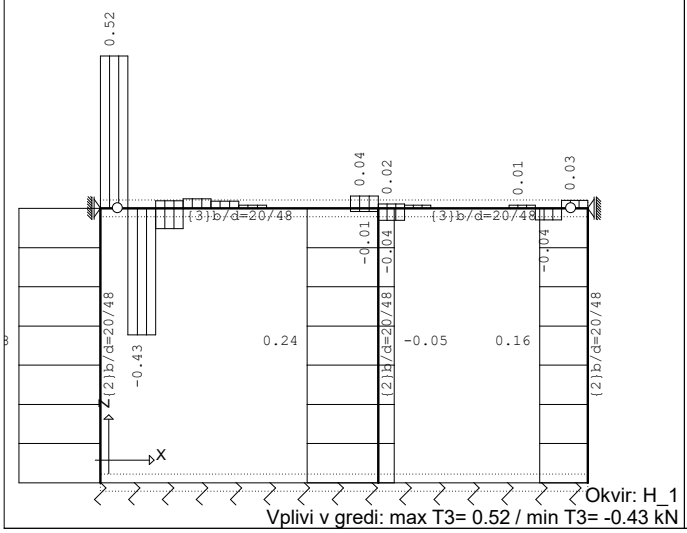




Okvir: H_1
Vplivi v gredi: max M2= 0.98 / min M2= -0.17 kNm

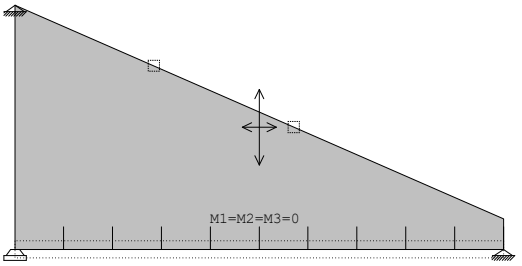
Obt. 39: [MSN] 8-13,22,23,32

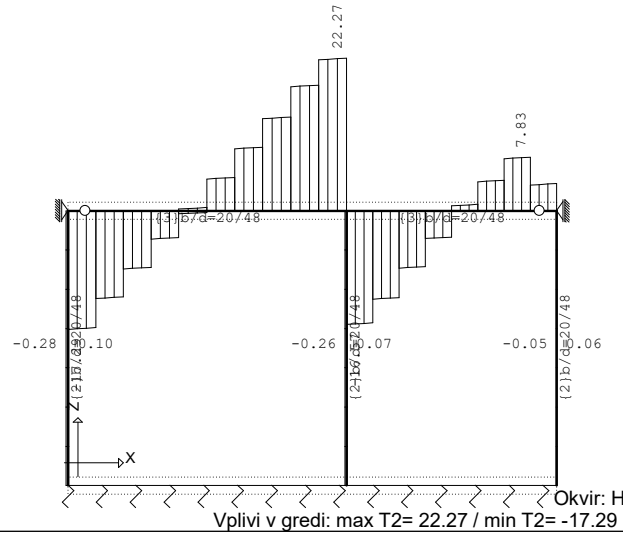




Okvir: H_1
Vplivi v gredi: max T3= 0.52 / min T3= -0.43 kN

Obt. 39: [MSN] 8-13,22,23,32

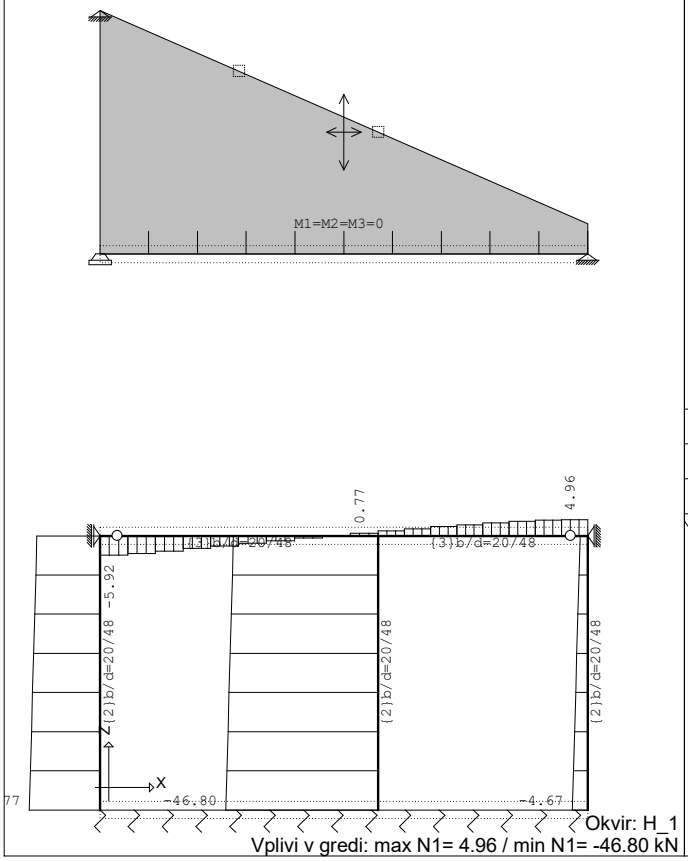




Okvir: H_1
Vplivi v gredi: max T2= 22.27 / min T2= -17.29 kN

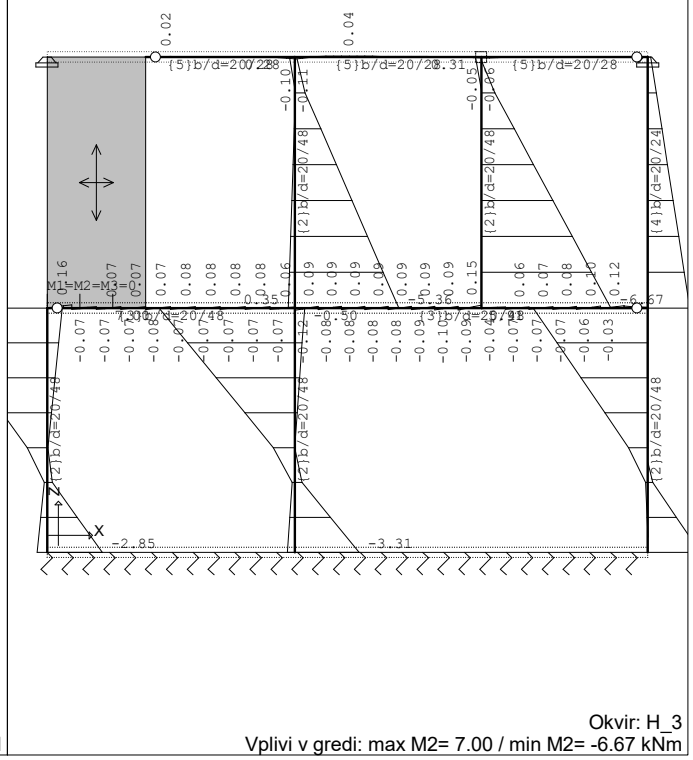
2. Načrt gradbeništva

Obt. 39: [MSN] 8-13,22,23,32



Okvir: H_1
Vplivi v gredi: max N1= 4.96 / min N1= -46.80 kN

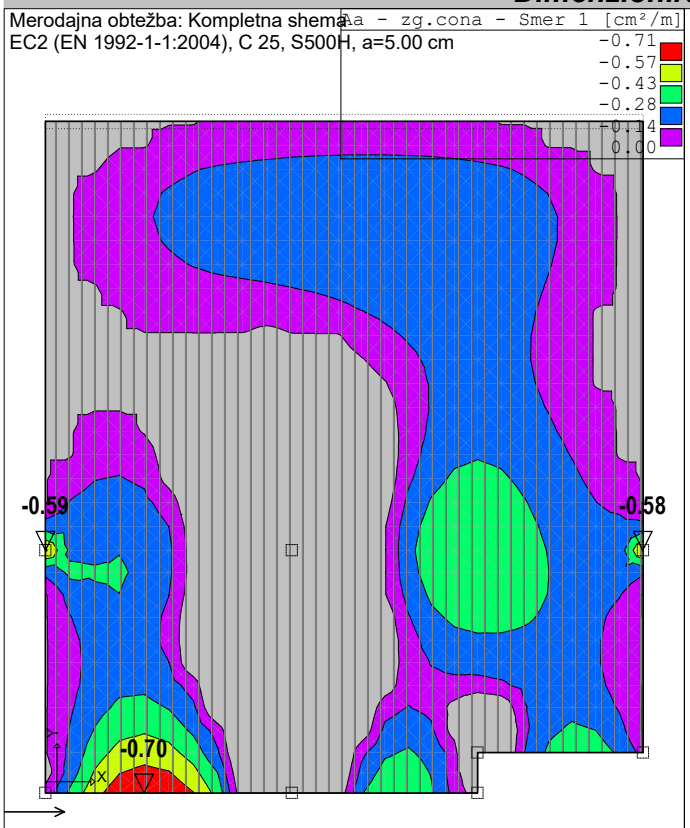
Obt. 39: [MSN] 8-13,22,23,32

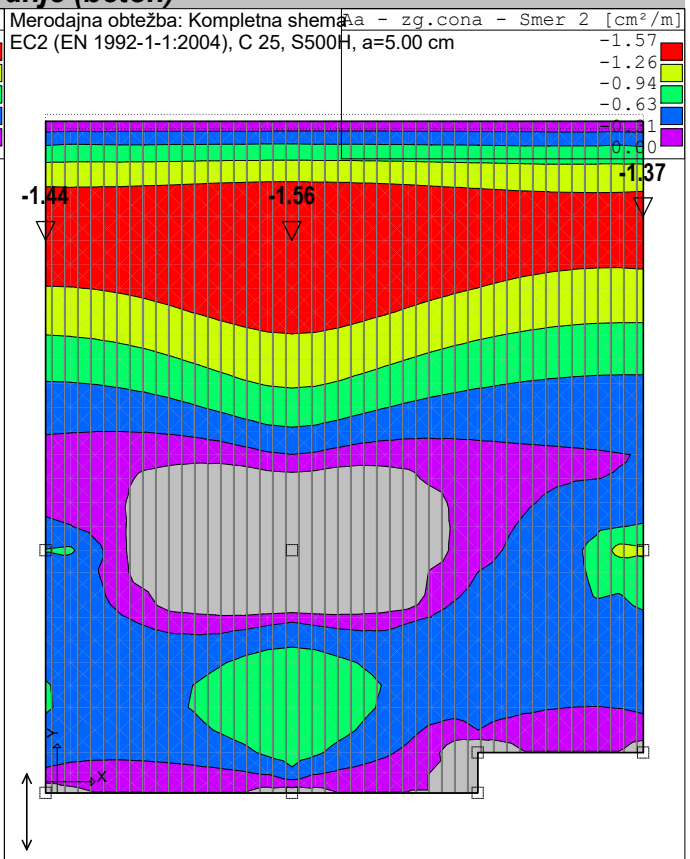


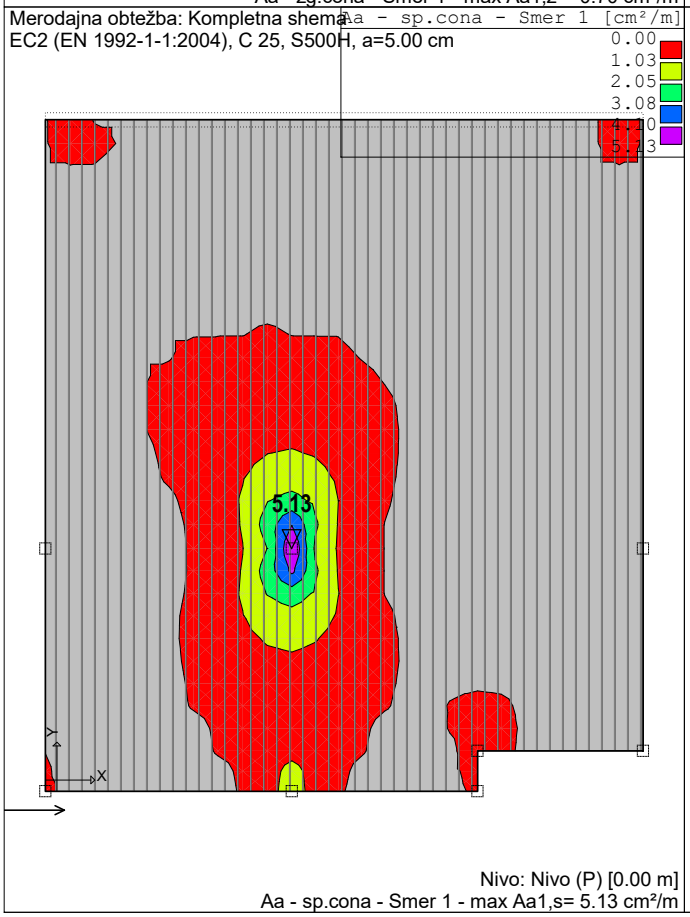
Okvir: H_3
Vplivi v gredi: max M2= 7.00 / min M2= -6.67 kNm

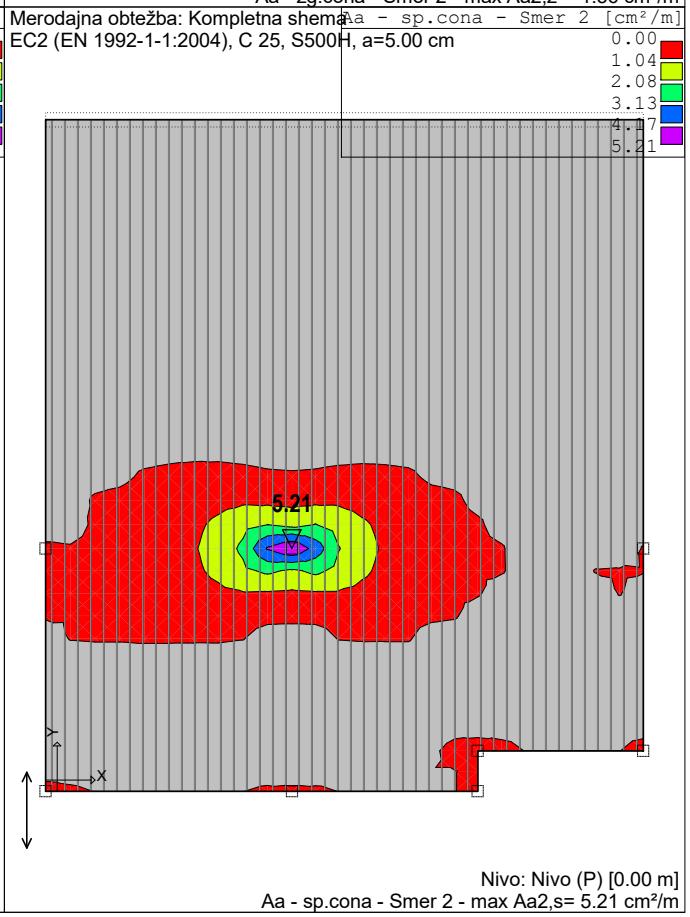
2. Načrt gradbeništva

Dimenzioniranje (beton)

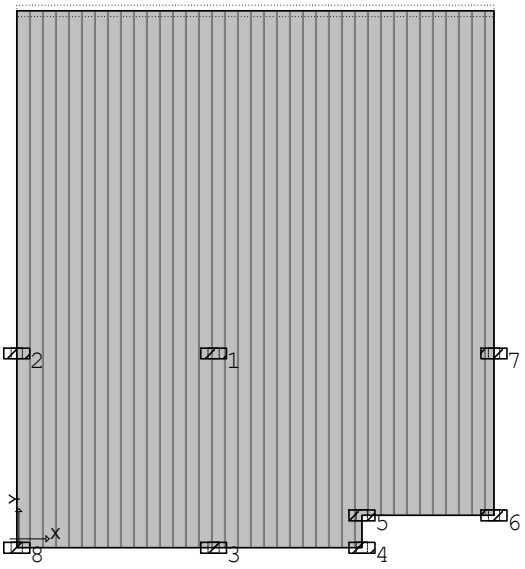






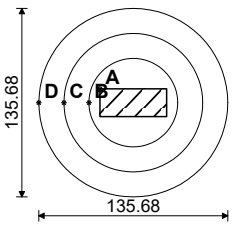


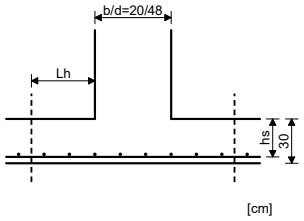
2. Načrt gradbeništva



Nivo: Nivo (P) [0.00 m]
Kontrola plošč na preboj - dispozicija

Kontrola plošče proti preboju
EC2 (EN 1992-1-1:2004)
Nivo: Nivo (P) [0.00 m]
Prerez 1 (3.65,3.60,0.00)
C 25





KONTROLA PREREZA OB ROBU STEBRA

Merodajna kombinacija: 1.35xI+1.05xII+1.50xIII		
Sila v stebru	Ne =	227.30 kN
Zmanjšanje sile od reak. podpor	dN =	3.686 kN
Računska sila v stebru	N =	223.62 kN
Merodajna strižna napetost (točka A)	ved =	0.609 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.61 <= 3.60)
Pogoj je izpolnjen.

KONTROLA PREREZA 1. (Lh = 0.18m od roba stebra)

Merodajna kombinacija: 1.35xI+1.05xII+1.50xIII		
Sila v stebru	Ne =	227.30 kN
Zmanjšanje sile od reak. podpor	dN =	3.686 kN
Računska sila v stebru	N =	223.62 kN
Merodajna strižna napetost (točka B)	ved =	0.414 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Obseg prereza	u =	2.001 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500

Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.41 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.444
Normalna napetost v betonu	σcp =	0.003 MPa

Odpornost proti preboju plošče brez dodatne armature za varnost.

	vRd,c =	1.332 MPa

Pogoj: ved <= vRd,c (0.41 <= 1.33)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA PREREZA 2. (Lh = 0.36m od roba stebra)

Merodajna kombinacija:
1.35xI+1.05xII+1.50xIII

Sila v stebru	Ne =	227.30 kN
Zmanjšanje sile od reak. podpor	dN =	28.535 kN
Računska sila v stebru	N =	198.77 kN
Merodajna strižna napetost (točka C)	ved =	0.235 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Obseg prereza	u =	3.132 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.24 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.444
Normalna napetost v betonu	σcp =	0.003 MPa

Odpornost proti preboju plošče brez dodatne armature za varnost.

	vRd,c =	0.666 MPa

Pogoj: ved <= vRd,c (0.24 <= 0.67)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA KRITIČNEGA PREREZA 3. (Lh = 0.54m od roba stebra)
(steber nadomestnega krožnega prereza, ds = 0.28m)

Merodajna kombinacija:
1.35xI+1.05xII+1.50xIII

Sila v stebru	Ne =	227.30 kN
Zmanjšanje sile od reak. podpor	dN =	35.686 kN
Računska sila v stebru	N =	191.62 kN
Merodajna strižna napetost (točka D)	ved =	0.166 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Obseg kritičnega prereza	u1 =	4.262 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.17 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.444
Normalna napetost v betonu	σcp =	0.002 MPa

Odpornost proti preboju plošče brez dodatne armature za varnost.

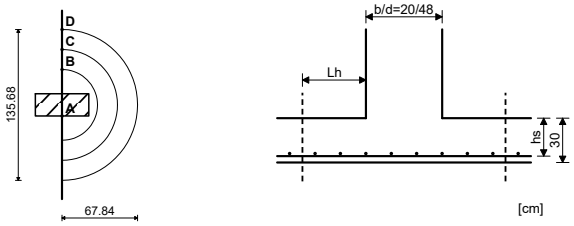
	vRd,c =	0.444 MPa

Pogoj: ved <= vRd,c (0.17 <= 0.44)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

Kontrola plošče proti preboju

EC2 (EN 1992-1-1:2004)
Nivo: Nivo (P) [0.00 m]
Prerez 2 (0.00,3.60,0.00)
C 25



KONTROLA PREREZA OB ROBU STEBRA

Merodajna kombinacija: 1.35xI+1.50xII		
Računska sila v stebru	N =	12.631 kN
(ni uporabljeno zmanjšanje sile od reakcij podpor)		
Merodajna strižna napetost (točka A)	ved =	0.069 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.07 <= 3.60)

Pogoj je izpolnjen.

KONTROLA PREREZA 1. (Lh = 0.18m od roba stebra)

Merodajna kombinacija: 1.35xI+1.50xII		
Računska sila v stebru	N =	12.631 kN
(ni uporabljeno zmanjšanje sile od reakcij podpor)		
Merodajna strižna napetost (točka B)	ved =	0.047 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Obseg prereza	u =	1.000 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.05 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.444
Normalna napetost v betonu	σcp =	-0.003 MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.		
	vRd,c =	1.332 MPa

Pogoj: ved <= vRd,c (0.05 <= 1.33)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA PREREZA 2. (Lh = 0.36m od roba stebra)

Merodajna kombinacija: 1.35xI+1.50xII		
Računska sila v stebru	N =	12.631 kN
(ni uporabljeno zmanjšanje sile od reakcij podpor)		
Merodajna strižna napetost (točka C)	ved =	0.030 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Obseg prereza	u =	1.566 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa

Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.03 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.444
Normalna napetost v betonu	σcp =	-0.001 MPa

Odpornost proti preboju plošče brez dodatne armature za varnost.

	vRd,c =	0.666 MPa

Pogoj: ved <= vRd,c (0.03 <= 0.67)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA KRITIČNEGA PREREZA 3. (Lh = 0.54m od roba stebra)
(steber nadomestnega krožnega prereza, ds = 0.28m)

Merodajna kombinacija: 1.35xI+1.50xII

Računska sila v stebru	N =	12.631 kN

(ni uporabljeno zmanjšanje sile od reakcij podpor)

Merodajna strižna napetost (točka D)	ved =	0.022 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Obseg kritičnega prereza	u1 =	2.131 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.02 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.444
Normalna napetost v betonu	σcp =	0.001 MPa

Odpornost proti preboju plošče brez dodatne armature za varnost.

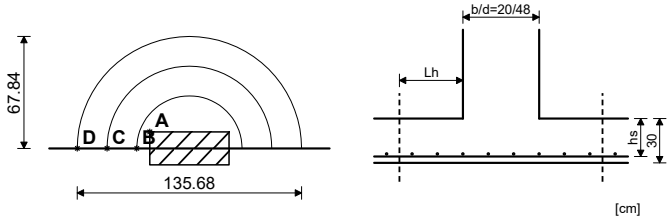
	vRd,c =	0.444 MPa

Pogoj: ved <= vRd,c (0.02 <= 0.44)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

Kontrola plošče proti preboju

EC2 (EN 1992-1-1:2004)
Nivo: Nivo (P) [0.00 m]
Prerez 3 (3.65,0.00,0.00)
C 25



KONTROLA PREREZA OB ROBU STEBRA

Merodajna kombinacija: 1.35xI+1.50xII

Sila v stebru	Ne =	46.802 kN
Zmanjšanje sile od reak. podpor	dN =	1.744 kN
Računska sila v stebru	N =	45.057 kN
Merodajna strižna napetost (točka A)	ved =	0.245 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500

Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.25 <= 3.60)

Pogoj je izpolnjen.

KONTROLA PREREZA 1. (Lh = 0.18m od roba stebra)

Merodajna kombinacija: 1.35xI+1.50xII		
Sila v stebru	Ne =	46.802 kN
Zmanjšanje sile od reak. podpor	dN =	5.051 kN
Računska sila v stebru	N =	41.750 kN
Merodajna strižna napetost (točka B)	ved =	0.155 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Obseg prereza	u =	1.000 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.15 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.444
Normalna napetost v betonu	σcp =	-0.001 MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.	vRd,c =	1.332 MPa

Pogoj: ved <= vRd,c (0.15 <= 1.33)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA PREREZA 2. (Lh = 0.36m od roba stebra)

Merodajna kombinacija: 1.35xI+1.50xII		
Sila v stebru	Ne =	46.802 kN
Zmanjšanje sile od reak. podpor	dN =	15.062 kN
Računska sila v stebru	N =	31.740 kN
Merodajna strižna napetost (točka C)	ved =	0.075 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Obseg prereza	u =	1.566 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.08 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.444
Normalna napetost v betonu	σcp =	-0.001 MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.	vRd,c =	0.666 MPa

Pogoj: ved <= vRd,c (0.08 <= 0.67)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA KRITIČNEGA PREREZA 3. (Lh = 0.54m od roba stebra)
(steber nadomestnega krožnega prereza, ds = 0.28m)

Merodajna kombinacija: 1.35xI+1.50xII		
Sila v stebru	Ne =	46.802 kN
Zmanjšanje sile od reak. podpor	dN =	18.382 kN
Računska sila v stebru	N =	28.420 kN
Merodajna strižna napetost (točka D)	ved =	0.049 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Obseg kritičnega prereza	u1 =	2.131 m

Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.05 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.444
Normalna napetost v betonu	σcp =	-0.001 MPa

Odpornost proti preboju plošče brez dodatne armature za varnost.

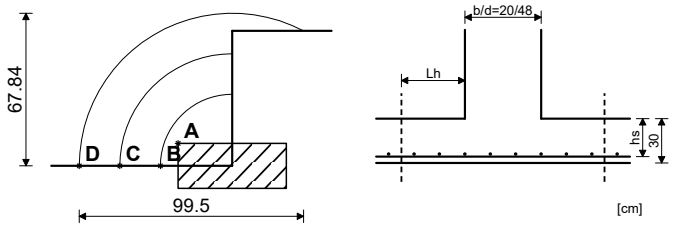
	vRd,c =	0.444 MPa

Pogoj: ved <= vRd,c (0.05 <= 0.44)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

Kontrola plošče proti preboju

EC2 (EN 1992-1-1:2004)
Nivo: Nivo (P) [0.00 m]
Prerez 4 (6.40,0.00,0.00)
C 25



KONTROLA PREREZA OB ROBU STEBRA

Merodajna kombinacija:
1.35xI+1.50xII+0.75xIII

Sila v stebru	Ne =	4.669 kN
Zmanjšanje sile od reak. podpor	dN =	0.769 kN
Računska sila v stebru	N =	3.900 kN
Merodajna strižna napetost (točka A)	ved =	0.042 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.04 <= 3.60)

Pogoj je izpolnjen.

KONTROLA PREREZA 1. (Lh = 0.18m od roba stebra)

Merodajna kombinacija:
1.35xI+1.05xII+1.50xIII

Sila v stebru	Ne =	4.458 kN
Zmanjšanje sile od reak. podpor	dN =	1.890 kN
Računska sila v stebru	N =	2.568 kN
Merodajna strižna napetost (točka B)	ved =	0.019 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Obseg prereza	u =	0.500 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.02 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120

Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.444
Normalna napetost v betonu	σcp =	-0.001 MPa

Odpornost proti preboju plošče brez dodatne armature za varnost.

	vRd,c =	1.332 MPa

Pogoj: ved <= vRd,c (0.02 <= 1.33)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA PREREZA 2. (Lh = 0.36m od roba stebra)

Merodajna kombinacija:
1.35xI+1.50xII+0.75xIII

Računska sila v stebru	N =	4.669 kN

(ni uporabljeno zmanjšanje sile od reakcij podpor)

Merodajna strižna napetost (točka C)	ved =	0.022 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Obseg prereza	u =	0.783 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.02 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.444
Normalna napetost v betonu	σcp =	-0.001 MPa

Odpornost proti preboju plošče brez dodatne armature za varnost.

	vRd,c =	0.666 MPa

Pogoj: ved <= vRd,c (0.02 <= 0.67)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA KRITIČNEGA PREREZA 3. (Lh = 0.54m od roba stebra)
(steber nadomestnega krožnega prereza, ds = 0.28m)

Merodajna kombinacija:
1.35xI+1.50xII+0.75xIII

Računska sila v stebru	N =	4.669 kN

(ni uporabljeno zmanjšanje sile od reakcij podpor)

Merodajna strižna napetost (točka D)	ved =	0.012 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Obseg kritičnega prereza	u1 =	1.395 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.01 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.444
Normalna napetost v betonu	σcp =	-0.001 MPa

Odpornost proti preboju plošče brez dodatne armature za varnost.

	vRd,c =	0.444 MPa

Pogoj: ved <= vRd,c (0.01 <= 0.44)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

Kontrola plošče proti preboju

EC2 (EN 1992-1-1:2004)
Nivo: Nivo (P) [0.00 m]
Prerez 5 (6.40,0.60,0.00)
C 25

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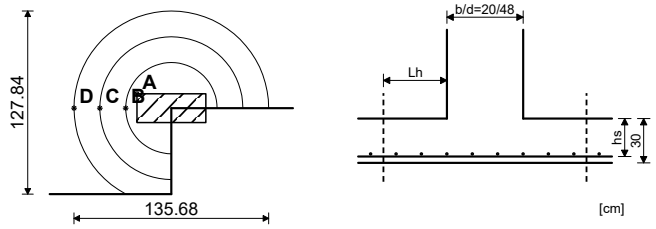
2. Načrt gradbeništva



KONTROLA PREREZA OB ROBU STEBRA

Merodajna kombinacija: 1.35xI+1.50xII			
Sila v stebru		Ne =	32.564 kN
Zmanjšanje sile od reak. podpor		dN =	2.403 kN
Računska sila v stebru		N =	30.162 kN
Merodajna strižna napetost (točka A)		ved =	0.110 MPa
Debelina plošče		d,pl =	0.300 m
Statična višina plošče		hs =	0.270 m
Trdnost betona		fck =	25.000 MPa
Računska trdnost betona		fcd =	16.667 MPa
Koeficient		ν =	0.540
Koeficient		γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =		3.600 MPa

Pogoj: ved <= vRd,max (0.11 <= 3.60)

Pogoj je izpolnjen.

KONTROLA PREREZA 1. (Lh = 0.18m od roba stebra)

Merodajna kombinacija: 1.35xI+1.50xII			
Sila v stebru		Ne =	32.564 kN
Zmanjšanje sile od reak. podpor		dN =	3.959 kN
Računska sila v stebru		N =	28.606 kN
Merodajna strižna napetost (točka B)		ved =	0.071 MPa
Debelina plošče		d,pl =	0.300 m
Statična višina plošče		hs =	0.270 m
Obseg prereza		u =	1.500 m
Trdnost betona		fck =	25.000 MPa
Računska trdnost betona		fcd =	16.667 MPa
Koeficient		ν =	0.540
Koeficient		γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =		3.600 MPa

Pogoj: ved <= vRd,max (0.07 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja		ρ =	0.000 %
Koeficient		CRd,c =	0.120
Koeficient		K1 =	0.100
Koeficient		k,vmin=	0.035
Koeficient		vmin=	0.444
Normalna napetost v betonu		σcp =	-0.001 MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.			
		vRd,c =	1.332 MPa

Pogoj: ved <= vRd,c (0.07 <= 1.33)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA PREREZA 2. (Lh = 0.36m od roba stebra)

Merodajna kombinacija: 1.35xI+1.50xII			
Sila v stebru		Ne =	32.564 kN
Zmanjšanje sile od reak. podpor		dN =	21.218 kN
Računska sila v stebru		N =	11.346 kN
Merodajna strižna napetost (točka C)		ved =	0.018 MPa
Debelina plošče		d,pl =	0.300 m
Statična višina plošče		hs =	0.270 m
Obseg prereza		u =	2.349 m
Trdnost betona		fck =	25.000 MPa
Računska trdnost betona		fcd =	16.667 MPa
Koeficient		ν =	0.540
Koeficient		γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =		3.600 MPa

Pogoj: ved <= vRd,max (0.02 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.444
Normalna napetost v betonu	σcp =	-0.001 MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.		
	vRd,c =	0.666 MPa

Pogoj: ved <= vRd,c (0.02 <= 0.67)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA KRITIČNEGA PREREZA 3. (Lh = 0.54m od roba stebra)
(steber nadomestnega krožnega prereza, ds = 0.28m)

Merodajna kombinacija: 1.35xI		
Računska sila v stebru	N =	16.048 kN
(ni uporabljeno zmanjšanje sile od reakcij podpor)		
Merodajna strižna napetost (točka D)	ved =	0.021 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Obseg kritičnega prereza	u1 =	2.868 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.02 <= 3.60)

Pogoj je izpolnjen.

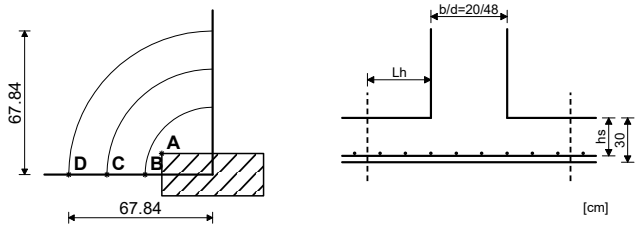
Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.444
Normalna napetost v betonu	σcp =	-0.000 MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.		
	vRd,c =	0.444 MPa

Pogoj: ved <= vRd,c (0.02 <= 0.44)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

Kontrola plošče proti preboju

EC2 (EN 1992-1-1:2004)
Nivo: Nivo (P) [0.00 m]
Prerez 6 (8.85,0.60,0.00)
C 25



KONTROLA PREREZA OB ROBU STEBRA

Merodajna kombinacija: 1.35xI+1.50xII		
Sila v stebru	Ne =	13.242 kN
Zmanjšanje sile od reak. podpor	dN =	0.776 kN
Računska sila v stebru	N =	12.465 kN
Merodajna strižna napetost (točka A)	ved =	0.136 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.14 <= 3.60)

Pogoj je izpolnjen.

KONTROLA PREREZA 1. (Lh = 0.18m od roba stebra)

Merodajna kombinacija: 1.35xI+1.50xII		
Sila v stebru	Ne =	13.242 kN
Zmanjšanje sile od reak. podpor	dN =	0.776 kN
Računska sila v stebru	N =	12.465 kN
Merodajna strižna napetost (točka B)	ved =	0.092 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Obseg prereza	u =	0.500 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.09 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.444
Normalna napetost v betonu	σcp =	-0.002 MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.	vRd,c =	1.332 MPa

Pogoj: ved <= vRd,c (0.09 <= 1.33)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA PREREZA 2. (Lh = 0.36m od roba stebra)

Merodajna kombinacija: 1.35xI+1.50xII		
Sila v stebru	Ne =	13.242 kN
Zmanjšanje sile od reak. podpor	dN =	6.639 kN
Računska sila v stebru	N =	6.603 kN
Merodajna strižna napetost (točka C)	ved =	0.031 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Obseg prereza	u =	0.783 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.03 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.444
Normalna napetost v betonu	σcp =	-0.002 MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.	vRd,c =	0.666 MPa

Pogoj: ved <= vRd,c (0.03 <= 0.67)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA KRITIČNEGA PREREZA 3. (Lh = 0.54m od roba stebra)
(steber nadomestnega krožnega prereza, ds = 0.28m)

Merodajna kombinacija: 1.35xI+1.50xII		
Sila v stebru	Ne =	13.242 kN
Zmanjšanje sile od reak. podpor	dN =	7.945 kN
Računska sila v stebru	N =	5.297 kN
Merodajna strižna napetost (točka D)	ved =	0.018 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Obseg kritičnega prereza	u1 =	1.066 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540

Koeficient	γc =	1.500
Maksimalna odpornost	$v_{Rd,max} = 0.40 \times \nu \times f_{cd}$ =	3.600 MPa

Pogoj: ved <= vRd,max (0.02 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.444
Normalna napetost v betonu	σcp =	-0.002 MPa

Odpornost proti preboju plošče brez dodatne armature za varnost.

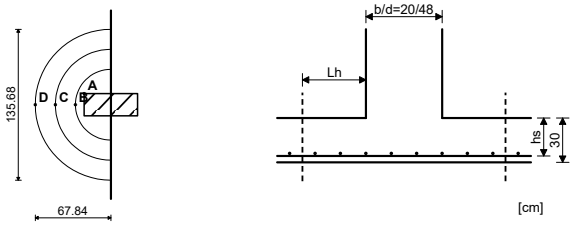
	vRd,c =	0.444 MPa

Pogoj: ved <= vRd,c (0.02 <= 0.44)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

Kontrola plošče proti preboju

EC2 (EN 1992-1-1:2004)
Nivo: Nivo (P) [0.00 m]
Prerez 7 (8.85,3.60,0.00)
C 25



KONTROLA PREREZA OB ROBU STEBRA

Merodajna kombinacija: 1.35xI+1.50xII		
Računska sila v stebru	N =	16.541 kN
(ni uporabljeno zmanjšanje sile od reakcij podpor)		
Merodajna strižna napetost (točka A)	ved =	0.090 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	$v_{Rd,max} = 0.40 \times \nu \times f_{cd}$ =	3.600 MPa

Pogoj: ved <= vRd,max (0.09 <= 3.60)

Pogoj je izpolnjen.

KONTROLA PREREZA 1. (Lh = 0.18m od roba stebra)

Merodajna kombinacija: 1.35xI+1.50xII		
Računska sila v stebru	N =	16.541 kN
(ni uporabljeno zmanjšanje sile od reakcij podpor)		
Merodajna strižna napetost (točka B)	ved =	0.061 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Obseg prereza	u =	1.000 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	$v_{Rd,max} = 0.40 \times \nu \times f_{cd}$ =	3.600 MPa

Pogoj: ved <= vRd,max (0.06 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.444
Normalna napetost v betonu	σcp =	-0.007 MPa

Odpornost proti preboju plošče brez dodatne armature za varnost.

	vRd,c =	1.332 MPa

Pogoj: ved <= vRd,c (0.06 <= 1.33)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA PREREZA 2. (Lh = 0.36m od roba stebra)

Merodajna kombinacija: 1.35xI+1.50xII		
Računska sila v stebru	N =	16.541 kN
(ni uporabljeno zmanjšanje sile od reakcij podpor)		
Merodajna strižna napetost (točka C)	ved =	0.039 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Obseg prereza	u =	1.566 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.04 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.444
Normalna napetost v betonu	σcp =	-0.005 MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.		
	vRd,c =	0.666 MPa

Pogoj: ved <= vRd,c (0.04 <= 0.67)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA KRITIČNEGA PREREZA 3. (Lh = 0.54m od roba stebra)
(steber nadomestnega krožnega prereza, ds = 0.28m)

Merodajna kombinacija: 1.35xI+1.50xII		
Računska sila v stebru	N =	16.541 kN
(ni uporabljeno zmanjšanje sile od reakcij podpor)		
Merodajna strižna napetost (točka D)	ved =	0.029 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Obseg kritičnega prereza	u1 =	2.131 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.03 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.444
Normalna napetost v betonu	σcp =	-0.003 MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.		
	vRd,c =	0.444 MPa

Pogoj: ved <= vRd,c (0.03 <= 0.44)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

Kontrola plošče proti preboju

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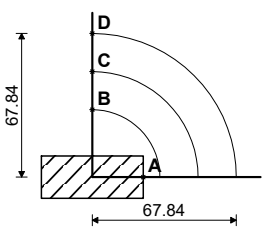
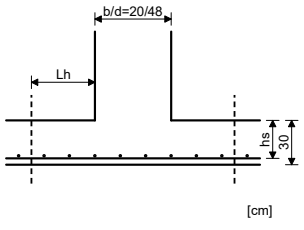
Prerez 8 (0.00,0.00,0.00)
C 25





KONTROLA PREREZA OB ROBU STEBRA

Merodajna kombinacija: 1.35xI+1.50xII			
Sila v stebru		Ne =	21.767 kN
Zmanjšanje sile od reak. podpor		dN =	0.800 kN
Računska sila v stebru		N =	20.967 kN
Merodajna strižna napetost (točka A)		ved =	0.228 MPa
Debelina plošče		d,pl =	0.300 m
Statična višina plošče		hs =	0.270 m
Trdnost betona		fck =	25.000 MPa
Računska trdnost betona		fcd =	16.667 MPa
Koeficient		ν =	0.540
Koeficient		γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =		3.600 MPa

Pogoj: ved <= vRd,max (0.23 <= 3.60)

Pogoj je izpolnjen.

KONTROLA PREREZA 1. (Lh = 0.18m od roba stebra)

Merodajna kombinacija: 1.35xI+1.50xII			
Sila v stebru		Ne =	21.767 kN
Zmanjšanje sile od reak. podpor		dN =	2.291 kN
Računska sila v stebru		N =	19.476 kN
Merodajna strižna napetost (točka B)		ved =	0.144 MPa
Debelina plošče		d,pl =	0.300 m
Statična višina plošče		hs =	0.270 m
Obseg prereza		u =	0.500 m
Trdnost betona		fck =	25.000 MPa
Računska trdnost betona		fcd =	16.667 MPa
Koeficient		ν =	0.540
Koeficient		γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =		3.600 MPa

Pogoj: ved <= vRd,max (0.14 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja		ρ =	0.000 %
Koeficient		CRd,c =	0.120
Koeficient		K1 =	0.100
Koeficient		k,vmin=	0.035
Koeficient		vmin=	0.444
Normalna napetost v betonu		σcp =	0.006 MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.			
		vRd,c =	1.332 MPa

Pogoj: ved <= vRd,c (0.14 <= 1.33)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA PREREZA 2. (Lh = 0.36m od roba stebra)

Merodajna kombinacija: 1.35xI+1.50xII			
Sila v stebru		Ne =	21.767 kN
Zmanjšanje sile od reak. podpor		dN =	6.821 kN
Računska sila v stebru		N =	14.946 kN
Merodajna strižna napetost (točka C)		ved =	0.071 MPa
Debelina plošče		d,pl =	0.300 m
Statična višina plošče		hs =	0.270 m
Obseg prereza		u =	0.783 m
Trdnost betona		fck =	25.000 MPa
Računska trdnost betona		fcd =	16.667 MPa
Koeficient		ν =	0.540
Koeficient		γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =		3.600 MPa

Pogoj: ved <= vRd,max (0.07 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja		ρ =	0.000 %
Koeficient		CRd,c =	0.120
Koeficient		K1 =	0.100
Koeficient		k,vmin=	0.035
Koeficient		vmin=	0.444
Normalna napetost v betonu		σcp =	0.003 MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.			
		vRd,c =	0.666 MPa

Pogoj: ved <= vRd,c (0.07 <= 0.67)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA KRITIČNEGA PREREZA 3. (Lh = 0.54m od roba stebra)
(steber nadomestnega krožnega prereza, ds = 0.28m)

Merodajna kombinacija: 1.35xI+1.50xII		
Sila v stebru	Ne =	21.767 kN
Zmanjšanje sile od reak. podpor	dN =	8.280 kN
Računska sila v stebru	N =	13.487 kN
Merodajna strižna napetost (točka D)	ved =	0.047 MPa
Debelina plošče	d,pl =	0.300 m
Statična višina plošče	hs =	0.270 m
Obseg kritičnega prereza	u1 =	1.066 m
Trdnost betona	fck =	25.000 MPa
Računska trdnost betona	fcd =	16.667 MPa
Koeficient	ν =	0.540
Koeficient	γc =	1.500
Maksimalna odpornost	vRd,max = 0.40×ν×fcd =	3.600 MPa

Pogoj: ved <= vRd,max (0.05 <= 3.60)

Pogoj je izpolnjen.

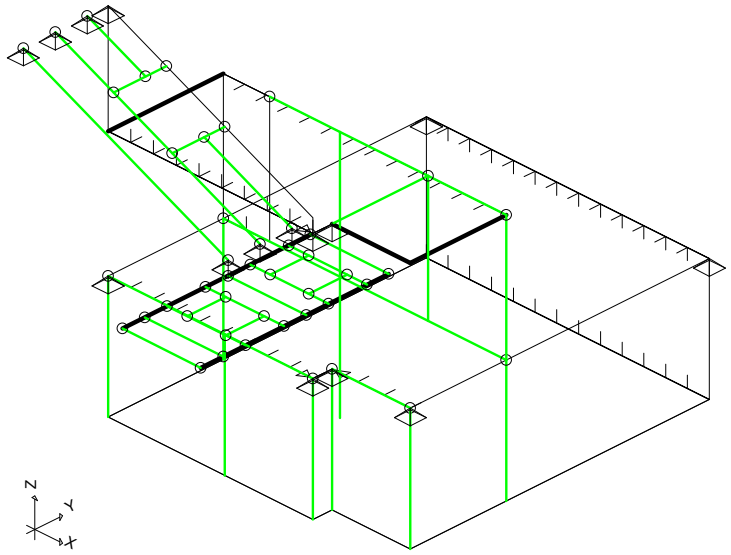
Procent armiranja	ρ =	0.000 %
Koeficient	CRd,c =	0.120
Koeficient	K1 =	0.100
Koeficient	k,vmin=	0.035
Koeficient	vmin=	0.444
Normalna napetost v betonu	σcp =	0.001 MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.	vRd,c =	0.444 MPa

Pogoj: ved <= vRd,c (0.05 <= 0.44)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

2. Načrt gradbeništva

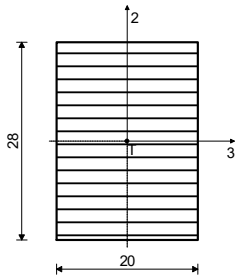
Dimenzioniranje (les)



Izometrija
Kontrola stabilnosti

PALICA 2245-2493

Lepljen lameliran les - GL 24h
v smeri zgornjega roba palice
Debelina lamele 4.00 cm
Eksploatacijski razred 1
EUROCODE (EN 1995-1-1)



[cm]

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

8. γ=0.75	10. γ=0.66	9. γ=0.66
12. γ=0.63	13. γ=0.57	11. γ=0.57
22. γ=0.54	34. γ=0.53	32. γ=0.51
23. γ=0.48	35. γ=0.46	36. γ=0.45
37. γ=0.41	33. γ=0.38	38. γ=0.38
19. γ=0.36	18. γ=0.36	17. γ=0.36
16. γ=0.36	29. γ=0.28	28. γ=0.28
27. γ=0.28	26. γ=0.28	21. γ=0.26
20. γ=0.26	15. γ=0.26	14. γ=0.26
31. γ=0.21	30. γ=0.21	25. γ=0.20
24. γ=0.20		

KONTROLA NORMALNIH NAPETOSTI
(obtežni primer 8, začetek palice)

Računska osna sila	Ned =	0.815 kN
Prečna sila v smeri osi 2	V2ed =	12.660 kN
Prečna sila v smeri osi 3	V3ed =	-0.108 kN
Moment torzije	M1ed =	-0.138 kNm
Upogibni moment okoli osi 2	M2ed ≈	0.000 kNm
Upogibni moment okoli osi 3	M3ed =	-36.536 kNm

KONTROLA NAPETOSTI - NATEG IN UPOGIB
Vrsta obtežbe: osnovno - kratkotrajno

Korekcijski koeficient	Kmod =	0.900
Parcialni koef. za karakteristike materiala	γm =	1.250
Dodatek za elemente z malimi dimenzijami - os 2	Kh_2 =	1.100
Dodatek za elemente z malimi dimenzijami - os 3	Kh_3 =	1.079
Dodatek za elemente z malimi dimenzijami - nateg	Kh_t =	1.100
Karakteristična natezna trdnost	ft,0,k =	19.200 MPa

Računska natezna trdnost	ft,0,d =	15.206 MPa
Faktor oblik (za pravokotni prerez)	km =	0.700
Karakteristična upogibna trdnost	fm,k =	24.000 MPa
Računska upogibna trdnost - os 2	fm,2,d =	19.008 MPa
Računska upogibna trdnost - os 3	fm,3,d =	18.648 MPa
Normalna natezna napetost	σt,0,d =	0.015 MPa
Odpornostni moment	W3 =	2613.3 cm3
Normalna upogibna napetost okoli osi 3	σm3,d =	13.981 MPa

σm3,d <= fm,3,d (13.981 <= 18.648)

Izkoriščenost prereza je 75.0%

σt,0,d / ft,0,d + km x (σm3,d / fm,3,d) + σm2,d / fm,2,d <= 1
(0.526 <= 1)

Izkoriščenost prereza je 52.6%

σt,0,d / ft,0,d + σm3,d / fm,3,d + km x (σm2,d / fm,2,d) <= 1
(0.751 <= 1)

Izkoriščenost prereza je 75.1%

DOKAZ BOČNE STABILNOSTI

Vrsta obtežbe: osnovno - kratkotrajno		
Korekcijski koeficient	Kmod =	0.900
Parcialni koef. za karakteristike materiala	γm =	1.250
Razmak pridržanih točk pravokotno na smer osi 2	lef =	245.00 cm
5% fraktil modula E paralelno z vlakni	E0.05 =	9600.0 MPa
5% fraktil strižnega modula G	G0.05 =	540.00 MPa
Torzijski vztrajnostni moment	Itor =	41497 cm4
Vztrajnostni moment	I2 =	18667 cm4
Odpornostni moment	W3 =	2613.3 cm3
Kritična napetost uklona	σm,crit =	310.93 MPa
Relativna vitkost za uklon	λrel =	0.278
Koeficient	k_krit =	1.000
Normalna upogibna napetost okoli osi 3	σm3,d =	13.981 MPa

σm,3,d <= k_krit x fm,3,d (13.981 <= 18.648)

Izkoriščenost prereza je 75.0%

KONTROLA STRIŽNIH NAPETOSTI
(obtežni primer 8, konec palice)

Prečna sila v smeri osi 2	V2ed =	16.833 kN
Prečna sila v smeri osi 3	V3ed ≈	0.000 kN
Moment torzije	M1ed =	-0.135 kNm

KONTROLA NAPETOSTI - STRIG

Vrsta obtežbe: osnovno - kratkotrajno		
Korekcijski koeficient	Kmod =	0.900
Parcialni koef. za karakteristike materiala	γm =	1.250
Karakteristična strižna napetost	fv,k =	3.500 MPa
Računska strižna trdnost	fv,d =	2.520 MPa
Površina prečnega prereza	A =	560.00 cm2
Dejanska strižna napetost(os 2)	τ2,d =	0.451 MPa

τ2,d <= fv,d (0.451 <= 2.520)

Izkoriščenost prereza je 17.9%

KONTROLA NAPETOSTI - TORZIJA

Karakteristična strižna trdnost	fv,k =	3.500 MPa
Računska strižna trdnost	fv,d =	2.520 MPa
Koeficient	k_{shape} =	1.210
Torzijski odpornostni moment	Wt =	2542.4 cm3
Dejanska strižna napetost	τtor,d =	0.053 MPa

$\tau_{tor,d} <= k_{shape}$ x fv,d (0.053 <= 3.049)

Izkoriščenost prereza je 1.7%

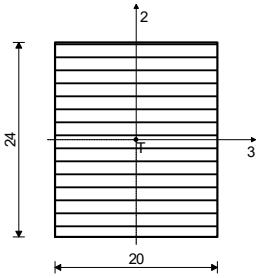
Superpozicija vplivov prečne sile in torzijskega momenta

(1)	$\tau_{tor,d}/(k_{shape}$ x fv,d) =	0.017
(2)	τ2,d / fv,d =	0.179

$(1) + (2)^2 <= 1$ (0.049 <= 1)

Izkoriščenost prereza je 4.9%

PALICA 2493-2060
Lepljen lameliran les - GL 24h
v smeri zgornjega roba palice
Debelina lamele 4.00 cm
Eksploatacijski razred 1
EUROCODE (EN 1995-1-1)



[cm]

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

8. γ=0.22	12. γ=0.19	10. γ=0.19
9. γ=0.18	22. γ=0.17	11. γ=0.15
34. γ=0.15	32. γ=0.15	13. γ=0.15
36. γ=0.14	35. γ=0.13	23. γ=0.12
33. γ=0.11	38. γ=0.11	37. γ=0.11
17. γ=0.10	18. γ=0.10	19. γ=0.10
16. γ=0.10	29. γ=0.08	26. γ=0.08
27. γ=0.08	28. γ=0.08	15. γ=0.07
20. γ=0.07	21. γ=0.07	14. γ=0.07
31. γ=0.06	24. γ=0.06	25. γ=0.06
30. γ=0.06		

KONTROLA NORMALNIH NAPETOSTI
(obtežni primer 8, konec palice)

Računska osna sila	Ned =	96.784 kN
Prečna sila v smeri osi 2	V2ed =	-0.224 kN
Prečna sila v smeri osi 3	V3ed =	0.519 kN
Upogibni moment okoli osi 2	M2ed =	-2.055 kNm
Upogibni moment okoli osi 3	M3ed =	-0.829 kNm

KONTROLA NAPETOSTI - NATEG IN UPOGIB
Vrsta obtežbe: osnovno - kratkotrajno

Korekcijski koeficient	Kmod =	0.900
Parcialni koef. za karakteristike materiala	γm =	1.250
Dodatek za elemente z malimi dimenzijami - os 2	Kh_2 =	1.100
Dodatek za elemente z malimi dimenzijami - os 3	Kh_3 =	1.096
Dodatek za elemente z malimi dimenzijami - nateg	Kh_t =	1.100
Karakteristična natezna trdnost	ft,0,k =	19.200 MPa
Računska natezna trdnost	ft,0,d =	15.206 MPa
Faktor oblik (za pravokotni prerez)	km =	0.700
Karakteristična upogibna trdnost	fm,k =	24.000 MPa
Računska upogibna trdnost - os 2	fm,2,d =	19.008 MPa
Računska upogibna trdnost - os 3	fm,3,d =	18.938 MPa
Normalna natezna napetost	σt,0,d =	2.016 MPa
Odpornostni moment	W2 =	1600.0 cm3
Normalna upogibna napetost okoli osi 2	σm2,d =	1.284 MPa

σm2,d <= fm,2,d (1.284 <= 19.008)
Izkoriščenost prereza je 6.8%

Odpornostni moment	W3 =	1920.0 cm3
Normalna upogibna napetost okoli osi 3	σm3,d =	0.432 MPa

σm3,d <= fm,3,d (0.432 <= 18.938)
Izkoriščenost prereza je 2.3%

σt,0,d / ft,0,d + km x (σm3,d / fm,3,d) + σm2,d / fm,2,d <= 1
(0.216 <= 1)
Izkoriščenost prereza je 21.6%

σt,0,d / ft,0,d + σm3,d / fm,3,d + km x (σm2,d / fm,2,d) <= 1
(0.203 <= 1)

Izkoriščenost prereza je 20.3%

DOKAZ BOČNE STABILNOSTI

Vrsta obtežbe: osnovno - kratkotrajno		
Korekcijski koeficient	Kmod =	0.900
Parcialni koef. za karakteristike materiala	γm =	1.250
Razmak pridržanih točk pravokotno na smer osi 2		
	lef =	370.00 cm
5% fraktil modula E paralelno z vlakni	E0.05 =	9600.0 MPa
5% fraktil strižnega modula G	G0.05 =	540.00 MPa
Torzijski vztrajnostni moment	Itor =	31706 cm4
Vztrajnostni moment	I2 =	16000 cm4
Odpornostni moment	W3 =	1920.0 cm3
Kritična napetost uklona	σm,crit =	226.78 MPa
Relativna vitkost za uklon	λrel =	0.325
Koeficient	k_krit =	1.000
Normalna upogibna napetost okoli osi 3	σm3,d =	0.432 MPa

σm,3,d <= k_krit x fm,3,d (0.432 <= 18.938)

Izkoriščenost prereza je 2.3%

KONTROLA STRIŽNIH NAPETOSTI
(obtežni primer 12, začetek palice)

Prečna sila v smeri osi 2	V2ed =	-0.191 kN
Prečna sila v smeri osi 3	V3ed =	0.544 kN

KONTROLA NAPETOSTI - STRIG

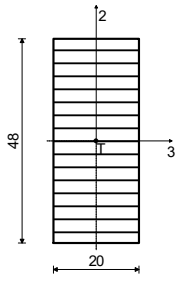
Vrsta obtežbe: osnovno - kratkotrajno		
Korekcijski koeficient	Kmod =	0.900
Parcialni koef. za karakteristike materiala	γm =	1.250
Karakteristična strižna napetost	fv,k =	3.500 MPa
Računska strižna trdnost	fv,d =	2.520 MPa
Površina prečnega prereza	A =	480.00 cm2
Dejanska strižna napetost(os 2)	τ2,d =	0.006 MPa
Dejanska strižna napetost(os 3)	τ3,d =	0.017 MPa
Superpozicija vplivov prečne sile		
(2)	τ2,d / fv,d =	0.002
(3)	τ3,d / fv,d =	0.007

$(2)^2 + (3)^2 <= 1$ (0.000 <= 1)

Izkoriščenost prereza je 0.0%

PALICA 988-2060

Lepljen lameliran les - GL 24h
v smeri zgornjega roba palice
Debelina lamele 4.00 cm
Eksploatacijski razred 1
EUROCODE (EN 1995-1-1)



[cm]

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

8. γ=0.68	10. γ=0.61	12. γ=0.58
9. γ=0.58	22. γ=0.51	11. γ=0.50
13. γ=0.49	34. γ=0.48	32. γ=0.44
36. γ=0.41	35. γ=0.41	23. γ=0.40
37. γ=0.35	33. γ=0.32	38. γ=0.32
17. γ=0.31	18. γ=0.31	19. γ=0.31
16. γ=0.31	29. γ=0.24	26. γ=0.24
27. γ=0.24	28. γ=0.24	15. γ=0.22
20. γ=0.22	21. γ=0.22	14. γ=0.22
31. γ=0.18	24. γ=0.18	25. γ=0.18
30. γ=0.18		

KONTROLA NORMALNIH NAPETOSTI
(obtežni primer 8, na 275.0 cm od začetka palice)

Računska osna sila	Ned =	1.858 kN
Prečna sila v smeri osi 2	V2ed =	0.835 kN
Prečna sila v smeri osi 3	V3ed =	-0.180 kN
Moment torzije	M1ed =	-1.675 kNm
Upogibni moment okoli osi 3	M3ed =	-92.596 kNm

KONTROLA NAPETOSTI - NATEG IN UPOGIB
Vrsta obtežbe: osnovno - kratkotrajno

Korekcijski koeficient	Kmod =	0.900
Parcialni koef. za karakteristike materiala	γm =	1.250
Dodatek za elemente z malimi dimenzijami - os 2	Kh_2 =	1.100
Dodatek za elemente z malimi dimenzijami - os 3	Kh_3 =	1.023
Dodatek za elemente z malimi dimenzijami - nateg	Kh_t =	1.100
Karakteristična natezna trdnost	ft,0,k =	19.200 MPa
Računska natezna trdnost	ft,0,d =	15.206 MPa
Faktor oblik (za pravokotni prerez)	km =	0.700
Karakteristična upogibna trdnost	fm,k =	24.000 MPa
Računska upogibna trdnost - os 2	fm,2,d =	19.008 MPa
Računska upogibna trdnost - os 3	fm,3,d =	17.670 MPa
Normalna natezna napetost	σt,0,d =	0.019 MPa
Odpornostni moment	W3 =	7680.0 cm3
Normalna upogibna napetost okoli osi 3	σm3,d =	12.057 MPa

σm3,d <= fm,3,d (12.057 <= 17.670)
Izkoriščenost prereza je 68.2%

σt,0,d / ft,0,d + km x (σm3,d / fm,3,d) + σm2,d / fm,2,d <= 1
(0.479 <= 1)
Izkoriščenost prereza je 47.9%

σt,0,d / ft,0,d + σm3,d / fm,3,d + km x (σm2,d / fm,2,d) <= 1
(0.684 <= 1)
Izkoriščenost prereza je 68.4%

DOKAZ BOČNE STABILNOSTI
Vrsta obtežbe: osnovno - kratkotrajno

Korekcijski koeficient	Kmod =	0.900
Parcialni koef. za karakteristike materiala	γm =	1.250
Razmak pridržanih točk pravokotno na smer osi 2	lef =	520.00 cm
5% fraktil modula E paralelno z vlakni	E0.05 =	9600.0 MPa
5% fraktil strižnega modula G	G0.05 =	540.00 MPa
Torzijski vztrajnostni moment	Itor =	94201 cm4
Vztrajnostni moment	I2 =	32000 cm4
Odpornostni moment	W3 =	7680.0 cm3
Kritična napetost uklona	σm,crit =	98.338 MPa
Relativna vitkost za uklon	λrel =	0.494
Koeficient	k_krit =	1.000
Normalna upogibna napetost okoli osi 3	σm3,d =	12.057 MPa

σm,3,d <= k_krit x fm,3,d (12.057 <= 17.670)
Izkoriščenost prereza je 68.2%

KONTROLA STRIŽNIH NAPETOSTI
(obtežni primer 8, začetek palice)

Prečna sila v smeri osi 2	V2ed =	-96.904 kN
Prečna sila v smeri osi 3	V3ed =	-0.608 kN
Moment torzije	M1ed =	-3.504 kNm

KONTROLA NAPETOSTI - STRIG
Vrsta obtežbe: osnovno - kratkotrajno

Korekcijski koeficient	Kmod =	0.900
Parcialni koef. za karakteristike materiala	γm =	1.250
Karakteristična strižna napetost	fv,k =	3.500 MPa
Računska strižna trdnost	fv,d =	2.520 MPa
Površina prečnega prereza	A =	960.00 cm2
Dejanska strižna napetost(os 2)	τ2,d =	1.514 MPa
Dejanska strižna napetost(os 3)	τ3,d =	0.009 MPa
Superpozicija vplivov prečne sile		
(2)	τ2,d / fv,d =	0.601
(3)	τ3,d / fv,d =	0.004

$(2)^2 + (3)^2 <= 1$ (0.363 <= 1)

Izkoriščenost prereza je 36.3%

KONTROLA NAPETOSTI - TORZIJA

Karakteristična strižna trdnost	fv,k =	3.500 MPa
Računska strižna trdnost	fv,d =	2.520 MPa
Koeficient	k_{shape} =	1.360
Torzijski odpornostni moment	Wt =	4907.5 cm3
Dejanska strižna napetost	τtor,d =	0.714 MPa

$\tau_{tor,d} <= k_{shape} \times f_{v,d}$ (0.714 <= 3.427)

Izkoriščenost prereza je 20.8%

Superpozicija vplivov prečne sile in torzijskega momenta

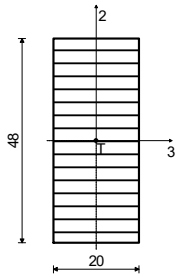
(1)	$\tau_{tor,d}/(k_{shape} \times f_{v,d})$ =	0.208
(2)	τ2,d / fv,d =	0.601
(3)	τ3,d / fv,d =	0.004

$(1) + (2)^2 + (3)^2 <= 1$ (0.569 <= 1)

Izkoriščenost prereza je 56.9%

PALICA 988-331

Lepljen lameliran les - GL 24h
v smeri zgornjega roba palice
Debelina lamele 4.00 cm
Eksploatacijski razred 1
EUROCODE (EN 1995-1-1)



[cm]

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

8. γ=0.35	12. γ=0.33	10. γ=0.32
22. γ=0.30	9. γ=0.26	34. γ=0.25
11. γ=0.23	36. γ=0.23	13. γ=0.19
32. γ=0.19	35. γ=0.19	23. γ=0.16
33. γ=0.14	38. γ=0.14	37. γ=0.13
19. γ=0.12	18. γ=0.12	17. γ=0.12
16. γ=0.12	29. γ=0.10	26. γ=0.10
27. γ=0.10	28. γ=0.10	21. γ=0.09
20. γ=0.09	15. γ=0.09	14. γ=0.09
31. γ=0.07	24. γ=0.07	25. γ=0.07
30. γ=0.07		

KONTROLA NORMALNIH IN STRIŽNIH NAPETOSTI
(obtežni primer 8, začetek palice)

Računska osna sila	Ned =	-224.97 kN
Prečna sila v smeri osi 2	V2ed =	6.495 kN
Prečna sila v smeri osi 3	V3ed =	2.464 kN
Upogibni moment okoli osi 2	M2ed =	6.064 kNm
Upogibni moment okoli osi 3	M3ed =	-15.637 kNm

KONTROLA NAPETOSTI - TLAK IN UPOGIB

Vrsta obtežbe: osnovno - kratkotrajno		
Korekcijski koeficient	Kmod =	0.900
Parcialni koef. za karakteristike materiala	γm =	1.250
Dodatek za elemente z malimi dimenzijami - os 2		
	Kh_2 =	1.100
Dodatek za elemente z malimi dimenzijami - os 3		
	Kh_3 =	1.023
Faktor oblik (za pravokotni prerez)	km =	0.700
Karakteristična tlačna trdnost	fc,0,k =	24.000 MPa
Računska tlačna trdnost	fc,0,d =	17.280 MPa
Karakteristična upogibna trdnost	fm,k =	24.000 MPa
Računska upogibna trdnost - os 2	fm,2,d =	19.008 MPa
Računska upogibna trdnost - os 3	fm,3,d =	17.670 MPa
Relativna vitkost	λrel,2 =	0.992
Relativna vitkost	λrel,3 =	0.413
Normalne tlačne napetosti	σc,0,d =	2.343 MPa

Odpornostni moment	W2 =	3200.0 cm3
Normalna upogibna napetost okoli osi 2	σm2,d =	1.895 MPa

σm2,d <= fm,2,d (1.895 <= 19.008)

Izkoriščenost prereza je 10.0%

Odpornostni moment	W3 =	7680.0 cm3
Normalna upogibna napetost okoli osi 3	σm3,d =	2.036 MPa

σm3,d <= fm,3,d (2.036 <= 17.670)

Izkoriščenost prereza je 11.5%

TLAK IN UPOGIB - VELIKA VITKOST

Začetna imperfekcija	βc =	0.100
Koeficient	k3 =	0.591
Koeficient	k2 =	1.027
Koeficient	kc,3 =	0.987
Koeficient	kc,2 =	0.774

(σc,0,d / (kc_2 x fc,0,d)) + km x (σm3,d / fm,3,d) +
+ σm2,d / fm,2,d <= 1 (0.356 <= 1)

Izkoriščenost prereza je 35.6%

(σc,0,d / (kc_3 x fc,0,d)) + σm3,d / fm,3,d +
+ km x (σm2,d / fm,2,d) <= 1 (0.322 <= 1)

Izkoriščenost prereza je 32.2%

KONTROLA NAPETOSTI - STRIG

Vrsta obtežbe: osnovno - kratkotrajno		
Korekcijski koeficient	Kmod =	0.900
Parcialni koef. za karakteristike materiala	γm =	1.250
Karakteristična strižna napetost	fv,k =	3.500 MPa
Računska strižna trdnost	fv,d =	2.520 MPa
Površina prečnega prereza	A =	960.00 cm2
Dejanska strižna napetost(os 2)	τ2,d =	0.101 MPa
Dejanska strižna napetost(os 3)	τ3,d =	0.038 MPa
Superpozicija vplivov prečne sile		
(2)	τ2,d / fv,d =	0.040
(3)	τ3,d / fv,d =	0.015

$(2)^2 + (3)^2 <= 1 (0.002 <= 1)$

Izkoriščenost prereza je 0.2%

DOKAZ BOČNE STABILNOSTI

Vrsta obtežbe: osnovno - kratkotrajno		
Korekcijski koeficient	Kmod =	0.900
Parcialni koef. za karakteristike materiala	γm =	1.250
Razmak pridržanih točk pravokotno na smer osi 2		
	lef =	360.00 cm
5% fraktil modula E paralelno z vlakni	E0.05 =	9600.0 MPa
5% fraktil strižnega modula G	G0.05 =	540.00 MPa
Torzijski vztrajnostni moment	Itor =	94201 cm4
Vztrajnostni moment	I2 =	32000 cm4
Odpornostni moment	W3 =	7680.0 cm3
Kritična napetost uklona	σm,crit =	142.04 MPa
Relativna vitkost za uklon	λrel =	0.411
Koeficient	k_krit =	1.000
Normalna upogibna napetost okoli osi 3	σm3,d =	2.036 MPa

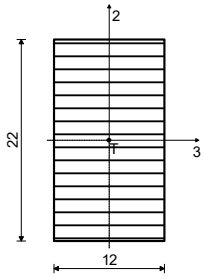
σm,3,d <= k_krit x fm,3,d (2.036 <= 17.670)

Izkoriščenost prereza je 11.5%

PALICA 1345-566

Lepljen lameliran les - GL 24h
v smeri zgornjega roba palice
Debelina lamele 4.00 cm
Eksploatacijski razred 1
EUROCODE (EN 1995-1-1)

2. Načrt gradbeništva



[cm]

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

12. γ=1.00	8. γ=1.00	19. γ=0.94
29. γ=0.94	22. γ=0.92	10. γ=0.92
26. γ=0.85	16. γ=0.85	28. γ=0.73
18. γ=0.73	34. γ=0.69	36. γ=0.69
9. γ=0.64	17. γ=0.64	27. γ=0.64
11. γ=0.57	35. γ=0.45	32. γ=0.44
13. γ=0.33	33. γ=0.33	38. γ=0.33
21. γ=0.28	31. γ=0.28	30. γ=0.28
20. γ=0.28	37. γ=0.24	23. γ=0.24
15. γ=0.16	24. γ=0.16	25. γ=0.16
14. γ=0.16		

KONTROLA NORMALNIH NAPETOSTI
(obtežni primer 12, na 300.0 cm od začetka palice)

Računska osna sila	Ned =	-0.262 kN
Prečna sila v smeri osi 2	V2ed =	-1.239 kN
Prečna sila v smeri osi 3	V3ed =	0.684 kN
Upogibni moment okoli osi 3	M3ed =	-18.317 kNm

KONTROLA NAPETOSTI - TLAK IN UPOGIB

Vrsta obtežbe: osnovno - kratkotrajno		
Korekcijski koeficient	Kmod =	0.900
Parcialni koef. za karakteristike materiala	γm =	1.250
Dodatek za elemente z malimi dimenzijami - os 2		
	Kh_2 =	1.100
Dodatek za elemente z malimi dimenzijami - os 3		
	Kh_3 =	1.100
Faktor oblik (za pravokotni prerez)	km =	0.700
Karakteristična tlačna trdnost	fc,0,k =	24.000 MPa
Računska tlačna trdnost	fc,0,d =	17.280 MPa
Karakteristična upogibna trdnost	fm,k =	24.000 MPa
Računska upogibna trdnost	fm,d =	19.008 MPa
Relativna vitkost	λrel,2 =	3.210
Relativna vitkost	λrel,3 =	1.751
Normalne tlačne napetosti	σc,0,d =	0.010 MPa
Odpornostni moment	W3 =	968.00 cm3
Normalna upogibna napetost okoli osi 3	σm3,d =	18.923 MPa

σm3,d <= fm,d (18.923 <= 19.008)

Izkoriščenost prereza je 99.6%

TLAK IN UPOGIB - VELIKA VITKOST

Začetna imperfekcija	βc =	0.100
Koeficient	k3 =	2.105
Koeficient	k2 =	5.796
Koeficient	kc,3 =	0.305
Koeficient	kc,2 =	0.094

(σc,0,d / (kc_2 x fc,0,d)) + km x (σm3,d / fm,d) +
+ σm2,d / fm,d <= 1 (0.703 <= 1)

Izkoriščenost prereza je 70.3%

(σc,0,d / (kc_3 x fc,0,d)) + σm3,d / fm,d +
+ km x (σm2,d / fm,d) <= 1 (0.997 <= 1)

Izkoriščenost prereza je 99.7%

DOKAZ BOČNE STABILNOSTI

Vrsta obtežbe: osnovno - kratkotrajno		
Korekcijski koeficient	Kmod =	0.900
Parcialni koef. za karakteristike materiala	γm =	1.250
Razmak pridržanih točk pravokotno na smer osi 2		
	lef =	698.57 cm
5% fraktil modula E paralelno z vlakni	E0.05 =	9600.0 MPa
5% fraktil strižnega modula G	G0.05 =	540.00 MPa
Torzijski vztrajnostni moment	Itor =	8279.2 cm4

Vztrajnostni moment	I2 =	3168.0 cm4
Odpornostni moment	W3 =	968.00 cm3
Kritična napetost uklona	σm,crit =	54.173 MPa
Relativna vitkost za uklon	λrel =	0.666
Koeficient	k_krit =	1.000
Normalna upogibna napetost okoli osi 3	σm3,d =	18.923 MPa

σm,3,d <= k_krit x fm,3,d (18.923 <= 19.008)

Izkoriščenost prereza je 99.6%

KONTROLA STRIŽNIH NAPETOSTI
(obtežni primer 19, na 500.0 cm od začetka palice)

Prečna sila v smeri osi 2	V2ed =	1.684 kN
Prečna sila v smeri osi 3	V3ed =	-0.580 kN
Moment torzije	M1ed =	2.054 kNm

KONTROLA NAPETOSTI - STRIG

Vrsta obtežbe: osnovno - srednjetrajno		
Korekcijski koeficient	Kmod =	0.800
Parcialni koef. za karakteristike materiala	γm =	1.250
Karakteristična strižna napetost	fv,k =	3.500 MPa
Računska strižna trdnost	fv,d =	2.240 MPa
Površina prečnega prereza	A =	264.00 cm2
Dejanska strižna napetost(os 2)	τ2,d =	0.096 MPa
Dejanska strižna napetost(os 3)	τ3,d =	0.033 MPa
Superpozicija vplivov prečne sile		
(2)	τ2,d / fv,d =	0.043
(3)	τ3,d / fv,d =	0.015

$(2)^2 + (3)^2 <= 1$ (0.002 <= 1)

Izkoriščenost prereza je 0.2%

KONTROLA NAPETOSTI - TORZIJA

Karakteristična strižna trdnost	fv,k =	3.500 MPa
Računska strižna trdnost	fv,d =	2.240 MPa
Koeficient	k_{shape} =	1.275
Torzijski odpornostni moment	Wt =	763.49 cm3
Dejanska strižna napetost	τtor,d =	2.690 MPa

τtor,d <= k_{shape} x fv,d (2.690 <= 2.856)

Izkoriščenost prereza je 94.2%

Superpozicija vplivov prečne sile in torzijskega momenta

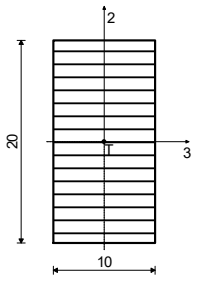
(1)	τtor,d/(k_{shape} x fv,d) =	0.942
(2)	τ2,d / fv,d =	0.043
(3)	τ3,d / fv,d =	0.015

$(1) + (2)^2 + (3)^2 <= 1$ (0.944 <= 1)

Izkoriščenost prereza je 94.4%

PALICA 2071-1630

Lepljen lameliran les - GL 24h
v smeri zgornjega roba palice
Debelina lamele 4.00 cm
Eksploatacijski razred 1
EUROCODE (EN 1995-1-1)



[cm]

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

8. γ=0.26	12. γ=0.26	10. γ=0.25
22. γ=0.25	34. γ=0.18	36. γ=0.18
9. γ=0.16	11. γ=0.14	35. γ=0.11
32. γ=0.09	13. γ=0.07	33. γ=0.06
38. γ=0.06	27. γ=0.05	28. γ=0.05
29. γ=0.05	17. γ=0.05	18. γ=0.05
19. γ=0.05	16. γ=0.05	23. γ=0.05

37. γ=0.05	26. γ=0.05	31. γ=0.04
24. γ=0.04	25. γ=0.04	20. γ=0.04
21. γ=0.04	14. γ=0.04	15. γ=0.04
30. γ=0.04		

KONTROLA NORMALNIH NAPETOSTI
(obtežni primer 8, na 102.1 cm od začetka palice)

Prečna sila v smeri osi 2	V2ed =	-0.935 kN
Upogibni moment okoli osi 3	M3ed =	-3.299 kNm

KONTROLA NAPETOSTI - UPOGIB

Vrsta obtežbe: osnovno - kratkotrajno		
Korekcijski koeficient	Kmod =	0.900
Parcialni koef. za karakteristike materiala	γm =	1.250
Dodatek za elemente z malimi dimenzijami - os 2		
	Kh_2 =	1.100
Dodatek za elemente z malimi dimenzijami - os 3		
	Kh_3 =	1.100
Faktor oblik (za pravokotni prerez)	km =	0.700
Karakteristična upogibna trdnost	fm,k =	24.000 MPa
Računska upogibna trdnost	fm,d =	19.008 MPa
Odpornostni moment	W3 =	666.67 cm3
Normalna upogibna napetost okoli osi 3	σm3,d =	4.948 MPa

σm3,d <= fm,d (4.948 <= 19.008)

Izkoriščenost prereza je 26.0%

DOKAZ BOČNE STABILNOSTI

Vrsta obtežbe: osnovno - kratkotrajno		
Korekcijski koeficient	Kmod =	0.900
Parcialni koef. za karakteristike materiala	γm =	1.250
Razmak pridržanih točk pravokotno na smer osi 2		
	lef =	245.00 cm
5% fraktil modula E paralelno z vlakni	E0.05 =	9600.0 MPa
5% fraktil strižnega modula G	G0.05 =	540.00 MPa
Torzijski vztrajnostni moment	Itor =	4545.5 cm4
Vztrajnostni moment	I2 =	1666.7 cm4
Odpornostni moment	W3 =	666.67 cm3
Kritična napetost uklona	σm,crit =	120.54 MPa
Relativna vitkost za uklon	λrel =	0.446
Koeficient	k_krit =	1.000
Normalna upogibna napetost okoli osi 3	σm3,d =	4.948 MPa

σm,3,d <= k_krit x fm,3,d (4.948 <= 19.008)

Izkoriščenost prereza je 26.0%

KONTROLA STRIŽNIH NAPETOSTI
(obtežni primer 8, začetek palice)

Prečna sila v smeri osi 2	V2ed =	-5.610 kN

KONTROLA NAPETOSTI - STRIG

Vrsta obtežbe: osnovno - kratkotrajno		
Korekcijski koeficient	Kmod =	0.900
Parcialni koef. za karakteristike materiala	γm =	1.250
Karakteristična strižna napetost	fv,k =	3.500 MPa
Računska strižna trdnost	fv,d =	2.520 MPa
Površina prečnega prereza	A =	200.00 cm2
Dejanska strižna napetost(os 2)	τ2,d =	0.421 MPa

τ2,d <= fv,d (0.421 <= 2.520)

Izkoriščenost prereza je 16.7%

GRADBENI BIRO
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1310 Ribnica, Slovenija
T 01 836 90 60
info@zasnova.si
www.zasnova.si

2.5.6. Analiza nadstreška kolesarnice POZ-1000

Glej izpis iz programa

Vhodni podatki - Konstrukcija

Shema nivojev

Naziv	z [m]	h [m]
Nivo (streha)	2.50	2.50

Nivo (0)	0.00	

Tabele materialov

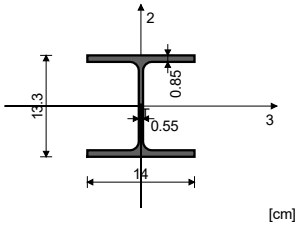
No	Naziv materiala	E[kN/m2]	μ	γ[kN/m3]	αt[1/C]	Em[kN/m2]	μm
1	C 25/30	3.100e+7	0.20	25.00	1.000e-5	3.100e+7	0.20
2	Jeklo	2.100e+8	0.30	78.50	1.000e-5	2.100e+8	0.30

Seti plošč

No	d[m]	e[m]	Material	Tip preračuna	Ortotropija	E2[kN/m2]	G[kN/m2]	α
<1>	0.200	0.100	1	Tanka plošča	Izotropna			

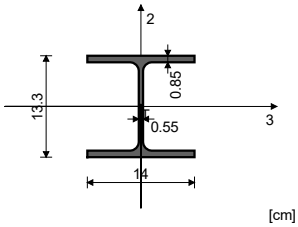
Seti gred

Set: 1 Prerez: IPBl 140, Fiktivna ekscentričnost



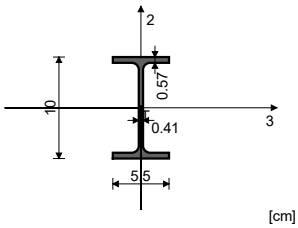
Mat.	A1	A2	A3	I1	I2	I3
2 - Jeklo	3.140e-3	1.011e-3	2.129e-3	8.160e-8	3.890e-6	1.030e-5

Set: 2 Prerez: IPBl 140, Fiktivna ekscentričnost



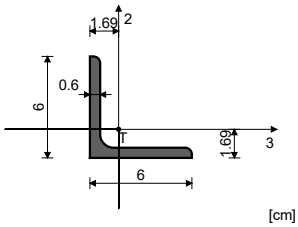
Mat.	A1	A2	A3	I1	I2	I3
2 - Jeklo	3.140e-3	1.011e-3	2.129e-3	8.160e-8	3.890e-6	1.030e-5

Set: 3 Prerez: IPE 100, Fiktivna ekscentričnost



Mat.	A1	A2	A3	I1	I2	I3
2 - Jeklo	1.030e-3	5.062e-4	5.238e-4	1.210e-8	1.590e-7	1.710e-6

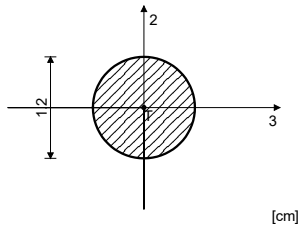
Set: 4 Prerez: L 60x60x6, Prosta palica, Fiktivna ekscentričnost



Mat.	A1	A2	A3	I1	I2	I3
2 - Jeklo	6.910e-4	3.600e-4	3.600e-4	8.600e-9	2.277e-7	2.277e-7

2. Načrt gradbeništva

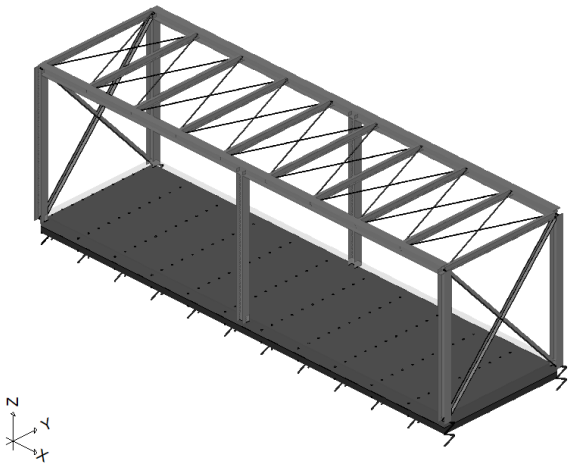
Set: 5 Prerez: D=1.2, Prosta palica, Fiktivna ekscentričnost



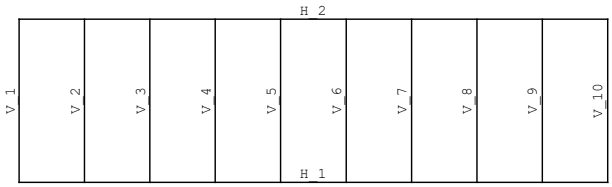
Mat.	A1	A2	A3	I1	I2	I3
2 - Jeklo	1.131e-4	1.018e-4	1.018e-4	2.036e-9	1.018e-9	1.018e-9

Seti površinskih podpor

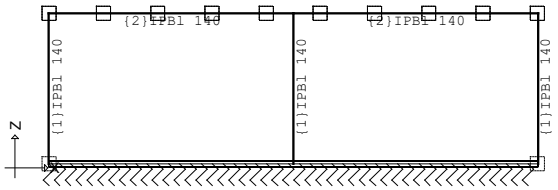
Set	K,R1	K,R2	K,R3
1	2.000e+4	2.000e+4	2.000e+4



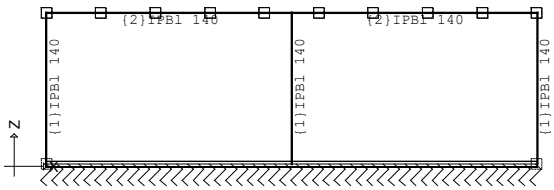
Izometrija



Dispozicija okvirjev

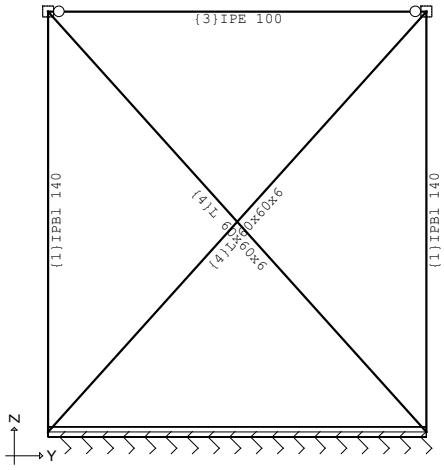


Okvir: H_1

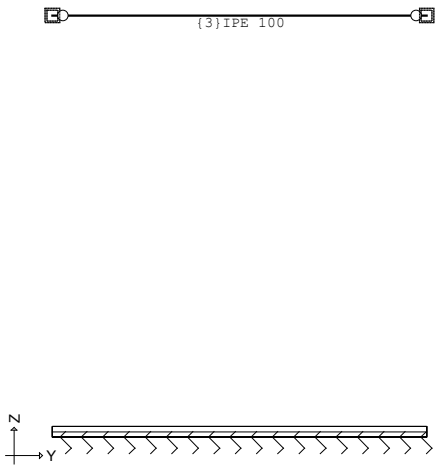


Okvir: H_2

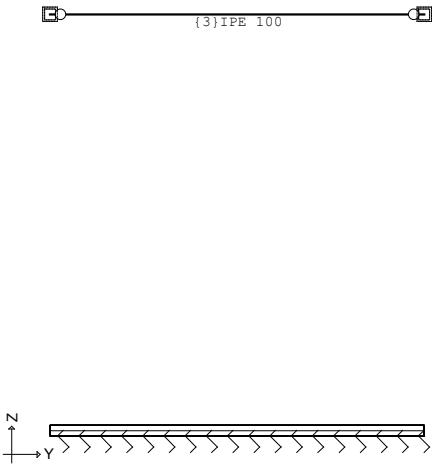
2. Načrt gradbeništva



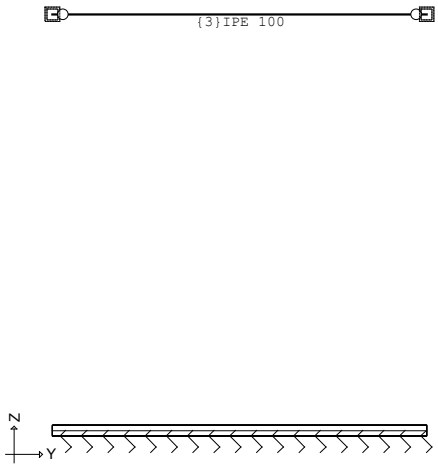
Okvir: V_1



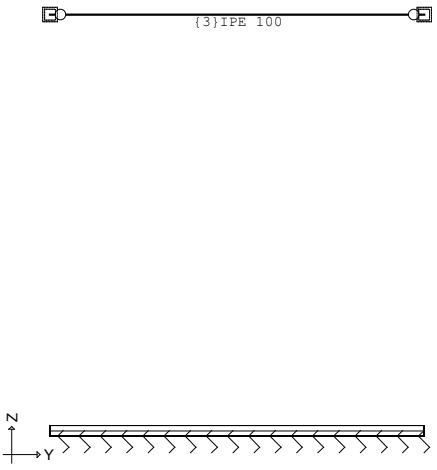
Okvir: V_2



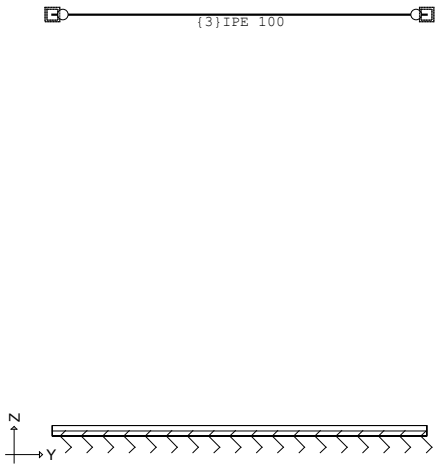
Okvir: V_3



Okvir: V_4

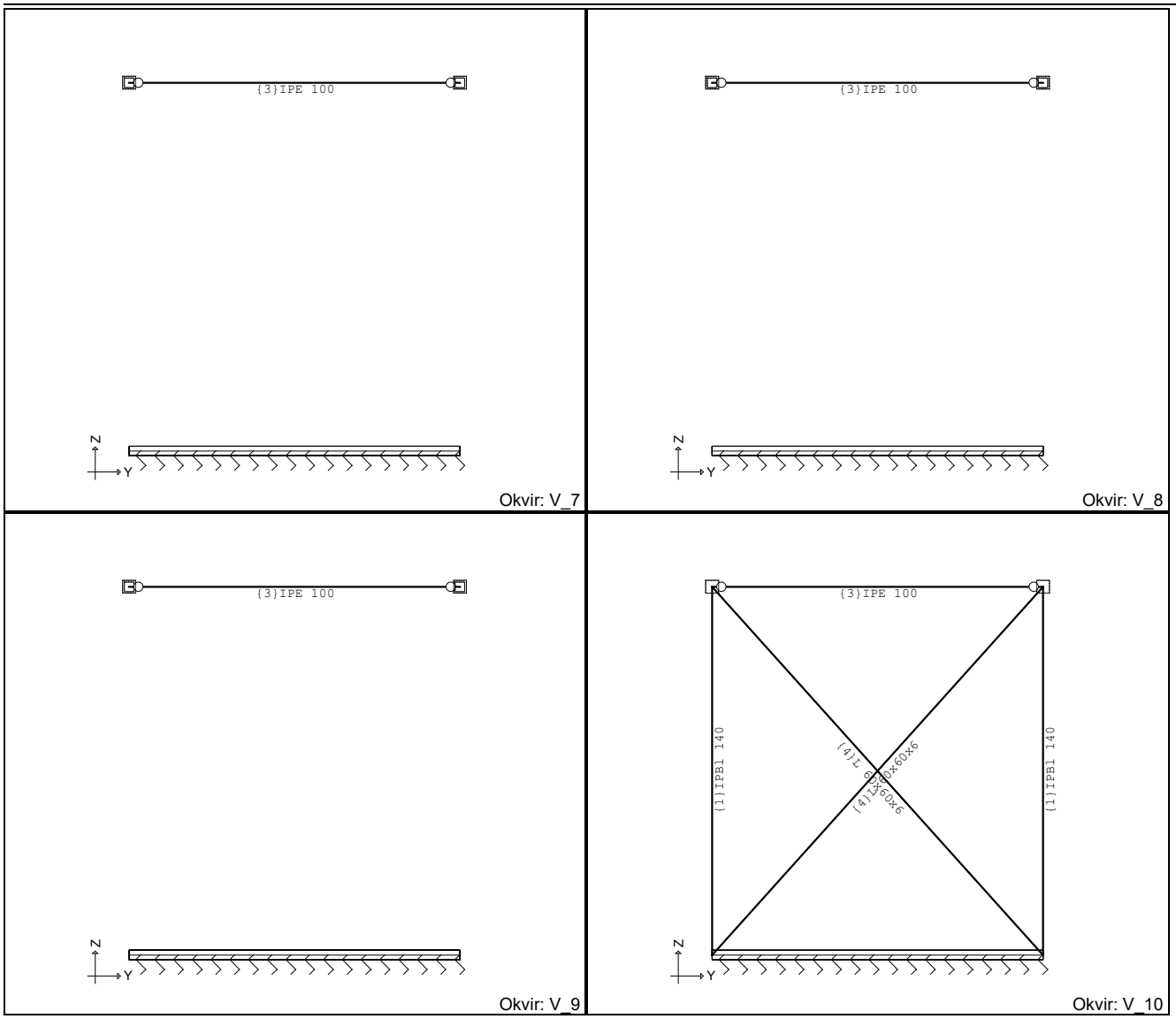


Okvir: V_5



Okvir: V_6

2. Načrt gradbeništva



2. Načrt gradbeništva

Vhodni podatki - Obtežba

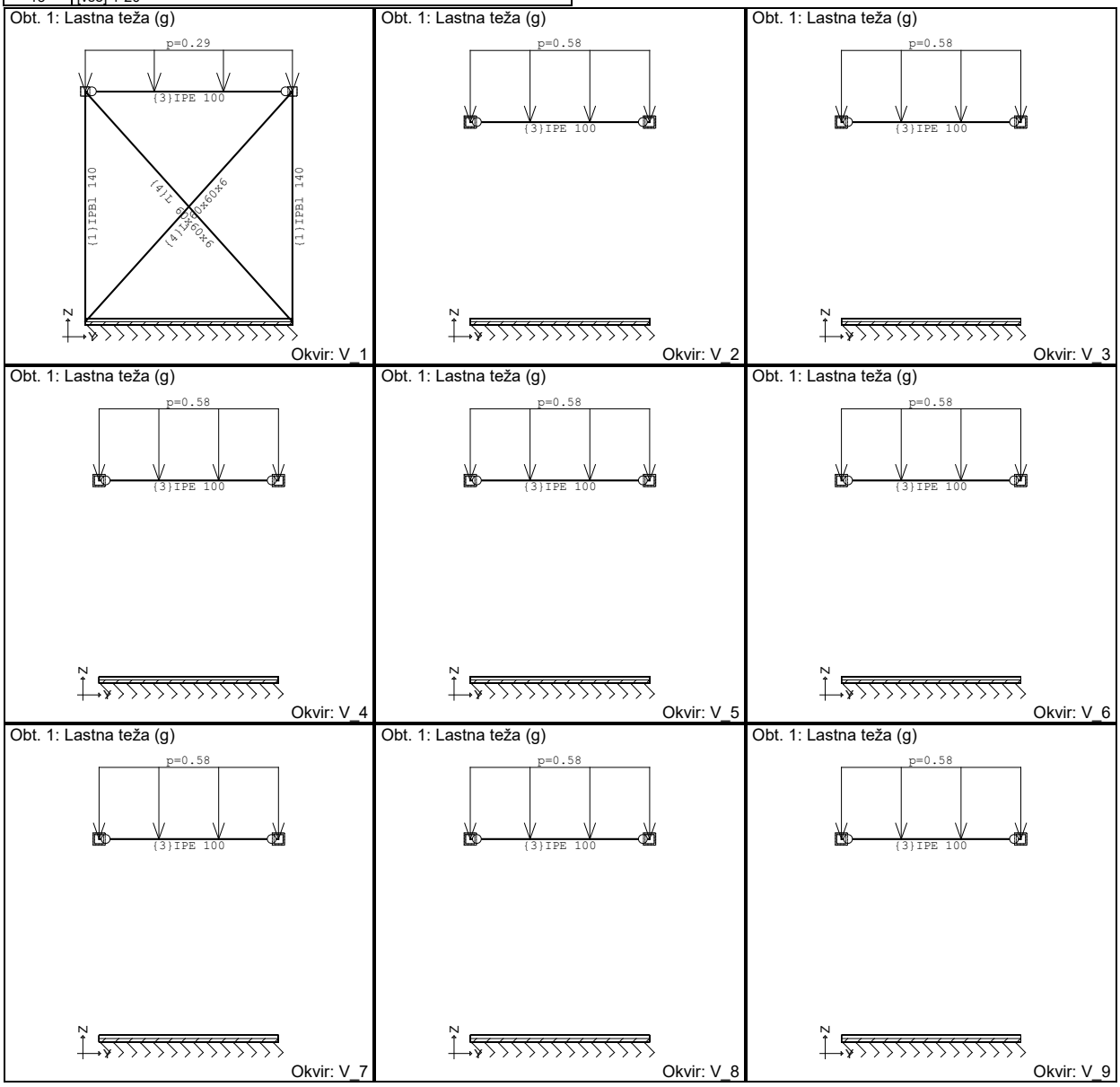
Lista obtežnih primerov

LC	Naziv
1	Lastna teža (g)
2	Sneg
3	Potres_x (+e)
4	Potres_x (-e)
5	Potres_y (+e)
6	Potres_y (-e)

7	Komb.: 1.35xI+1.5xII
8	Komb.: I+II
9	Komb.: 1.35xI+1.5xII
10	Komb.: I+1.5xII
11	Komb.: 1.35xI
12	Komb.: I

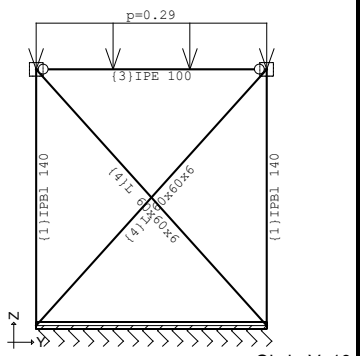
Seznam obtežnih primerov ovojnic

LC	Naziv
13	[vse] 1-20



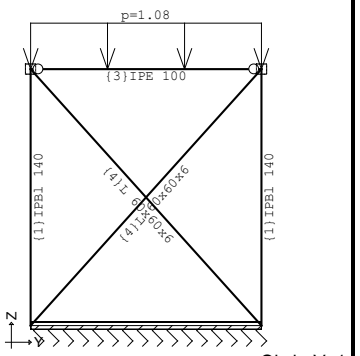
2. Načrt gradbeništva

Obt. 1: Lastna teža (g)



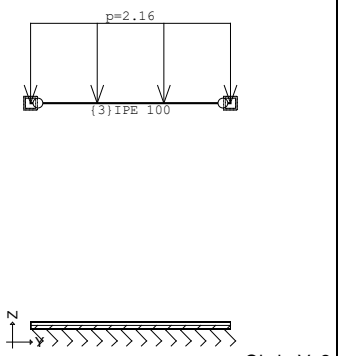
Okvir: V_10

Obt. 2: Sneg



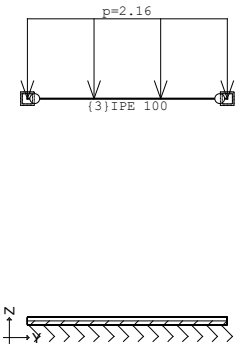
Okvir: V_1

Obt. 2: Sneg



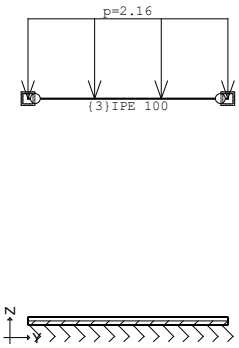
Okvir: V_2

Obt. 2: Sneg



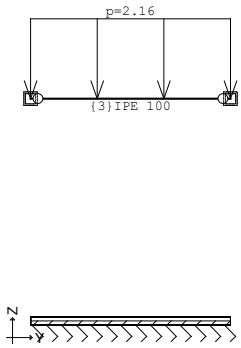
Okvir: V_3

Obt. 2: Sneg



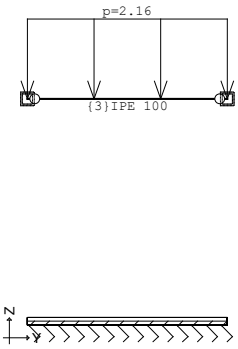
Okvir: V_4

Obt. 2: Sneg



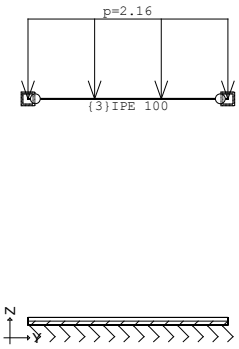
Okvir: V_5

Obt. 2: Sneg



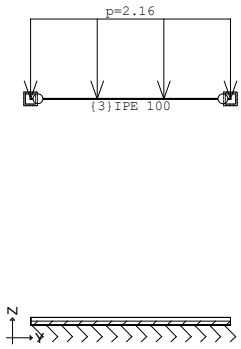
Okvir: V_6

Obt. 2: Sneg



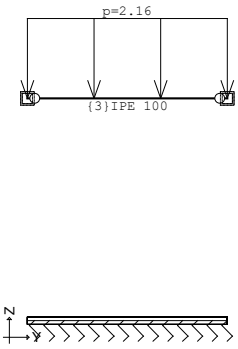
Okvir: V_7

Obt. 2: Sneg



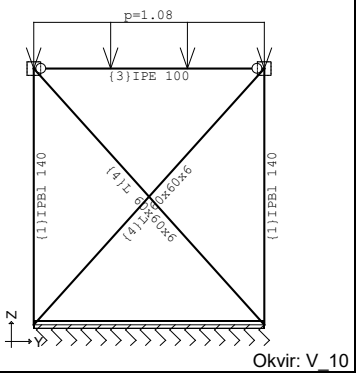
Okvir: V_8

Obt. 2: Sneg



Okvir: V_9

Obt. 2: Sneg



Okvir: V_10

Modalna analiza

Napredne opcije seizmičnega preračuna

Preprečeno nihanje v Z smeri

Faktorji obtežb za preračun mas

No	Naziv	Koeficient
1	Lastna teža (g)	1.00
2	Sneg	0.00

Razporeditev mas po višini objekta

Nivo	Z [m]	X [m]	Y [m]	Masa [T]	T/m²
Nivo (streha)	2.50	4.05	1.13	2.07	
Nivo (0)	0.00	4.05	1.13	9.52	0.52
Skupno:	0.45	4.05	1.13	11.58	

Položaj centra togosti po višini objekta (približna metoda)

Nivo	Z [m]	X [m]	Y [m]
Nivo (streha)	2.50	4.05	1.13
Nivo (0)	0.00	4.05	1.13

Ekscentriciteta po višini objekta (približna metoda)

Nivo	Z [m]	eox [m]	eoy [m]
Nivo (streha)	2.50	0.00	0.00
Nivo (0)	0.00	0.00	0.00

Nihajne dobe konstrukcije

No	T [s]	f [Hz]	m' [T]
1	0.1267	7.8923	2.0781
2	0.1044	9.5797	1.9148
3	0.0823	12.1437	0.0414
4	0.0820	12.1977	0.0420
5	0.0617	16.1998	1.6433
6	0.0327	30.5929	3.4322
7	0.0318	31.4170	9.4950
8	0.0311	32.2046	4.4139
9	0.0298	33.5071	2.3397
10	0.0286	34.9814	2.9871

Seizmični preračun

Seizmični preračun: EC8 (SIST EN 1998)

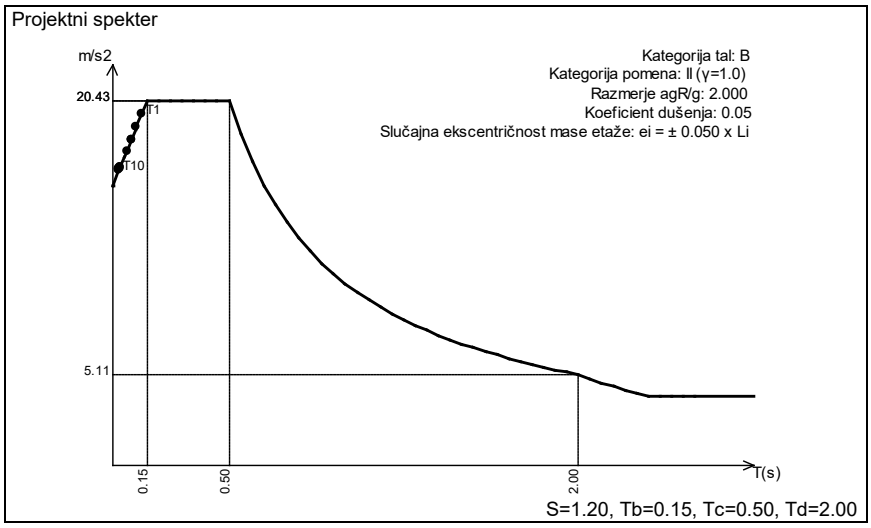
Kategorija tal:	B
Kategorija pomena:	II (γ=1.0)
Razmerje agR/g:	2.000
Koeficient dušenja:	0.05
Slučajna ekscentričnost mase etaže:	ei = ± 0.050 x Li

Faktorji smeri potresa:

Obtežni primer	Kot α[°]	k,α	k,α+90°	kz	Faktor O.
Potres_x	0	1.000	0.300	0.000	2.880*
Potres_y	90	1.000	0.300	0.000	2.880*

Tip spektra

Obtežni primer	S	Tb	Tc	Td	avg/ag
Potres_x	1.200	0.150	0.500	2.000	1.000
Potres_y	1.200	0.150	0.500	2.000	1.000



Razporeditev potresnih sil po višini objekta - Potres_x (+e)

Konstrukcija neregularna po višini, Okvirni sistemi (Okvirni: Večnadstropni, eno polje - αu/α1=1.2), Razred duktilnosti DCM:
qo=0.8*3αu/α1=2.88
Okvirni in dvojni dominantno okvirni sistem: αo=2.00, kw=1.00.
Faktor obnašanja: q=qo·kw=2.88

Nivo	Z [m]	Ton 1			Ton 2			Ton 3		
		Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]
Nivo (streha)	2.50	43.64	-0.00	-0.00	0.00	11.79	0.00	-0.00	0.00	0.00
Nivo (0)	0.00	2.99	-0.00	-0.00	0.00	1.23	0.00	0.00	0.00	-0.00
	Σ=	46.63	-0.00	-0.00	0.00	13.03	0.00	0.00	0.00	0.00

Nivo	Z [m]	Ton 4			Ton 5			Ton 6		
		Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]
Nivo (streha)	2.50	0.01	-0.00	0.00	0.00	0.00	0.00	-0.00	1.21	-0.00
Nivo (0)	0.00	0.00	-0.00	0.00	0.00	-0.00	-0.00	0.00	31.59	0.00
	Σ=	0.02	-0.00	0.00	0.00	-0.00	0.00	0.00	32.80	-0.00

Nivo	Z [m]	Ton 7			Ton 8			Ton 9		
		Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]
Nivo (streha)	2.50	-2.35	0.00	0.00	-0.00	0.00	-0.00	-0.00	-1.43	0.00
Nivo (0)	0.00	155.82	-0.00	-0.00	0.00	0.00	0.00	0.00	10.72	-0.00
	Σ=	153.47	-0.00	-0.00	0.00	0.00	0.00	-0.00	9.29	0.00

Nivo	Z [m]	Ton 10		
		Px [kN]	Py [kN]	Pz [kN]
Nivo (streha)	2.50	-0.00	0.00	-0.00
Nivo (0)	0.00	0.00	0.00	-0.00
	Σ=	0.00	0.00	-0.00

Razporeditev potresnih sil po višini objekta - Potres_x (-e)

Konstrukcija neregularna po višini, Okvirni sistemi (Okvirni: Večnadstropni, eno polje - αu/α1=1.2), Razred duktilnosti DCM:
qo=0.8*3αu/α1=2.88
Okvirni in dvojni dominantno okvirni sistem: αo=2.00, kw=1.00.
Faktor obnašanja: q=qo·kw=2.88

Nivo	Z [m]	Ton 1			Ton 2			Ton 3		
		Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]
Nivo (streha)	2.50	43.64	-0.00	-0.00	0.00	11.79	0.00	-0.00	0.00	0.00
Nivo (0)	0.00	2.99	-0.00	-0.00	0.00	1.23	0.00	0.00	0.00	-0.00
	Σ=	46.63	-0.00	-0.00	0.00	13.03	0.00	0.00	0.00	0.00

Nivo	Z [m]	Ton 4			Ton 5			Ton 6		
		Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]
Nivo (streha)	2.50	0.01	-0.00	0.00	0.00	0.00	0.00	-0.00	1.21	-0.00
Nivo (0)	0.00	0.00	-0.00	0.00	0.00	-0.00	-0.00	0.00	31.59	0.00
	Σ=	0.02	-0.00	0.00	0.00	-0.00	0.00	0.00	32.80	-0.00

Nivo	Z [m]	Ton 7			Ton 8			Ton 9		
		Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]
Nivo (streha)	2.50	-2.35	0.00	0.00	-0.00	0.00	-0.00	-0.00	-1.43	0.00
Nivo (0)	0.00	155.82	-0.00	-0.00	0.00	0.00	0.00	0.00	10.72	-0.00
	Σ=	153.47	-0.00	-0.00	0.00	0.00	0.00	-0.00	9.29	0.00

Nivo	Z [m]	Ton 10		
		Px [kN]	Py [kN]	Pz [kN]
Nivo (streha)	2.50	-0.00	0.00	-0.00
Nivo (0)	0.00	0.00	0.00	-0.00
	Σ=	0.00	0.00	-0.00

Razporeditev potresnih sil po višini objekta - Potres_y (+e)
Konstrukcija neregularna po višini, Okvirni sistemi (Okvirni: Večnadstropni, eno polje - αu/α1=1.2), Razred duktilnosti DCM:
qo=0.8*3αu/α1=2.88
Okvirni in dvojni dominantno okvirni sistem: αo=2.00, kw=1.00.
Faktor obnašanja: q=qo·kw=2.88

Nivo	Z [m]	Ton 1			Ton 2			Ton 3		
		Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]
Nivo (streha)	2.50	-13.09	0.00	0.00	0.00	39.30	0.00	-0.00	0.00	0.00
Nivo (0)	0.00	-0.90	0.00	0.00	0.00	4.12	0.00	0.00	0.00	-0.00
	Σ=	-13.99	0.00	0.00	0.00	43.42	0.00	0.00	0.00	0.00

Nivo	Z [m]	Ton 4			Ton 5			Ton 6		
		Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]
Nivo (streha)	2.50	-0.00	0.00	-0.00	-0.00	-0.00	-0.00	-0.00	4.05	-0.00
Nivo (0)	0.00	-0.00	0.00	-0.00	-0.00	0.00	0.00	0.00	105.29	0.00
	Σ=	-0.00	0.00	-0.00	-0.00	0.00	-0.00	0.00	109.34	-0.00

Nivo	Z [m]	Ton 7			Ton 8			Ton 9		
		Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]
Nivo (streha)	2.50	0.70	-0.00	-0.00	0.00	-0.00	0.00	-0.00	-4.77	0.00
Nivo (0)	0.00	-46.75	0.00	0.00	-0.00	-0.00	-0.00	0.00	35.75	-0.00
	Σ=	-46.04	0.00	0.00	-0.00	-0.00	-0.00	-0.00	30.98	0.00

Nivo	Z [m]	Ton 10		
		Px [kN]	Py [kN]	Pz [kN]
Nivo (streha)	2.50	0.00	-0.00	0.00
Nivo (0)	0.00	-0.00	-0.00	0.00
	Σ=	-0.00	-0.00	0.00

Razporeditev potresnih sil po višini objekta - Potres_y (-e)
Konstrukcija neregularna po višini, Okvirni sistemi (Okvirni: Večnadstropni, eno polje - αu/α1=1.2), Razred duktilnosti DCM:
qo=0.8*3αu/α1=2.88
Okvirni in dvojni dominantno okvirni sistem: αo=2.00, kw=1.00.
Faktor obnašanja: q=qo·kw=2.88

Nivo	Z [m]	Ton 1			Ton 2			Ton 3		
		Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]
Nivo (streha)	2.50	-13.09	0.00	0.00	0.00	39.30	0.00	-0.00	0.00	0.00
Nivo (0)	0.00	-0.90	0.00	0.00	0.00	4.12	0.00	0.00	0.00	-0.00
	Σ=	-13.99	0.00	0.00	0.00	43.42	0.00	0.00	0.00	0.00

Nivo	Z [m]	Ton 4			Ton 5			Ton 6		
		Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]
Nivo (streha)	2.50	-0.00	0.00	-0.00	-0.00	-0.00	-0.00	-0.00	4.05	-0.00
Nivo (0)	0.00	-0.00	0.00	-0.00	-0.00	0.00	0.00	0.00	105.29	0.00
	Σ=	-0.00	0.00	-0.00	-0.00	0.00	-0.00	0.00	109.34	-0.00

Nivo	Z [m]	Ton 7			Ton 8			Ton 9		
		Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]	Px [kN]	Py [kN]	Pz [kN]
Nivo (streha)	2.50	0.70	-0.00	-0.00	0.00	-0.00	0.00	-0.00	-4.77	0.00
Nivo (0)	0.00	-46.75	0.00	0.00	-0.00	-0.00	-0.00	0.00	35.75	-0.00
	Σ=	-46.04	0.00	0.00	-0.00	-0.00	-0.00	-0.00	30.98	0.00

Nivo	Z [m]	Ton 10		
		Px [kN]	Py [kN]	Pz [kN]
Nivo (streha)	2.50	0.00	-0.00	0.00
Nivo (0)	0.00	-0.00	-0.00	0.00
	Σ=	-0.00	-0.00	0.00

Faktorji participacije - relativno sodelovanje

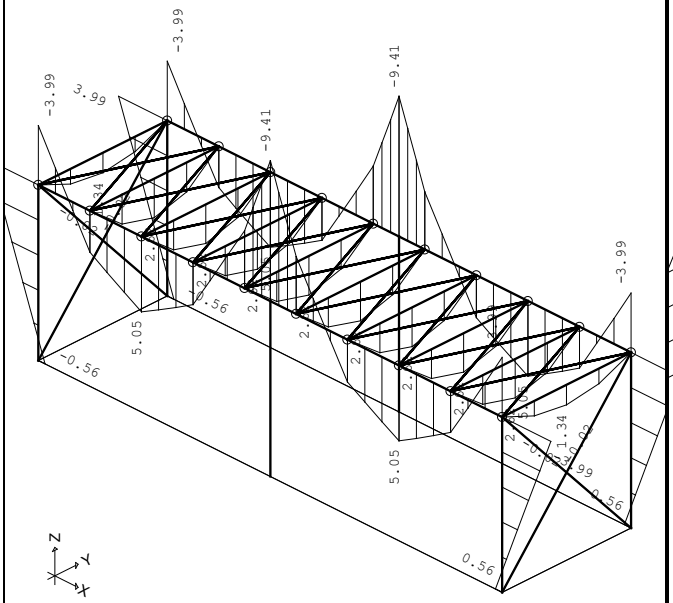
Ton \ Naziv	1. Potres_x (	2. Potres_x (	3. Potres_y (	4. Potres_y (
1	0.215	0.215	0.021	0.021
2	0.018	0.018	0.215	0.215
3	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000
6	0.045	0.045	0.542	0.542
7	0.708	0.708	0.068	0.068
8	0.000	0.000	0.000	0.000
9	0.013	0.013	0.154	0.154
10	0.000	0.000	0.000	0.000

Faktorji participacije - angažiranje mase

Ton	U [α=0°]	U [α=90°]
Upošteva se samo masa nad koto temelja		
Kota temelja:		0.00 m
Skupna masa nad temeljem:		2.09 T
Skupna masa celega objekta:		11.58 T
1	99.97	0.00
2	0.00	96.15
3	0.00	0.00
4	0.03	0.00
5	0.00	0.00
6	0.00	1.29
7	99.92	0.00
8	0.00	0.00
9	0.00	4.13
10	0.00	0.00
ΣU (%)	199.92	101.57

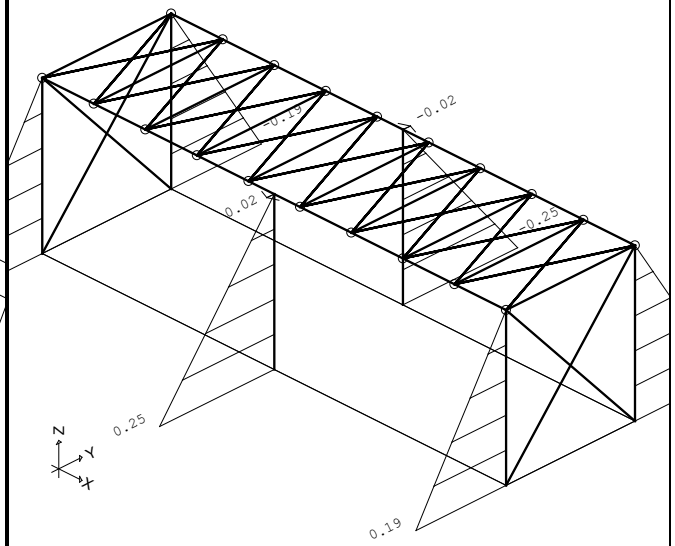
Statični preračun

Obt. 7: 1.35xI+1.5xII



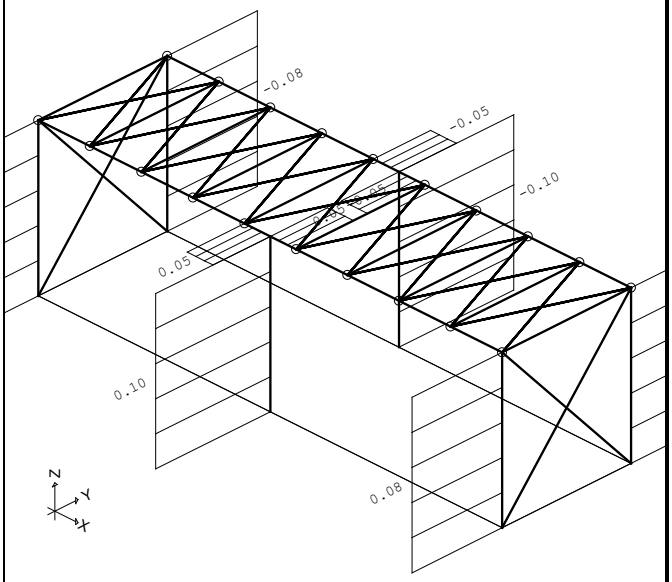
Izometrija
Vplivi v gredi: max M3= 5.05 / min M3= -9.41 kNm

Obt. 7: 1.35xI+1.5xII



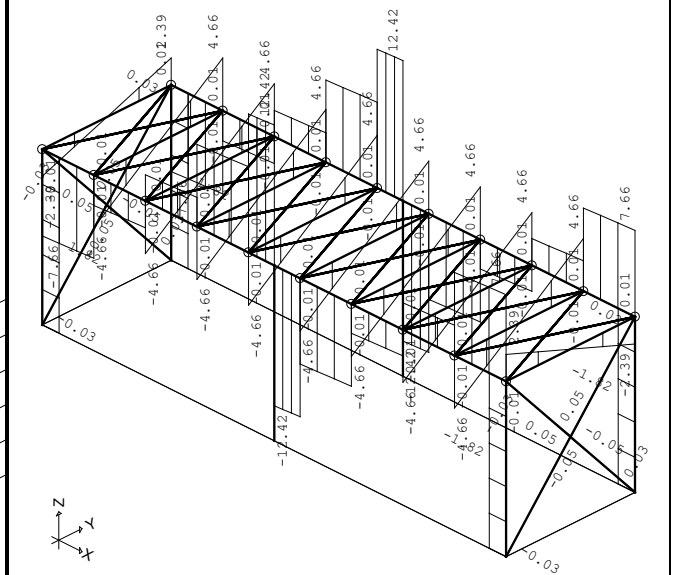
Izometrija
Vplivi v gredi: max M2= 0.25 / min M2= -0.25 kNm

Obt. 7: 1.35xI+1.5xII



Izometrija
Vplivi v gredi: max T3= 0.10 / min T3= -0.10 kN

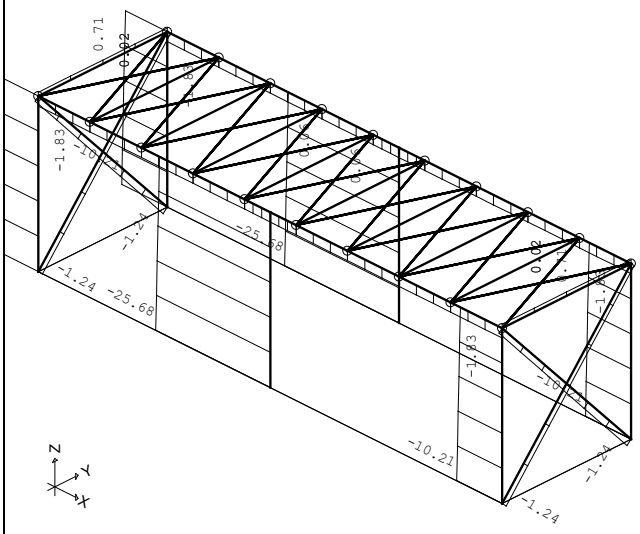
Obt. 7: 1.35xI+1.5xII



Izometrija
Vplivi v gredi: max T2= 12.42 / min T2= -12.42 kN

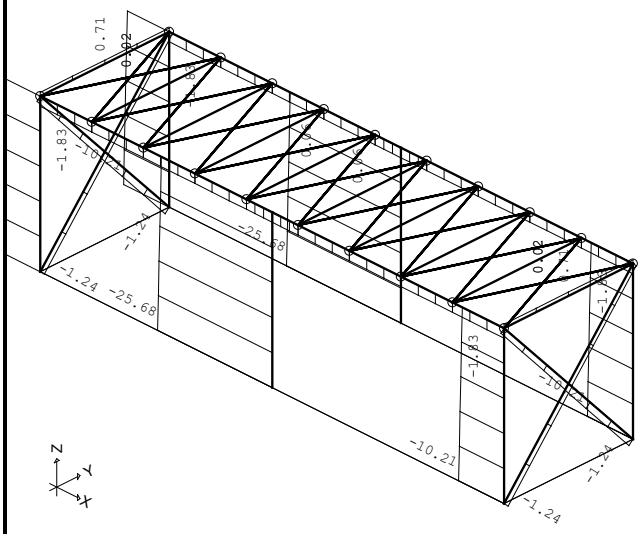
2. Načrt gradbeništva

Obt. 7: 1.35xI+1.5xII



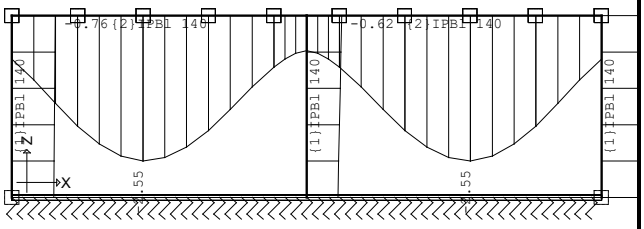
Izometrija
Vplivi v gredi: max N1= 0.71 / min N1= -25.68 kN

Obt. 7: 1.35xI+1.5xII



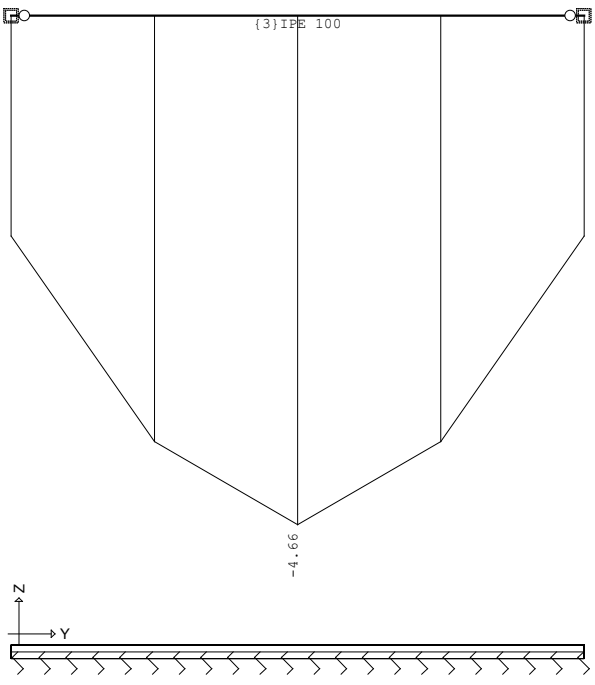
Izometrija
Vplivi v gredi: max N1= 0.71 / min N1= -25.68 kN

Obt. 8: I+II



Okvir: H_1
Vplivi v gredi: max Zp= -0.55 / min Zp= -2.55 m / 1000

Obt. 8: I+II

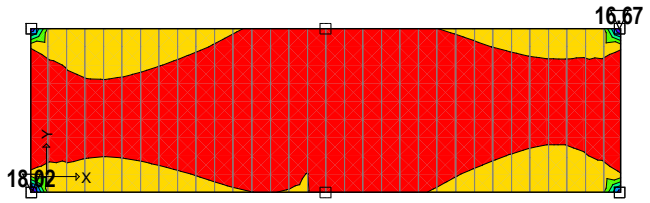


Okvir: V_7
Vplivi v gredi: max Zp= -2.02 / min Zp= -4.66 m / 1000

2. Načrt gradbeništva

Obt. 6: Potres_y (-e)

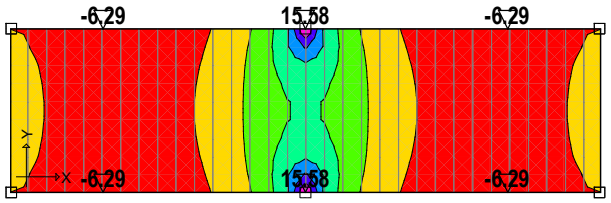
Mx [kNm/m]
0.23
2.77
5.32
7.86
10.40
12.94
15.49
18.03



Nivo: Nivo (0) [0.00 m]
Vplivi v plošči: max Mx= 18.02 / min Mx= 0.23 kNm/m

Obt. 7: 1.35xI+1.5xII

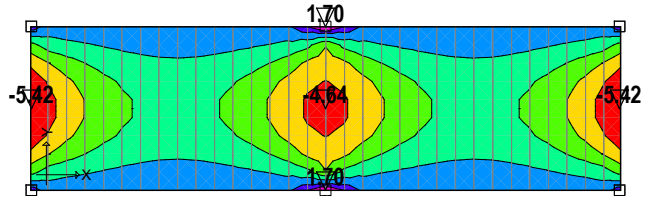
Mx [kNm/m]
-6.30
-3.15
0.00
3.12
6.23
9.35
12.46
15.58



Nivo: Nivo (0) [0.00 m]
Vplivi v plošči: max Mx= 15.58 / min Mx= -6.29 kNm/m

Obt. 7: 1.35xI+1.5xII

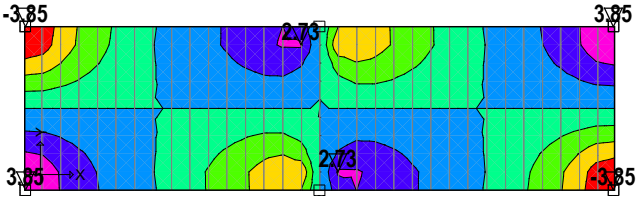
My [kNm/m]
-5.43
-4.34
-3.26
-2.17
-1.09
0.00
0.85
1.70



Nivo: Nivo (0) [0.00 m]
Vplivi v plošči: max My= 1.70 / min My= -5.42 kNm/m

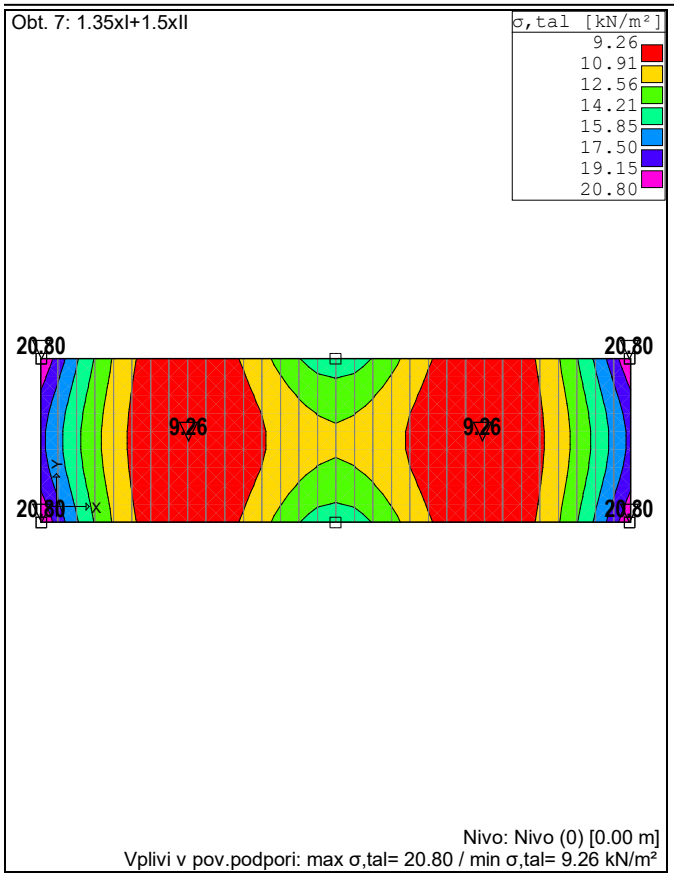
Obt. 7: 1.35xI+1.5xII

Mxy [kNm/m]
-3.86
-2.90
-1.93
-0.97
0.00
1.29
2.57
3.86



Nivo: Nivo (0) [0.00 m]
Vplivi v plošči: max Mxy= 3.85 / min Mxy= -3.85 kNm/m

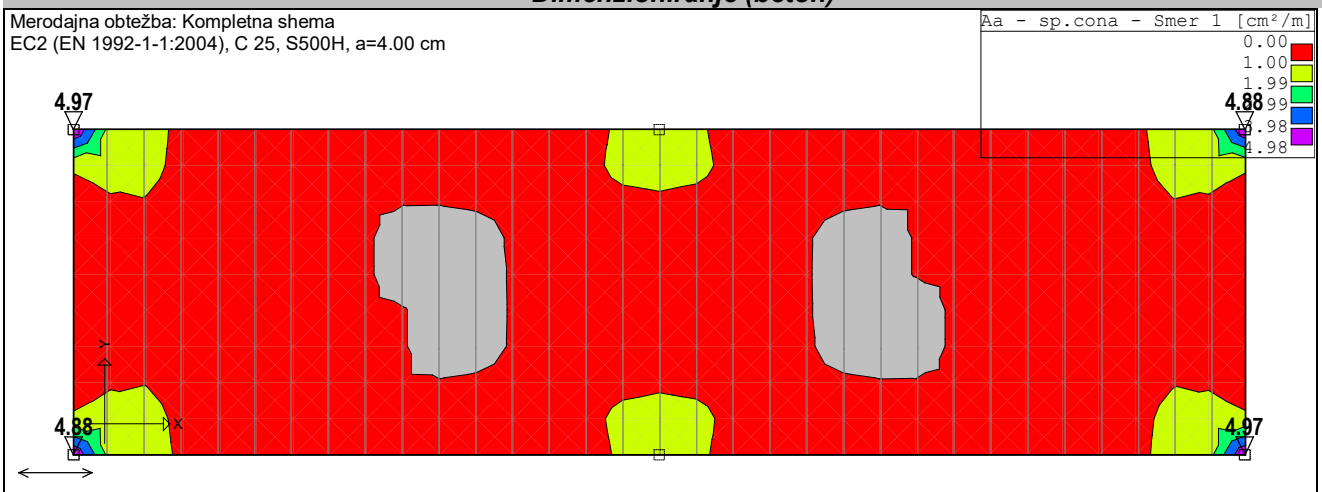
2. Načrt gradbeništva



2. Načrt gradbeništva

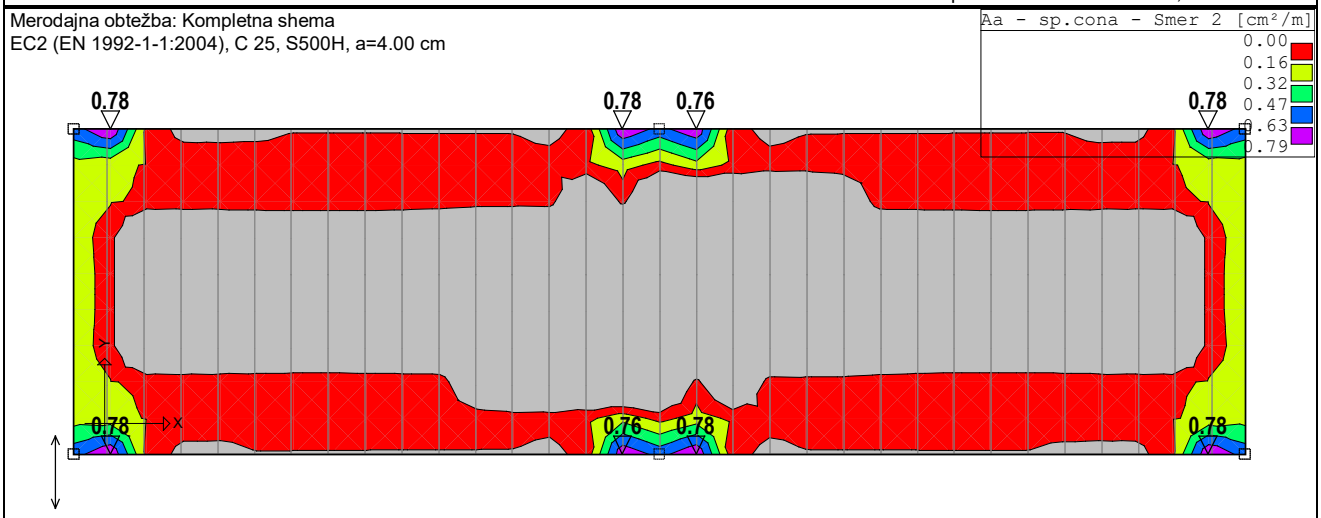
Dimenzioniranje (beton)

Merodajna obtežba: Kompletna shema
EC2 (EN 1992-1-1:2004), C 25, S500H, a=4.00 cm



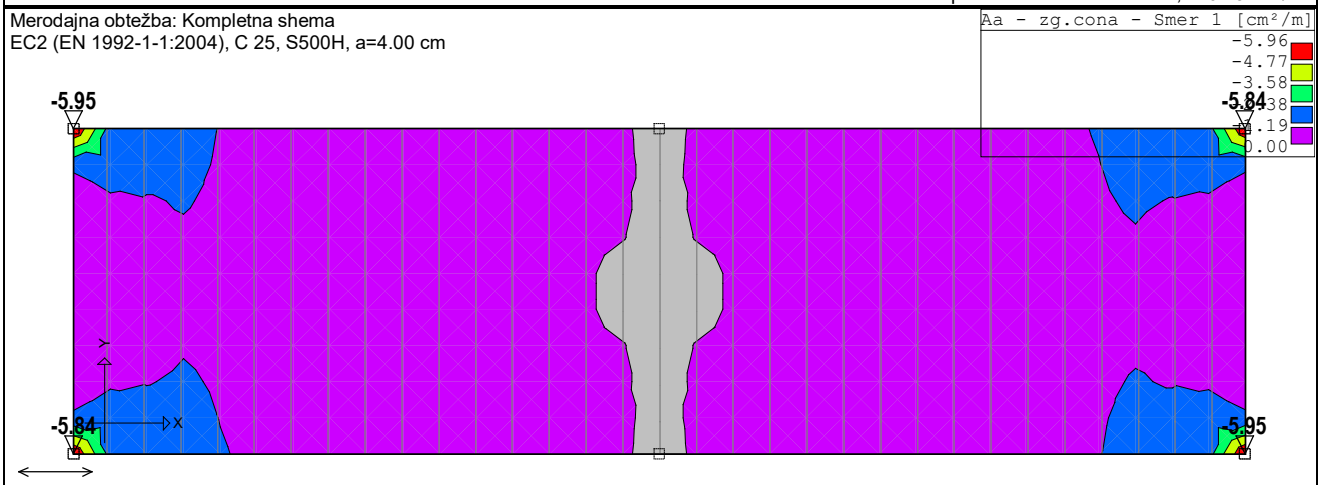
Nivo: Nivo (0) [0.00 m]
Aa - sp.cona - Smer 1 - max Aa1,s= 4.97 cm²/m

Merodajna obtežba: Kompletna shema
EC2 (EN 1992-1-1:2004), C 25, S500H, a=4.00 cm



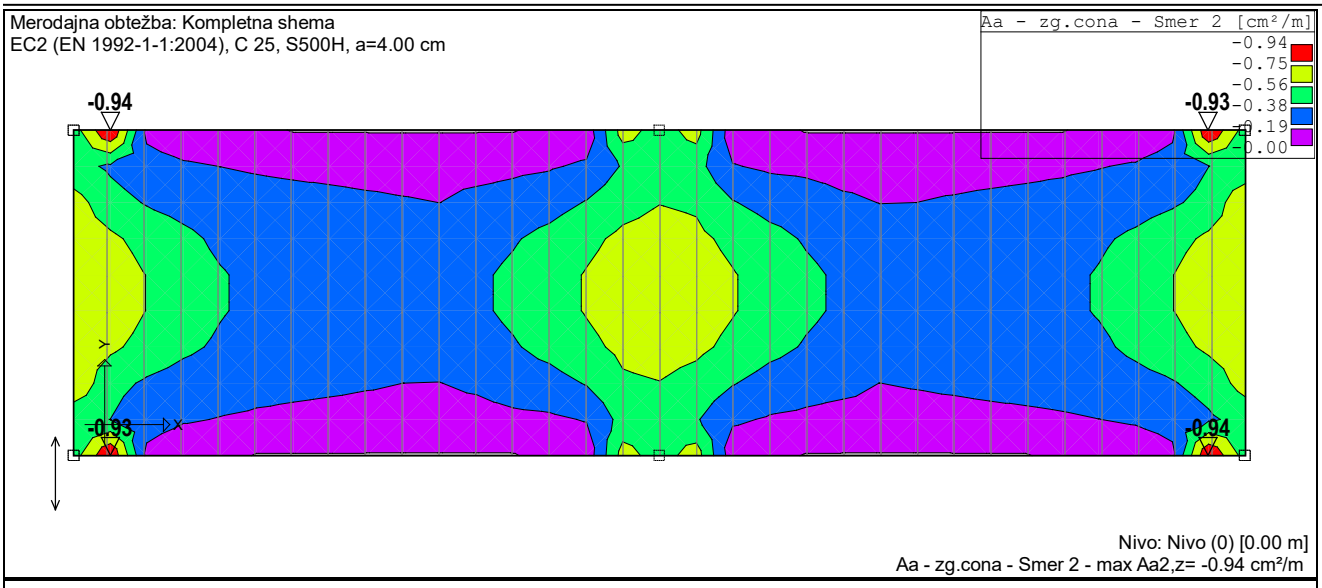
Nivo: Nivo (0) [0.00 m]
Aa - sp.cona - Smer 2 - max Aa2,s= 0.78 cm²/m

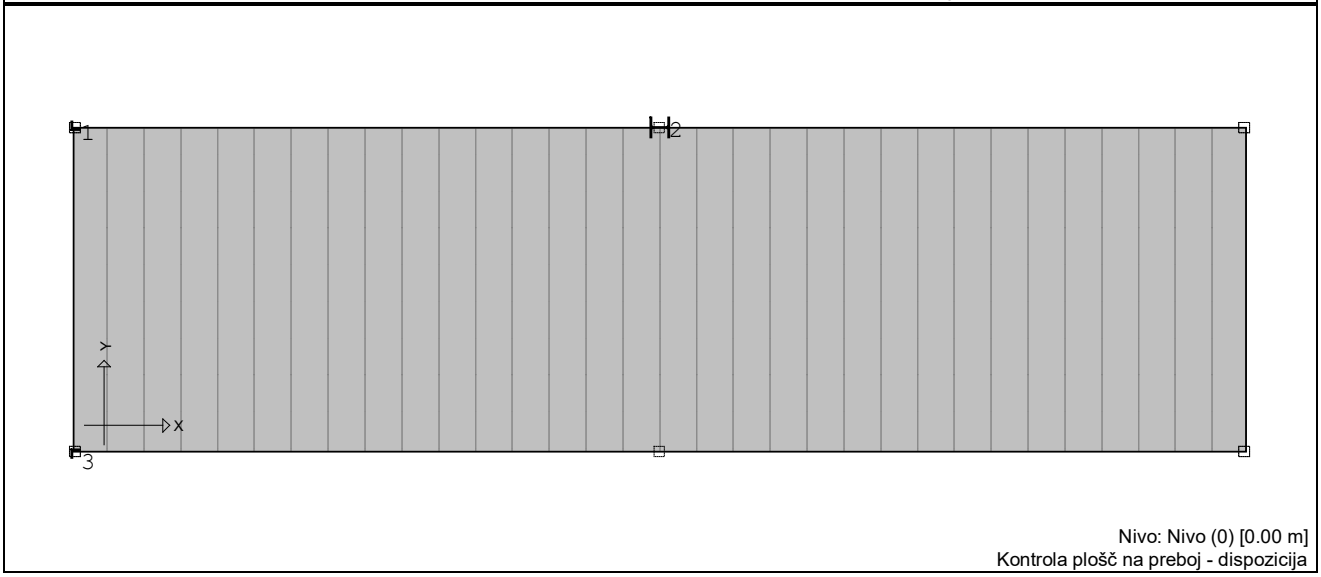
Merodajna obtežba: Kompletna shema
EC2 (EN 1992-1-1:2004), C 25, S500H, a=4.00 cm



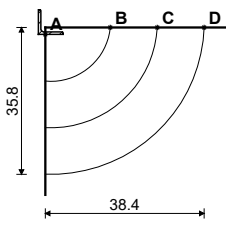
Nivo: Nivo (0) [0.00 m]
Aa - zg.cona - Smer 1 - max Aa1,z= -5.95 cm²/m

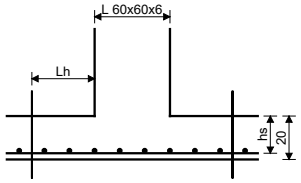
2. Načrt gradbeništva





Kontrola plošče proti preboju
EC2 (EN 1992-1-1:2004)
Nivo: Nivo (0) [0.00 m]
Prerez 1 (0.00,2.25,0.00)
C 25





KONTROLA PREREZA OB ROBU STEBRA

Merodajna kombinacija: 1.35xI+1.50xII

Sila v stebru	Ne =	11.105	kN
Zmanjšanje sile od reak. podpor	dN =	0.000	kN
Računska sila v stebru	N =	11.105	kN
Merodajna strižna napetost (točka A)	ved =	0.722	MPa
Debelina plošče	d,pl =	0.200	m
Statična višina plošče	hs =	0.170	m
Trdnost betona	fck =	25.000	MPa
Računska trdnost betona	fcd =	16.667	MPa
Koeficient	v =	0.540	
Koeficient	γc =	1.500	

Maksimalna odpornost	vRd,max = 0.40×v×fcd =	3.600	MPa

Pogoj: ved <= vRd,max (0.72 <= 3.60)
Pogoj je izpolnjen.

KONTROLA PREREZA 1. (Lh = 0.11m od roba stebra)

Merodajna kombinacija: 1.35xI+1.50xII

Sila v stebru	Ne =	11.105	kN
Zmanjšanje sile od reak. podpor	dN =	0.329	kN
Računska sila v stebru	N =	10.776	kN
Merodajna strižna napetost (točka B)	ved =	0.279	MPa
Debelina plošče	d,pl =	0.200	m
Statična višina plošče	hs =	0.170	m
Obseg prereza	u =	0.227	m
Trdnost betona	fck =	25.000	MPa
Računska trdnost betona	fcd =	16.667	MPa
Koeficient	v =	0.540	
Koeficient	γc =	1.500	
Maksimalna odpornost	vRd,max = 0.40×v×fcd =	3.600	MPa

Pogoj: ved <= vRd,max (0.28 <= 3.60)
Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000	%
Koeficient	CRd,c =	0.120	
Koeficient	K1 =	0.100	
Koeficient	k,vmin=	0.035	
Koeficient	vmin=	0.495	
Normalna napetost v betonu	σcp =	-0.057	MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.	vRd,c =	1.485	MPa

Pogoj: ved <= vRd,c (0.28 <= 1.48)
Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA PREREZA 2. (Lh = 0.23m od roba stebra)

Merodajna kombinacija: 1.35xI+1.50xII

Sila v stebru	Ne =	11.105	kN
Zmanjšanje sile od reak. podpor	dN =	0.906	kN
Računska sila v stebru	N =	10.199	kN
Merodajna strižna napetost (točka C)	ved =	0.148	MPa
Debelina plošče	d,pl =	0.200	m
Statična višina plošče	hs =	0.170	m
Obseg prereza	u =	0.405	m
Trdnost betona	fck =	25.000	MPa
Računska trdnost betona	fcd =	16.667	MPa
Koeficient	v =	0.540	
Koeficient	γc =	1.500	
Maksimalna odpornost	vRd,max = 0.40×v×fcd =	3.600	MPa

Pogoj: ved <= vRd,max (0.15 <= 3.60)
Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000	%
Koeficient	CRd,c =	0.120	
Koeficient	K1 =	0.100	
Koeficient	k,vmin=	0.035	
Koeficient	vmin=	0.495	
Normalna napetost v betonu	σcp =	-0.060	MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.	vRd,c =	0.742	MPa

Pogoj: ved <= vRd,c (0.15 <= 0.74)
Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA KRITIČNEGA PREREZA 3. (Lh = 0.34m od roba stebra)
(steber nadomestnega krožnega prereza, ds = 0.06m)

Merodajna kombinacija: 1.35xI+1.50xII

Sila v stebru	Ne =	11.105	kN
Zmanjšanje sile od reak. podpor	dN =	2.642	kN
Računska sila v stebru	N =	8.463	kN
Merodajna strižna napetost (točka D)	ved =	0.085	MPa
Debelina plošče	d,pl =	0.200	m
Statična višina plošče	hs =	0.170	m
Obseg kritičnega prereza	u1 =	0.583	m
Trdnost betona	fck =	25.000	MPa
Računska trdnost betona	fcd =	16.667	MPa
Koeficient	v =	0.540	
Koeficient	γc =	1.500	

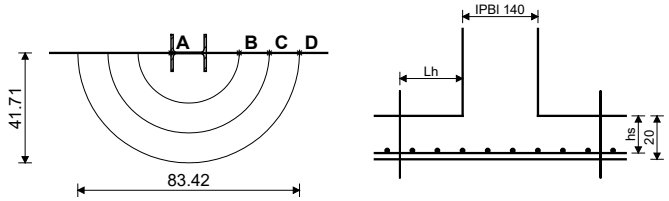
Maksimalna odpornost	vRd,max = 0.40×v×fcd =	3.600	MPa

Pogoj: ved <= vRd,max (0.09 <= 3.60)
Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000	%
Koeficient	CRd,c =	0.120	
Koeficient	K1 =	0.100	
Koeficient	k,vmin=	0.035	
Koeficient	vmin=	0.495	
Normalna napetost v betonu	σcp =	-0.039	MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.			
	vRd,c =	0.495	MPa

Pogoj: ved <= vRd,c (0.09 <= 0.49)
Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

Kontrola plošče proti preboju
EC2 (EN 1992-1-1:2004)
Nivo: Nivo (0) [0.00 m]
Prerez 2 (4.05,2.25,0.00)
C 25



KONTROLA PREREZA OB ROBU STEBRA

Merodajna kombinacija: 1.35xI+1.50xII			
Sila v stebru	Ne =	25.680	kN
Zmanjšanje sile od reak. podpor	dN =	0.489	kN
Računska sila v stebru	N =	25.191	kN
Merodajna strižna napetost (točka A)	ved =	0.373	MPa
Debelina plošče	d,pl =	0.200	m
Statična višina plošče	hs =	0.170	m
Trdnost betona	fck =	25.000	MPa
Računska trdnost betona	fcd =	16.667	MPa
Koeficient	v =	0.540	
Koeficient	γc =	1.500	
Maksimalna odpornost	vRd,max = 0.40×v×fcd =	3.600	MPa

Pogoj: ved <= vRd,max (0.37 <= 3.60)
Pogoj je izpolnjen.

KONTROLA PREREZA 1. (Lh = 0.11m od roba stebra)

Merodajna kombinacija: 1.35xI+1.50xII			
Sila v stebru	Ne =	25.680	kN
Zmanjšanje sile od reak. podpor	dN =	0.489	kN
Računska sila v stebru	N =	25.191	kN
Merodajna strižna napetost (točka B)	ved =	0.248	MPa
Debelina plošče	d,pl =	0.200	m
Statična višina plošče	hs =	0.170	m
Obseg prereza	u =	0.598	m
Trdnost betona	fck =	25.000	MPa
Računska trdnost betona	fcd =	16.667	MPa
Koeficient	v =	0.540	
Koeficient	γc =	1.500	
Maksimalna odpornost	vRd,max = 0.40×v×fcd =	3.600	MPa

Pogoj: ved <= vRd,max (0.25 <= 3.60)
Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000	%
Koeficient	CRd,c =	0.120	
Koeficient	K1 =	0.100	
Koeficient	k,vmin=	0.035	
Koeficient	vmin=	0.495	
Normalna napetost v betonu	σcp =	-0.004	MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.			
	vRd,c =	1.485	MPa

Pogoj: ved <= vRd,c (0.25 <= 1.48)
Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA PREREZA 2. (Lh = 0.23m od roba stebra)

Merodajna kombinacija: 1.35xI+1.50xII			
Sila v stebru	Ne =	25.680	kN
Zmanjšanje sile od reak. podpor	dN =	2.344	kN
Računska sila v stebru	N =	23.337	kN
Merodajna strižna napetost (točka C)	ved =	0.144	MPa
Debelina plošče	d,pl =	0.200	m
Statična višina plošče	hs =	0.170	m
Obseg prereza	u =	0.954	m
Trdnost betona	fck =	25.000	MPa
Računska trdnost betona	fcd =	16.667	MPa
Koeficient	v =	0.540	
Koeficient	γc =	1.500	
Maksimalna odpornost	vRd,max = 0.40×v×fcd =	3.600	MPa

Pogoj: ved <= vRd,max (0.14 <= 3.60)
Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000	%
Koeficient	CRd,c =	0.120	
Koeficient	K1 =	0.100	
Koeficient	k,vmin=	0.035	
Koeficient	vmin=	0.495	
Normalna napetost v betonu	σcp =	-0.004	MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.	vRd,c =	0.742	MPa

Pogoj: ved <= vRd,c (0.14 <= 0.74)
Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA KRITIČNEGA PREREZA 3. (Lh = 0.34m od roba stebra)
(steber nadomestnega krožnega prereza, ds = 0.15m)

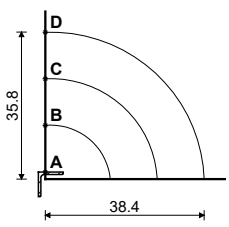
Merodajna kombinacija: 1.35xI+1.50xII			
Sila v stebru	Ne =	25.680	kN
Zmanjšanje sile od reak. podpor	dN =	4.117	kN
Računska sila v stebru	N =	21.563	kN
Merodajna strižna napetost (točka D)	ved =	0.097	MPa
Debelina plošče	d,pl =	0.200	m
Statična višina plošče	hs =	0.170	m
Obseg kritičnega prereza	u1 =	1.310	m
Trdnost betona	fck =	25.000	MPa
Računska trdnost betona	fcd =	16.667	MPa
Koeficient	v =	0.540	
Koeficient	γc =	1.500	
Maksimalna odpornost	vRd,max = 0.40×v×fcd =	3.600	MPa

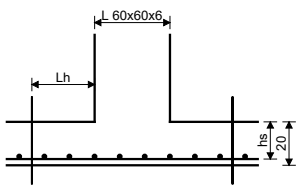
Pogoj: ved <= vRd,max (0.10 <= 3.60)
Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000	%
Koeficient	CRd,c =	0.120	
Koeficient	K1 =	0.100	
Koeficient	k,vmin=	0.035	
Koeficient	vmin=	0.495	
Normalna napetost v betonu	σcp =	-0.005	MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.	vRd,c =	0.495	MPa

Pogoj: ved <= vRd,c (0.10 <= 0.49)
Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

Kontrola plošče proti preboju
EC2 (EN 1992-1-1:2004)
Nivo: Nivo (0) [0.00 m]
Prerez 3 (0.00,0.00,0.00)
C 25





KONTROLA PREREZA OB ROBU STEBRA

Merodajna kombinacija: 1.35xI+1.50xII			
Sila v stebru	Ne =	11.147	kN

Zmanjšanje sile od reak. podpor	dN =	0.000	kN
Računska sila v stebru	N =	11.147	kN
Merodajna strižna napetost (točka A)	ved =	0.725	MPa
Debelina plošče	d,pl =	0.200	m
Statična višina plošče	hs =	0.170	m
Trdnost betona	fck =	25.000	MPa
Računska trdnost betona	fcd =	16.667	MPa
Koeficient	v =	0.540	
Koeficient	γc =	1.500	
Maksimalna odpornost	vRd,max = 0.40×v×fcd =	3.600	MPa

Pogoj: ved <= vRd,max (0.72 <= 3.60)

Pogoj je izpolnjen.

KONTROLA PREREZA 1. (Lh = 0.11m od roba stebra)

Merodajna kombinacija: 1.35xI+1.50xII			
Sila v stebru	Ne =	11.147	kN
Zmanjšanje sile od reak. podpor	dN =	0.329	kN
Računska sila v stebru	N =	10.818	kN
Merodajna strižna napetost (točka B)	ved =	0.280	MPa
Debelina plošče	d,pl =	0.200	m
Statična višina plošče	hs =	0.170	m
Obseg prereza	u =	0.227	m
Trdnost betona	fck =	25.000	MPa
Računska trdnost betona	fcd =	16.667	MPa
Koeficient	v =	0.540	
Koeficient	γc =	1.500	
Maksimalna odpornost	vRd,max = 0.40×v×fcd =	3.600	MPa

Pogoj: ved <= vRd,max (0.28 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000	%
Koeficient	CRd,c =	0.120	
Koeficient	K1 =	0.100	
Koeficient	k,vmin=	0.035	
Koeficient	vmin=	0.495	
Normalna napetost v betonu	σcp =	-0.010	MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.			
	vRd,c =	1.485	MPa

Pogoj: ved <= vRd,c (0.28 <= 1.48)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA PREREZA 2. (Lh = 0.23m od roba stebra)

Merodajna kombinacija: 1.35xI+1.50xII			
Sila v stebru	Ne =	11.147	kN
Zmanjšanje sile od reak. podpor	dN =	0.906	kN
Računska sila v stebru	N =	10.241	kN
Merodajna strižna napetost (točka C)	ved =	0.149	MPa
Debelina plošče	d,pl =	0.200	m
Statična višina plošče	hs =	0.170	m
Obseg prereza	u =	0.405	m
Trdnost betona	fck =	25.000	MPa
Računska trdnost betona	fcd =	16.667	MPa
Koeficient	v =	0.540	
Koeficient	γc =	1.500	
Maksimalna odpornost	vRd,max = 0.40×v×fcd =	3.600	MPa

Pogoj: ved <= vRd,max (0.15 <= 3.60)

Pogoj je izpolnjen.

Procent armiranja	ρ =	0.000	%
Koeficient	CRd,c =	0.120	
Koeficient	K1 =	0.100	
Koeficient	k,vmin=	0.035	
Koeficient	vmin=	0.495	
Normalna napetost v betonu	σcp =	0.024	MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.			
	vRd,c =	0.742	MPa

Pogoj: ved <= vRd,c (0.15 <= 0.74)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

KONTROLA KRITIČNEGA PREREZA 3. (Lh = 0.34m od roba stebra)
(steber nadomestnega krožnega prereza, ds = 0.06m)

Merodajna kombinacija: 1.35xI+1.50xII			
Sila v stebru	Ne =	11.147	kN
Zmanjšanje sile od reak. podpor	dN =	2.642	kN
Računska sila v stebru	N =	8.505	kN
Merodajna strižna napetost (točka D)	ved =	0.086	MPa
Debelina plošče	d,pl =	0.200	m

2. Načrt gradbeništva

Statična višina plošče	hs =	0.170	m
Obseg kritičnega prereza	u1 =	0.583	m
Trdnost betona	fck =	25.000	MPa
Računska trdnost betona	fcd =	16.667	MPa
Koeficient	v =	0.540	
Koeficient	γc =	1.500	
Maksimalna odpornost	vRd,max = 0.40×v×fcd =	3.600	MPa

Pogoj: ved <= vRd,max (0.09 <= 3.60)

Pogoj je izpolnjen.

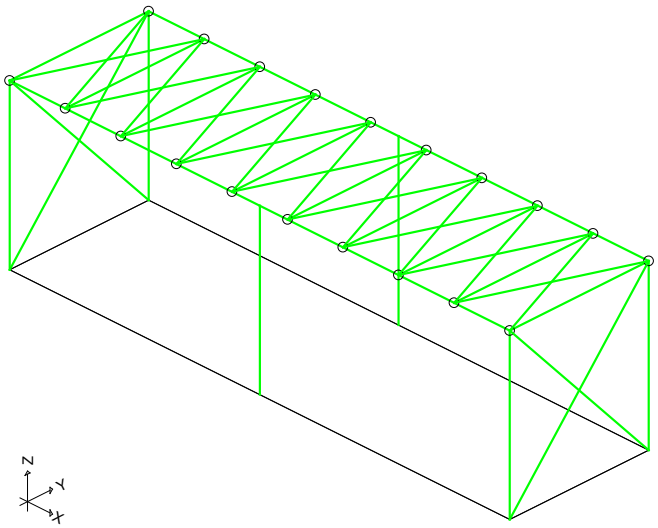
Procent armiranja	ρ =	0.000	%
Koeficient	CRd,c =	0.120	
Koeficient	K1 =	0.100	
Koeficient	k,vmin=	0.035	
Koeficient	vmin=	0.495	
Normalna napetost v betonu	σcp =	0.019	MPa
Odpornost proti preboju plošče brez dodatne armature za varnost.	vRd,c =	0.495	MPa

Pogoj: ved <= vRd,c (0.09 <= 0.49)

Pogoj je izpolnjen, ni potrebna dodatna armatura proti preboju plošče.

2. Načrt gradbeništva

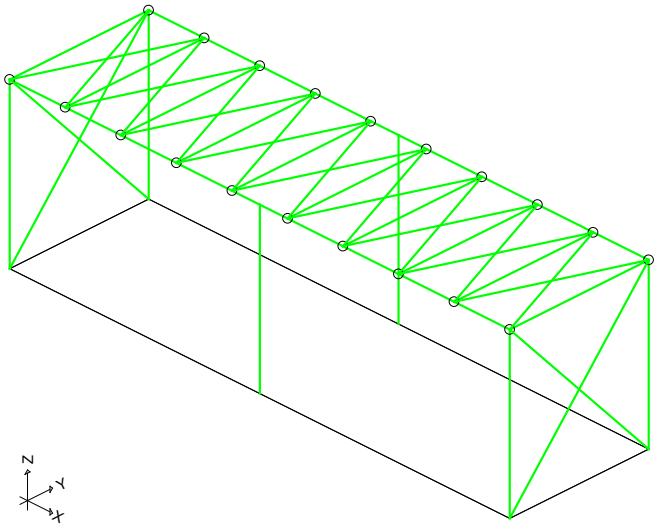
Dimenzioniranje (jeklo)



Izometrija
Kontrola napetosti

Kontrola napetosti - EUROCODE 3 (ENV)

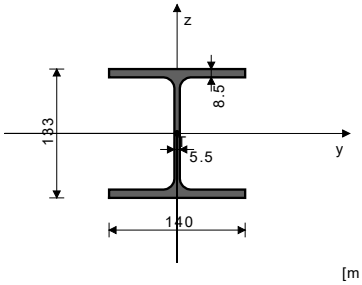
Opis	LC	σ [kN/cm²]	τ [kN/cm²]	σu [kN/cm²]
Set 1: IPBl 140				
(57 - 1)	7	**2.877**	**0.184**	**2.894**
(351 - 298)	7	**2.877**	**0.184**	**2.894**
(150 - 46)	7	**2.876**	**0.184**	**2.894**
(354 - 349)	7	**2.876**	**0.184**	**2.894**
(318 - 214)	7	**1.259**	**0.005**	**1.259**
(225 - 128)	7	**1.259**	**0.005**	**1.259**
Set 2: IPBl 140				
(57 - 225)	7	**6.164**	**1.232**	**6.523**
(225 - 351)	7	**6.164**	**1.232**	**6.523**
(150 - 318)	7	**6.164**	**1.232**	**6.523**
(318 - 354)	7	**6.164**	**1.232**	**6.523**
Set 3: IPE 100				
(213 - 307)	7	**7.317**	**0.920**	**7.318**
(246 - 332)	7	**7.317**	**0.920**	**7.318**
(137 - 224)	7	**7.311**	**0.920**	**7.312**
(317 - 352)	7	**7.311**	**0.920**	**7.312**
(288 - 348)	7	**7.311**	**0.920**	**7.312**
(171 - 267)	7	**7.311**	**0.920**	**7.312**
(98 - 192)	7	**7.310**	**0.920**	**7.312**
(342 - 353)	7	**7.310**	**0.920**	**7.312**
(57 - 150)	7	**3.821**	**0.472**	**3.821**
(354 - 351)	7	**3.821**	**0.472**	**3.821**
Set 4: L 60x60x6				
(57 - 46)	7	**0.332**	**0.014**	**0.332**
(351 - 349)	7	**0.332**	**0.014**	**0.332**
(298 - 354)	7	**0.332**	**0.014**	**0.332**
(1 - 150)	7	**0.332**	**0.014**	**0.332**
Set 5: D=1.2				
(192 - 137)	7	**4.986**	**0.014**	**4.986**
(353 - 317)	7	**4.986**	**0.014**	**4.986**
(352 - 342)	7	**4.986**	**0.014**	**4.986**
(224 - 98)	7	**4.986**	**0.014**	**4.986**
(171 - 224)	7	**4.986**	**0.014**	**4.986**
(288 - 352)	7	**4.986**	**0.014**	**4.986**
(137 - 267)	7	**4.986**	**0.014**	**4.986**
(317 - 348)	7	**4.986**	**0.014**	**4.986**
(267 - 213)	7	**4.983**	**0.014**	**4.983**
(348 - 246)	7	**4.983**	**0.014**	**4.983**
(332 - 288)	7	**4.983**	**0.014**	**4.983**
(307 - 171)	7	**4.983**	**0.014**	**4.983**
(246 - 307)	7	**4.981**	**0.014**	**4.981**
(213 - 332)	7	**4.981**	**0.014**	**4.981**
(351 - 353)	11	**4.973**	**0.014**	**4.973**
(57 - 192)	11	**4.973**	**0.014**	**4.973**
(342 - 354)	11	**4.973**	**0.014**	**4.973**
(98 - 150)	11	**4.973**	**0.014**	**4.973**



Izometrija
Kontrola stabilnosti

PALICA 298-351
PREČNI PREREZ: IPBl 140 [S 235] [Set: 1]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



[mm]

Ax =	31.400	cm2
Ay =	21.293	cm2
Az =	10.107	cm2
Ix =	8.160	cm4
Iy =	1030.0	cm4
Iz =	389.00	cm4
Wy =	154.89	cm3
Wz =	55.571	cm3
Wy,pl =	170.19	cm3
Wz,pl =	83.300	cm3
γM0 =	1.100	
γM1 =	1.100	
γM2 =	1.250	
Anet/A =	0.900	

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

7. γ=0.14	9. γ=0.14	10. γ=0.13
8. γ=0.10	11. γ=0.10	12. γ=0.10

PALICA IZPOSTAVLJENA PRITISKU IN UPOGIBU
(obtežni primer 7, začetek palice)

Računska osna sila	Nsd =	-9.376	kN
Prečna sila v y smeri	Vsd_y =	0.077	kN
Prečna sila v z smeri	Vsd_z =	-1.819	kN
Upogibni moment okoli y osi	Msd_y =	-3.993	kNm
Sistemska dolžina palice	L =	250.00	cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.4 Tlak

Plastična računska nosilnost	Npl.Rd =	670.82	kN
Računska nosilnost na tlak	Nc.Rd =	670.82	kN

Pogoj 5.16: Nsd <= Nc.Rd (9.38 <= 670.82)

5.4.5 Upogib y-y

Računski plastični moment	Mpl.Rd =	36.358	kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	33.090	kNm
Računski elastični moment	Mel.Rd =	33.090	kNm
Računska nosilnost na upogib	Mc.Rd =	36.358	kNm

Pogoj 5.17: Msd_y <= Mc.Rd_y (3.99 <= 36.36)

5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	124.67	kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (1.82 <= 124.67)

Računska plast.nos.na strig y-y	Vpl.Rd =	262.63	kN

Pogoj 5.20: Vsd_y <= Vpl.Rd_y (0.08 <= 262.63)

5.4.9 Upogib z osno in prečno silo
Ni potrebno zmanjšanje upogibne nosilnosti
Pogoj: Vsd_z <= 50%Vpl.Rd_z i Vsd_y <= 50%Vpl.Rd_y

5.4.8 Upogib in osna sila

Razmerje Nsd / Npl.Rd		0.014
Razmerje Msd_y / Mpl.Rd_y		0.110

Pogoj 5.36: (0.12 <= 1)

5.5 NOSILNOST ELEMENTOV
5.5.1 Uklonska nosilnost

Uklonska dolžina y-y	l,y =	250.00	cm
Vztrajnostni radij y-y	i,y =	5.727	cm
Vitkost y-y	λ,y =	43.650	
Relativna vitkost y-y	λ_y =	0.465	
Uklonska krivulja za os y-y: B	α =	0.340	
Koeficient nepopolnosti	χ,y =	0.899	
Koeficient efektivnega prereza	βA =	1.000	
Računska uklonska nosilnost	Nb.Rd_y =	603.37	kN

Pogoj 5.45: Nsd <= Nb.Rd_y (9.38 <= 603.37)

Uklonska dolžina z-z	l,z =	250.00	cm
Vztrajnostni radij z-z	i,z =	3.520	cm
Vitkost z-z	λ,z =	71.028	
Relativna vitkost z-z	λ_z =	0.756	
Uklonska krivulja za os z-z: C	α =	0.490	
Koeficient nepopolnosti	χ,z =	0.690	
Koeficient efektivnega prereza	βA =	1.000	
Računska uklonska nosilnost	Nb.Rd_z =	462.54	kN

Pogoj 5.45: Nsd <= Nb.Rd_z (9.38 <= 462.54)

5.5.2 Bočna zvrnitev upogibnih nosilcev

Koeficient	C1 =	2.103	
Koeficient	C2 =	0.000	
Koeficient	C3 =	0.892	
Koef.ukl.dolžine za uklon	k =	1.000	
Koef.ukl.dolžine za vbočenje	kw =	1.000	
Koordinata	zg =	0.000	cm
Koordinata	zj =	0.000	cm
Razmak med bočnimi podporami	L =	250.00	cm
Sektorski vztrajnostni moment	Iw =	15064	cm6
Krit.moment bočne zvrnitve	Mcr =	257.05	kNm
Koeficient	βw =	1.000	
Koeficient imperf.	αLT =	0.210	
Brezdimenz.vitkost	λLT_ =	0.394	
Koeficient zmanjšanja	χLT =	0.954	
Računska uklonska nosilnost	Mb.Rd =	34.695	kNm

Kontrola bočne zvrnitve ni potrebna: λ_LT <= 0.4

5.5.4 Upogib in tlak

Koeficient nepopolnosti	χmin =	0.690	
Nsd / ...		0.020	
Koeficient oblike momenta	βy =	1.897	
Koeficient	μy =	0.003	
Koeficient	ky =	1.000	
ky * My / ...		0.110	

Pogoj 5.51: (0.13 <= 1)

Koeficient nepopolnosti	χ_z =	0.690	
Nsd/ ...		0.020	
Koeficient nepopolnosti	χLT =	0.954	
Koef.obl.mom.za bočno zvrnitev	βM.LT =	1.897	
Koeficient	μLT =	0.065	
Koeficient	kLT =	0.999	
kLT * My / ...		0.115	

Pogoj 5.52: (0.14 <= 1)

5.6 LOKALNO IZBOČENJE ZARADI STRIGA
za strig v ravnini z-z

Višina stojine	d =	11.600	cm
Debelina stojine	tw =	0.550	cm

Ni prečnih ojačitev v sredini

Koeficient izbočenja pri strigu	kτ =	5.340	

Ni potrebna kontrola izbočenja zaradi striga

Pogoj: d / tw <= 69 ε (21.09 <= 69.00)

5.6.7 Interakcija prečne sile, upogiba in osne sile
za strig v ravnini z-z

Računski plastični moment pasnic	Mf.Rd =	33.806	kNm

Pogoji 5.66a in 5.66b so izpolnjeni

5.7 VNOS KONCENTRIRANIH SIL V STOJINO
5.7.7 Uklon pasnice v smeri stojine

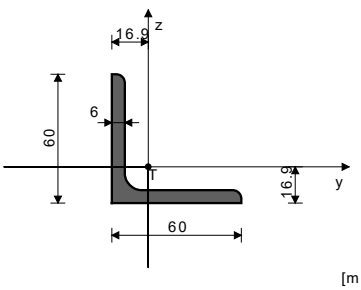
Koeficient(razred pasnice 1)	k =	0.300	
Površina stojine	Aw =	7.315	cm2
Površina tlač.pasnice	Afc =	11.900	cm2

Preprečen je uklon pasnice v smeri stojine

Pogoj 5.80: (21.09 <= 210.19)

PALICA 349-351
PREČNI PREREZ: L 60x60x6 [S 235] [Set: 4]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



[mm]

Ax =	6.910	cm2
Ay =	3.600	cm2
Az =	3.600	cm2
Ix =	0.860	cm4
Iξ =	9.430	cm4
Iη =	36.100	cm4
Iy =	22.765	cm4
Iz =	22.765	cm4
Wy =	5.282	cm3
Wz =	5.282	cm3
Wy,pl =	9.828	cm3
Wz,pl =	11.718	cm3
γM0 =	1.100	
γM1 =	1.100	
γM2 =	1.250	
Anet/A =	0.900	

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

7. γ=0.11	9. γ=0.11	10. γ=0.09
8. γ=0.07	11. γ=0.04	12. γ=0.03

PALICA IZPOSTAVLJENA PRITISKU IN UPOGIBU
(obtežni primer 7, na 168.2 cm od začetka palice)

Računska osna sila	Nsd =	-1.143	kN
Prečna sila v z smeri	Vsd_z =	-0.051	kN
Upogibni moment okoli y osi	Msd_y =	-0.017	kNm
Sistemska dolžina palice	L =	336.34	cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 3

5.4 NOSILNOST PREČNIH PREREZOV
5.4.4 Tlak

Plastična računska nosilnost	Npl.Rd =	147.62	kN
Računska nosilnost na tlak	Nc.Rd =	147.62	kN

Pogoj 5.16: Nsd <= Nc.Rd (1.14 <= 147.62)

5.4.5 Upogib y-y

Računski plastični moment	Mpl.Rd =	2.100	kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	1.128	kNm
Računski elastični moment	Mel.Rd =	1.128	kNm
Računska nosilnost na upogib	Mc.Rd =	1.128	kNm

Pogoj 5.17: Msd_y <= Mc.Rd_y (0.02 <= 1.13)

5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	44.404	kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (0.05 <= 44.40)

5.4.9 Upogib z osno in prečno silo
Ni potrebno zmanjšanje upogibne nosilnosti
Pogoj: Vsd_z <= 50%Vpl.Rd_z

5.4.8 Upogib in osna sila
Pogoj 5.38: (0.02 <= 1)

5.5 NOSILNOST ELEMENTOV
5.5.1 Uklonska nosilnost

Uklonska dolžina ξ-ξ	l,ξ =	336.34	cm
Vztrajnostni radij ξ-ξ	i,ξ =	1.168	cm
Vitkost ξ-ξ	λ,ξ =	287.91	
Relativna vitkost ξ-ξ	λ_ξ =	3.066	
Uklonska krivulja za os ξ-ξ: C	α =	0.490	
Koeficient nepopolnosti	χ,ξ =	0.091	
Koeficient efektivnega prereza	βA =	1.000	
Računska uklonska nosilnost	Nb.Rd_ξ =	13.485	kN

Pogoj 5.45: Nsd <= Nb.Rd_ξ (1.14 <= 13.49)

Uklonska dolžina η-η	l,η =	336.34	cm
Vztrajnostni radij η-η	i,η =	2.286	cm
Vitkost η-η	λ,η =	147.15	
Relativna vitkost η-η	λ_η =	1.567	
Uklonska krivulja za os η-η: C	α =	0.490	
Koeficient nepopolnosti	χ,η =	0.294	
Koeficient efektivnega prereza	βA =	1.000	
Računska uklonska nosilnost	Nb.Rd_η =	43.363	kN

Pogoj 5.45: Nsd <= Nb.Rd_η (1.14 <= 43.36)

5.5.2 Bočna zvrnitev upogibnih nosilcev

Koeficient	C1 =	1.132	
Koeficient	C2 =	0.459	
Koeficient	C3 =	0.525	
Koef.ukl.dolžine za uklon	k =	1.000	
Koef.ukl.dolžine za vbočenje	kw =	1.000	
Koordinata	zg =	0.000	cm
Koordinata	zj =	0.000	cm
Razmak med bočnimi podporami	L =	336.34	cm
Sektorski vztrajnostni moment	Iw =	0.000	cm6
Krit.moment bočne zvrnitve	Mcr =	6.093	kNm
Koeficient	βw =	0.537	
Koeficient imperf.	αLT =	0.210	
Brezdimenz.vitkost	λLT_ =	0.451	
Koeficient zmanjšanja	χLT =	0.939	
Računska uklonska nosilnost	Mb.Rd =	1.059	kNm

Pogoj 5.48: Msd_y <= Mb.Rd (0.02 <= 1.06)

5.5.4 Upogib in tlak

Koeficient nepopolnosti	χ_* =	0.091	
Nsd / ...		0.085	
Koeficient oblike momenta	βy =	1.193	
Koeficient	μy =	-4.948	
Koeficient	ky =	1.381	
ky * My / ...		0.011	

Pogoj 5.53: (0.11 <= 1)

Koeficient nepopolnosti	χ_z =	0.294	
Nsd/ ...		0.026	
Koeficient nepopolnosti	χLT =	0.939	
Koef.obl.mom.za bočno zvrnitev	βM.LT =	1.193	
Koeficient	μLT =	0.130	
Koeficient	kLT =	0.997	
kLT * My / ...		0.016	

Pogoj 5.54: (0.04 <= 1)

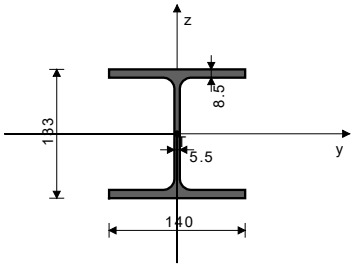
5.6.7 Interakcija prečne sile, upogiba in osne sile
za strig v ravnini z-z

Računski plastični moment pasnic	Mf.Rd =	1.128	kNm

Pogoji 5.66a in 5.66b so izpolnjeni

PALICA 351-225
PREČNI PREREZ: IPBl 140 [S 235] [Set: 2]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



[mm]

Ax =	31.400	cm2
Ay =	21.293	cm2
Az =	10.107	cm2
Ix =	8.160	cm4
Iy =	1030.0	cm4
Iz =	389.00	cm4
Wy =	154.89	cm3
Wz =	55.571	cm3
Wy,pl =	170.19	cm3
Wz,pl =	83.300	cm3
γM0 =	1.100	
γM1 =	1.100	
γM2 =	1.250	
Anet/A =	0.900	

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

7. γ=0.31	9. γ=0.31	10. γ=0.29
8. γ=0.21	11. γ=0.10	12. γ=0.10

PALICA IZPOSTAVLJENA PRITISKU IN UPOGIBU
(obtežni primer 7, začetek palice)

Računska osna sila	Nsd =	-1.818	kN
Prečna sila v y smeri	Vsd_y =	-0.049	kN
Prečna sila v z smeri	Vsd_z =	-12.424	kN
Upogibni moment okoli y osi	Msd_y =	-9.414	kNm
Upogibni moment okoli z osi	Msd_z =	-0.016	kNm
Sistemska dolžina palice	L =	405.00	cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.4 Tlak

Plastična računska nosilnost	Npl.Rd =	670.82	kN
Računska nosilnost na tlak	Nc.Rd =	670.82	kN

Pogoj 5.16: Nsd <= Nc.Rd (1.82 <= 670.82)

5.4.5 Upogib y-y

Računski plastični moment	Mpl.Rd =	36.358	kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	33.090	kNm
Računski elastični moment	Mel.Rd =	33.090	kNm
Računska nosilnost na upogib	Mc.Rd =	36.358	kNm

Pogoj 5.17: Msd_y <= Mc.Rd_y (9.41 <= 36.36)

5.4.5 Upogib z-z

Računski plastični moment	Mpl.Rd =	17.796	kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	11.872	kNm
Računski elastični moment	Mel.Rd =	11.872	kNm
Računska nosilnost na upogib	Mc.Rd =	17.796	kNm

Pogoj 5.17: Msd_z <= Mc.Rd_z (0.02 <= 17.80)

5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	124.67	kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (12.42 <= 124.67)

Računska plast.nos.na strig y-y	Vpl.Rd =	262.63	kN

Pogoj 5.20: Vsd_y <= Vpl.Rd_y (0.05 <= 262.63)

5.4.9 Upogib z osno in prečno silo
Ni potrebno zmanjšanje upogibne nosilnosti
Pogoj: Vsd_z <= 50%Vpl.Rd_z i Vsd_y <= 50%Vpl.Rd_y

5.4.8 Upogib in osna sila

Razmerje Msd_y / Mpl.Rd_y		0.259

Pogoj 5.36: (0.26 <= 1)

5.5 NOSILNOST ELEMENTOV
5.5.1 Uklonska nosilnost

Uklonska dolžina y-y	l,y =	405.00	cm
Vztrajnostni radij y-y	i,y =	5.727	cm
Vitkost y-y	λ,y =	70.713	
Relativna vitkost y-y	λ_y =	0.753	
Uklonska krivulja za os y-y: B	α =	0.340	
Koeficient nepopolnosti	χ,y =	0.753	
Koeficient efektivnega prereza	βA =	1.000	
Računska uklonska nosilnost	Nb.Rd_y =	505.07	kN

Pogoj 5.45: Nsd <= Nb.Rd_y (1.82 <= 505.07)

Uklonska dolžina z-z	l,z =	405.00	cm

Vztrajnostni radij z-z	i,z =	3.520	cm
Vitkost z-z	λ,z =	115.07	
Relativna vitkost z-z	λ_z =	1.225	
Uklonska krivulja za os z-z: C	α =	0.490	
Koeficient nepopolnosti	χ,z =	0.422	
Koeficient efektivnega prereza	βA =	1.000	
Računska uklonska nosilnost	Nb.Rd_z =	282.97	kN
Pogoj 5.45: Nsd <= Nb.Rd_z (1.82 <= 282.97)			
5.5.2 Bočna zvrnitev upogibnih nosilcev			
Koeficient	C1 =	1.285	
Koeficient	C2 =	1.562	
Koeficient	C3 =	0.753	
Koef.ukl.dolžine za uklon	k =	1.000	
Koef.ukl.dolžine za vbočenje	kw =	1.000	
Koordinata	zg =	0.000	cm
Koordinata	zj =	0.000	cm
Razmak med bočnimi podporami	L =	405.00	cm
Sektorski vztrajnostni moment	Iw =	15064	cm6
Krit.moment bočne zvrnitve	Mcr =	83.032	kNm
Koeficient	βw =	1.000	
Koeficient imperf.	αLT =	0.210	
Brezdimenz.vitkost	λLT_ =	0.694	
Koeficient zmanjšanja	χLT =	0.851	
Računska uklonska nosilnost	Mb.Rd =	30.924	kNm
Pogoj 5.48: Msd_y <= Mb.Rd (9.41 <= 30.92)			
5.5.4 Upogib in tlak			
Koeficient nepopolnosti	χmin =	0.422	
Nsd / ...		0.006	
Koeficient oblike momenta	βy =	1.338	
Koeficient	μy =	-0.898	
Koeficient	ky =	1.003	
ky * My / ...		0.260	
Koeficient oblike momenta	βz =	1.622	
Koeficient	μz =	-0.427	
Koeficient	kz =	1.002	
kz * Mz / ...		0.001	

Pogoj 5.51: (0.27 <= 1)			
Koeficient nepopolnosti	χ_z =	0.422	
Nsd/ ...		0.006	
Koeficient nepopolnosti	χLT =	0.851	
Koef.obl.mom.za bočno zvrnitev	βM.LT =	1.338	
Koeficient	μLT =	0.096	
Koeficient	kLT =	0.999	
kLT * My / ...		0.304	
Koeficient oblike momenta	βz =	1.622	
Koeficient	μz =	-0.427	
Koeficient	kz =	1.002	
kz * Mz / ...		0.001	
Pogoj 5.52: (0.31 <= 1)			
5.6 LOKALNO IZBOČENJE ZARADI STRIGA			
za strig v ravnini z-z			
Višina stojine	d =	11.600	cm
Debelina stojine	tw =	0.550	cm
Ni prečnih ojačitev v sredini			
Koeficient izbočenja pri strigu	kτ =	5.340	
Ni potrebna kontrola izbočenja zaradi striga			
Pogoj: d / tw <= 69 ε (21.09 <= 69.00)			
5.6.7 Interakcija prečne sile, upogiba in osne sile			
za strig v ravnini z-z			
Računski plastični moment pasnic	Mf.Rd =	33.812	kNm
Pogoji 5.66a in 5.66b so izpolnjeni			
5.7 VNOS KONCENTRIRANIH SIL V STOJINO			
5.7.7 Uklon pasnice v smeri stojine			
Koeficient(razred pasnice 1)	k =	0.300	
Površina stojine	Aw =	7.315	cm2
Površina tlač.pasnice	Afc =	11.900	cm2
Preprečen je uklon pasnice v smeri stojine			
Pogoj 5.80: (21.09 <= 210.19)			

ZASNOVA

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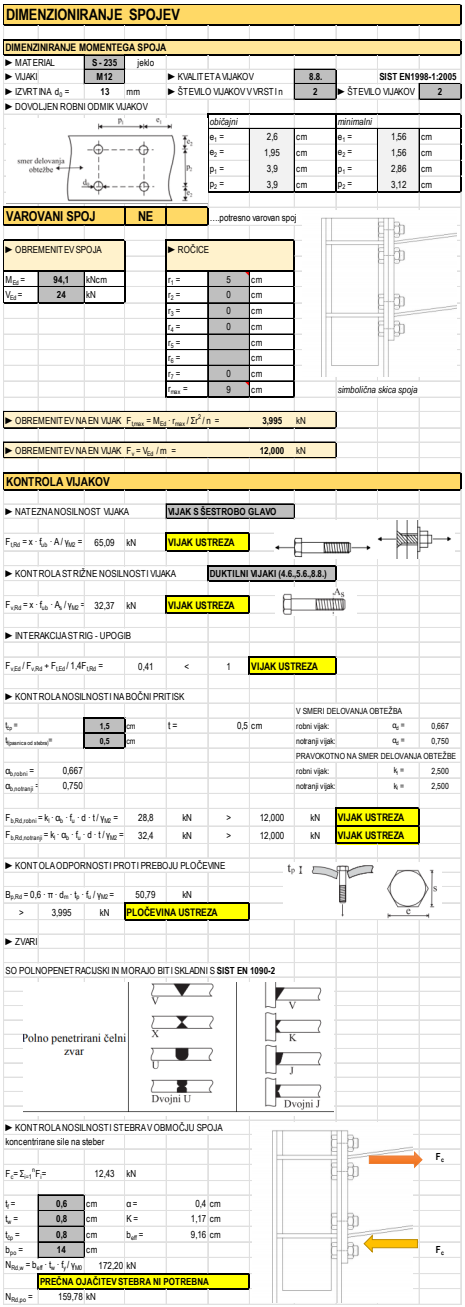
Dimenzioniranje glavnega spoja HEA 140 (steber) - HEA 140 (prečka)



DIMENZIONIRANJE SPOJEV

DIMENZINIRANJE MOMENTEGA SPOJA

► MATERIAL	S - 235	jeklo					
► VIJAKI	M12		► KVALITETA VIJAKOV	8.8.		SIST EN1998-1:2005	
► IZVRTINA d_0 =	13	mm	► ŠTEVILO VIJAKOV V VRSTI n	2	► ŠTEVILO VIJAKOV	2	

► DOVOLJEN ROBNI ODMIK VIJAKOV

	običajni			minimalni		
e_1 =	2,6	cm	e_1 =	1,56	cm
e_2 =	1,95	cm	e_2 =	1,56	cm
p_1 =	3,9	cm	p_1 =	2,86	cm
p_2 =	3,9	cm	p_2 =	3,12	cm

VAROVANI SPOJ | **NE** | ...potresno varovan spoj

simbolična skica spoja

► OBREMENITEV SPOJA

M_{Ed} =	94,1	kNcm
V_{Ed} =	24	kN

► ROČICE

r_1 =	5	cm
r_2 =	0	cm
r_3 =	0	cm
r_4 =	0	cm
r_5 =		cm
r_6 =		cm
r_7 =	0	cm
r_{max} =	9	cm

► OBREMENITEV NA EN VIJAK $F_{t,max} = M_{Ed} \cdot r_{max} / \Sigma r^2 / n$ = 3,995 kN

► OBREMENITEV NA EN VIJAK $F_v = V_{Ed} / m$ = 12,000 kN

KONTROLA VIJAKOV

► NATEZNA NOSILNOST VIJAKA — VIJAK S ŠESTROBO GLAVO

$F_{t,Rd} = x \cdot f_{ub} \cdot A / \gamma_{M2}$ = 65,09 kN — VIJAK USTREZA

► KONTROLA STRIŽNE NOSILNOSTI VIJAKA — DUKTILNI VIJAKI (4.6.,5.6.,8.8.)

$F_{v,Rd} = x \cdot f_{ub} \cdot A_s / \gamma_{M2}$ = 32,37 kN — VIJAK USTREZA

► INTERAKCIJA STRIG - UPOGIB

$F_{v,Ed} / F_{v,Rd} + F_{t,Ed} / 1,4F_{t,Rd}$ = 0,41 < 1 — VIJAK USTREZA

► KONTROLA NOSILNOSTI NA BOČNI PRITISK

t_p =	1,5	cm	t =	0,5	cm	V SMERI DELOVANJA OBTEŽBA		
$t_{podaljšana\ od\ stebra}$ =	0,5	cm				robni vijak:	α_d =	0,667
						notranji vijak:	α_d =	0,750
$\alpha_{b,robni}$ =	0,667					PRAVOKOTNO NA SMER DELOVANJA OBTEŽBE		
$\alpha_{b,notranji}$ =	0,750					robni vijak:	k_t =	2,500
						notranji vijak:	k_t =	2,500

$F_{b,Rd,robni} = k_t \cdot \alpha_b \cdot f_u \cdot d \cdot t / \gamma_{M2}$ = 28,8 kN > 12,000 kN — VIJAK USTREZA

$F_{b,Rd,notranji} = k_t \cdot \alpha_b \cdot f_u \cdot d \cdot t / \gamma_{M2}$ = 32,4 kN > 12,000 kN — VIJAK USTREZA

► KONTROLA ODPORNOSTI PROTI PREBOJU PLOČEVINE

$B_{p,Rd} = 0,6 \cdot \pi \cdot d_m \cdot t_p \cdot f_u / \gamma_{M2}$ = 50,79 kN

> 3,995 kN — PLOČEVINA USTREZA

► ZVARI

SO POLNOPENETRACIJSKI IN MORAJO BITI SKLADNI S **SIST EN 1090-2**

► KONTROLA NOSILNOSTI STEBRA V OBMOČJU SPOJA

koncentrirane sile na steber

$F_c = \Sigma_{i=1}{}^{n} F_i$ = 12,43 kN

t_f =	0,6	cm	α =	0,4	cm
t_w =	0,8	cm	K =	1,17	cm
t_{fp} =	0,8	cm	b_{eff} =	9,16	cm
b_{po} =	14	cm			

$N_{Rd,w} = b_{eff} \cdot t_w \cdot f_y / \gamma_{M0}$ 172,20 kN

PREČNA OJAČITEV STEBRA NI POTREBNA

$N_{Rd,po}$ = 159,78 kN

Čelna pločevina 15mm, Vijaki 2 x 2 x M 12 (8.8.)

Sidranje na tla z 4 x M12 (8.8.) vijaki + epoksi smolo, priključna pločevina d = 15mm

Spoj glavnega nosilca HEA140 in prečke IPE 100 - priključna pločevina d = 10mm 4 x M 12 (8.8.)

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2.5.7. Analiza nadstreška vhod POZ-1010

Glej izpis iz programa

Spoji podobni kot pri kolesarnici

2. Načrt gradbeništva

Vhodni podatki - Konstrukcija

Shema nivojev

Naziv	z [m]	h [m]
Nivo (streha)	2.60	2.60

Naziv	z [m]	h [m]
Nivo (0)	0.00	

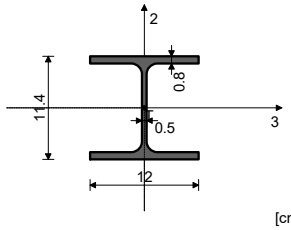
Tabele materialov

No	Naziv materiala	E[kN/m2]	μ	γ[kN/m3]	αt[1/C]	Em[kN/m2]	μm
1	Jeklo	2.100e+8	0.30	78.50	1.000e-5	2.100e+8	0.30

Seti gred

Set: 1 Prerez: IPBl 120, Fiktivna ekscentričnost

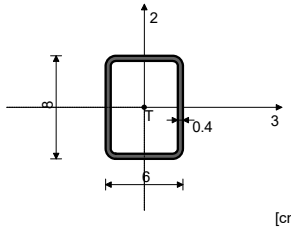
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	2.530e-3	8.420e-4	1.688e-3	6.020e-8	2.310e-6	6.060e-6



[cm]

Set: 2 Prerez: HOP [] 80x60x4, Fiktivna ekscentričnost

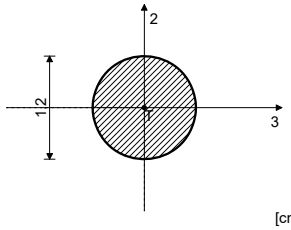
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	1.015e-3	6.400e-4	4.800e-4	1.126e-6	5.603e-7	8.792e-7



[cm]

Set: 3 Prerez: D=1.2, Prosta nelinearna (natezna) palica, Fiktivna ekscentričnost

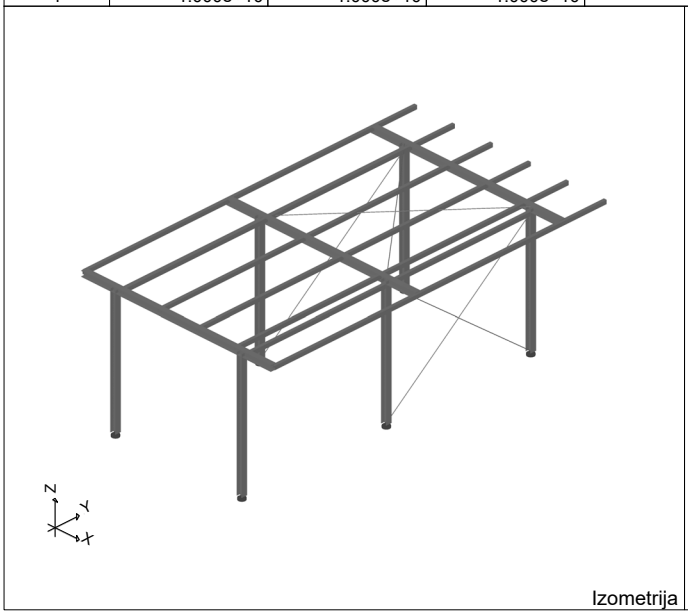
Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo	1.131e-4	1.018e-4	1.018e-4	2.036e-9	1.018e-9	1.018e-9



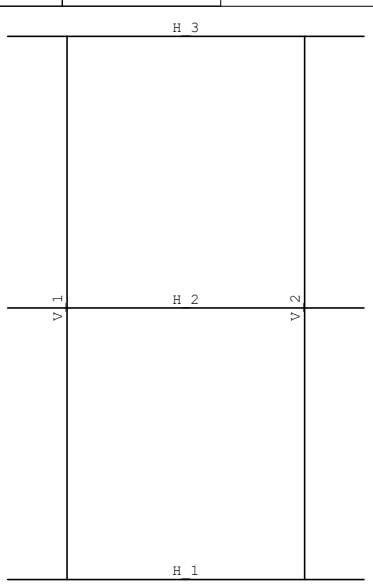
[cm]

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			

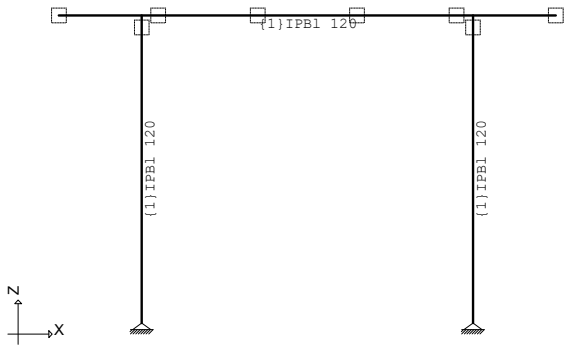


Izometrija

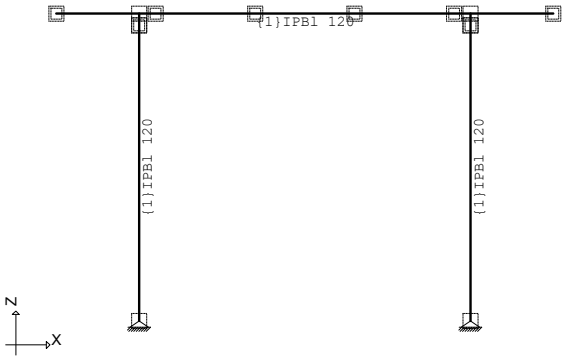


Dispozicija okvirjev

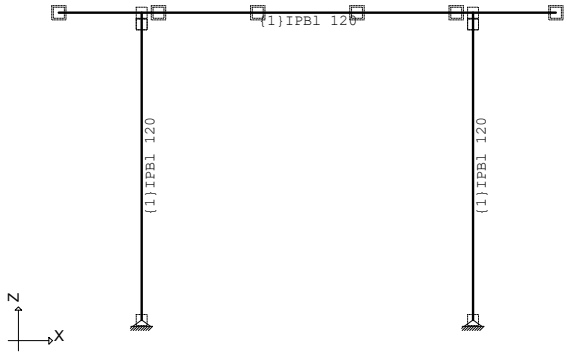
2. Načrt gradbeništva



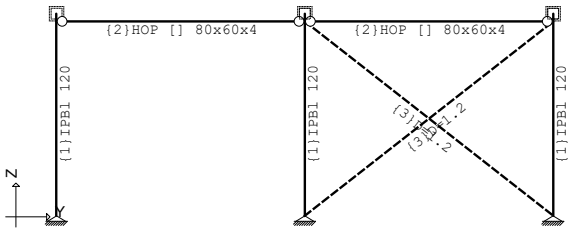
Okvir: H_1



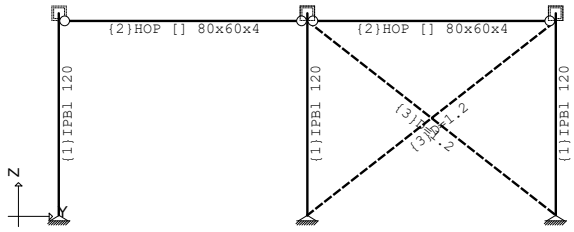
Okvir: H_2



Okvir: H_3



Okvir: V_1



Okvir: V_2

2. Načrt gradbeništva

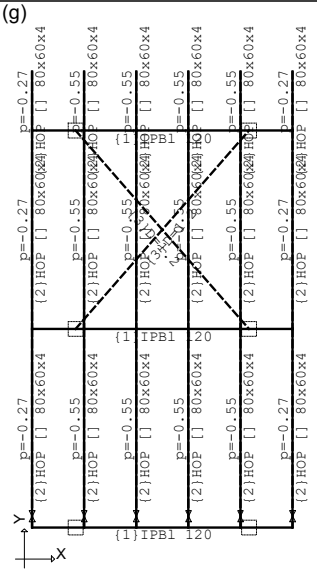
Vhodni podatki - Obtežba

Lista obtežnih primerov

LC	Naziv
1	Lastna teža (g)
2	Sneg

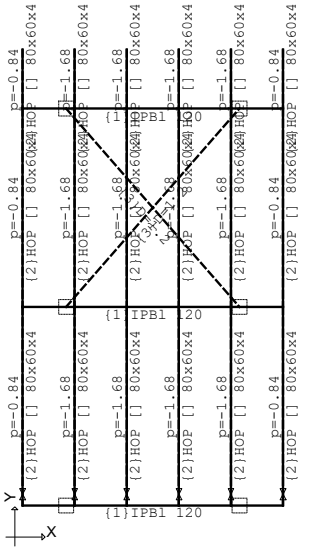
LC	Naziv
3	Komb.: 1.35xI+1.5xII
4	Komb.: I+II

Obt. 1: Lastna teža (g)



Nivo: Nivo (streha) [2.60 m]

Obt. 2: Sneg

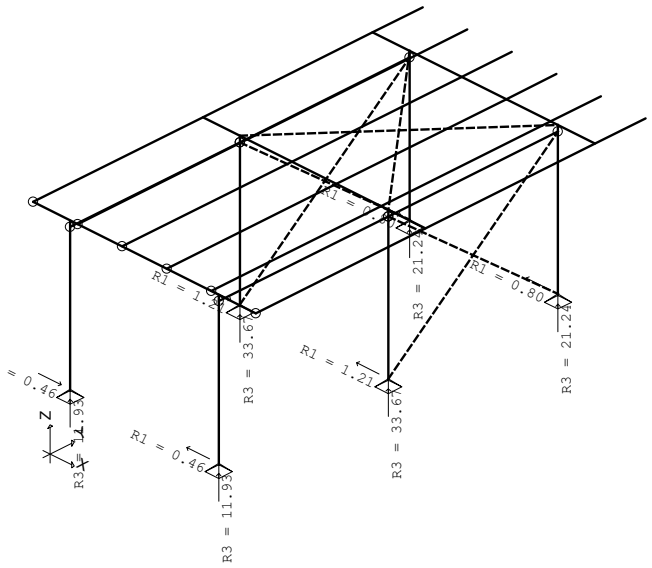


Nivo: Nivo (streha) [2.60 m]

2. Načrt gradbeništva

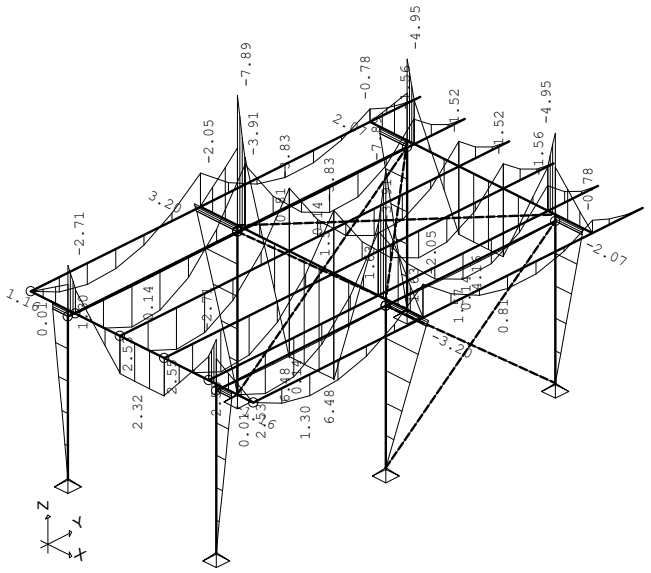
Statični preračun

Obt. 3: 1.35xI+1.5xII



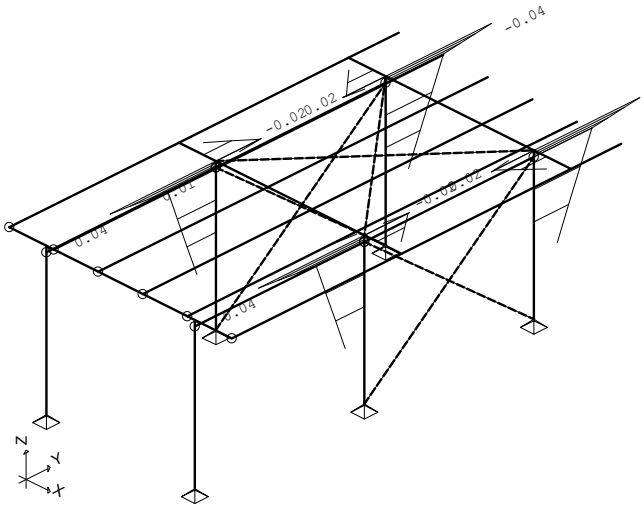
Izometrija
Reakcije podpor

Obt. 3: 1.35xI+1.5xII



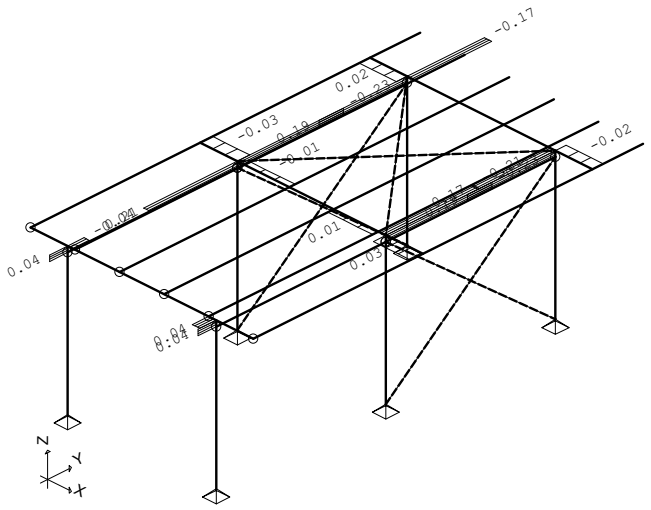
Izometrija
Vplivi v gredi: max M3= 6.48 / min M3= -7.89 kNm

Obt. 3: 1.35xI+1.5xII



Izometrija
Vplivi v gredi: max M2= 0.04 / min M2= -0.04 kNm

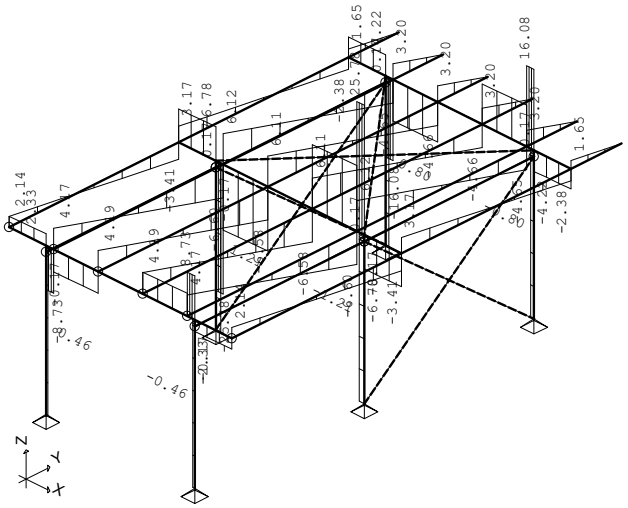
Obt. 3: 1.35xI+1.5xII



Izometrija
Vplivi v gredi: max T3= 0.21 / min T3= -0.23 kN

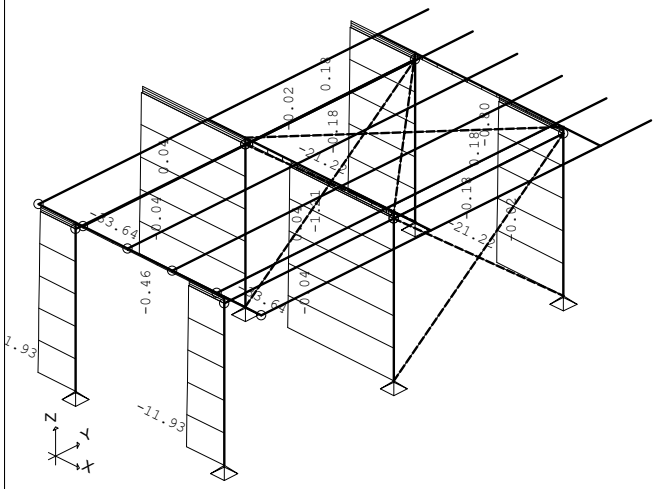
2. Načrt gradbeništva

Obt. 3: 1.35xI+1.5xII



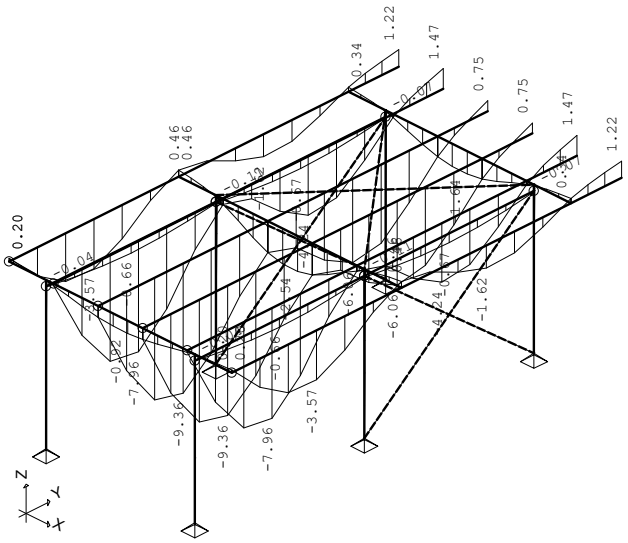
Izometrija
Vplivi v gredi: max T2= 25.78 / min T2= -25.78 kN

Obt. 3: 1.35xI+1.5xII



Izometrija
Vplivi v gredi: max N1= 0.18 / min N1= -33.64 kN

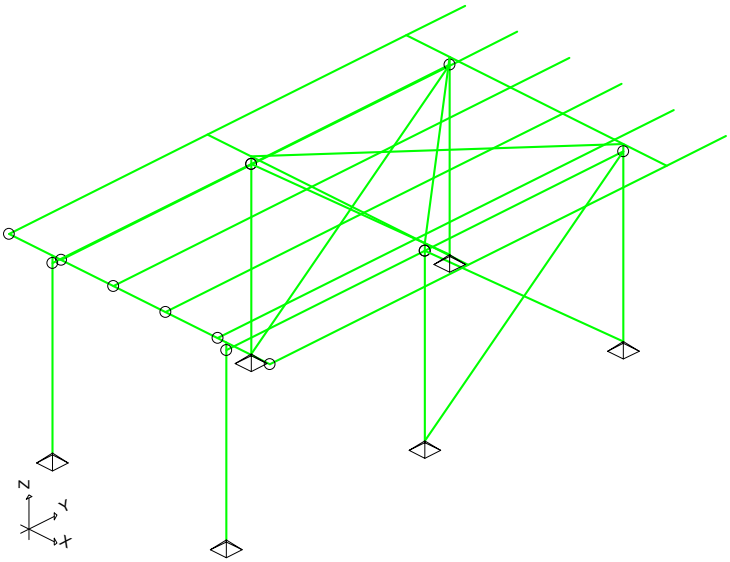
Obt. 4: I+II



Izometrija
Vplivi v gredi: max Zp= 1.47 / min Zp= -9.36 m / 1000

2. Načrt gradbeništva

Dimenzioniranje (jeklo)

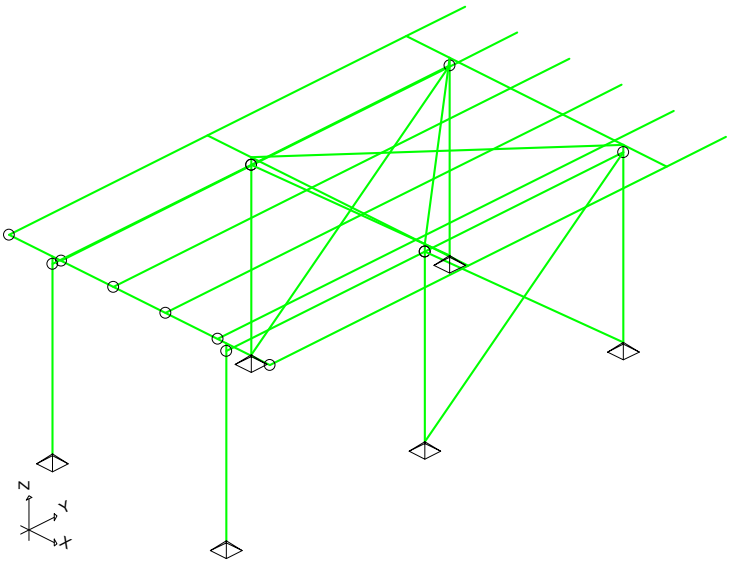


Izometrija
Kontrola napetosti

Kontrola napetosti - EUROCODE 3 (ENV)

Opis	LC	σ [kN/cm²]	τ [kN/cm²]	σu [kN/cm²]
Set 1: IPBl 120				
(10 - 31)	3	**7.519**	**3.598**	**9.765**
(22 - 40)	3	**4.734**	**2.796**	**6.773**
(15 - 7)	3	**4.404**	**0.158**	**4.412**
(25 - 17)	3	**4.404**	**0.158**	**4.412**
(2 - 18)	3	**2.571**	**1.039**	**3.139**
(27 - 19)	3	**2.862**	**0.133**	**2.872**
(39 - 29)	3	**2.862**	**0.133**	**2.872**
(4 - 1)	3	**1.534**	**0.091**	**1.537**
(13 - 6)	3	**1.534**	**0.091**	**1.537**
Set 2: HOP [] 80x60x4				
(28 - 16)	3	**16.918**	**1.146**	**17.034**
(36 - 23)	3	**16.918**	**1.146**	**17.034**
(16 - 5)	3	**16.786**	**1.304**	**16.937**
(23 - 11)	3	**16.786**	**1.304**	**16.937**
(21 - 9)	3	**16.563**	**1.261**	**16.706**
(20 - 8)	3	**16.563**	**1.261**	**16.706**
(34 - 21)	3	**16.569**	**1.123**	**16.683**
(32 - 20)	3	**16.569**	**1.123**	**16.683**
(22 - 10)	3	**8.853**	**0.568**	**8.908**

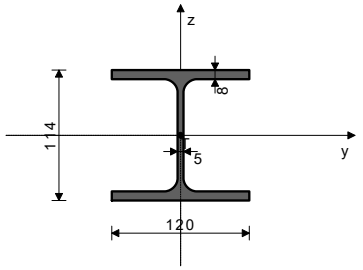
Opis	LC	σ [kN/cm²]	τ [kN/cm²]	σu [kN/cm²]
(40 - 31)	3	**8.853**	**0.568**	**8.908**
(10 - 2)	3	**8.798**	**0.633**	**8.866**
(31 - 18)	3	**8.798**	**0.633**	**8.866**
(33 - 28)	3	**6.562**	**0.551**	**6.631**
(35 - 32)	3	**6.562**	**0.551**	**6.631**
(38 - 34)	3	**6.562**	**0.551**	**6.631**
(41 - 36)	3	**6.562**	**0.551**	**6.631**
(30 - 22)	3	**3.386**	**0.284**	**3.422**
(42 - 40)	3	**3.386**	**0.284**	**3.422**
(3 - 14)	3	**0.606**	**0.141**	**0.636**
(12 - 24)	3	**0.606**	**0.141**	**0.636**
(14 - 26)	3	**0.620**	**0.090**	**0.628**
(24 - 37)	3	**0.620**	**0.090**	**0.628**
Set 3: D=1.2				
(7 - 26)	3	0.000	0.000	0.000
(14 - 19)	3	0.000	0.000	0.000
(17 - 37)	3	0.000	0.000	0.000
(24 - 29)	3	0.000	0.000	0.000
(27 - 25)	3	0.000	0.000	0.000
(15 - 39)	3	0.000	0.000	0.000



Izometrija
Kontrola stabilnosti

PALICA 31-10
PREČNI PREREZ: IPBI 120 [S 235] [Set: 1]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



[mm]

Ax =	25.300 cm2
Ay =	16.880 cm2
Az =	8.420 cm2
Ix =	6.020 cm4
Iy =	606.00 cm4
Iz =	231.00 cm4
Wy =	106.32 cm3
Wz =	38.500 cm3
Wy,pl =	116.40 cm3
Wz,pl =	57.600 cm3
γM0 =	1.100
γM1 =	1.100
γM2 =	1.250
Anet/A =	0.900

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB
3. γ=0.40 4. γ=0.28

PALICA IZPOSTAVLJENA PRITISKU IN UPOGIBU
(obtežni primer 3, na 70.0 cm od začetka palice)

Računska osna sila	Nsd =	-1.212 kN
Prečna sila v y smeri	Vsd_y =	0.206 kN
Prečna sila v z smeri	Vsd_z =	-25.776 kN
Upogibni moment okoli y osi	Msd_y =	-7.892 kNm
Upogibni moment okoli z osi	Msd_z =	0.018 kNm
Moment torzije	Mt =	-0.029 kNm
Sistemska dolžina palice	L =	420.00 cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.4 Tlak

Plastična računska nosilnost	Npl.Rd =	540.50 kN
Računska nosilnost na tlak	Nc.Rd =	540.50 kN

Pogoj 5.16: Nsd <= Nc.Rd (1.21 <= 540.50)

5.4.5 Upogib y-y

Računski plastični moment	Mpl.Rd =	24.868 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	22.713 kNm
Računski elastični moment	Mel.Rd =	22.713 kNm
Računska nosilnost na upogib	Mc.Rd =	24.868 kNm

Pogoj 5.17: Msd_y <= Mc.Rd_y (7.89 <= 24.87)

5.4.5 Upogib z-z

Računski plastični moment	Mpl.Rd =	12.305 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	8.225 kNm
Računski elastični moment	Mel.Rd =	8.225 kNm
Računska nosilnost na upogib	Mc.Rd =	12.305 kNm

Pogoj 5.17: Msd_z <= Mc.Rd_z (0.02 <= 12.31)

5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	103.85 kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (25.78 <= 103.85)

Računska plast.nos.na strig y-y	Vpl.Rd =	208.20 kN

Pogoj 5.20: Vsd_y <= Vpl.Rd_y (0.21 <= 208.20)

5.4.9 Upogib z osno in prečno silo
Ni potrebno zmanjšanje upogibne nosilnosti
Pogoj: Vsd_z <= 50%Vpl.Rd_z i Vsd_y <= 50%Vpl.Rd_y

5.4.8 Upogib in osna sila

Razmerje Msd_y / Mpl.Rd_y		0.317

Pogoj 5.36: (0.32 <= 1)

5.5 NOSILNOST ELEMENTOV
5.5.1 Uklonska nosilnost

Uklonska dolžina y-y	l,y =	420.00 cm
Vztrajnostni radij y-y	i,y =	4.894 cm
Vitkost y-y	λ,y =	85.817
Relativna vitkost y-y	λ_y =	0.914
Uklonska krivulja za os y-y: B	α =	0.340
Koeficient nepopolnosti	χ,y =	0.652
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_y =	352.53 kN

Pogoj 5.45: Nsd <= Nb.Rd_y (1.21 <= 352.53)

Uklonska dolžina z-z	l,z =	420.00 cm
Vztrajnostni radij z-z	i,z =	3.022 cm
Vitkost z-z	λ,z =	139.00
Relativna vitkost z-z	λ_z =	1.480
Uklonska krivulja za os z-z: C	α =	0.490
Koeficient nepopolnosti	χ,z =	0.321
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_z =	173.51 kN

Pogoj 5.45: Nsd <= Nb.Rd_z (1.21 <= 173.51)

5.5.2 Bočna zvrnitev upogibnih nosilcev

Koeficient	C1 =	1.132
Koeficient	C2 =	0.459
Koeficient	C3 =	0.525
Koef.ukl.dolžine za uklon	k =	1.000
Koef.ukl.dolžine za vbočenje	kw =	1.000
Koordinata	zg =	0.000 cm
Koordinata	zj =	0.000 cm
Razmak med bočnimi podporami	L =	420.00 cm
Sektorski vztrajnostni moment	Iw =	6471.9 cm6
Krit.moment bočne zvrnitve	Mcr =	44.222 kNm
Koeficient	βw =	1.000
Koeficient imperf.	αLT =	0.210
Brezdimenz.vitkost	λLT_ =	0.786
Koeficient zmanjšanja	χLT =	0.803
Računska uklonska nosilnost	Mb.Rd =	19.977 kNm

Pogoj 5.48: Msd_y <= Mb.Rd (7.89 <= 19.98)

5.5.4 Upogib in tlak

Koeficient nepopolnosti	χmin =	0.321
Nsd / ...		0.007
Koeficient oblike momenta	βy =	1.190
Koeficient	μy =	-1.386
Koeficient	ky =	1.004
ky * My / ...		0.319
Koeficient oblike momenta	βz =	1.015
Koeficient	μz =	-2.420
Koeficient	kz =	1.015
kz * Mz / ...		0.002

Pogoj 5.51: (0.33 <= 1)

Koeficient nepopolnosti	χ_z =	0.321
Nsd/ ...		0.007
Koeficient nepopolnosti	χLT =	0.803
Koef.obl.mom.za bočno zvrnitev	βM.LT =	1.190
Koeficient	μLT =	0.114
Koeficient	kLT =	0.999
kLT * My / ...		0.395
Koeficient oblike momenta	βz =	1.015
Koeficient	μz =	-2.420
Koeficient	kz =	1.015
kz * Mz / ...		0.002

Pogoj 5.52: (0.40 <= 1)

5.6 LOKALNO IZBOČENJE ZARADI STRIGA
za strig v ravnini z-z

Višina stojine	d =	9.800 cm
Debelina stojine	tw =	0.500 cm
Ni prečnih ojačitev v sredini		
Koeficient izbočenja pri strigu	k_τ =	5.340
Ni potrebna kontrola izbočenja zaradi striga		

Pogoj: d / tw <= 69 ε (19.60 <= 69.00)

5.6.7 Interakcija prečne sile, upogiba in osne sile
za strig v ravnini z-z

Računski plastični moment pasnic	Mf.Rd =	23.380 kNm

Pogoji 5.66a in 5.66b so izpolnjeni

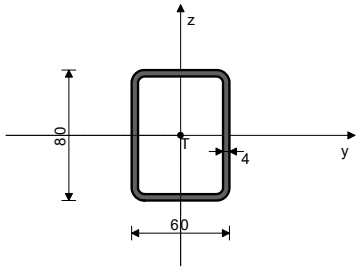
5.7 VNOS KONCENTRIRANIH SIL V STOJINO
5.7.7 Uklon pasnice v smeri stojine

Koeficient(razred pasnice 1)	k =	0.300
Površina stojine	Aw =	5.700 cm2
Površina tlač.pasnice	Afc =	9.600 cm2
Preprečen je uklon pasnice v smeri stojine		

Pogoj 5.80: (19.60 <= 206.57)

PALICA 23-36
PREČNI PREREZ: HOP [] 80x60x4 [S 235] [Set: 2]
EUROCODE 3 (ENV)

GEOMETRIJSKE KARAKTERISTIKE prereza



[mm]

Ax =	10.150 cm2
Ay =	4.350 cm2
Az =	5.800 cm2
Ix =	112.58 cm4
Iy =	87.920 cm4
Iz =	56.030 cm4
Wy =	21.980 cm3
Wz =	18.677 cm3
Wy,pl =	28.608 cm3
Wz,pl =	23.328 cm3
γM0 =	1.100
γM1 =	1.100
γM2 =	1.250
Anet/A =	0.900

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB
3. γ=0.65 4. γ=0.44

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

Računska osna sila	Nsd =	-0.177 kN
Prečna sila v z smeri	Vsd_z =	6.117 kN
Upogibni moment okoli y osi	Msd_y =	-3.910 kNm
Moment torzije	Mt =	0.028 kNm
Sistemska dolžina palice	L =	320.00 cm

5.3 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

5.4 NOSILNOST PREČNIH PREREZOV
5.4.4 Tlak

Plastična računska nosilnost	Npl.Rd =	216.84 kN
Računska nosilnost na tlak	Nc.Rd =	216.84 kN

Pogoj 5.16: Nsd <= Nc.Rd (0.18 <= 216.84)

5.4.5 Upogib y-y

Računski plastični moment	Mpl.Rd =	6.112 kNm
Računska nos.na lokalno izbočitev	Mo.Rd =	4.696 kNm
Računski elastični moment	Mel.Rd =	4.696 kNm
Računska nosilnost na upogib	Mc.Rd =	6.112 kNm

Pogoj 5.17: Msd_y <= Mc.Rd_y (3.91 <= 6.11)

5.4.6 Strig

Računska plast.nos.na strig z-z	Vpl.Rd =	71.539 kN

Pogoj 5.20: Vsd_z <= Vpl.Rd_z (6.12 <= 71.54)

5.4.9 Upogib z osno in prečno silo
Ni potrebno zmanjšanje upogibne nosilnosti
Pogoj: Vsd_z <= 50%Vpl.Rd_z

5.4.8 Upogib in osna sila

Razmerje Msd_y / Mpl.Rd_y		0.640

Pogoj 5.36: (0.64 <= 1)

5.5 NOSILNOST ELEMENTOV
5.5.1 Uklonska nosilnost

Uklonska dolžina y-y	l,y =	320.00 cm
Vztrajnostni radij y-y	i,y =	2.943 cm
Vitkost y-y	λ,y =	108.73
Relativna vitkost y-y	λ_y =	1.158
Uklonska krivulja za os y-y: B	α =	0.340
Koeficient nepopolnosti	χ,y =	0.501
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_y =	108.74 kN

Pogoj 5.45: Nsd <= Nb.Rd_y (0.18 <= 108.74)

Uklonska dolžina z-z	l,z =	320.00 cm
Vztrajnostni radij z-z	i,z =	2.350 cm
Vitkost z-z	λ,z =	136.20
Relativna vitkost z-z	λ_z =	1.450
Uklonska krivulja za os z-z: B	α =	0.340
Koeficient nepopolnosti	χ,z =	0.361
Koeficient efektivnega prereza	βA =	1.000
Računska uklonska nosilnost	Nb.Rd_z =	78.302 kN

Pogoj 5.45: Nsd <= Nb.Rd_z (0.18 <= 78.30)

5.5.2 Bočna zvrnitev upogibnih nosilcev

Koeficient	C1 =	1.285
Koeficient	C2 =	1.562
Koeficient	C3 =	0.753
Koef.ukl.dolžine za uklon	k =	1.000
Koef.ukl.dolžine za vbočenje	kw =	1.000
Koordinata	zg =	0.000 cm
Koordinata	zj =	0.000 cm
Razmak med bočnimi podporami	L =	320.00 cm
Sektorski vztrajnostni moment	Iw =	0.000 cm6
Krit.moment bočne zvrnitve	Mcr =	130.49 kNm
Koeficient	βw =	1.000
Koeficient imperf.	αLT =	0.210
Brezdimenz.vitkost	λLT_ =	0.227
Koeficient zmanjšanja	χLT =	0.994
Računska uklonska nosilnost	Mb.Rd =	6.075 kNm

Kontrola bočne zvrnitve ni potrebna: λ_LT <= 0.4

5.5.4 Upogib in tlak

Koeficient nepopolnosti	χmin =	0.361
Nsd / ...		0.002
Koeficient oblike momenta	βy =	1.347
Koeficient	μy =	-1.210
Koeficient	ky =	1.002
ky * My / ...		0.641

Pogoj 5.51: (0.64 <= 1)

Koeficient nepopolnosti	χ_z =	0.361
Nsd/ ...		0.002
Koeficient nepopolnosti	χLT =	0.994
Koef.obl.mom.za bočno zvrnitev	βM.LT =	1.347
Koeficient	μLT =	0.143
Koeficient	kLT =	1.000
kLT * My / ...		0.643

Pogoj 5.52: (0.65 <= 1)

5.6 LOKALNO IZBOČENJE ZARADI STRIGA
za strig v ravnini z-z

Višina stojine	d =	7.200 cm
Debelina stojine	tw =	0.400 cm

Ni prečnih ojačitev v sredini

Koeficient izbočenja pri strigu	k_τ =	5.340

Ni potrebna kontrola izbočenja zaradi striga
Pogoj: d / tw <= 69 ε (18.00 <= 69.00)

5.6.7 Interakcija prečne sile, upogiba in osne sile
za strig v ravnini z-z

Računski plastični moment pasnic	Mf.Rd =	4.102 kNm

Pogoji 5.66a in 5.66b so izpolnjeni

5.7 VNOS KONCENTRIRANIH SIL V STOJINO
5.7.7 Uklon pasnice v smeri stojine

Koeficient(razred pasnice 1)	k =	0.300
Površina stojine	Aw =	3.200 cm2
Površina tlač.pasnice	Afc =	2.400 cm2

Preprečen je uklon pasnice v smeri stojine
Pogoj 5.80: (9.00 <= 309.56)

GRADBENI BIRO
Vrvarska pot 1a
1310 Ribnica, Slovenija
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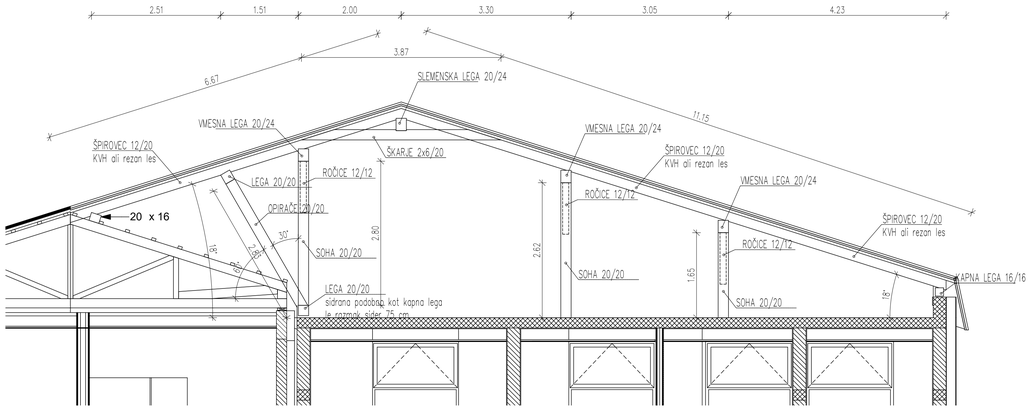
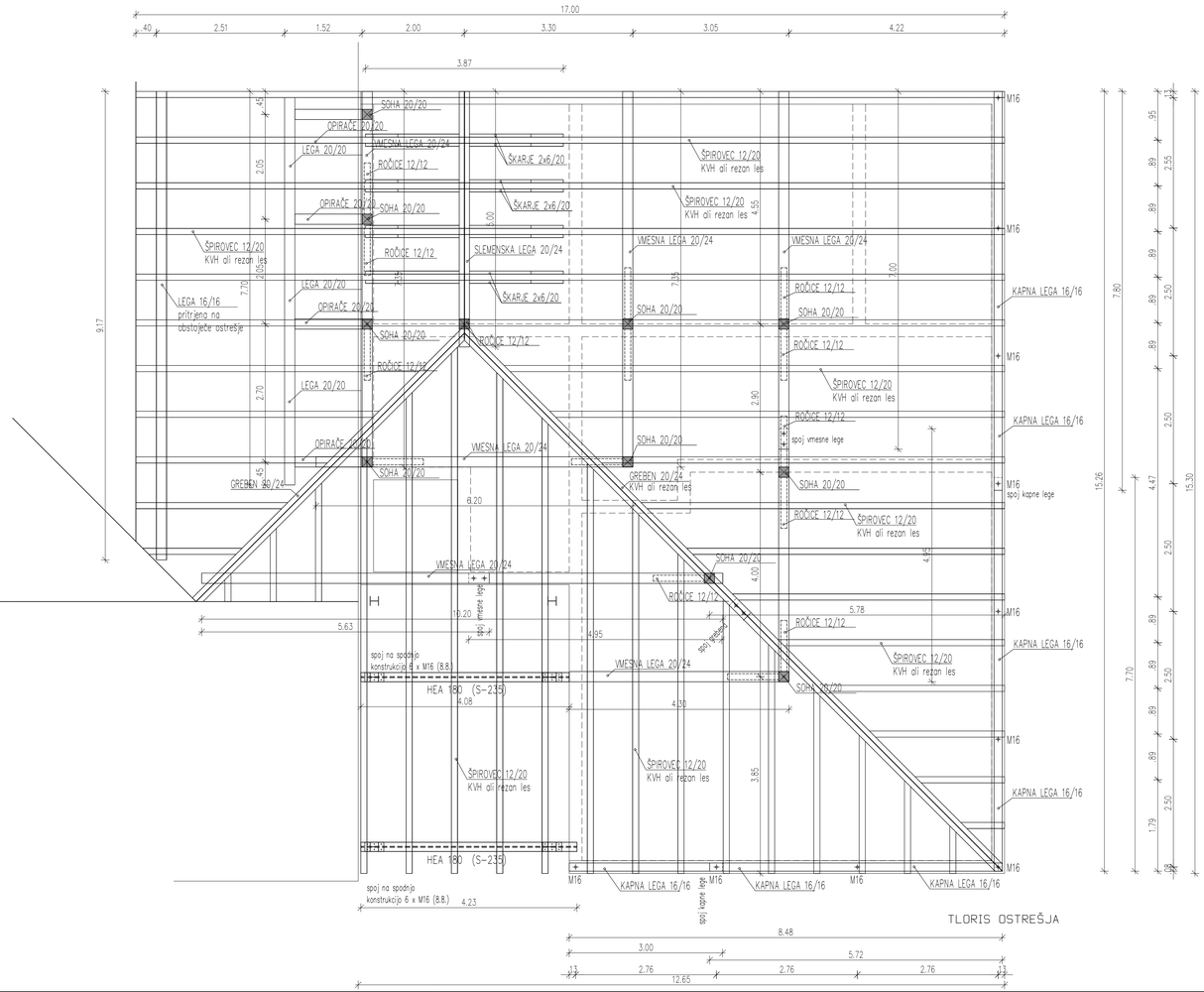
www.zasnova.si

2.6. NAČRT LESENE KONSTRUKCIJE

2.6.1. Načrt glavnega objekta – lesena konstrukcija



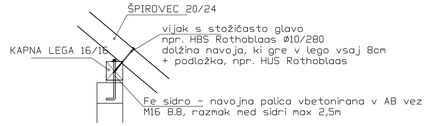
PREREZ PREKO OSTREŠJA



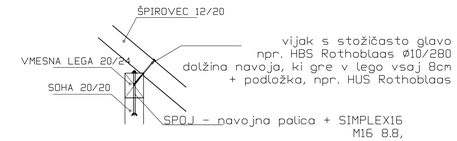
TLORIS OSTREŠJA

PRINCIP SPAJANJA

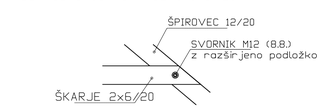
DETAJL SPOJA KAPNA LEGA-AB VEZ/PLOŠČA



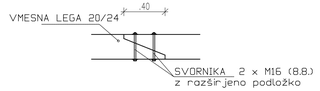
DETAJL SPOJA VMESNA LEGA-ŠPIROVEC



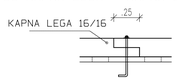
DETAJL SPOJA ŠKARJE-ŠPIROVEC



SPOJ VMESNA LEGA - VMESNA LEGE



SPOJ KAPNA LEGA - KAPNA LEGE



MATERIALI:

- LES:	C24	KVH 24	GL 24	CLT 24
- JEKLO:	S-235			
-VIJAKI	8.8.			

OPOMBE:
-- POSAMEZNE POZICIJE POTREBNO PRILAGODITI (pokriviti, porezati,..)
- VSE DIMEZIJE PREVERITI IN JIH USKLADITI NA LICU MESTA
- Preboje manjši od Ø 20cm niso v načrtu armature. Preboje uskladiti z ostalimi načrti
- Na mestu kjer se prekrivajo mreže je potrebno mreže obrniti tako, da se mreža uleže ena v drugo

SIDRA IZ TEMELJEV
TALNA PLOŠČA

ZAS NOV A
GRADBENI BIRO
Lovšin Tone s.p.
Vrvarska pot 1a
1310 Ribnica, Slovenija

LESENA KONSTRUKCIJA: OSTREŠJE — M 1:50 / 1:25

sestavni del:	2. Načrt gradbeništva	št. projekta:	04-2019-PZI
		št. načrta:	04-2019-PZI-Gk
objekt:	Prenova in širitev kuhinje - OŠ PT VL		
vodja projekta:	Miha Novina, univ. dipl. inž. arh., ZAPS A 1654	faza projekta:	PZI
pooblaščeni inž./arh.:	Tone Lovšin, dipl. inž. grad., IZS G - 0379	datum:	julij 2024
sodelavec:	Sandi Mohar, dipl. inž. grad., IZS G - 4126	št. lista:	2.6.1.

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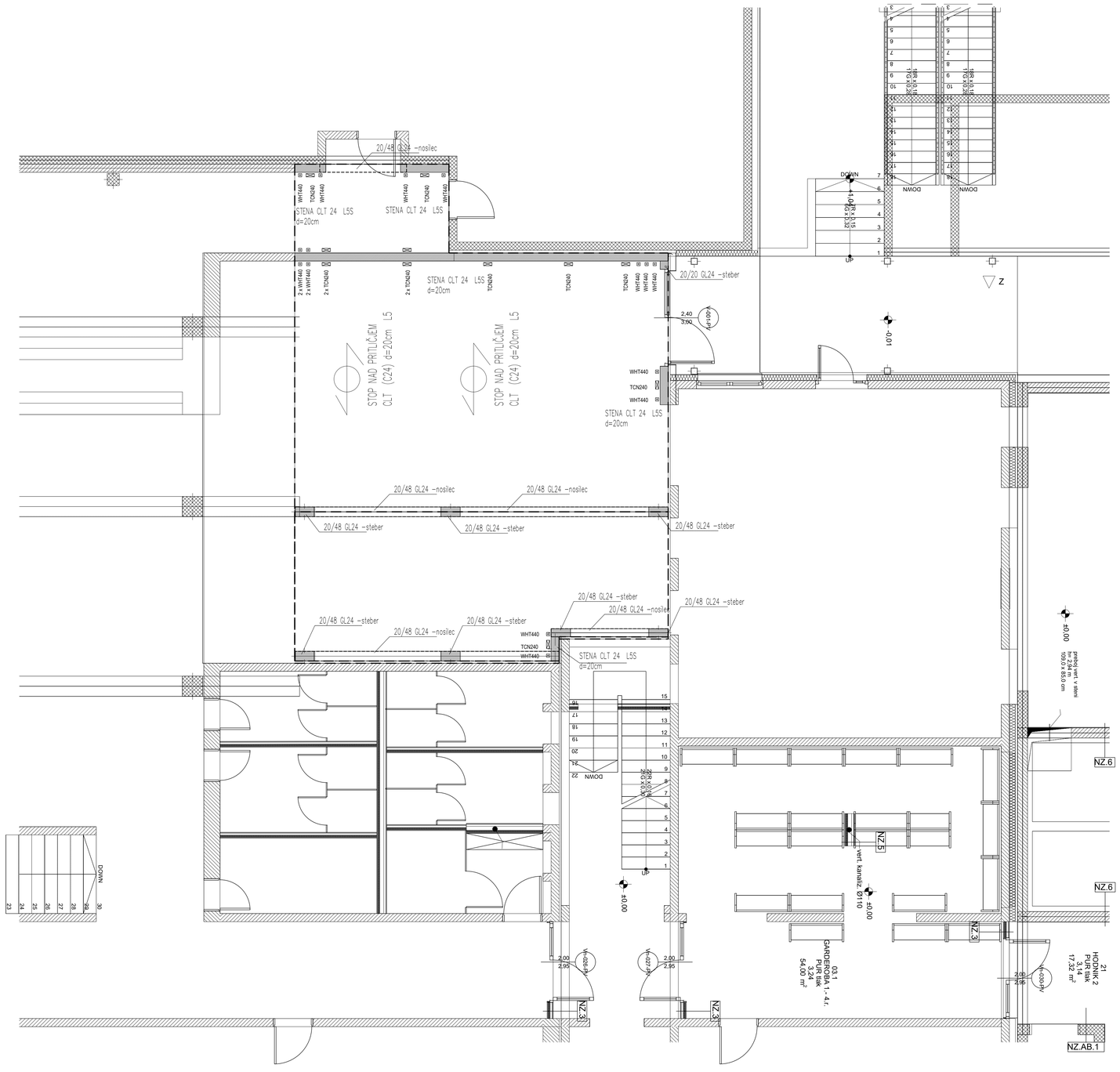
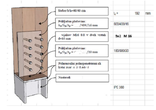
www.zasnova.si

2.6.2. Načrt vmesnega dela – lesena konstrukcija



STEBRE pritrditi na talno ploščo z Fe čevljem



SIDRANJE V TLA Z PLOŠČO 200/480/20 mm in 8 x M 16 (8.8.) + epoksi lepilo

SIDRANJE LESENIH ELEMENTOV

- WHT340; ŽEBLJI Ø4,0 x 60 kos 20 + M16 x 180 (8.8.) + FIS V (FIS A, RGM, R-70)
- WHT440; ŽEBLJI Ø4,0 x 60 kos 30 + M16 x 180 (8.8.) + FIS V (FIS A, RGM, R-70)
- WHTPLATE 540; ŽEBLJI Ø4,0 x 60 kos 50 + 2 X M16 x 190 (8.8.) + FIS V (FIS A, RGM, R-70)
- TCN 240; ŽEBLJI Ø5,0 x 50 kos 36 + 2 X M16 x 180 (8.8.) + FIS V (FIS A, RGM, R-70)

NAVODILA ZA SPAJANJE ELEMENTOV

- PRI MONTAŽI KOVINSKIH SIDER, JE POTREBNO UPOŠTEVATI NAVODILA IN PREDPISANE ODMIKE PROIZVAJALCA!
- STRIŽNE POVEZAVE NOTRANJIH STEN – STROP NAD STENO , HBS 10x260/20cm
- STRIŽNE POVEZAVE STEN – STROP NAD STENO, HBS 10x260/15cm
- NOSILCI NALEGAJO NA CLT STENO miN. 20cm, RAzen kjer je označeno drugače. SPOJ NOSILEC, STENA, SE POVEŽEJO S KRIŽNO VIJAČNIMI VIJAKI VGZ 7x140, PAROV/SPOJ.
- STROPNE PLOŠČE SE MED SEBOJ POVEŽEJO S KRIŽNO VIAJČNIMI VIJAKI VGZ 7x140/20cm. ALI PA SE NA SPOJIH SOSEDNJIH PLOŠČ POREZKA UTOR 20/100mm, KI SE GA PREKRIJE Z VEZANO PLOŠČO 20mm, KI SE JO NA OBEH SOSEDNJIH PLOŠČAH PRITRDI Z REBRASTIMI ŽEBLJI SN21RK 80RHG, NA MEDSEBOJNI RAZDALJI 5cm.
- STRIŽNA POVEZAVA NOTRANJA STENA – STROP NAD STENO, HBS 10x260/20cm
- STRIŽNA POVEZAVA FASADA STENA – STROP NAD STENO, HBS 10x260/15cm
- PRAVOKOTNE CLT STENE SE MED SEBOJ POVEŽEJO S HBS 10x200/20cM

OPOMBA:

- POZICIJSKI NAČRT GLEJ SKUPAJ Z NAČRTOM ARHITEKTURE!
- VSE MERE PREVERITI IN USKADITI NA LICU MESTA
- MED IZVORO DEL MORA BITI ZAGOTOVLJEN STROKOVNI NADZOR, KI BO ZAGOTOVIL SKLADNOST GRADNJE S POGOJI IZ GRABDENEGA DOVOLJENJA IN KVALITETO IZVEDENIH DEL SKLADNO Z GRADBENIMI POSEGI.
- V PRIMERU NEJASTNOSTI ALI SPREMEMB POGOJEV PRI IZVEDBI JE POTREBNO KONZULTIRATI PROJEKTANTA

MATERIALI:

- LES:	C24	KVH 24	GL 24	CLT 24
- JEKLO:	S-235			
-VIJAKI	8.8.			

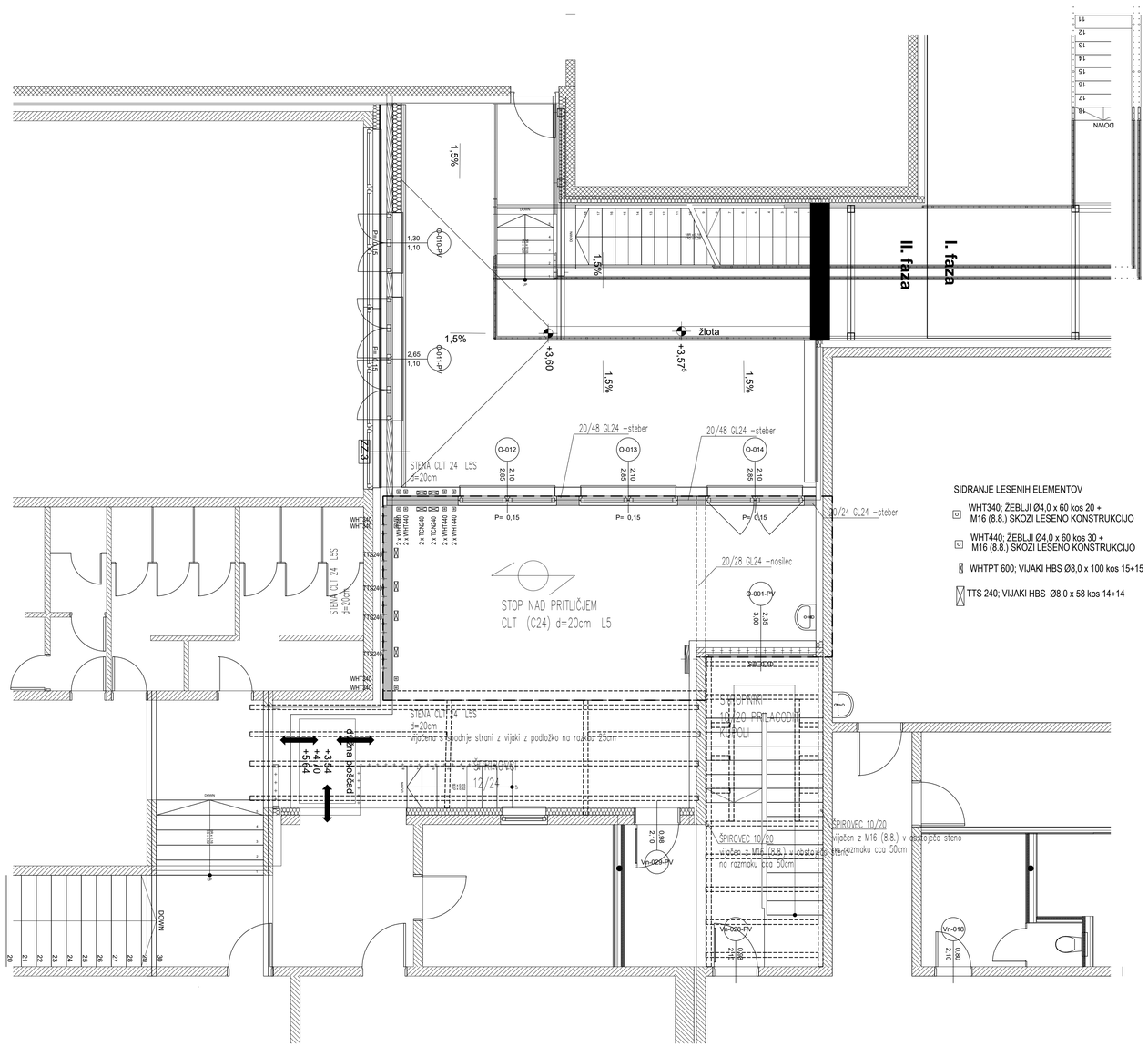
OPOMBE:
-- POSAMEZNE POZICIJE POTREBNO PRILAGODITI (pokriviti, porezati,..)
- VSE DIMEZIJE PREVERITI IN JIH USKLADITI NA LICU MESTA
- Preboje manjši od Ø 20cm niso v načrtu armature. Preboje uskladiti z ostalimi načrti
- Na mestu kjer se prekrivajo mreže je potrebno mreže obriti tako, da se mreža uleže ena v drugo

VMESNI MONTAŽNI DEL

ZAS NOV A
GRADBENI BIRO
Lovšin Tone s.p.
Vrvarska pot 1a
1310 Ribnica, Slovenija

LESENA KONSTRUKCIJA: PRITLIČJE - SIDRA M 1:50 / 1:25

sestavni del:	2. Načrt gradbeništva	št. projekta:	04-2019-PZI
		št. načrta:	04-2019-PZI-Gk
objekt:	Prenova in širitev kuhinje - OŠ PT VL		
vodja projekta:	Miha Novina, univ. dipl. inž. arh., ZAPS A 1654	faza projekta:	PZI
pooblaščeni inž./arh.:	Tone Lovšin, dipl. inž. grad., IZS G - 0379	datum:	julij 2024
sodelavec:	Sandi Mohar, dipl. inž. grad., IZS G - 4126	št. lista:	2.6.2.



SIDRANJE LESENIH ELEMENTOV

- WHT340; ŽEBLJI Ø4,0 x 60 kos 20 + M16 (8.8.) SKOZI LESENO KONSTRUKCIJO
- WHT440; ŽEBLJI Ø4,0 x 60 kos 30 + M16 (8.8.) SKOZI LESENO KONSTRUKCIJO
- WHTPT 600; VIJAKI HBS Ø8,0 x 100 kos 15+15
- TTS 240; VIJAKI HBS Ø8,0 x 58 kos 14+14

NAVODILA ZA SPAJANJE ELEMENTOV

- PRI MONTAŽI KOVINSKIH SIDER, JE POTREBNO UPOŠTEVATI NAVODILA IN PREDPISANE ODMIKE PROIZVAJALCA!
- STRIŽNE POVEZAVE NOTRANJIH STEN – STROP NAD STENO , HBS 10x260/20cm
- STRIŽNE POVEZAVE STEN – STROP NAD STENO, HBS 10x260/15cm
- NOSILCI NALEGAJO NA CLT STENO min. 20cm, RAzen kjer je označeno drugače. SPOJ NOSILEC, STENA, SE POVEŽEJO S KRIŽNO VIJAČNIMI VIJAKI VGZ 7x140, PAROV/SPOJ.
- STROPNE PLOŠČE SE MED SEBOJ POVEŽEJO S KRIŽNO VIAJČNIMI VIJAKI VGZ 7x140/20cm. ALI PA SE NA SPOJIH SOSEDNJIH PLOŠČ POREZKA UTOR 20/100mm, KI SE GA PREKRIJE Z VEZANO PLOŠČO 20mm, KI SE JO NA OBEH SOSEDNJIH PLOŠČAH PRITRDI Z REBRASTIMI ŽEBLJI SN21RK 80RHG, NA MEDSEBOJNI RAZDALJI 5cm.
- STRIŽNA POVEZAVA NOTRANJA STENA – STROP NAD STENO, HBS 10x260/20cm
- STRIŽNA POVEZAVA FASADA STENA – STROP NAD STENO, HBS 10x260/15cm
- PRAVOKOTNE CLT STENE SE MED SEBOJ POVEŽEJO S HBS 10x200/20cM

OPOMBA:

- POZICIJSKI NAČRT GLEJ SKUPAJ Z NAČRTOM ARHITEKTURE!
- VSE MERE PREVERITI IN USKADITI NA LICU MESTA
- MED IZVORO DEL MORA BITI ZAGOTOVLJEN STROKOVNI NADZOR, KI BO ZAGOTOVIL SKLADNOST GRADNJE S POGOJI IZ GRABDENEGA DOVOLJENJA IN KVALITETO IZVEDENIH DEL SKLADNO Z GRADBENIMI POSEGI.
- V PRIMERU NEJASTNOSTI ALI SPREMEMB POGOJEV PRI IZVEDBI JE POTREBNO KONZULTIRATI PROJEKTANTA

MATERIALI:

- LES:	C24	KVH 24	GL 24	CLT 24
- JEKLO:	S-235			
-VIJAKI	8.8.			

OPOMBE:
-- POSAMEZNE POZICIJE POTREBNO PRILAGODITI (pokriviti, porezati,..)
- VSE DIMEZIJE PREVERITI IN JIH USKLADITI NA LICU MESTA
- Preboje manjši od Ø 20cm niso v načrtu armature. Preboje uskladiti z ostalimi načrti
- Na mestu kjer se prekrivajo mreže je potrebno mreže obrniti tako, da se mreža uleže ena v drugo

VMESNI MONTAŽNI DEL

ZASNOVA
GRADBENI BIRO
Lovšin Tone s.p.
Vrvarska pot 1a
1310 Ribnica, Slovenija

LESENA KONSTRUKCIJA: NADSTROPJE - SIDRA M 1:50 / 1:25

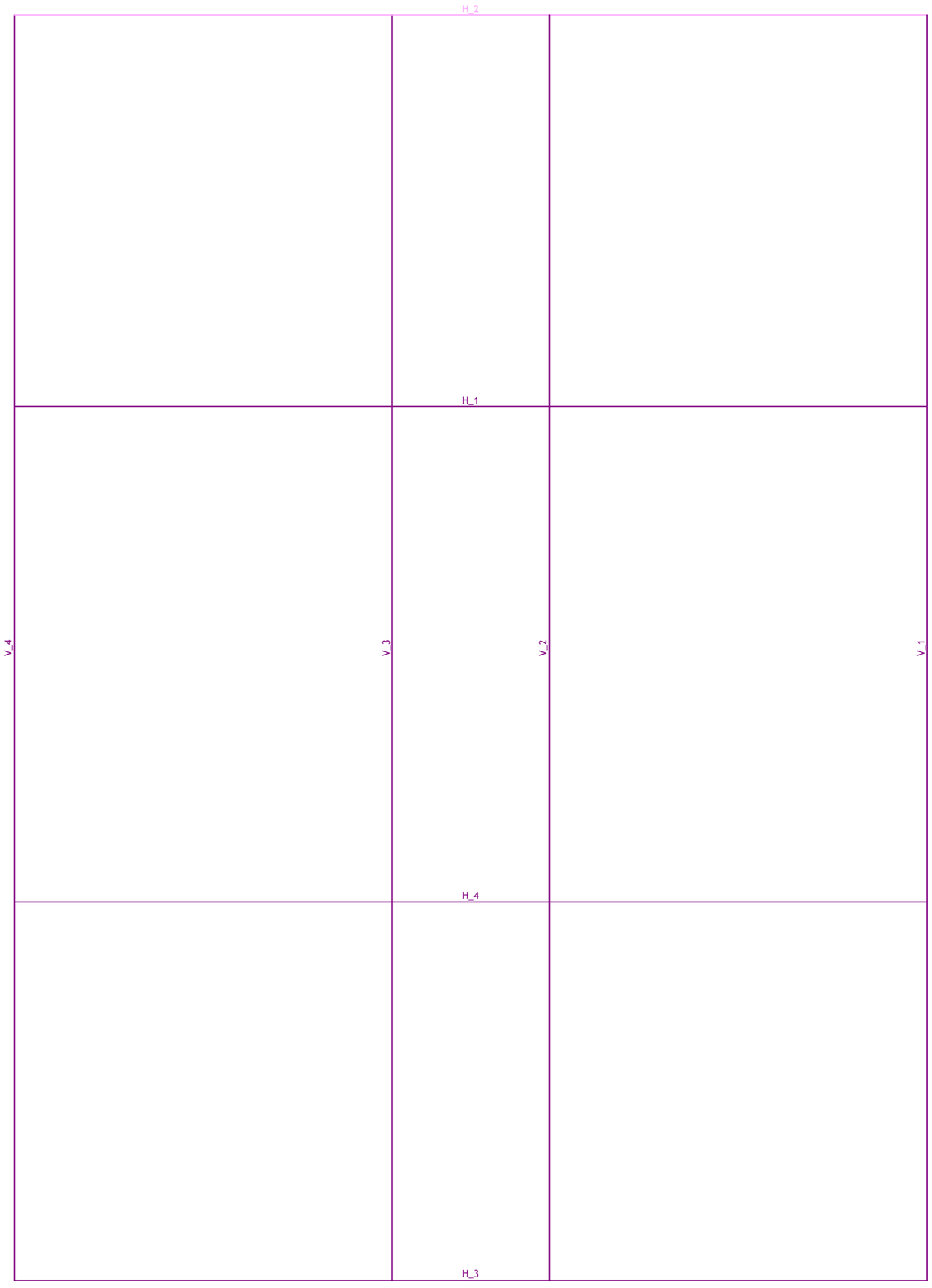
sestavni del:	2. Načrt gradbeništva	št. projekta:	04-2019-PZI
		št. načrta:	04-2019-PZI-Gk
objekt:	Prenova in širitev kuhinje - OŠ PT VL		
vodja projekta:	Miha Novina, univ. dipl. inž. arh., ZAPS A 1654	faza projekta:	PZI
pooblaščeni inž./arh.:	Tone Lovšin, dipl. inž. grad., IZS G - 0379	datum:	julij 2024
sodelavec:	Sandi Mohar, dipl. inž. grad., IZS G - 4126	št. lista:	2.6.3.

GRADBENI BIRO
Vrvarska pot 1a
1310 Ribnica, Slovenija
T 01 836 90 60
info@zasnova.si
www.zasnova.si

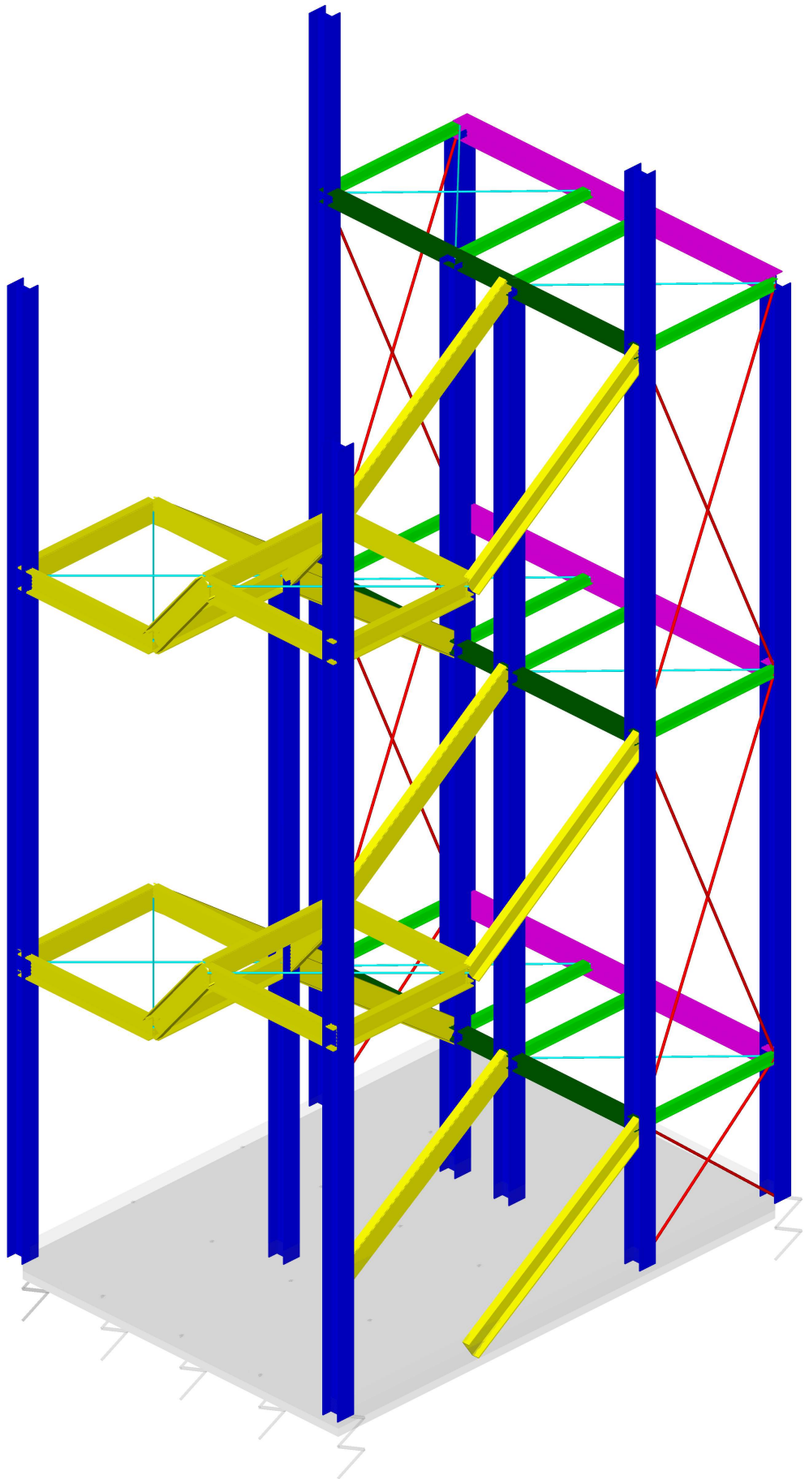
2.7. NAČRT JEKLENE KONSTRUKCIJE

2.7.1. Dispozicija glavnega – požarnega stopnišča

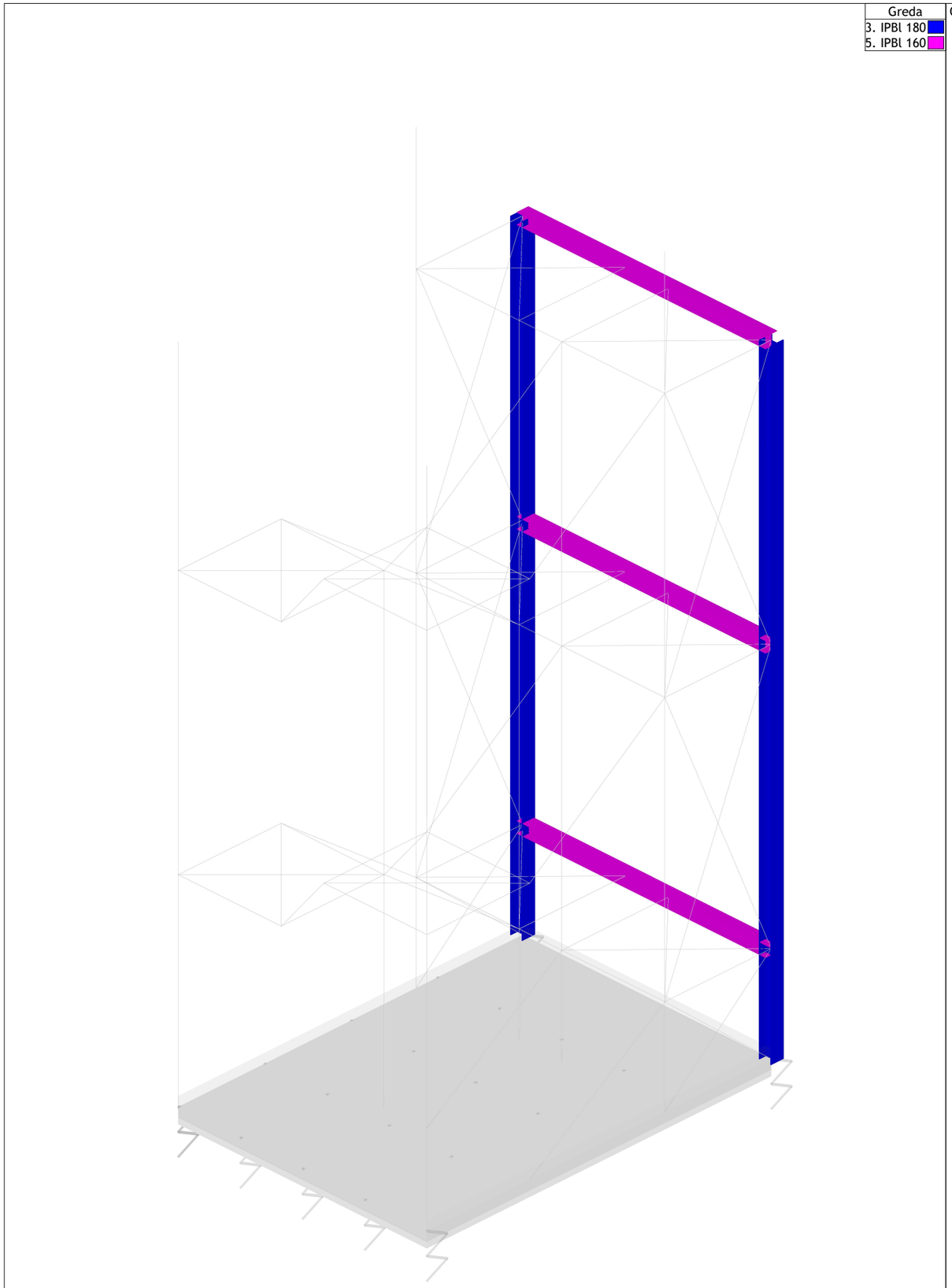
Vhodni podatki - Konstrukcija



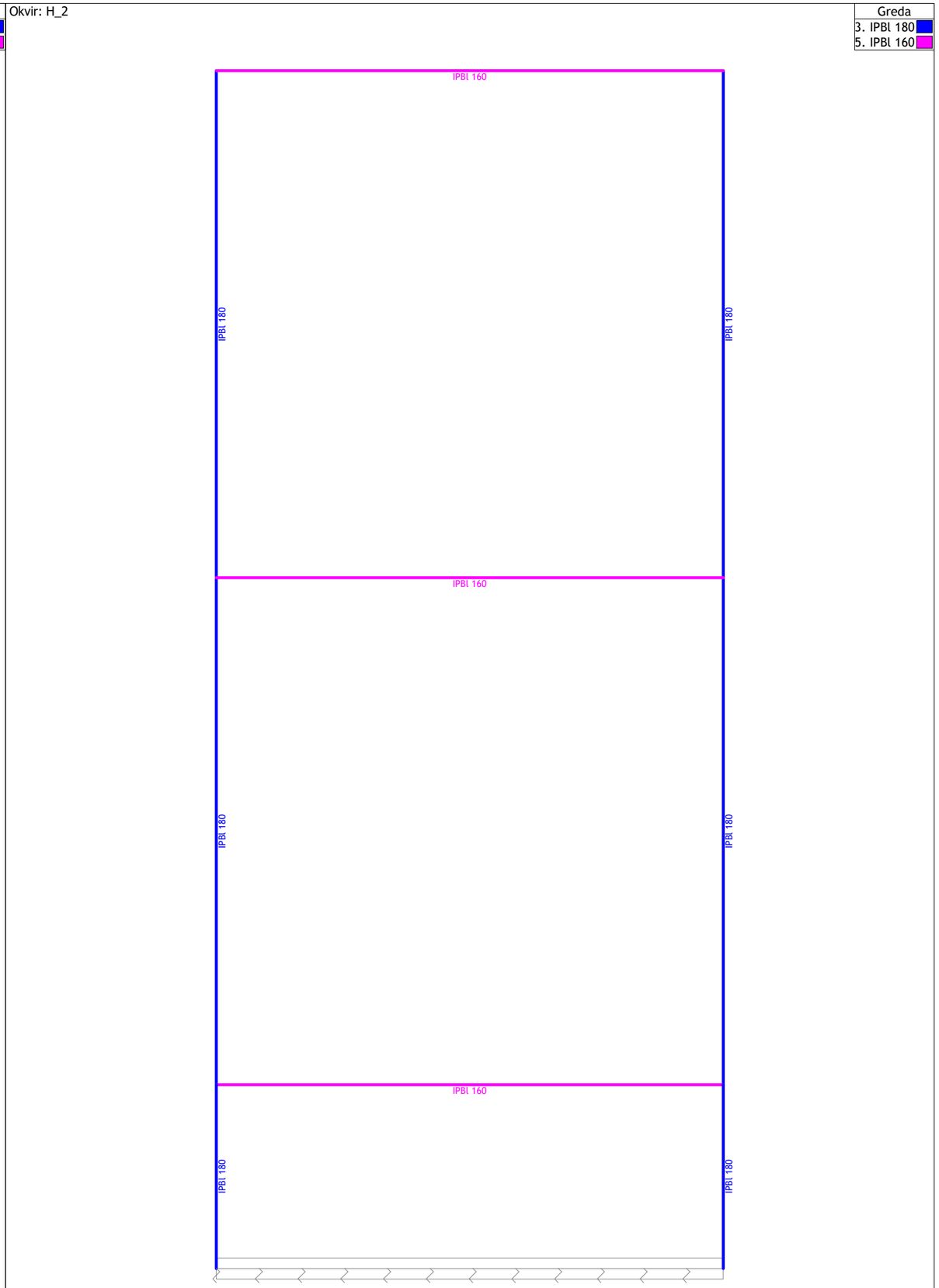
Dispozicija okvirjev



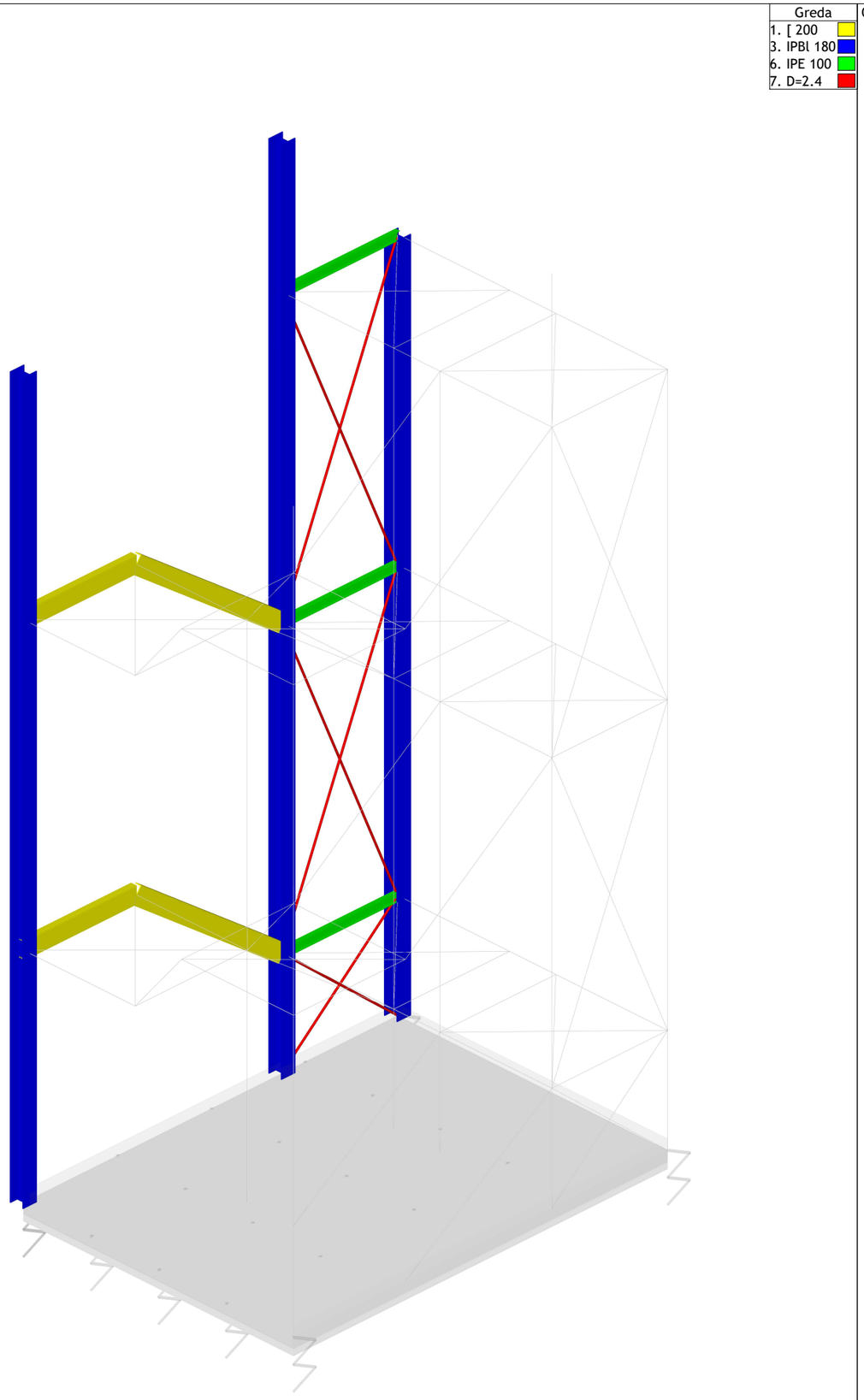
Seti numeričnih podatkov
Greda (1-9)



Seti numeričnih podatkov
Greda (3,5)

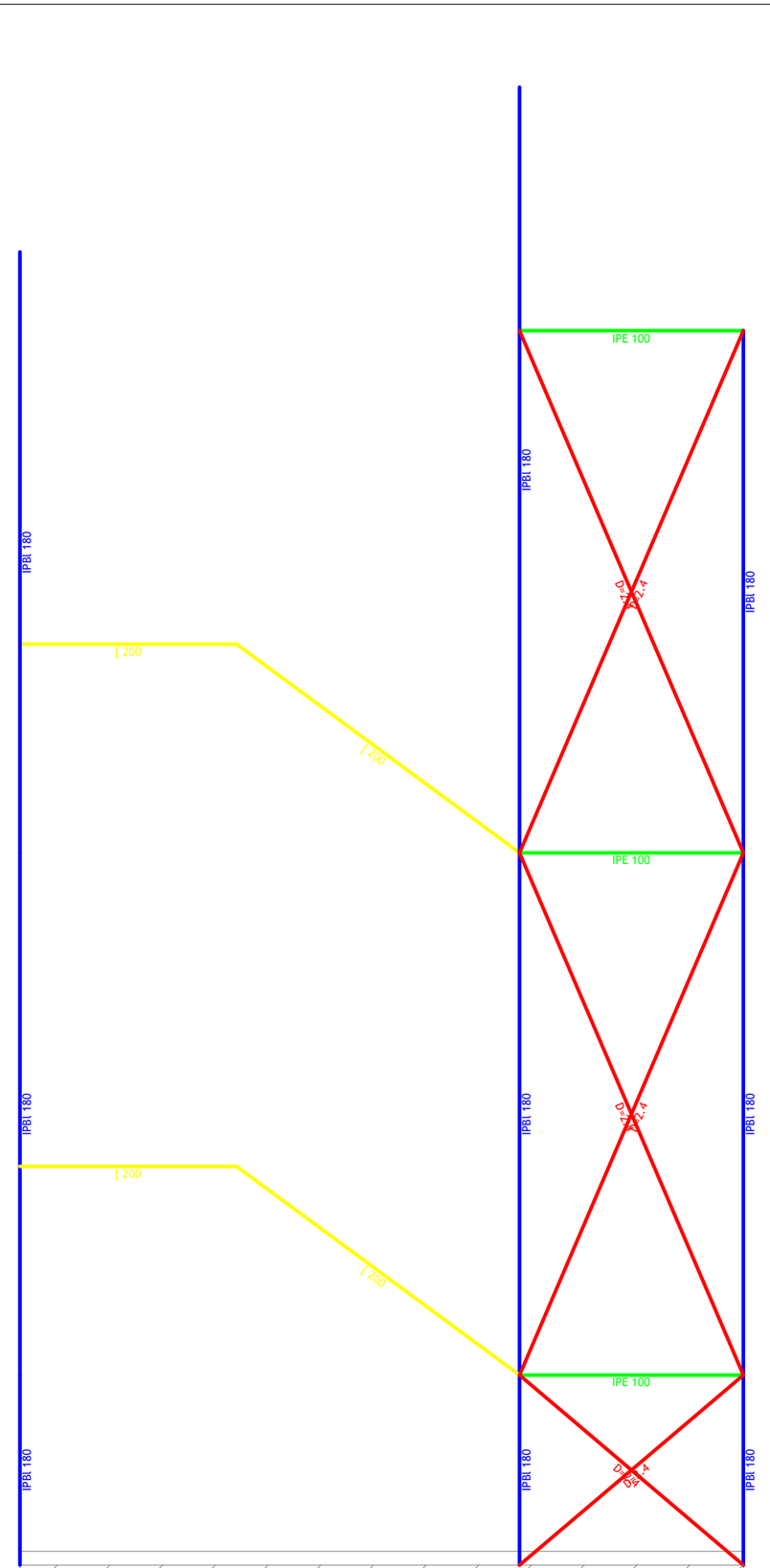


Seti numeričnih podatkov
Greda (3,5)



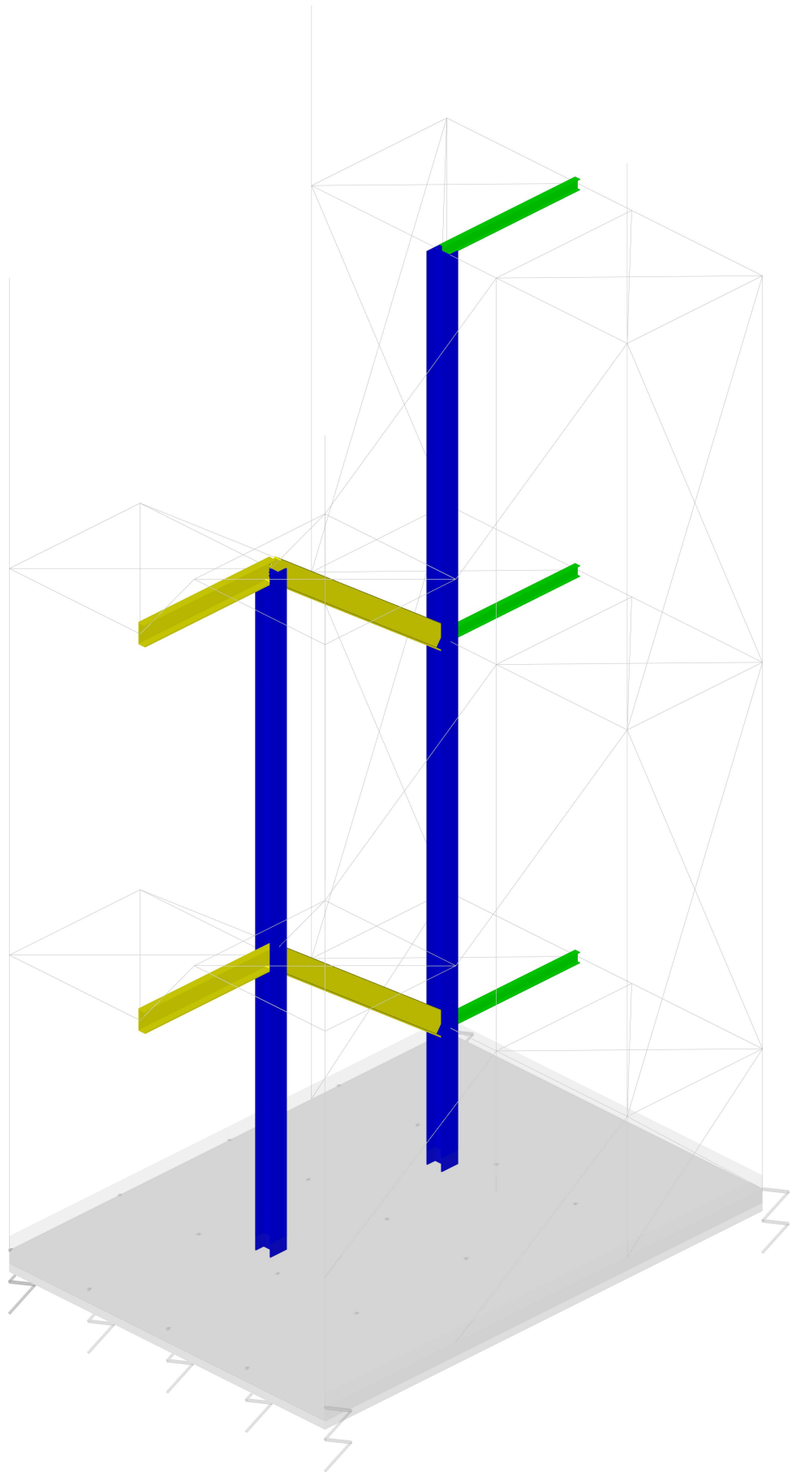
Seti numeričnih podatkov
Greda (1,3,6,7)

Okvir: V_4



Seti numeričnih podatkov
Greda (1,3,6,7)

Greda
2. [200
3. IPBl 180
6. IPE 100



Seti numeričnih podatkov
Greda (2,3,6)

Okvir: V_3

Greda
2. [200
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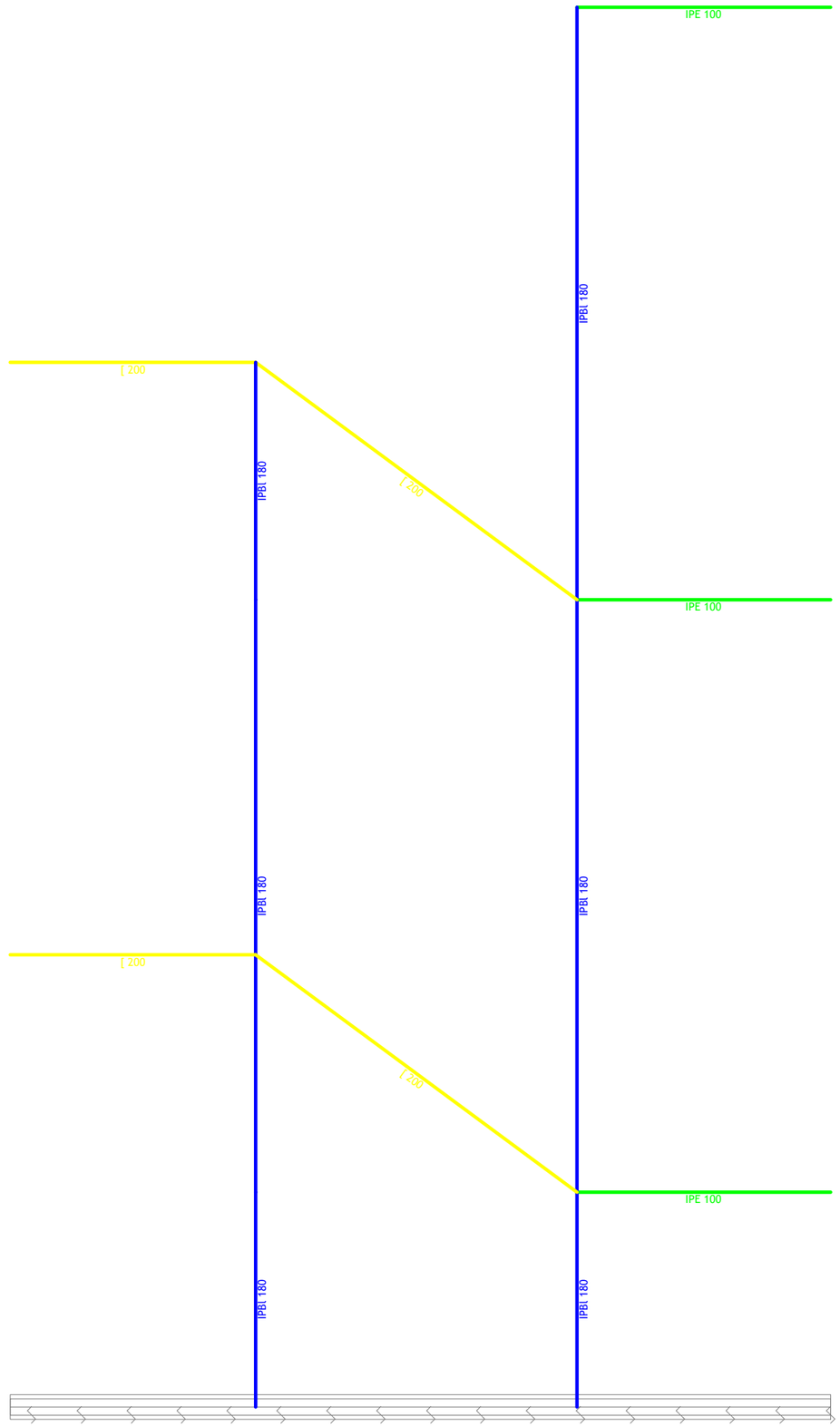
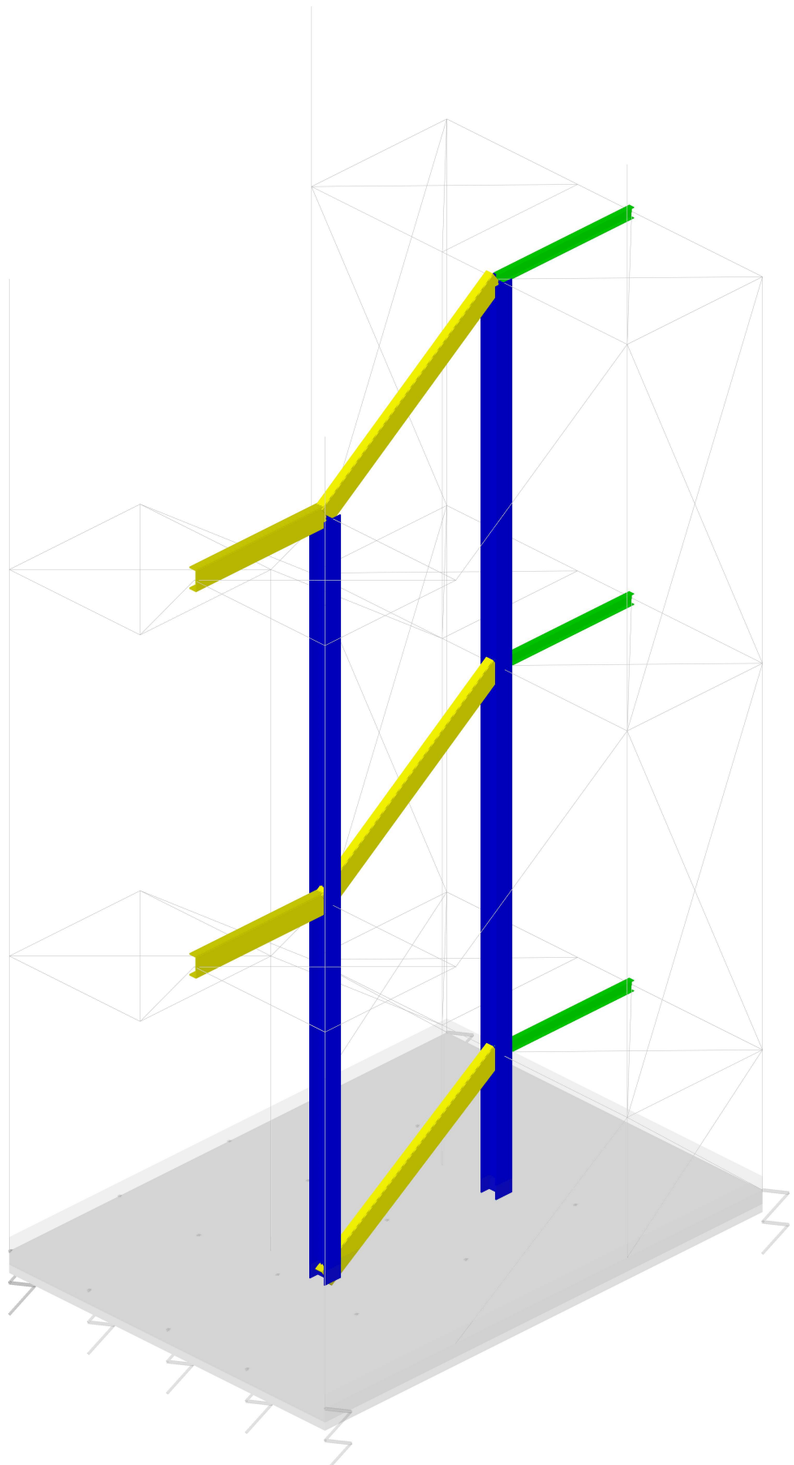
6. IPE 100



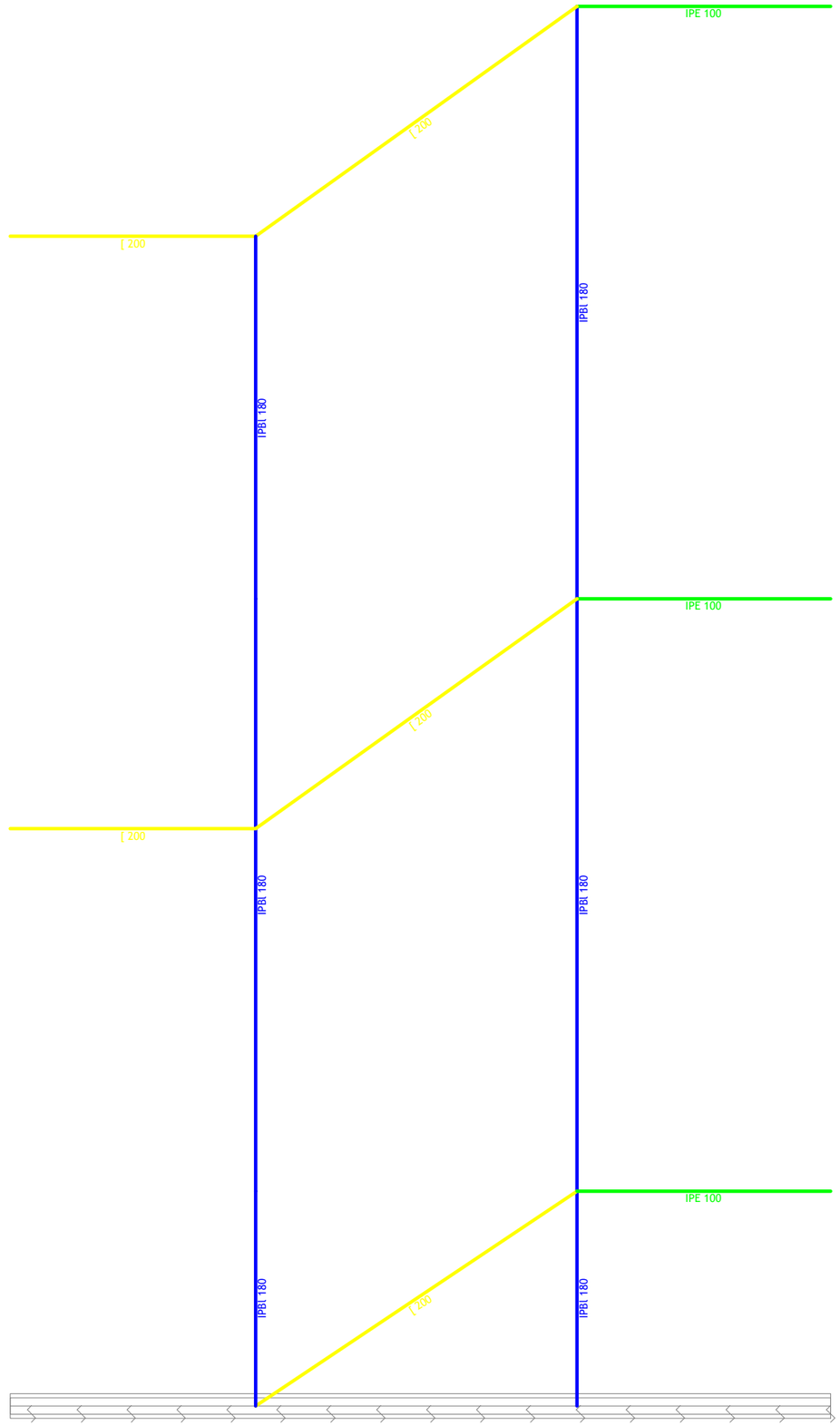
Seti numeričnih podatkov
Greda (2,3,6)

Greda
2. [200
3. IPBl 180
6. IPE 100



Seti numeričnih podatkov
Greda (2,3,6)

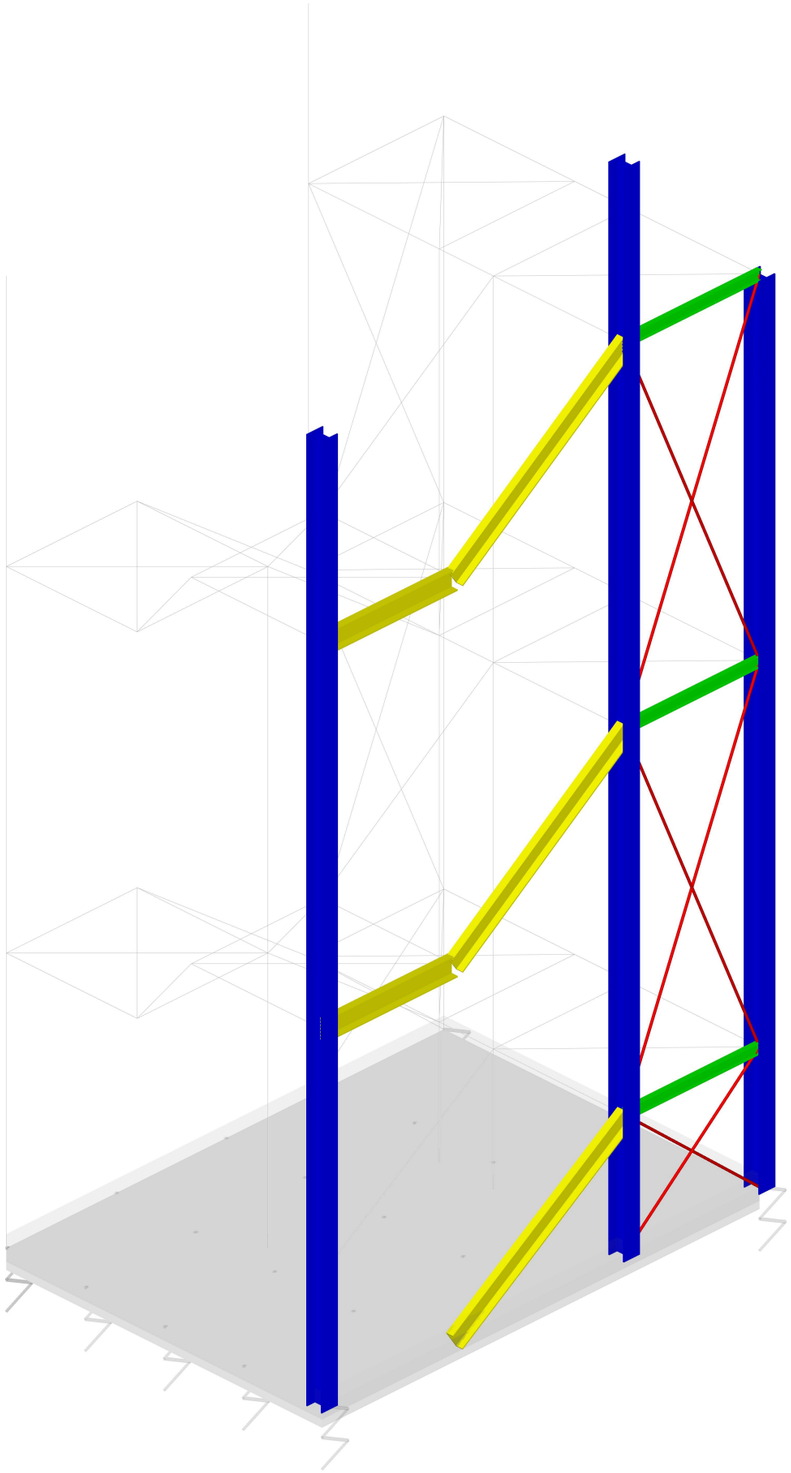
Okvir: V_2



Greda
2. [200
3. IPBl 180
6. IPE 100

Seti numeričnih podatkov
Greda (2,3,6)

Greda
1. [200
3. IPBl 180
6. IPE 100
7. D=2.4



Seti numeričnih podatkov
Greda (1,3,6,7)

Okvir: V_1

Greda
1. [200
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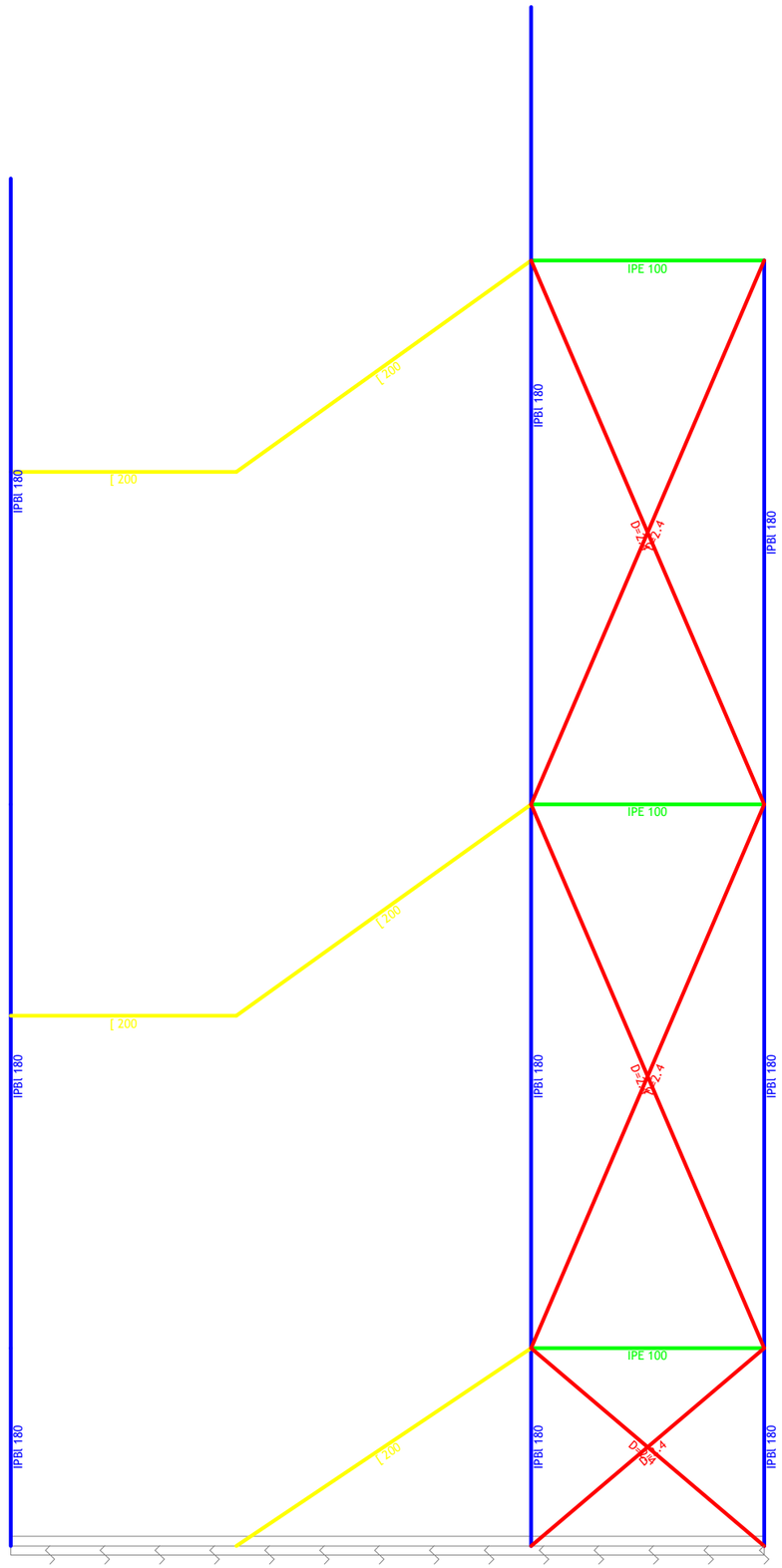
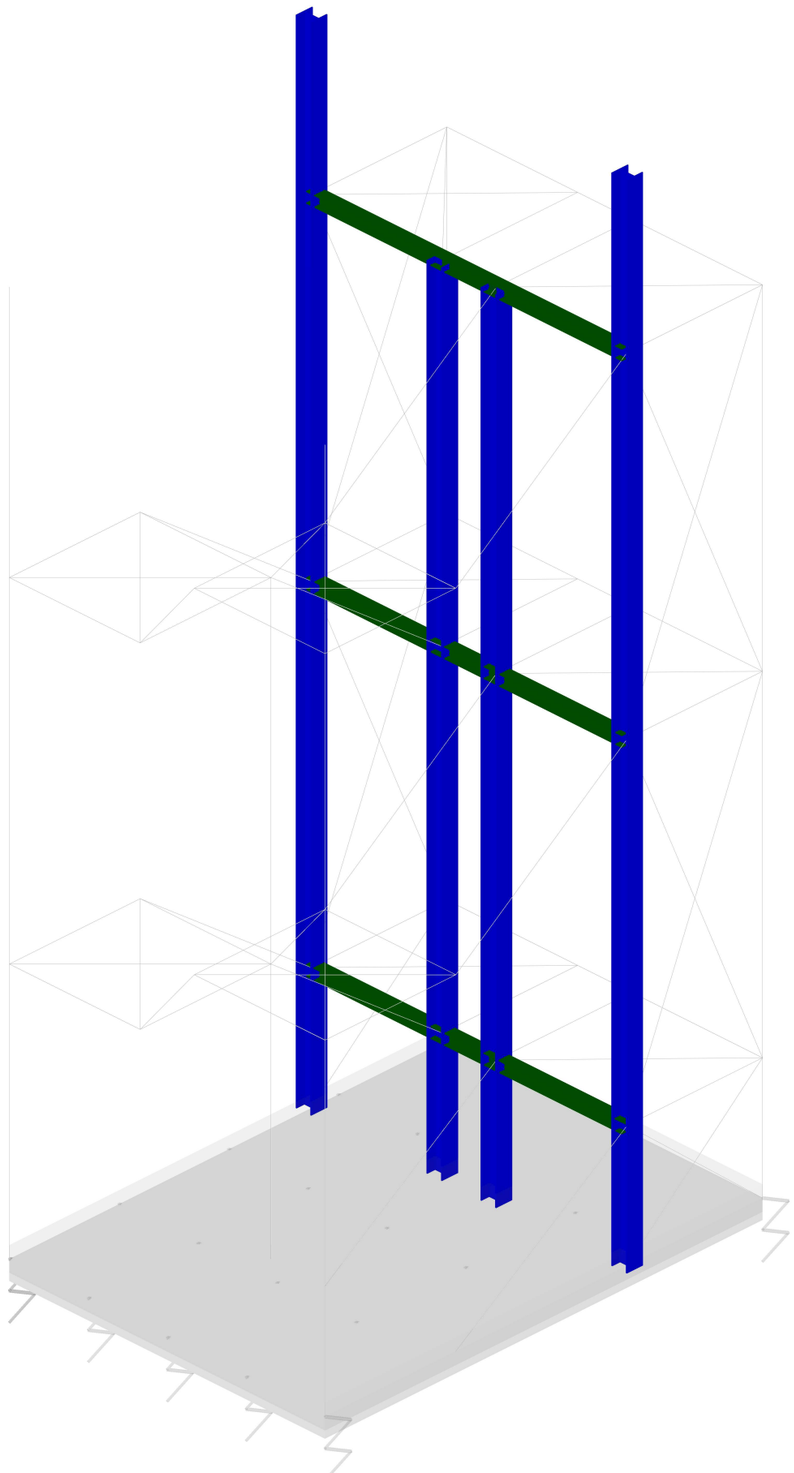
6. IPE 100
7. D=2.4



Seti numeričnih podatkov
Greda (1,3,6,7)

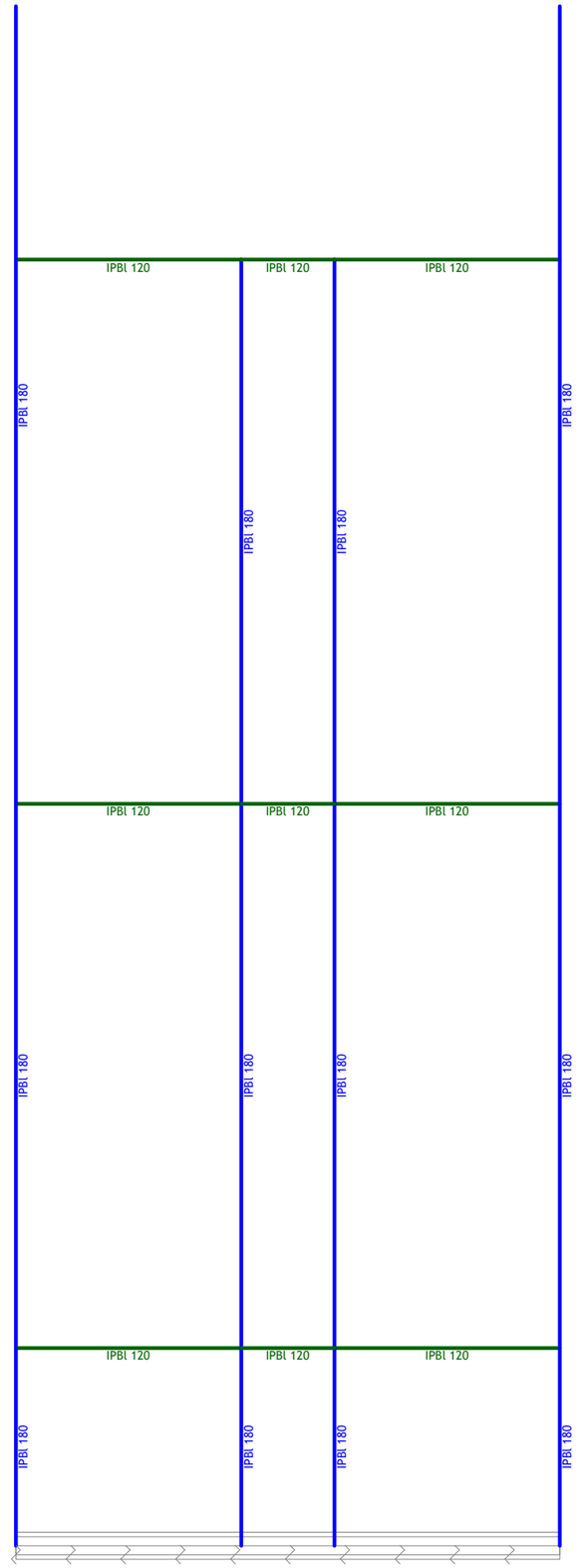
Greda
3. IPBl 180
4. IPBl 120



Seti numeričnih podatkov
Greda (3,4)

Okvir: H_1

Greda
3. IPBl 180
4. IPBl 120



Seti numeričnih podatkov
Greda (3,4)

Greda
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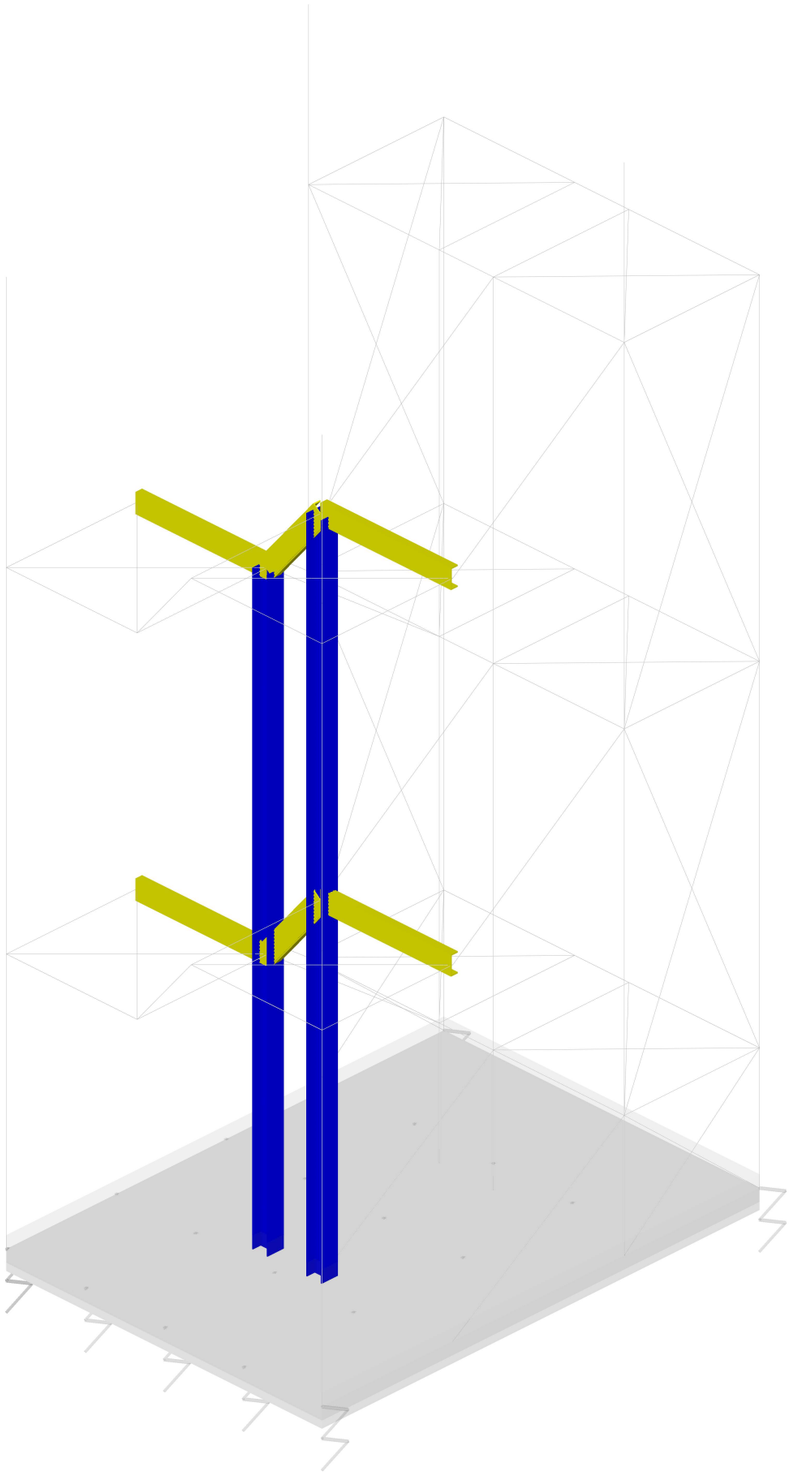
3. IPBl 180



Seti numeričnih podatkov
Greda (2,3)

Okvir: H_4

Greda
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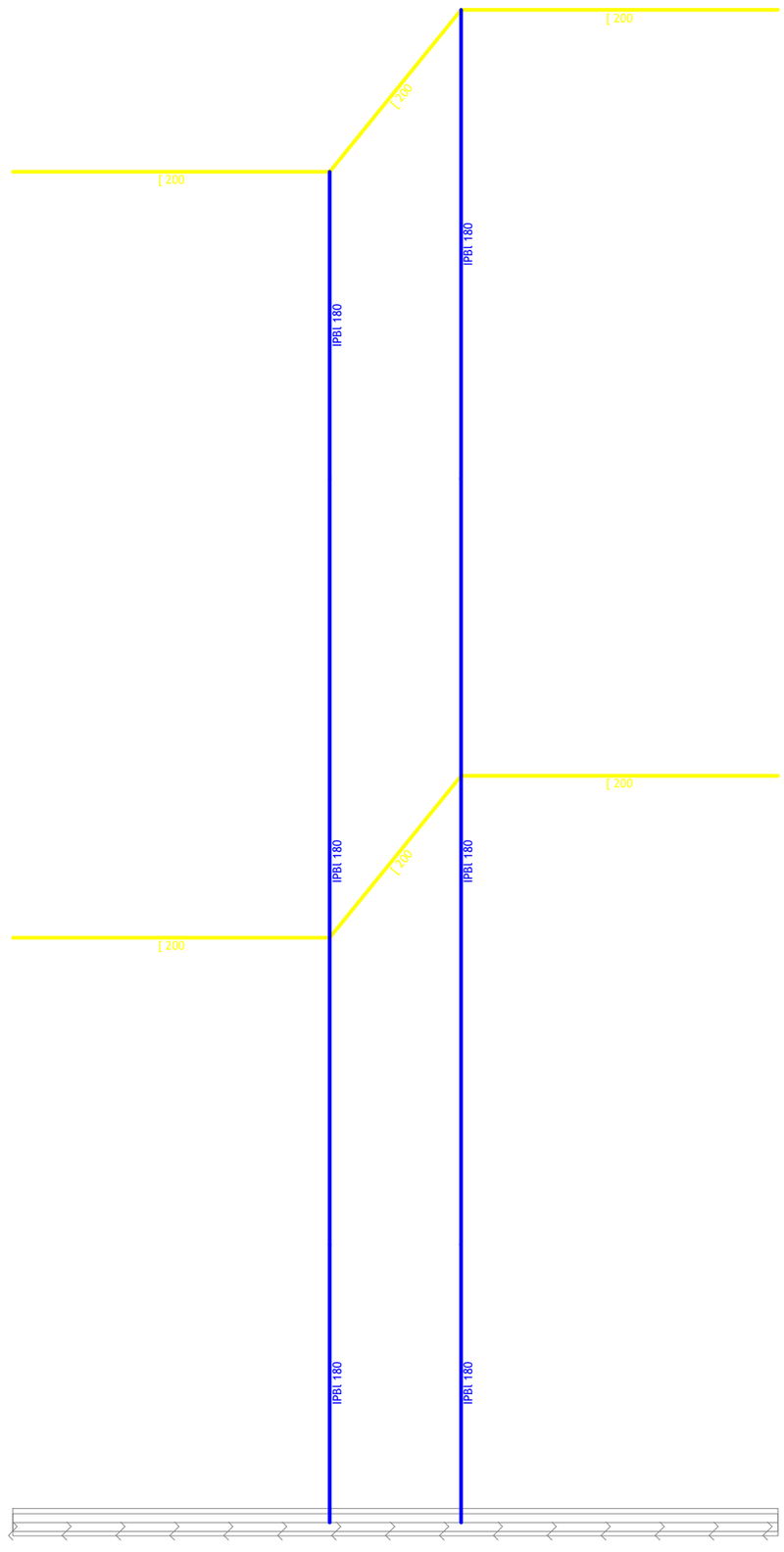
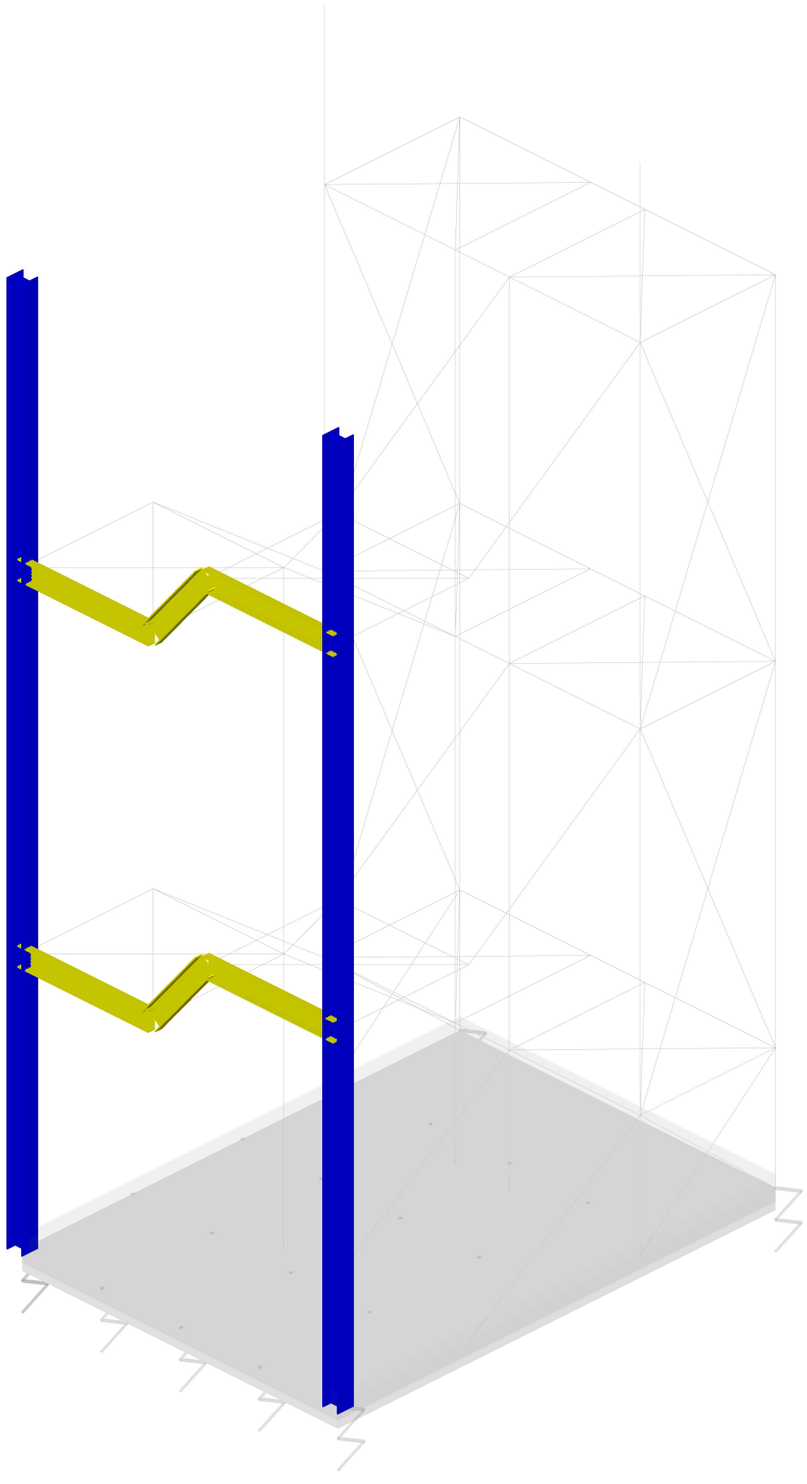
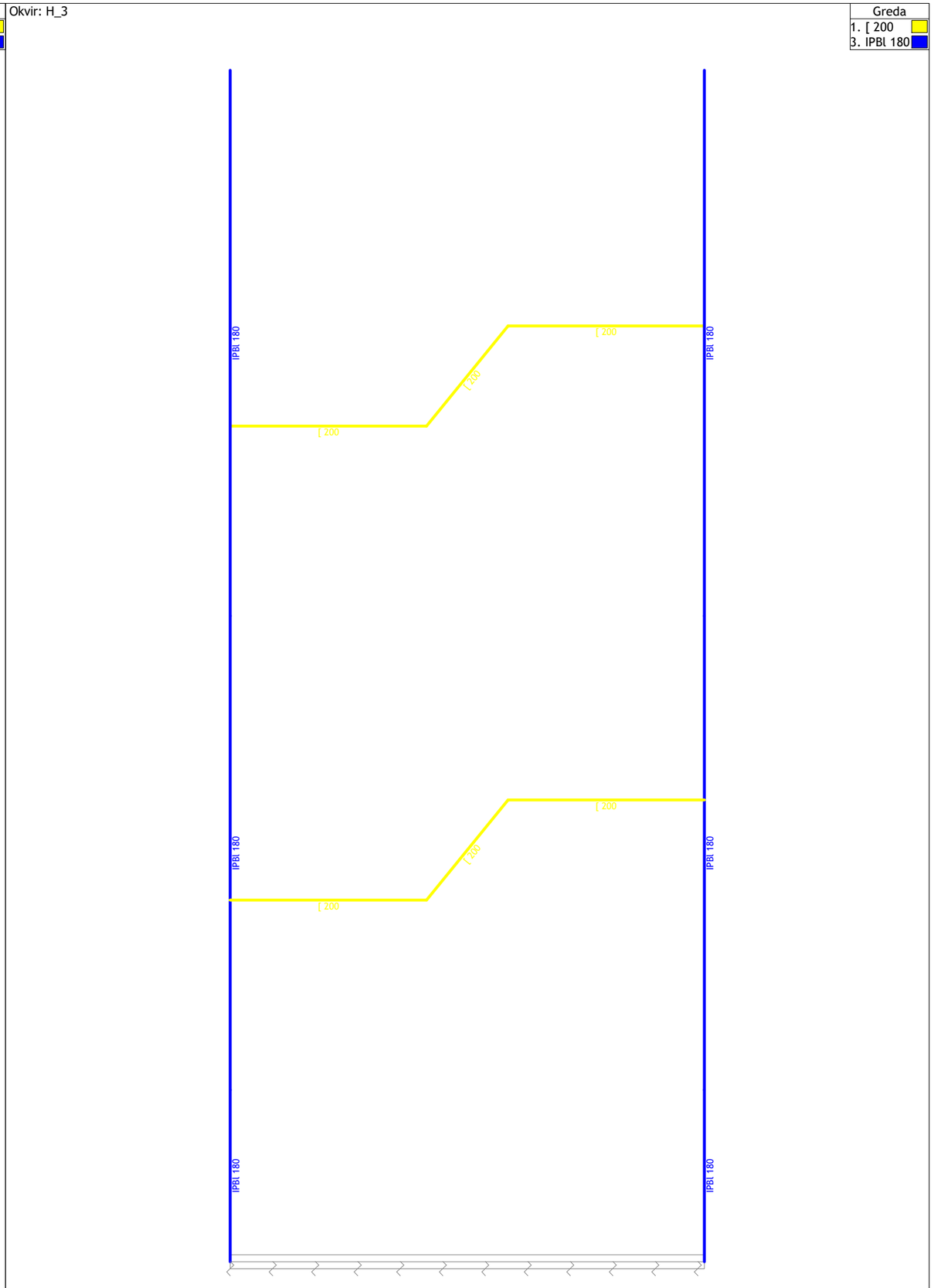
3. IPBl 180



Seti numeričnih podatkov
Greda (2,3)

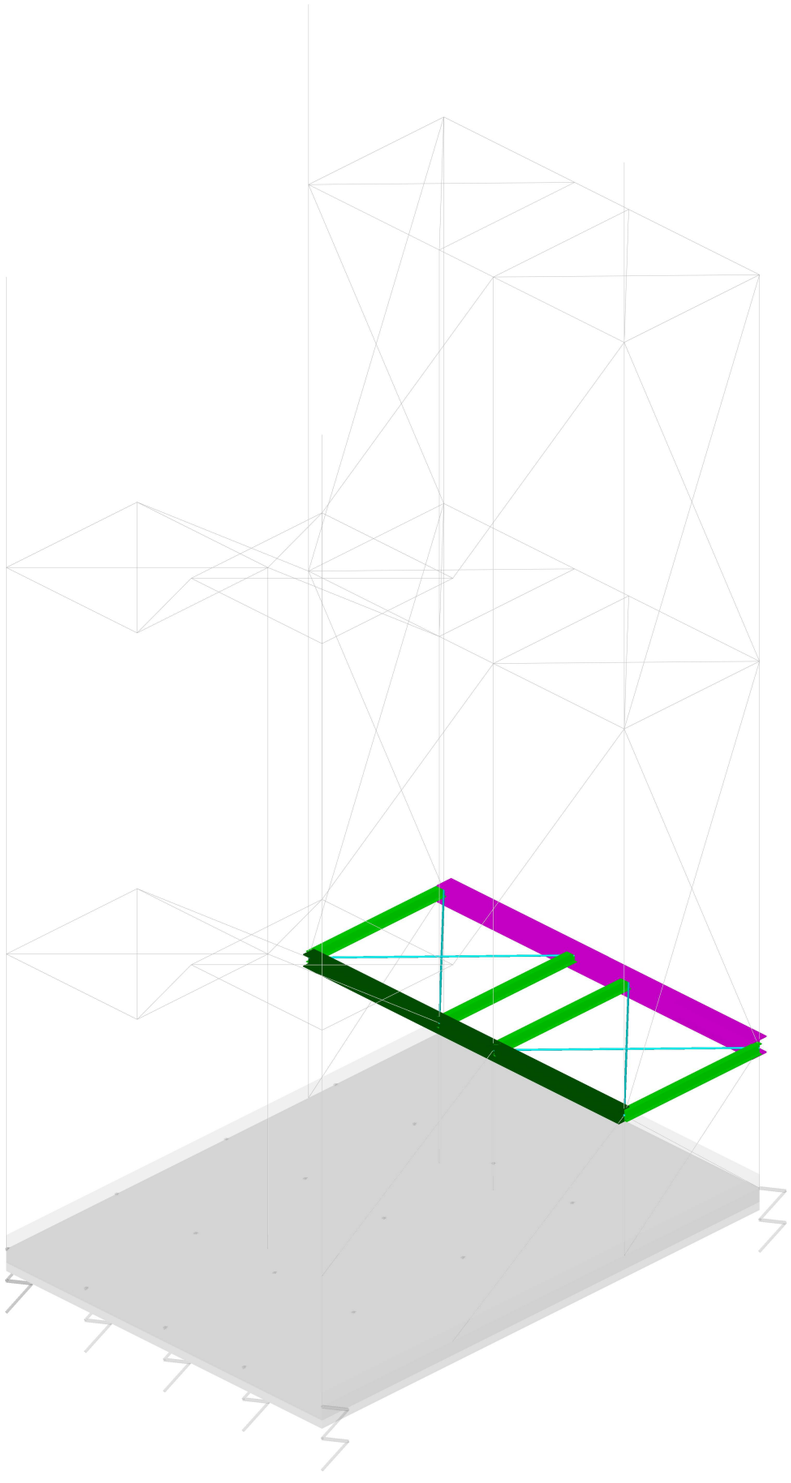


Seti numeričnih podatkov
Greda (1,3)



Seti numeričnih podatkov
Greda (1,3)

Greda
4. IPBl 120
5. IPBl 160
6. IPE 100
8. D=1.6



Seti numeričnih podatkov
Greda (4-6,8)

Pogled: Level_1

Greda
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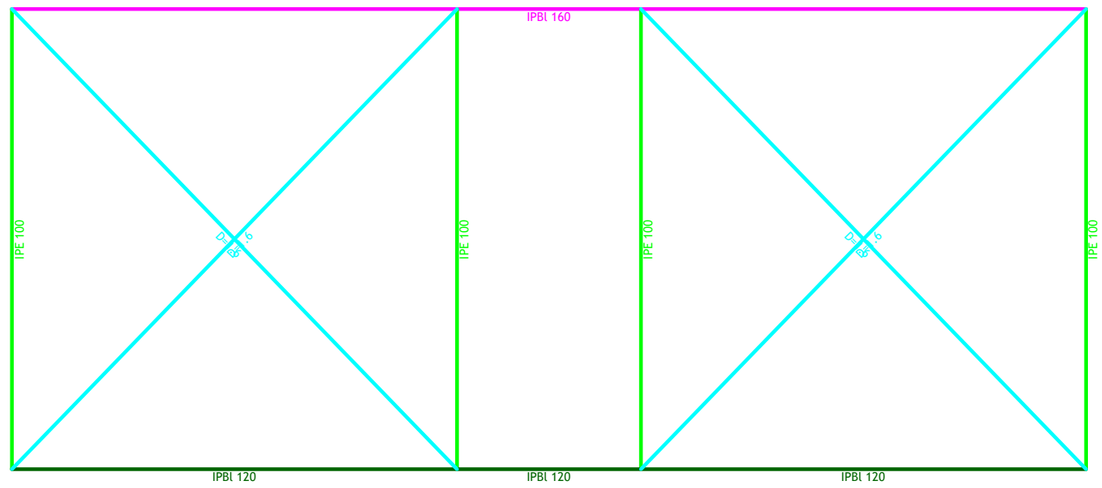
5. IPBl 160
6. IPE 100
8. D=1.6



Seti numeričnih podatkov
Greda (4-6,8)

Greda
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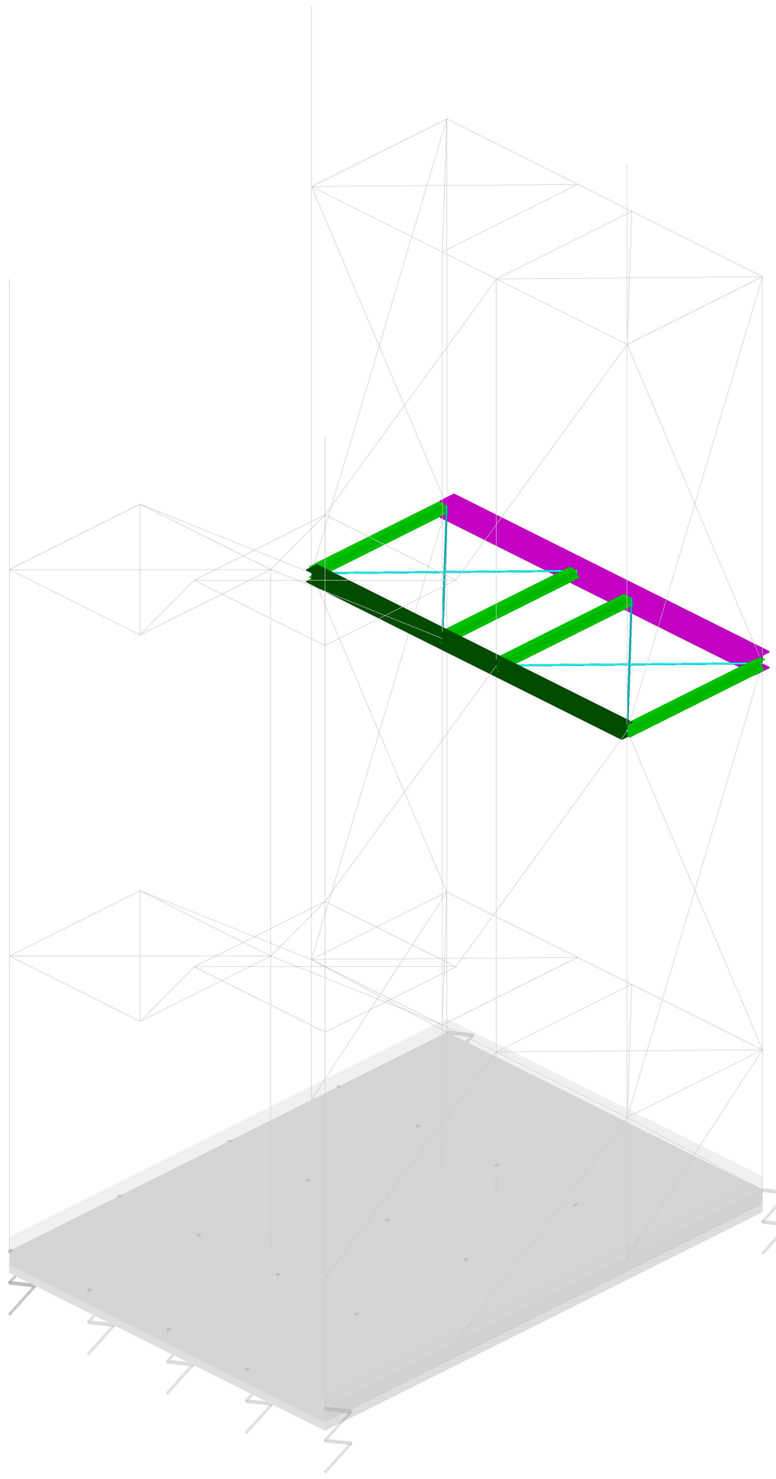
5. IPBl 160
6. IPE 100
8. D=1.6



Seti numeričnih podatkov
Greda (4-6,8)

Pogled: Level_2

Greda
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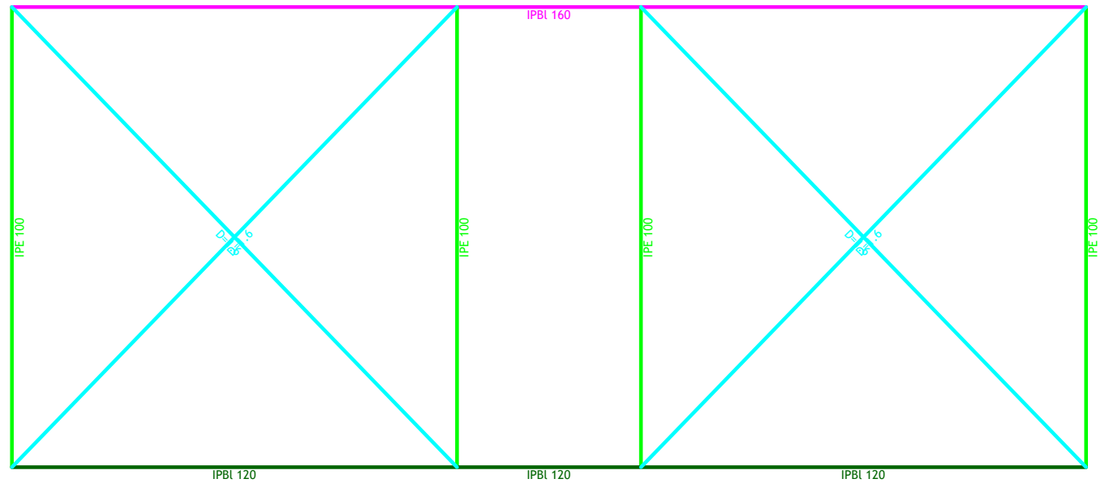
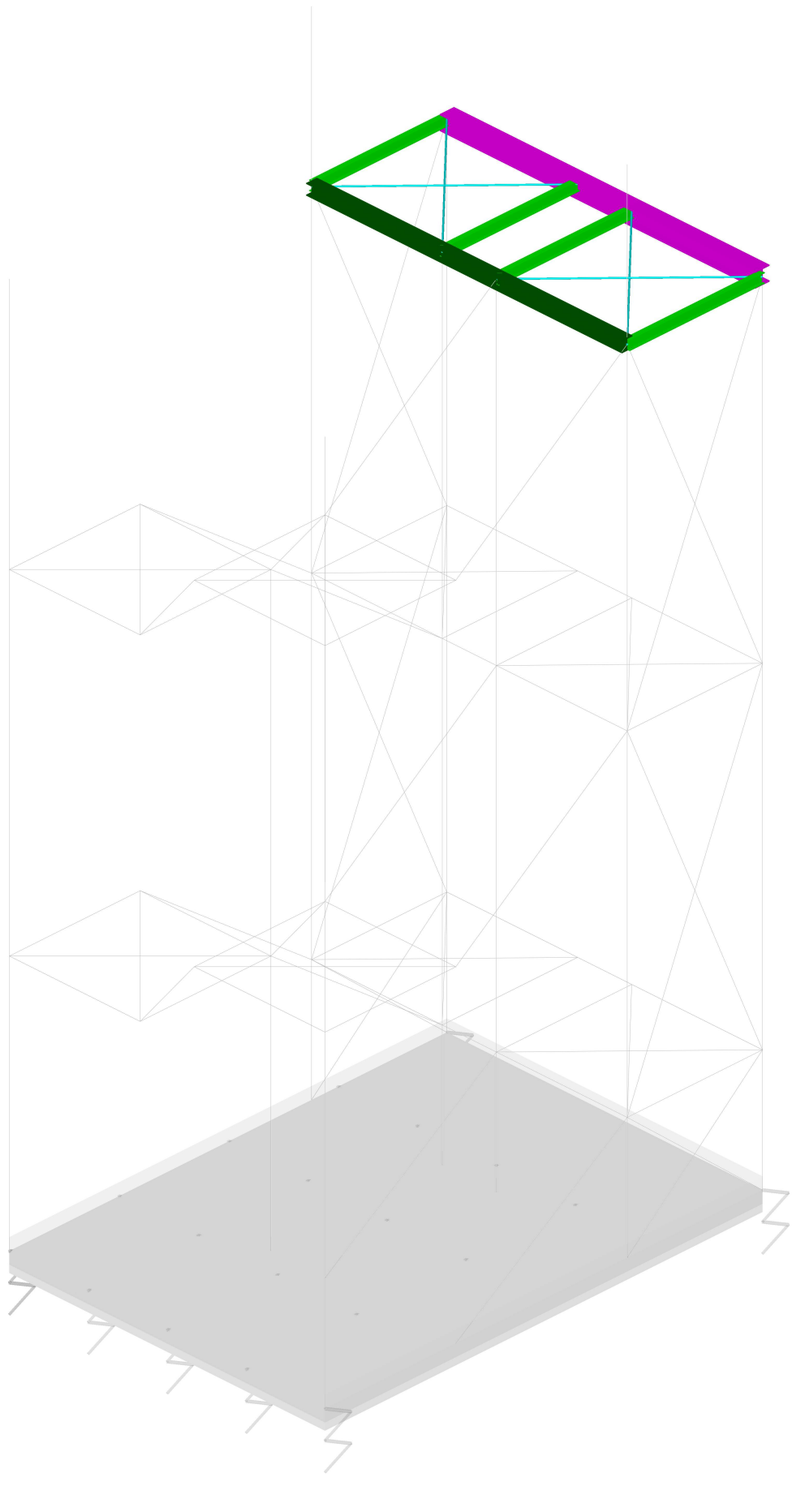
5. IPBl 160
6. IPE 100
8. D=1.6

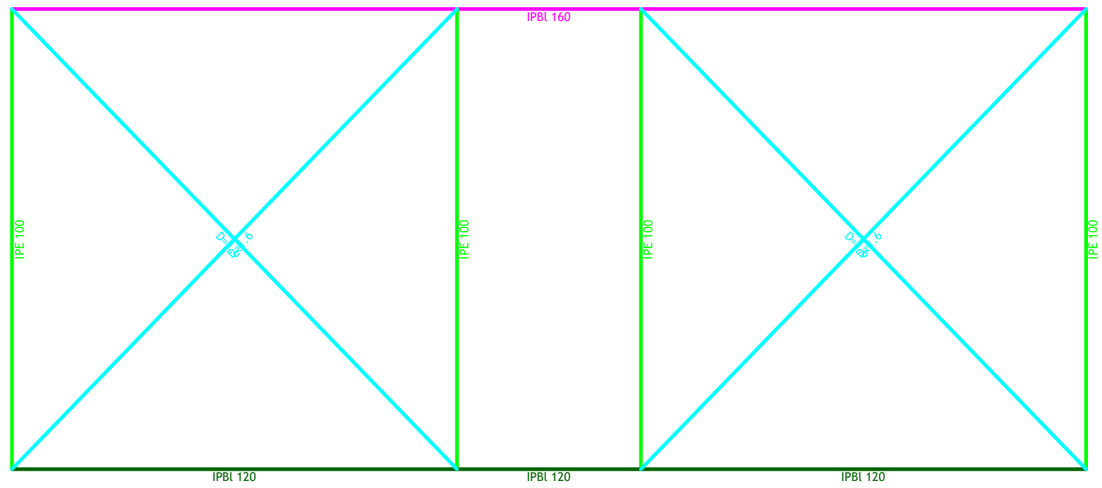


Seti numeričnih podatkov
Greda (4-6,8)

Greda
4. IPBl 120
5. IPBl 160
6. IPE 100
8. D=1.6



Pogled: Level_3



Greda
4. IPBl 120
5. IPBl 160
6. IPE 100
8. D=1.6

Seti numeričnih podatkov
Greda (4-6,8)

Seti numeričnih podatkov
Greda (4-6,8)

Grede - predizmere po setih

Set	Prerez/Material	γ [kN/m³]	L [m]	O [m²]	V [m³]	m [T]
1	[200 Jeklo	78.500	25.184	16.613	0.081	0.649
2	[200 Jeklo	78.500	25.184	16.613	0.081	0.649
3	IPBl 180 Jeklo	78.500	83.560	85.586	0.378	3.027
4	IPBl 120 Jeklo	78.500	10.500	7.113	0.027	0.213
5	IPBl 160 Jeklo	78.500	10.500	9.516	0.041	0.326
6	IPE 100 Jeklo	78.500	18.000	7.196	0.019	0.149
7	D=2.4 Jeklo	78.500	38.325	2.890	0.017	0.139
8	D=1.6 Jeklo	78.500	25.035	1.258	0.005	0.040
9	D=1.6 Jeklo	78.500	16.405	0.825	0.003	0.026
		Skupno:	252.69	147.61	0.652	5.218

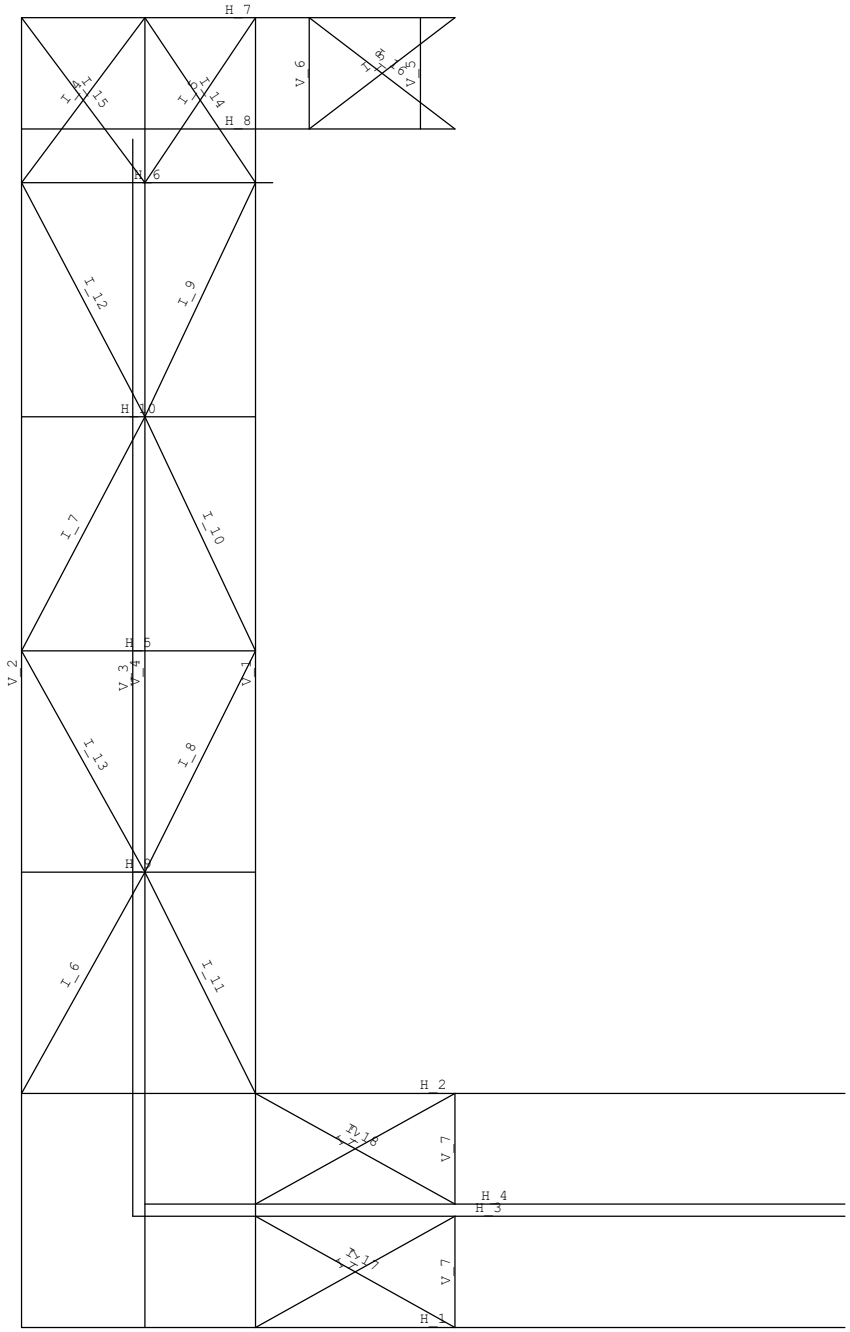
Grede - predizmera po prečnih prerezih

Prerez/Material	γ [kN/m³]	L [m]	O [m²]	V [m³]	m [T]
[200 Jeklo	78.500	50.368	33.225	0.162	1.298
IPBl 180 Jeklo	78.500	83.560	85.586	0.378	3.027
IPBl 120 Jeklo	78.500	10.500	7.113	0.027	0.213
IPBl 160 Jeklo	78.500	10.500	9.516	0.041	0.326
IPE 100 Jeklo	78.500	18.000	7.196	0.019	0.149
D=2.4 Jeklo	78.500	38.325	2.890	0.017	0.139
D=1.6 Jeklo	78.500	41.440	2.083	0.008	0.067
	Skupno:	252.69	147.61	0.652	5.218

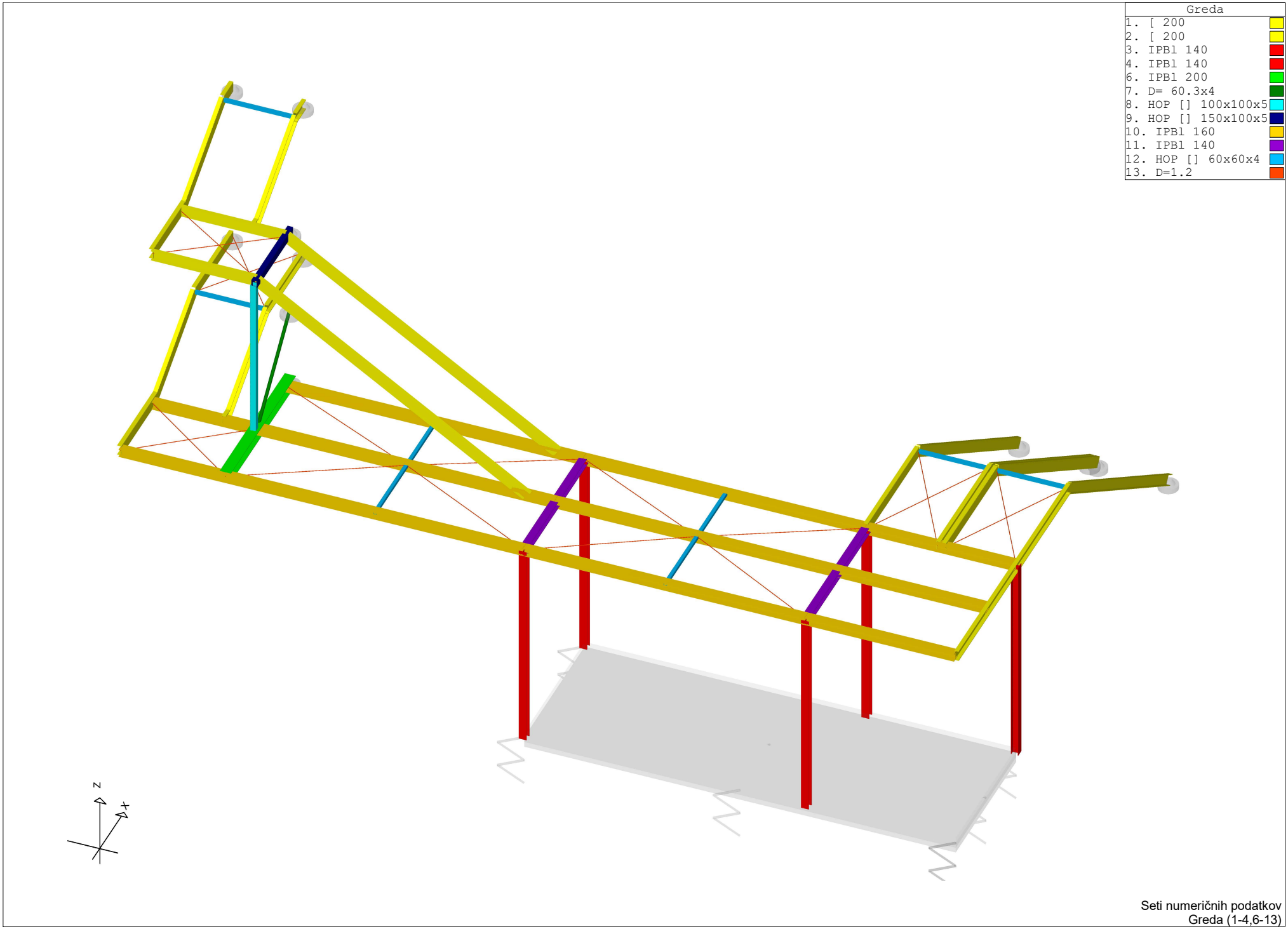
Rekapitulacija količine materiala

Material	γ [kN/m³]	O [m²]	V [m³]	m [T]
Jeklo	78.500	147.61	0.652	5.218

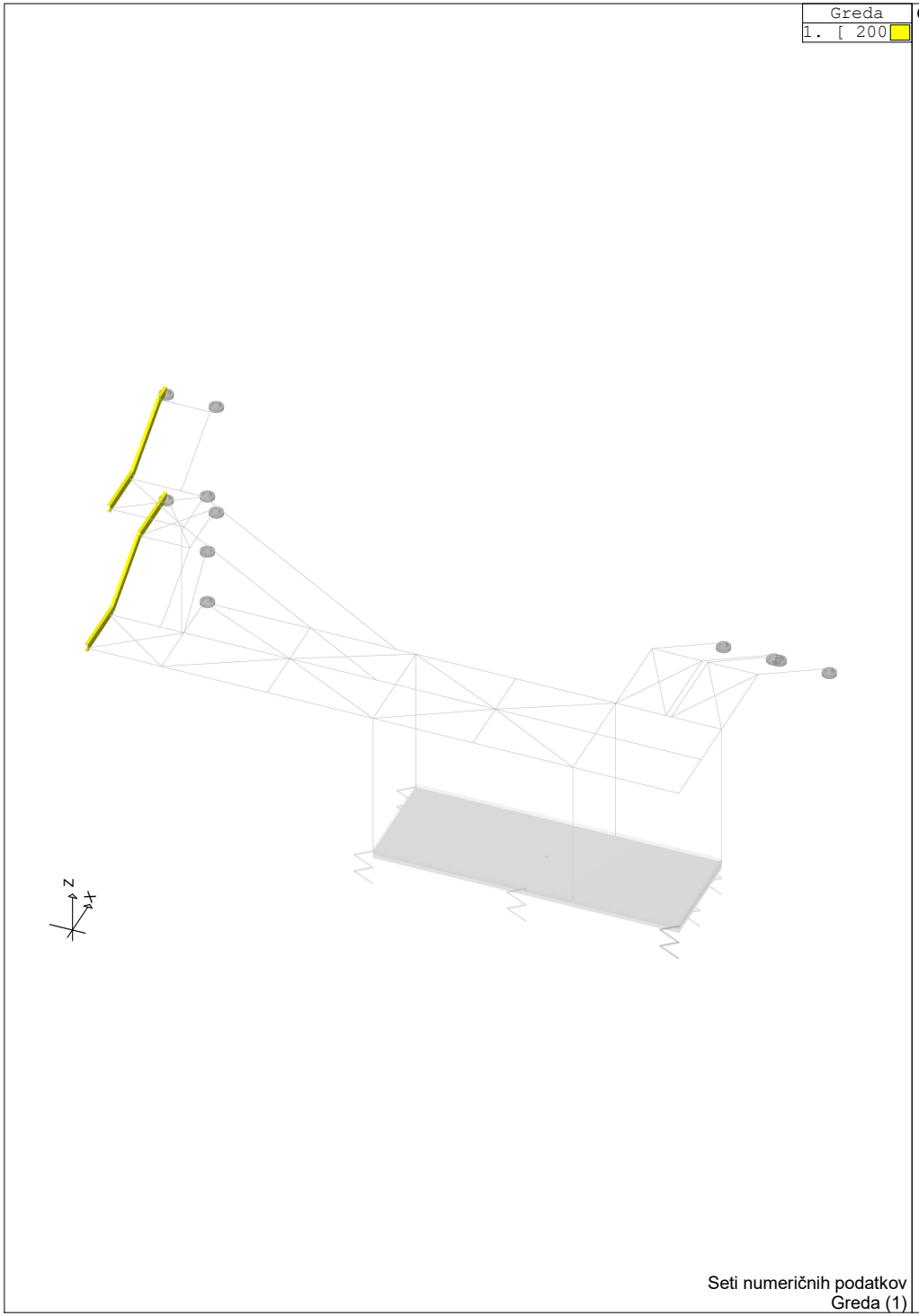
2.7.2. Dispozicija pomožnega – požarnega stopnišča



Dispozicija okvirjev

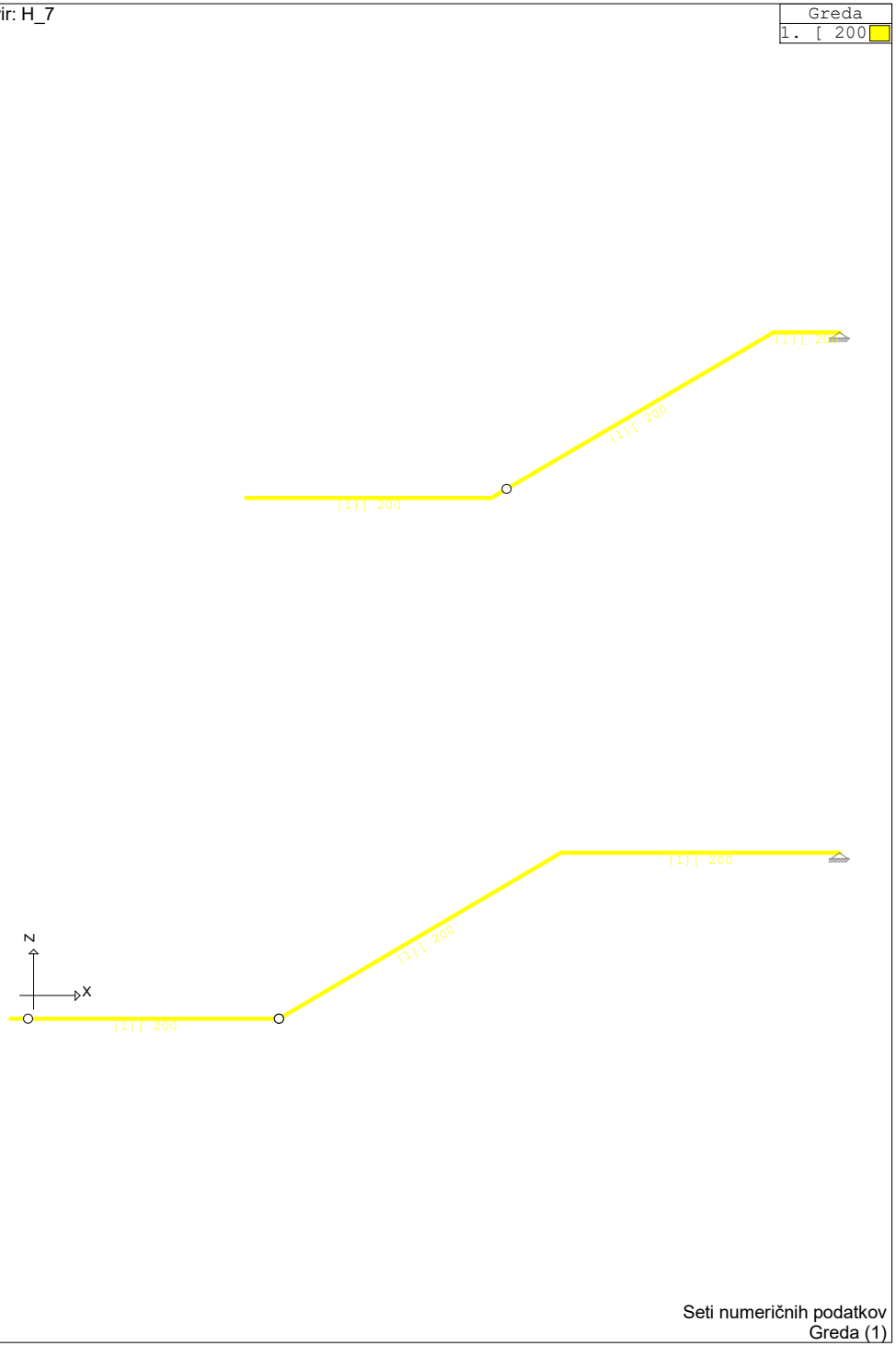


Seti numeričnih podatkov
Greda (1-4,6-13)

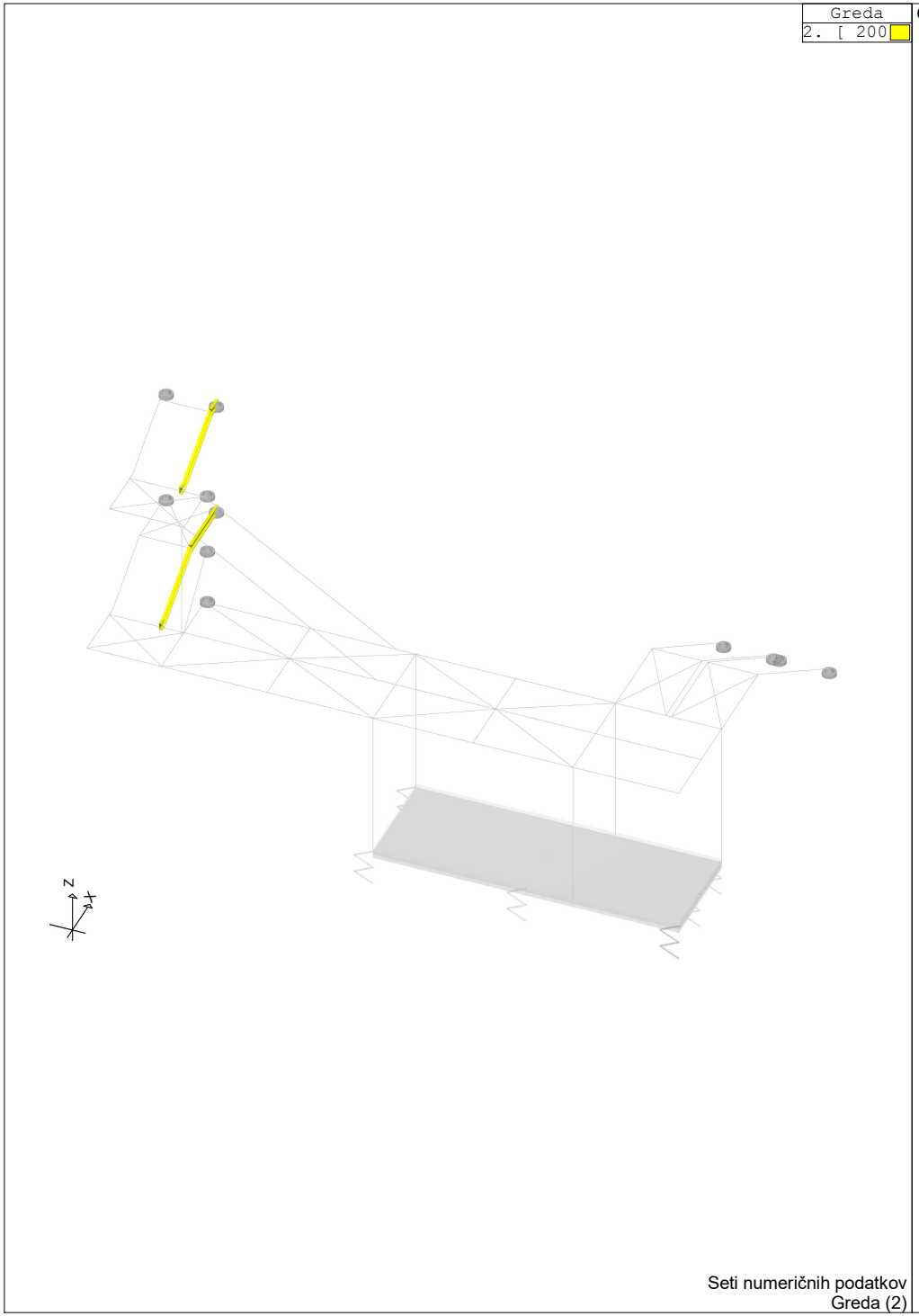


Seti numeričnih podatkov
Greda (1)

Okvir: H_7

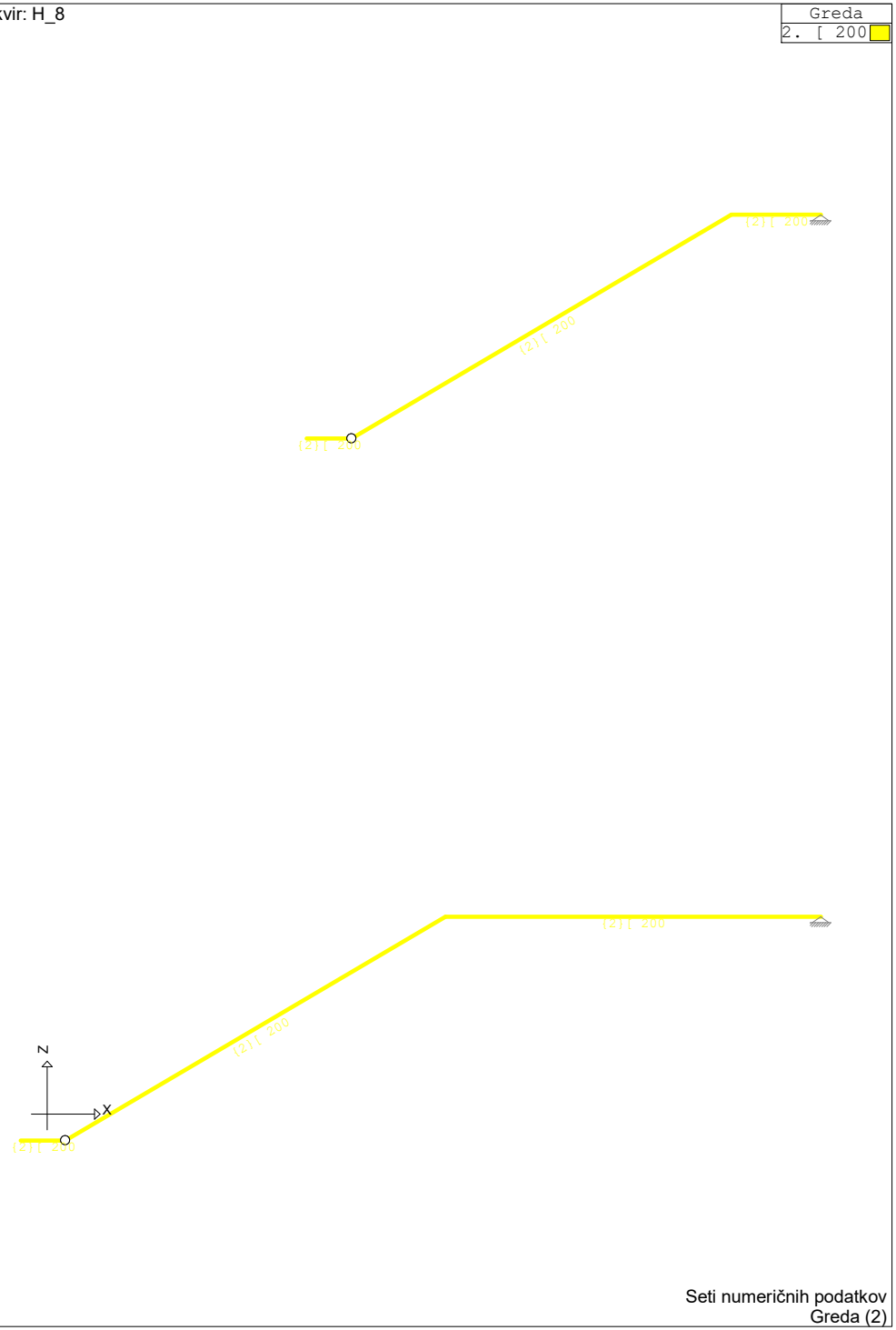


Seti numeričnih podatkov
Greda (1)



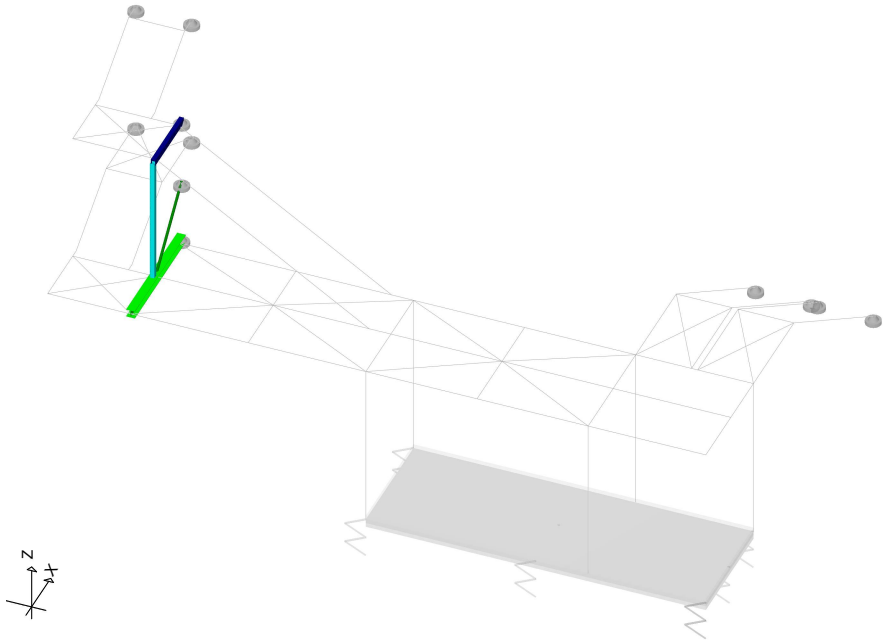
Seti numeričnih podatkov
Greda (2)

Okvir: H_8



Seti numeričnih podatkov
Greda (2)

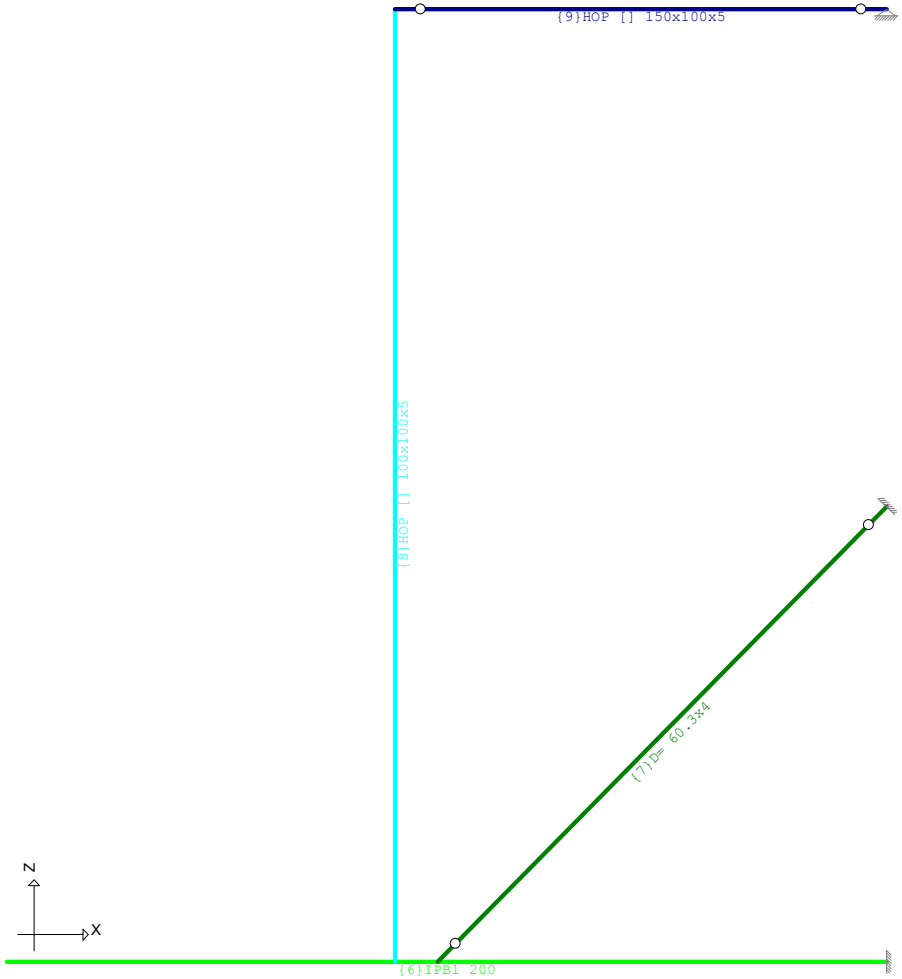
Greda
6. IPBl 200
7. D= 60.3x4
8. HOP [] 100x100x5
9. HOP [] 150x100x5



Seti numeričnih podatkov
Greda (6-9)

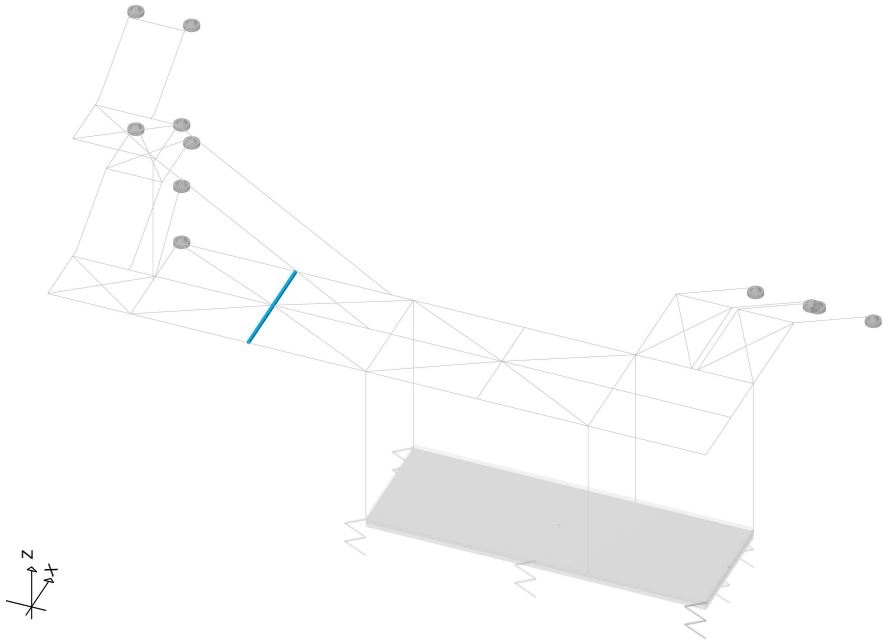
Okvir: H_6

Greda
6. IPBl 200
7. D= 60.3x4
8. HOP [] 100x100x5
9. HOP [] 150x100x5



Seti numeričnih podatkov
Greda (6-9)

Greda
12. HOP [] 60x60x4

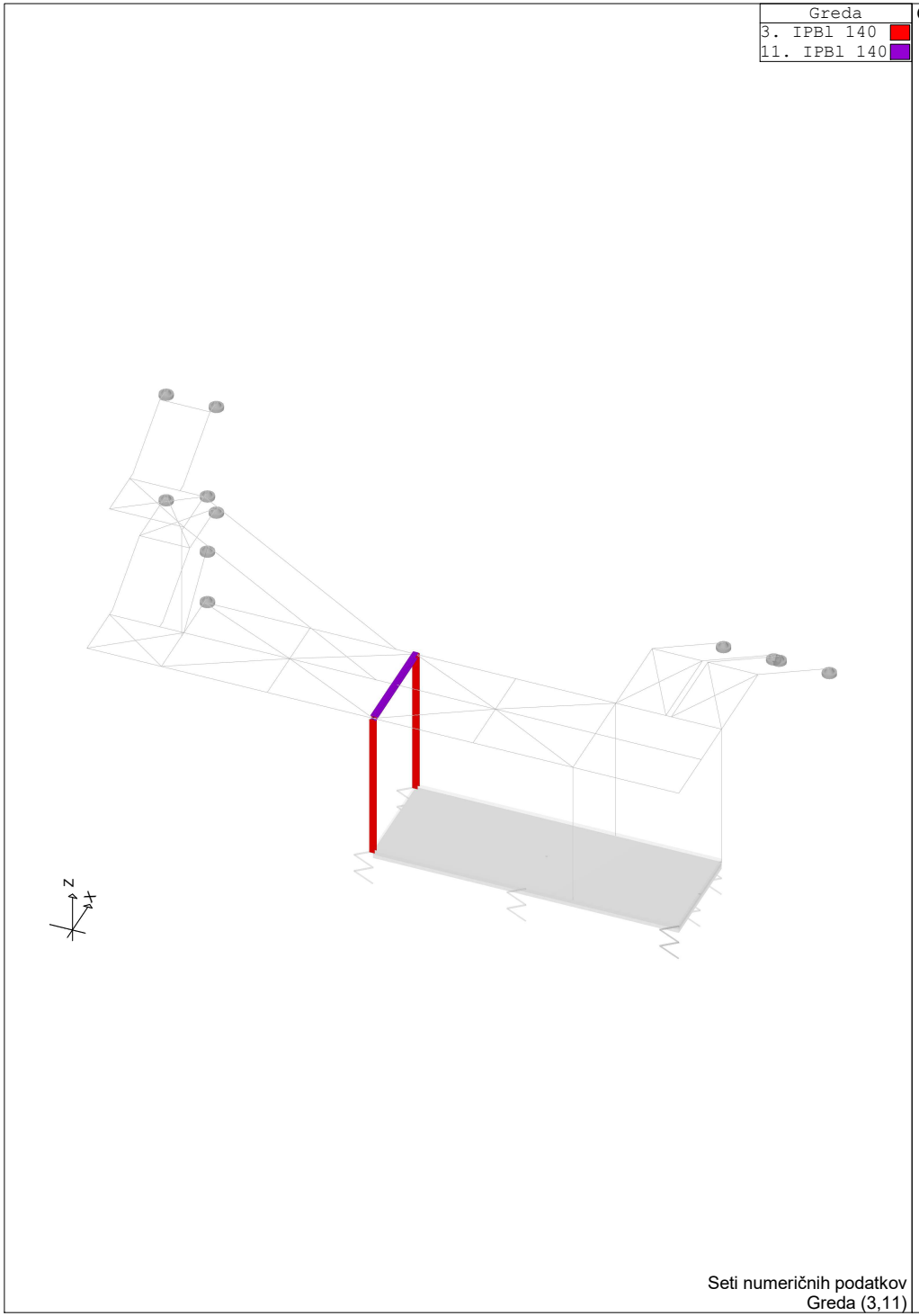


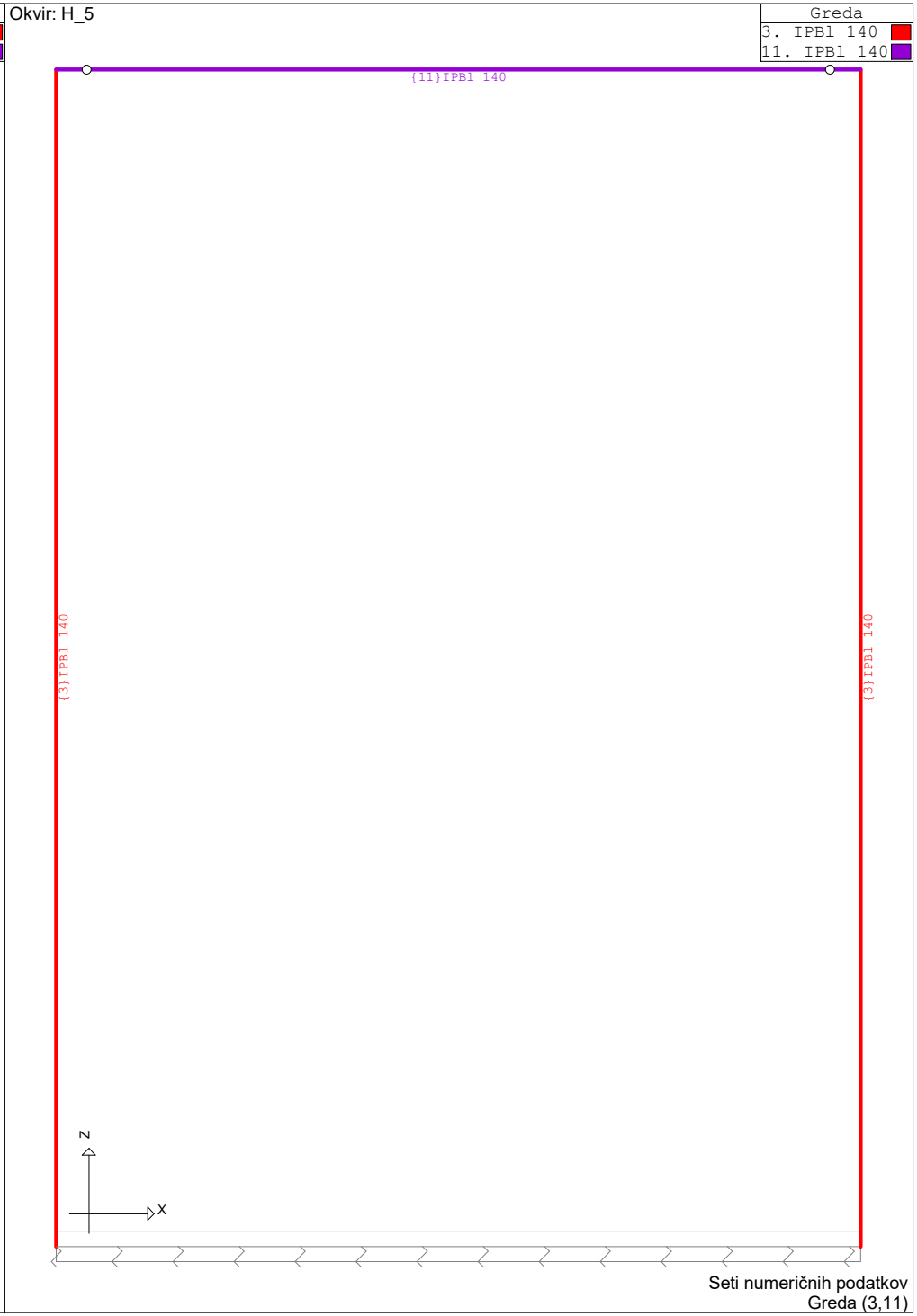
Seti numeričnih podatkov
Greda (12)

Greda
12. HOP [] 60x60x4

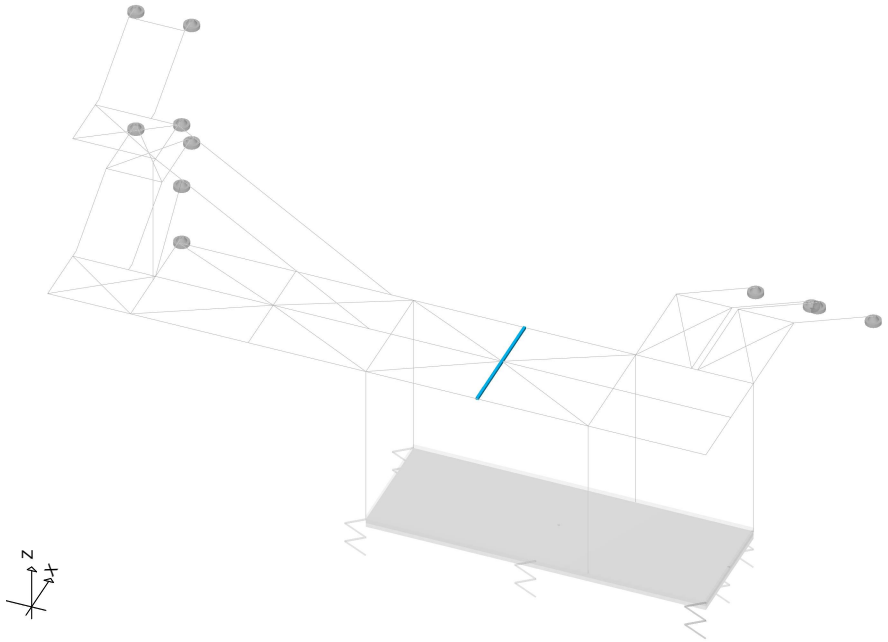


Seti numeričnih podatkov
Greda (12)


Greda
3. IPBl 140
11. IPBl 140
Z
X
Seti numeričnih podatkov
Greda (3,11)


Okvir: H_5
Greda
3. IPBl 140
11. IPBl 140
{11}IPBl 140
{3}IPBl 140
{3}IPBl 140
Z
X
Seti numeričnih podatkov
Greda (3,11)

Greda
12. HOP [] 60x60x4



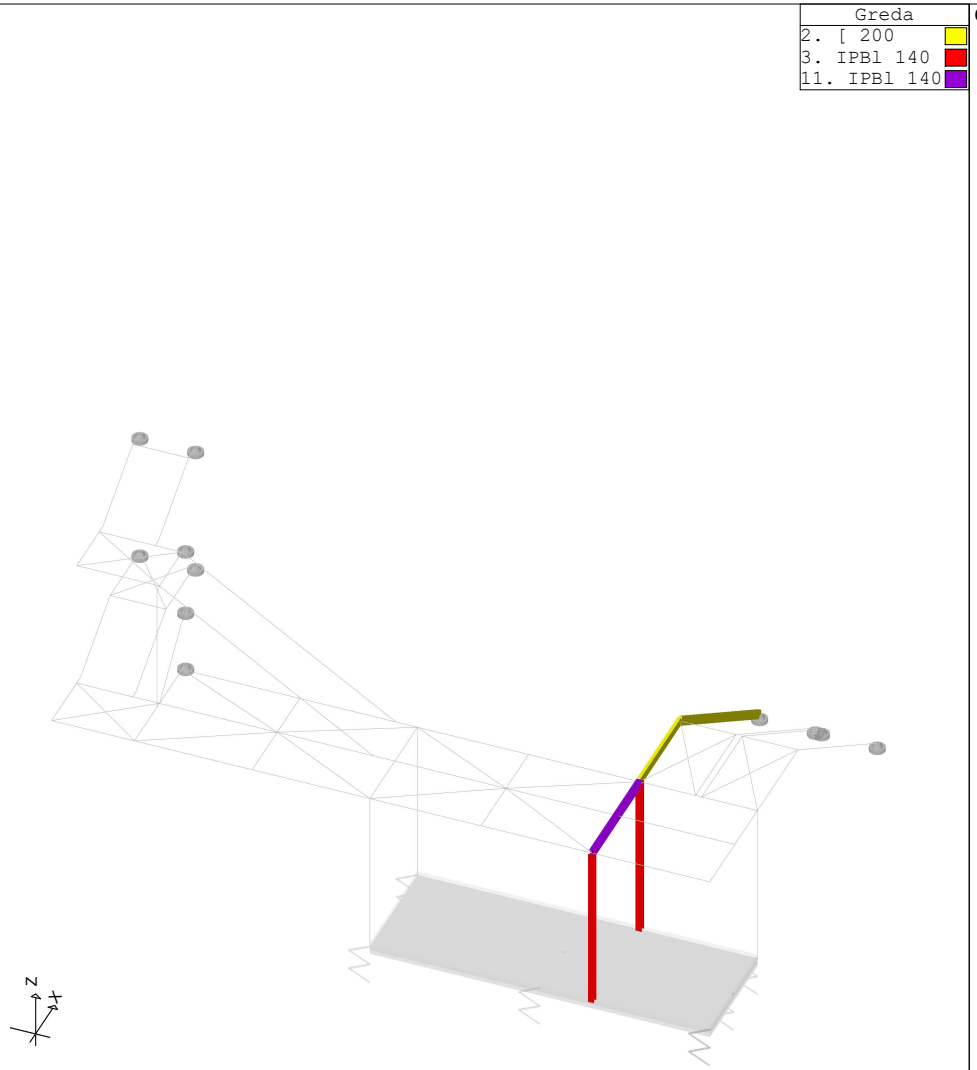
Seti numeričnih podatkov
Greda (12)

Okvir: H_9

Greda
12. HOP [] 60x60x4

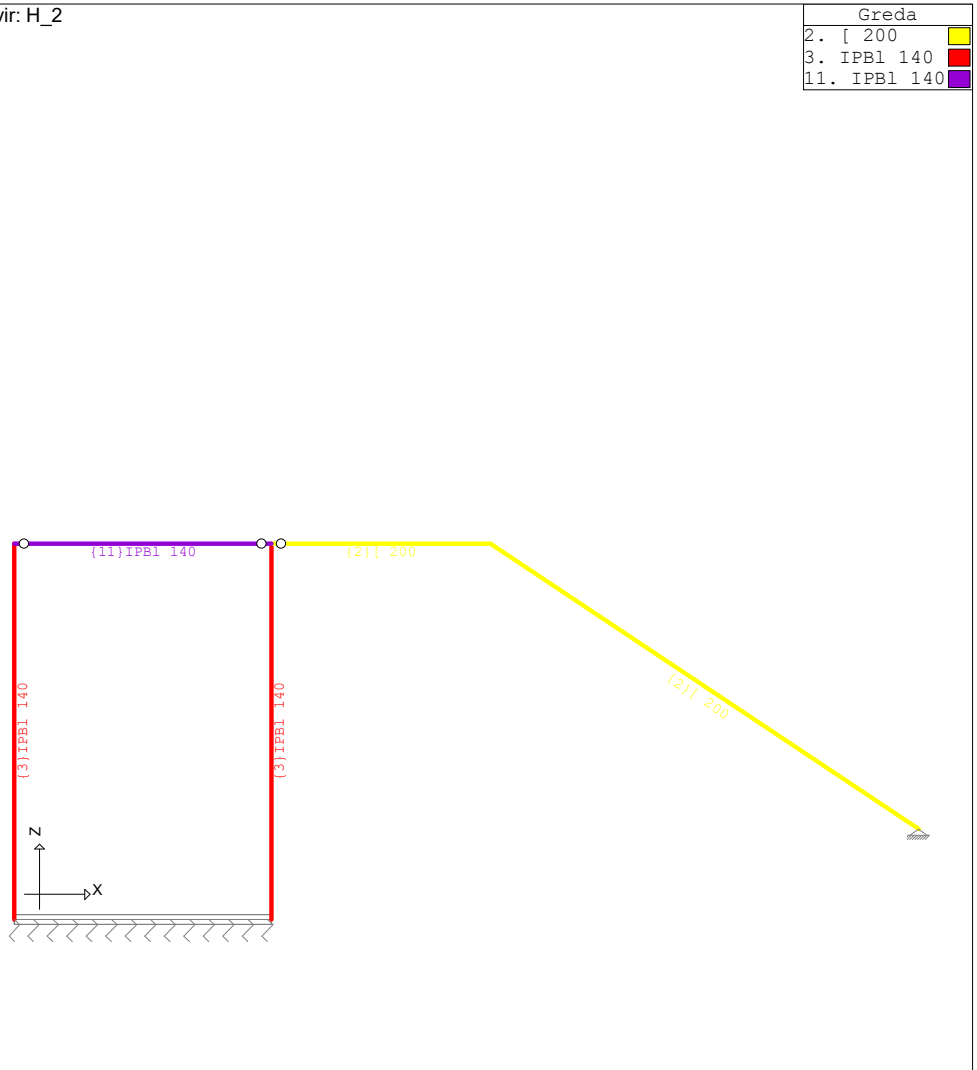


Seti numeričnih podatkov
Greda (12)

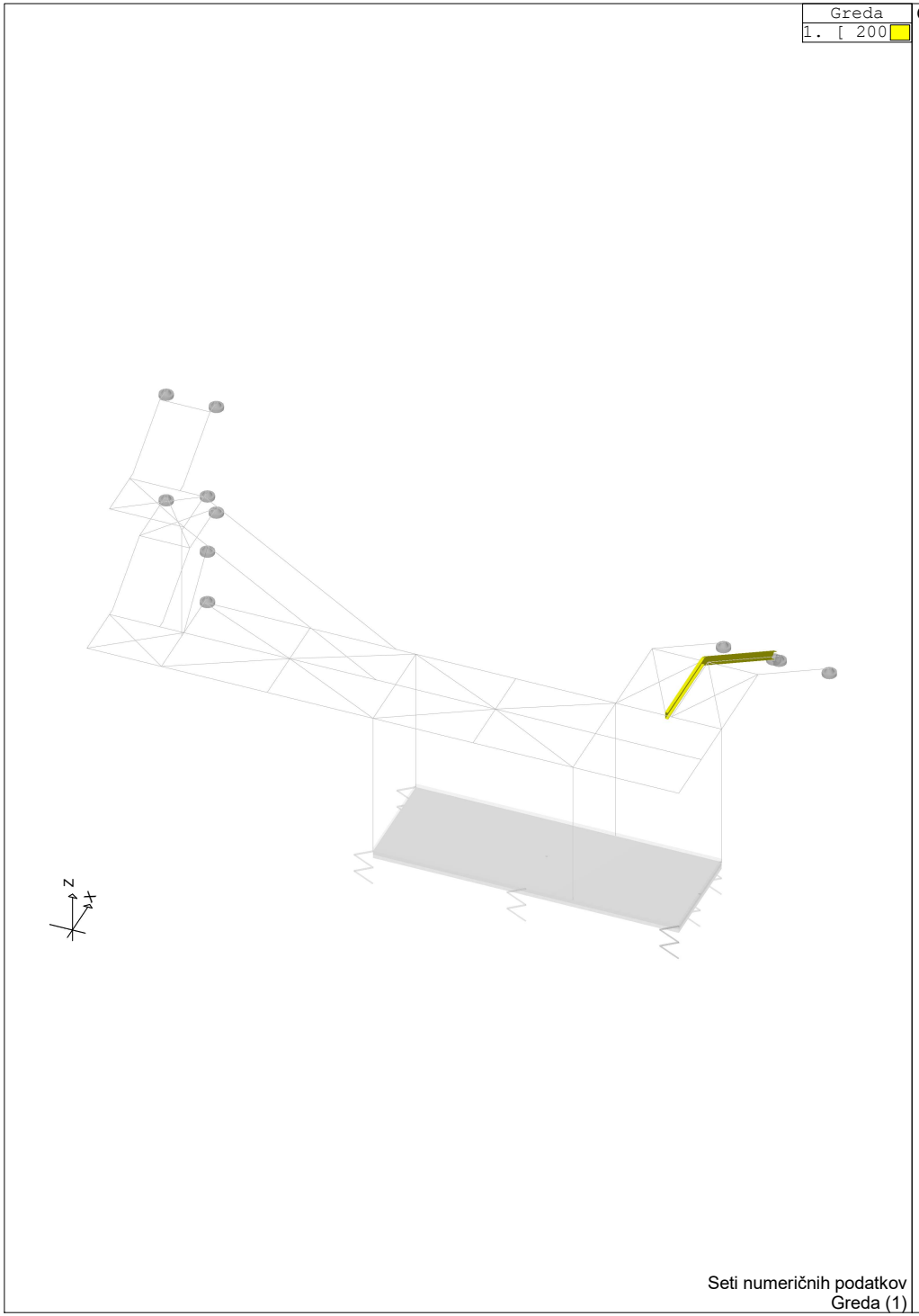


Seti numeričnih podatkov
Greda (2,3,11)

Okvir: H_2

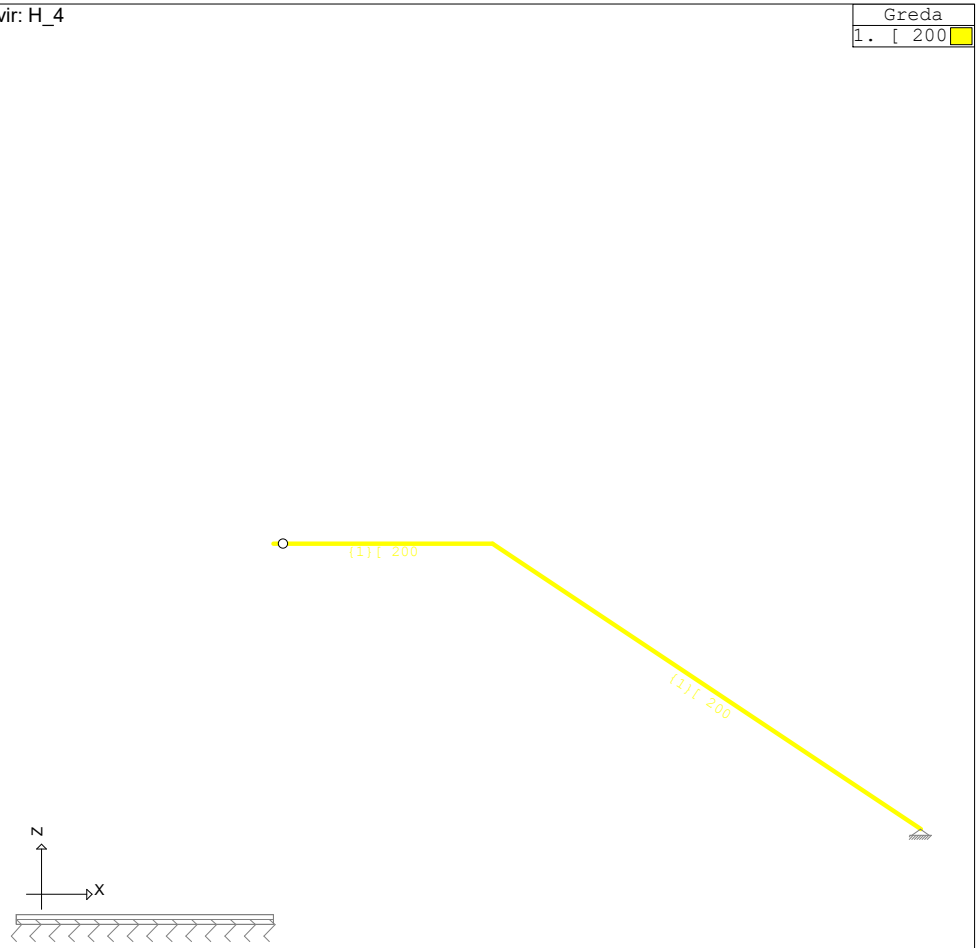


Seti numeričnih podatkov
Greda (2,3,11)

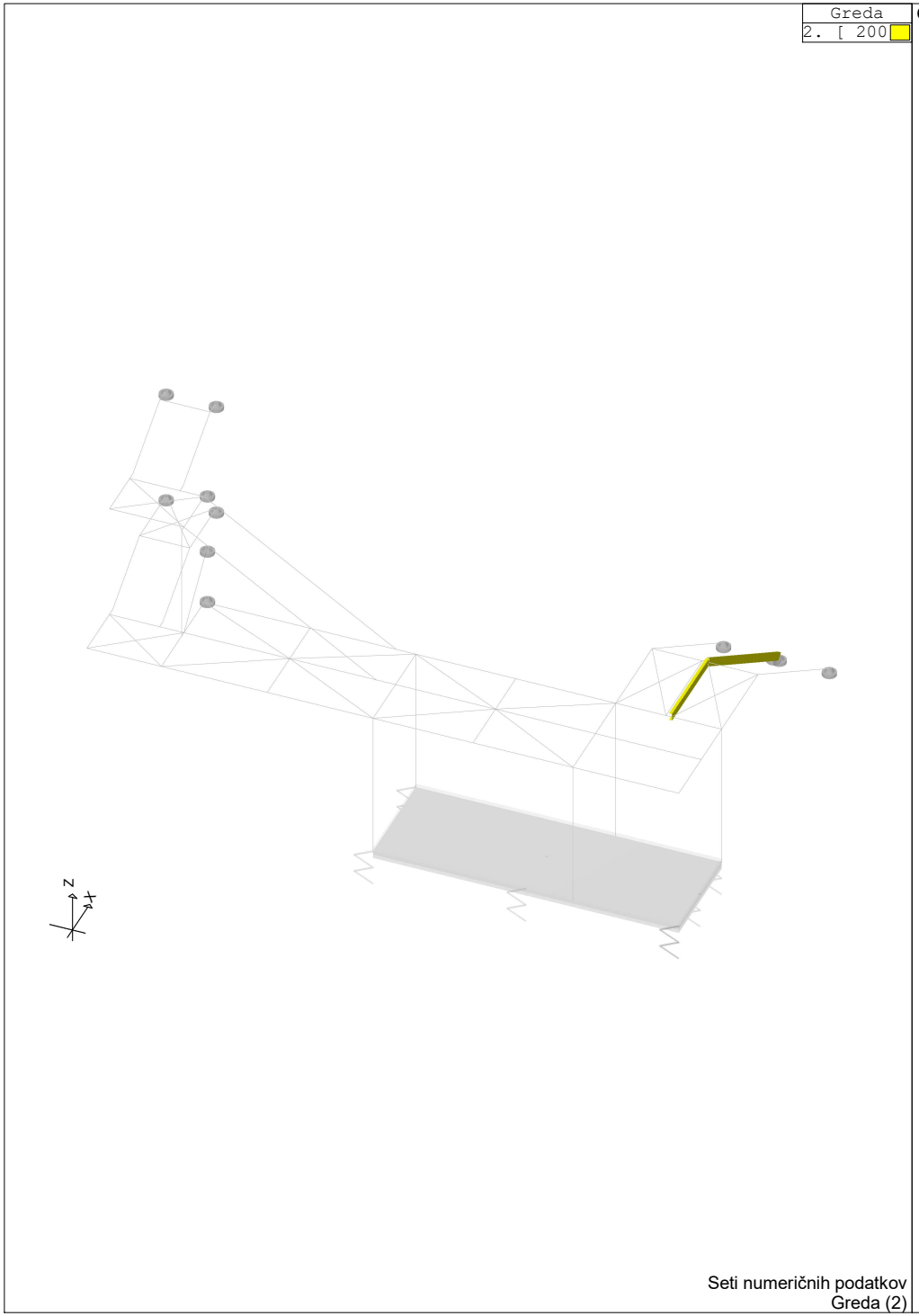


Seti numeričnih podatkov
Greda (1)

Okvir: H_4

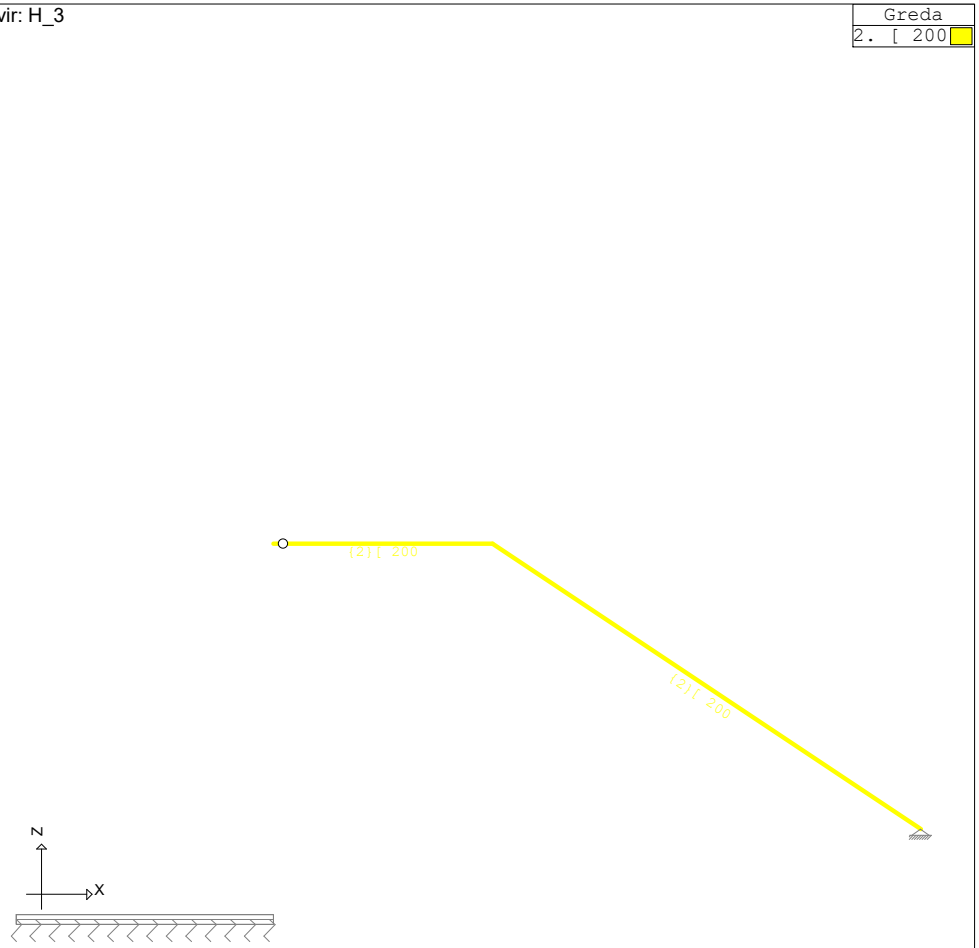


Seti numeričnih podatkov
Greda (1)

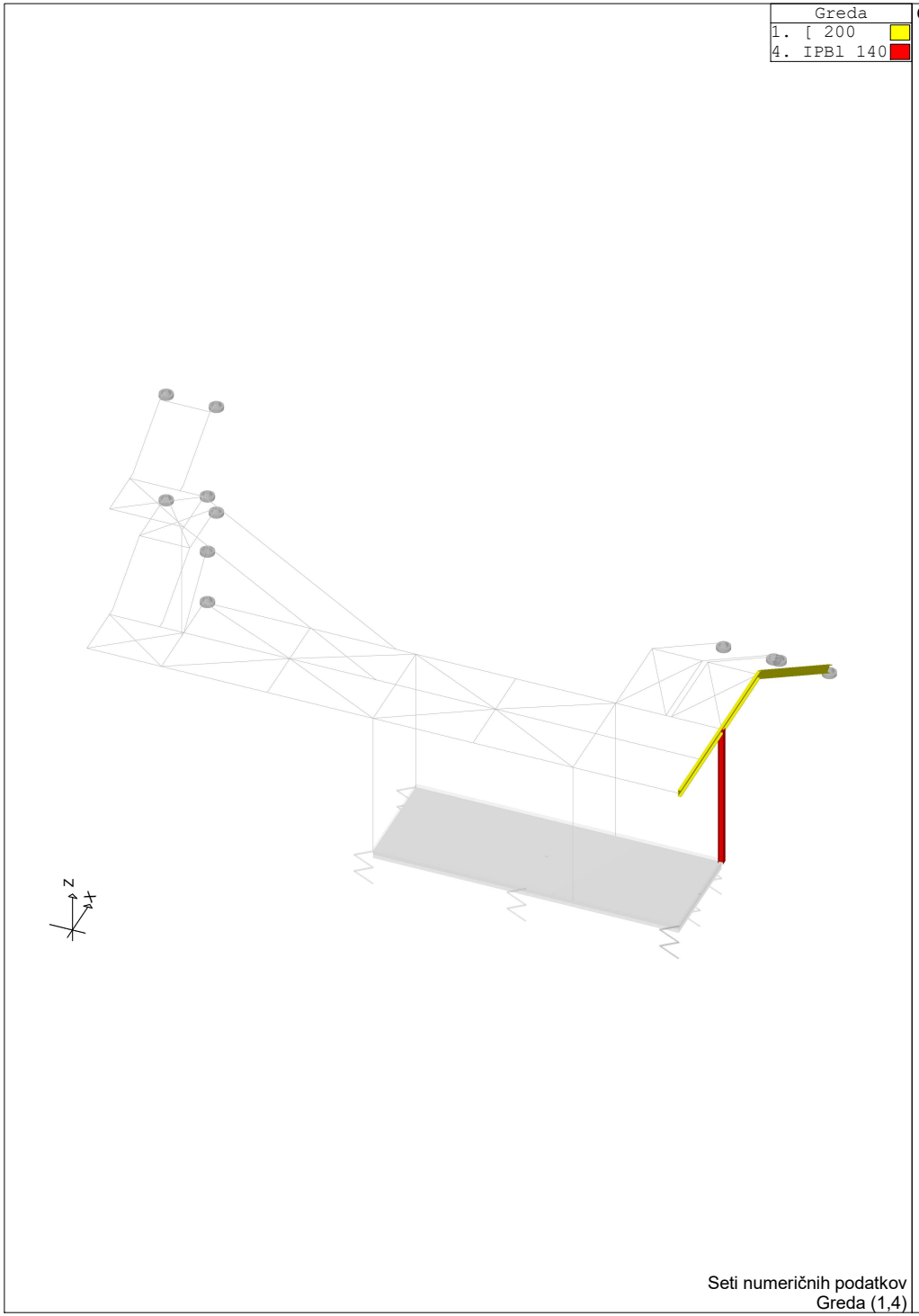


Seti numeričnih podatkov
Greda (2)

Okvir: H_3

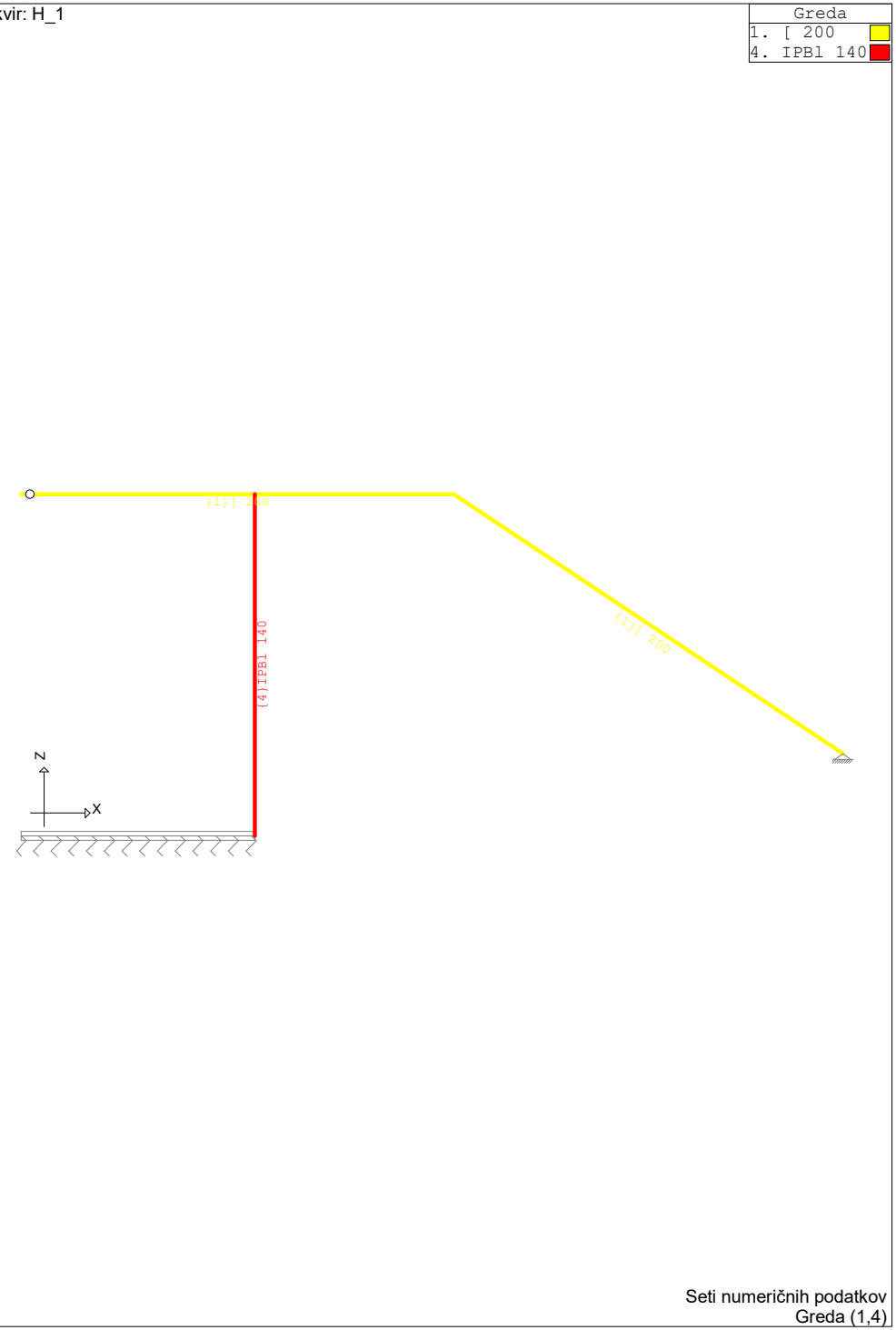


Seti numeričnih podatkov
Greda (2)



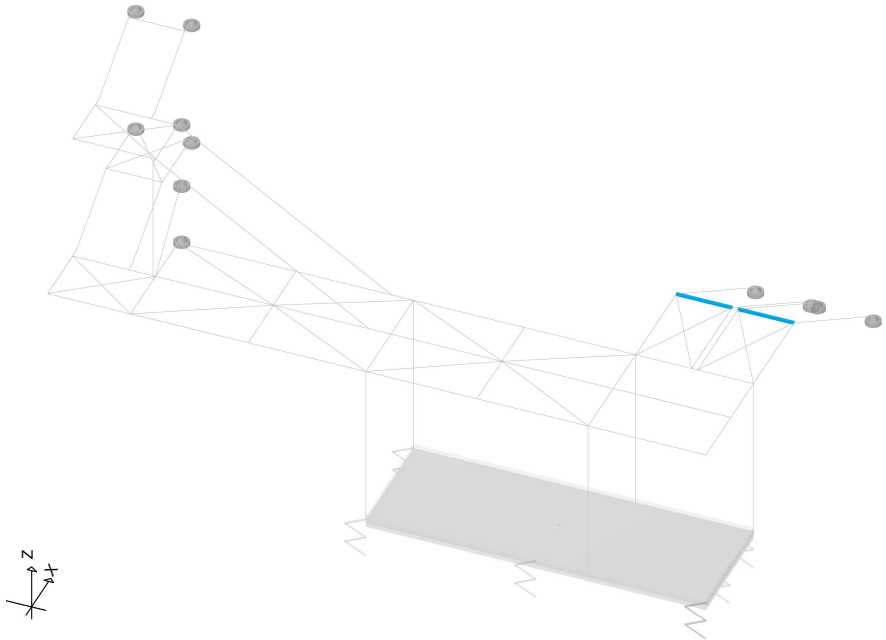
Seti numeričnih podatkov
Greda (1,4)

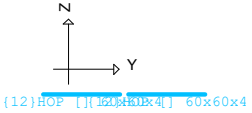
Okvir: H_1



Seti numeričnih podatkov
Greda (1,4)

Greda
12. HOP [] 60x60x4





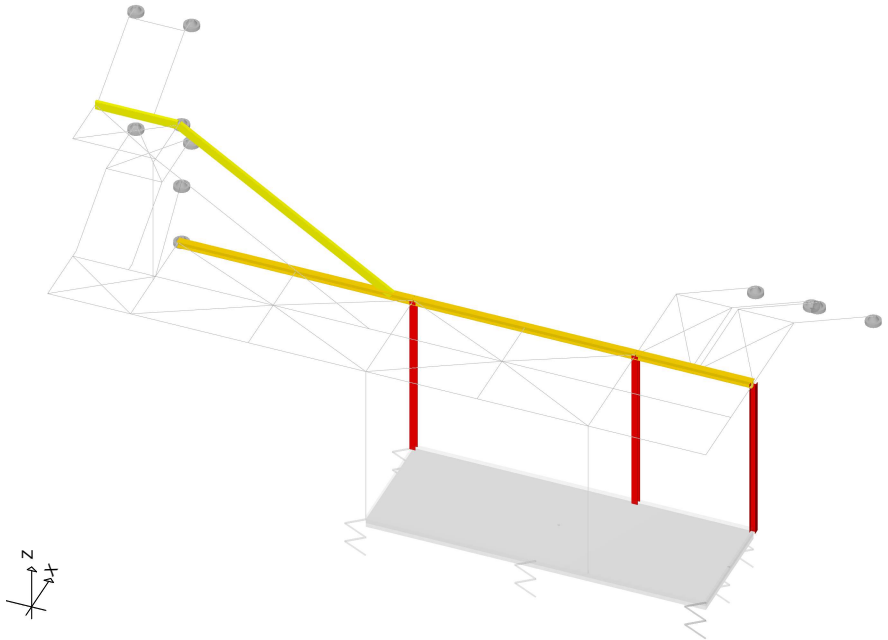


Seti numeričnih podatkov
Greda (12)

Greda
12. HOP [] 60x60x4

Seti numeričnih podatkov
Greda (12)

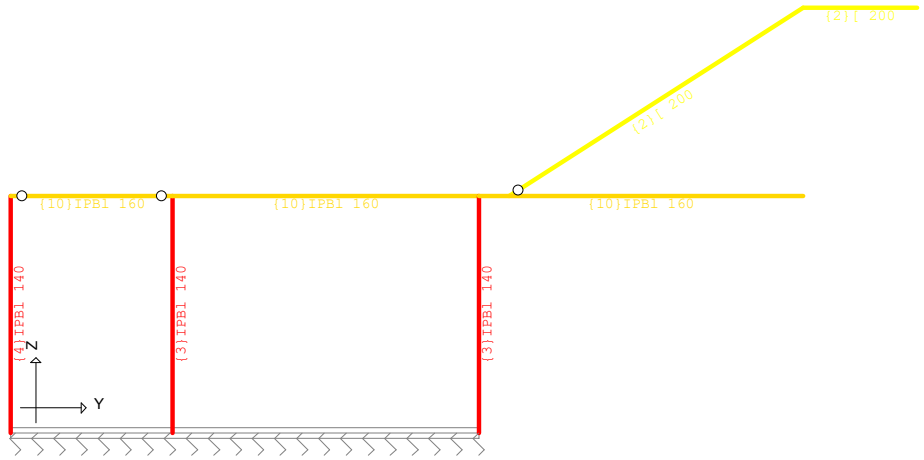
Greda
2. [200
3. IPBl 140
4. IPBl 140
10. IPBl 160



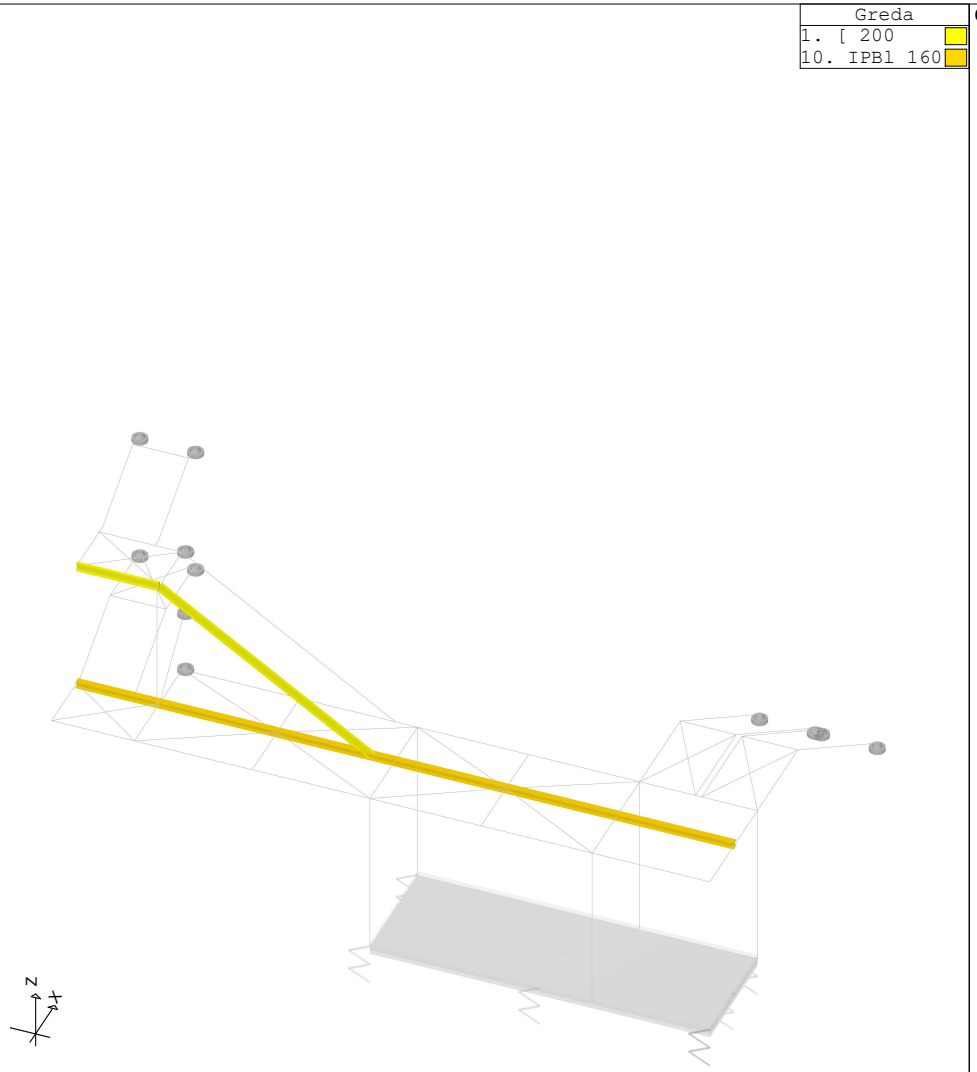
Seti numeričnih podatkov
Greda (2-4,10)

Okvir: V_1

Greda
2. [200
3. IPBl 140
4. IPBl 140
10. IPBl 160

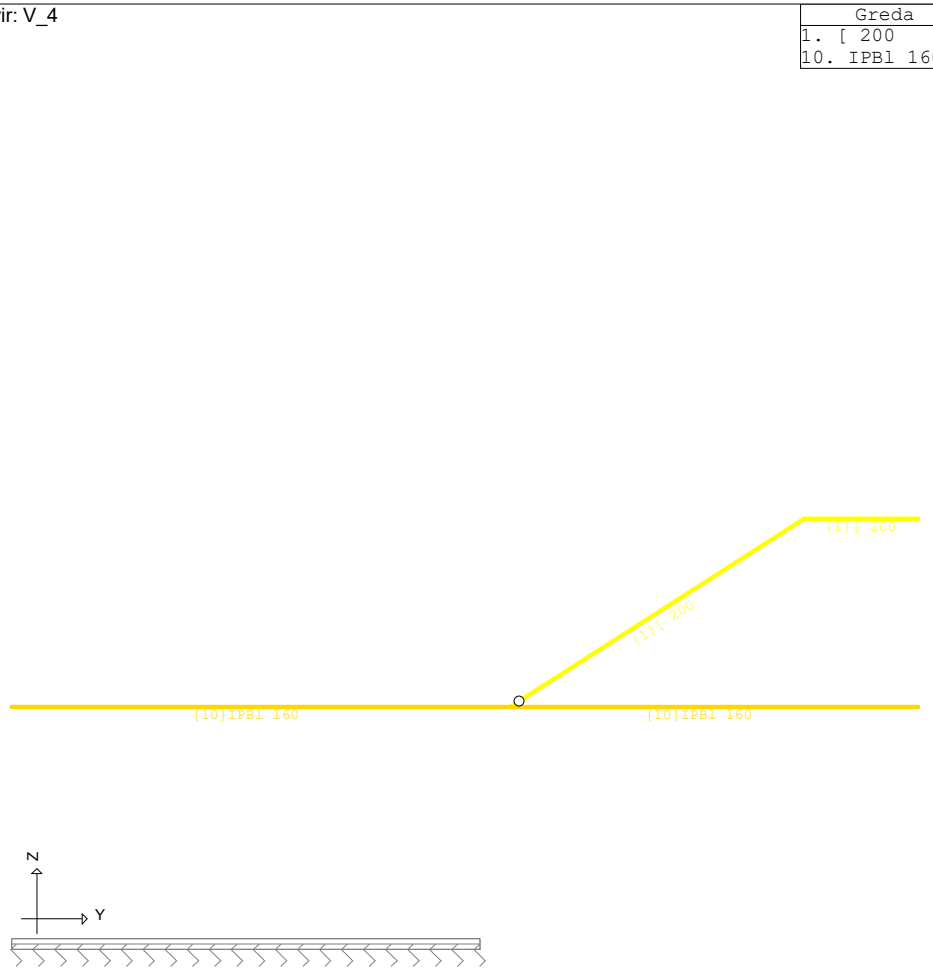


Seti numeričnih podatkov
Greda (2-4,10)

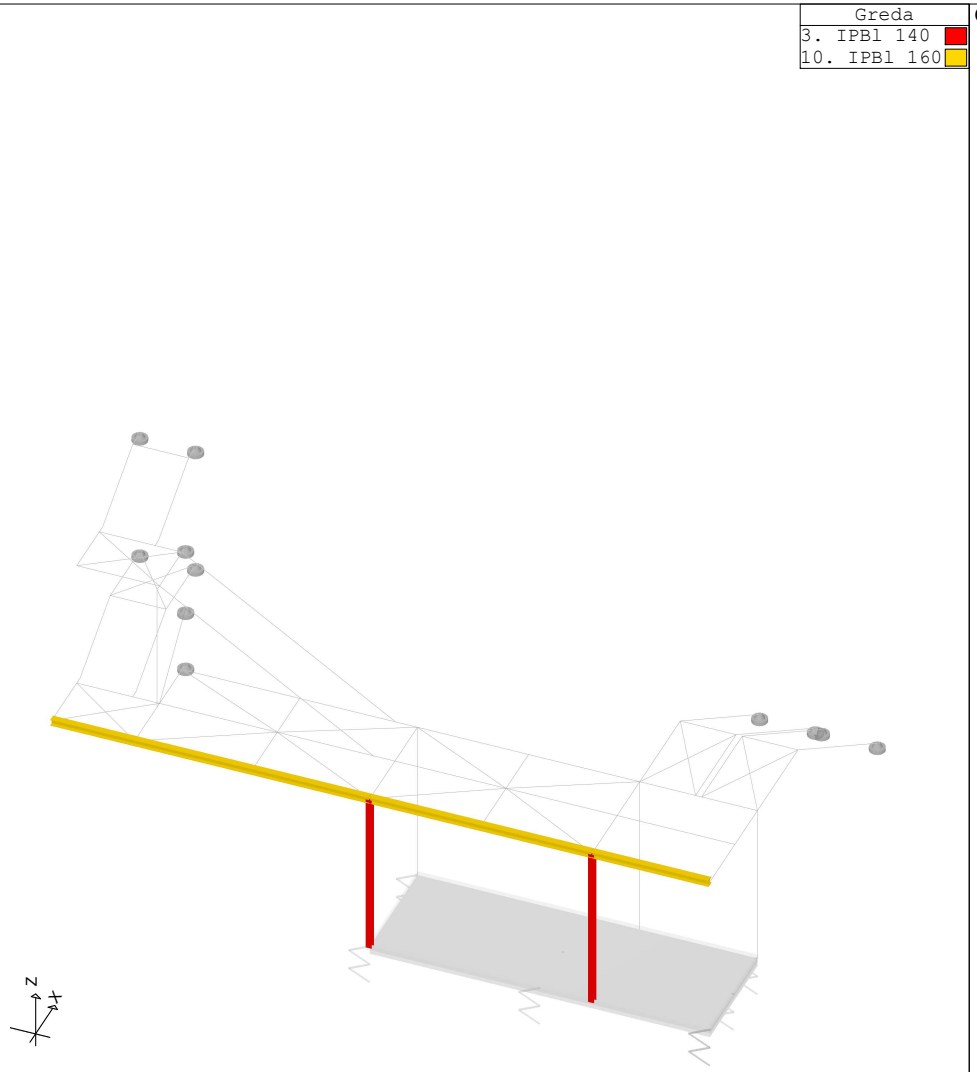


Seti numeričnih podatkov
Greda (1,10)

Okvir: V_4

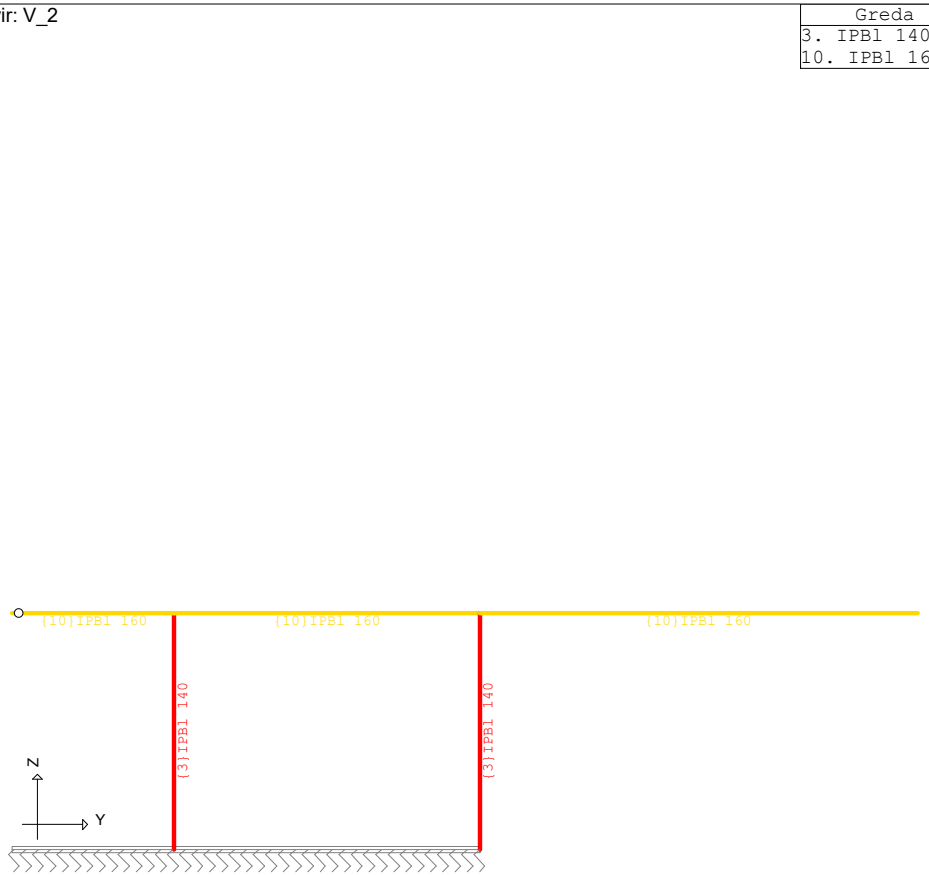


Seti numeričnih podatkov
Greda (1,10)



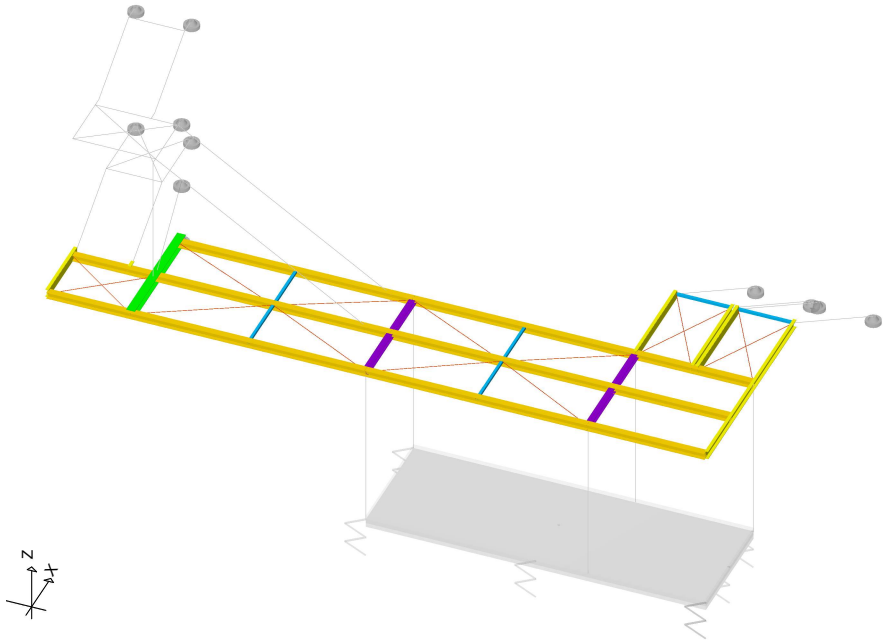
Seti numeričnih podatkov
Greda (3,10)

Okvir: V_2



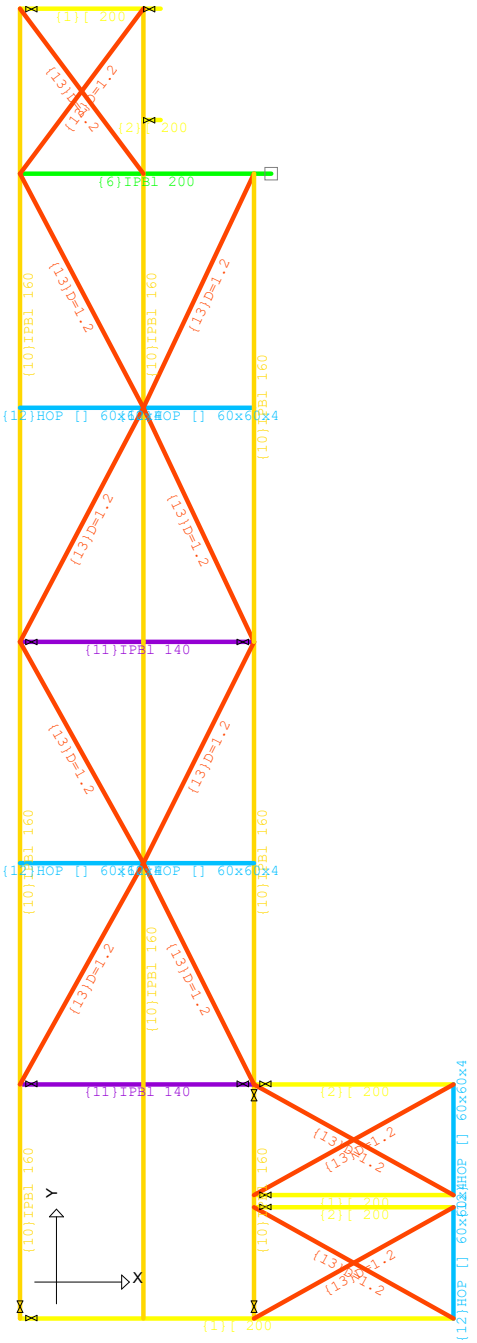
Seti numeričnih podatkov
Greda (3,10)

Greda
1. [200
2. [200
6. IPBl 200
10. IPBl 160
11. IPBl 140
12. HOP [] 60x60x4
13. D=1.2



Seti numeričnih podatkov
Greda (1,2,6,10-13)

Pogled: Nivo_1



Greda
1. [200
2. [200
6. IPBl 200
10. IPBl 160
11. IPBl 140
12. HOP [] 60x60x4
13. D=1.2

Seti numeričnih podatkov
Greda (1,2,6,10-13)

Plošče - predizmera

Set	d [m]/Material	γ [kN/m³]	P [m²]	V [m³]	m [T]
1	d=0.200 C 25/30	25.000	21.060	4.212	10.738

Grede - predizmere po setih

Set	Prerez/Material	γ [kN/m³]	L [m]	O [m²]	V [m³]	m [T]
1	[200 Jeklo	78.500	34.961	23.062	0.113	0.901
2	[200 Jeklo	78.500	29.561	19.500	0.095	0.762
3	IPBl 140 Jeklo	78.500	15.800	12.551	0.050	0.397
4	IPBl 140 Jeklo	78.500	3.950	3.138	0.012	0.099
6	IPBl 200 Jeklo	78.500	2.900	3.295	0.016	0.125
7	D= 60.3x4 Jeklo	78.500	2.107	0.399	0.001	0.012
8	HOP [] 100x100x5 Jeklo	78.500	3.140	1.202	0.006	0.046
9	HOP [] 150x100x5 Jeklo	78.500	1.620	0.782	0.004	0.030
10	IPBl 160 Jeklo	78.500	43.400	39.331	0.168	1.348
11	IPBl 140 Jeklo	78.500	5.400	4.290	0.017	0.136
12	HOP [] 60x60x4 Jeklo	78.500	10.520	2.380	0.009	0.072
13	D=1.2 Jeklo	78.500	47.700	1.798	0.005	0.043
		Skupno:	201.06	111.73	0.496	3.972

Grede - predizmera po prečnih prerezih

Prerez/Material	γ [kN/m³]	L [m]	O [m²]	V [m³]	m [T]
[200 Jeklo	78.500	64.522	42.562	0.208	1.663
IPBl 140 Jeklo	78.500	25.150	19.979	0.079	0.632
IPBl 200 Jeklo	78.500	2.900	3.295	0.016	0.125
D= 60.3x4 Jeklo	78.500	2.107	0.399	0.001	0.012
HOP [] 100x100x5 Jeklo	78.500	3.140	1.202	0.006	0.046
HOP [] 150x100x5 Jeklo	78.500	1.620	0.782	0.004	0.030
IPBl 160 Jeklo	78.500	43.400	39.331	0.168	1.348
HOP [] 60x60x4 Jeklo	78.500	10.520	2.380	0.009	0.072
D=1.2 Jeklo	78.500	47.700	1.798	0.005	0.043
	Skupno:	201.06	111.73	0.496	3.972

Rekapitulacija količine materiala

Material	γ [kN/m³]	O [m²]	P [m²]	V [m³]	m [T]
Jeklo	78.500	111.73		0.496	3.972
C 25/30	25.000		21.060	4.212	10.738
	Skupno:	111.73	21.060	4.708	14.709

GRADBENI BIRO
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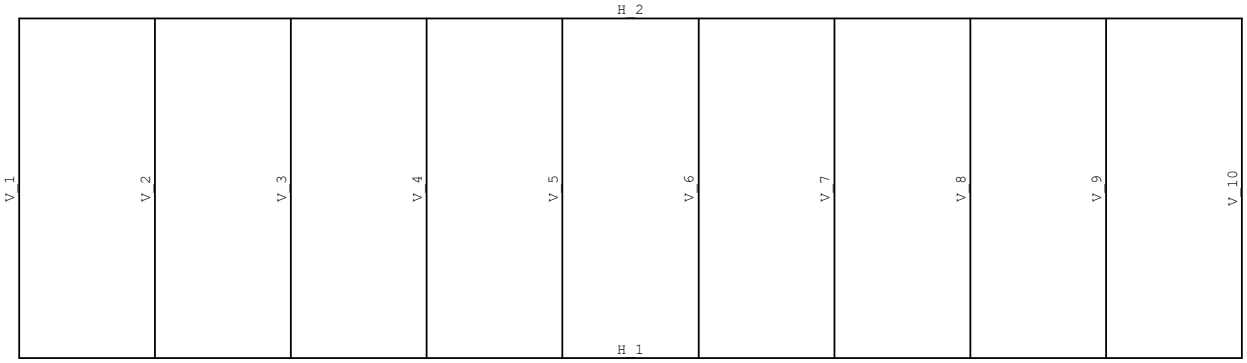
www.zasnova.si

2.7.3. Dispozicija jeklene nadstrešnice - kolesarnica

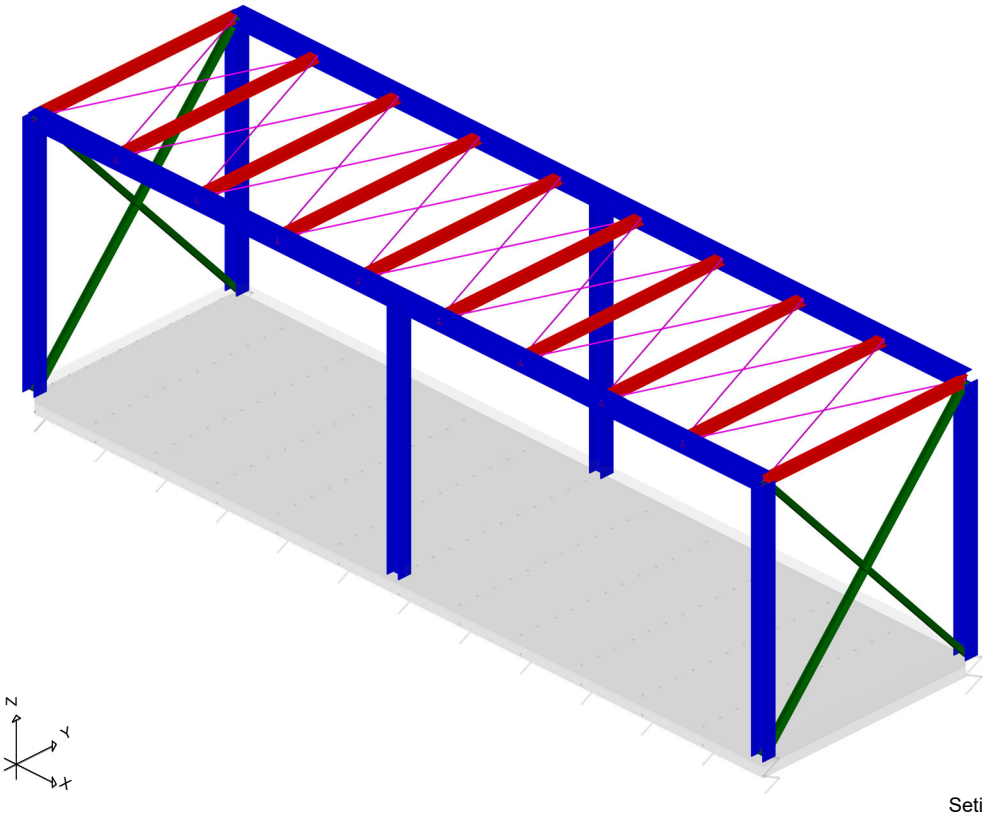
2. Načrt gradbeništva

Vhodni podatki - Konstrukcija



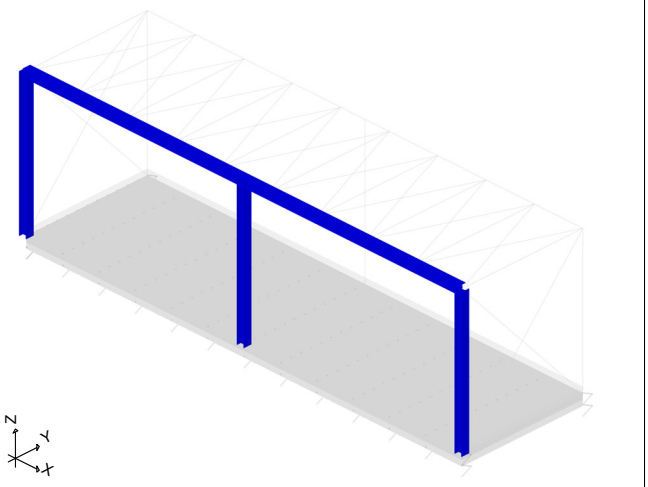
Dispozicija okvirjev

Greda
1. IPBl 140
2. IPBl 140
3. IPE 100
4. L 60x60x6
5. D=1.2



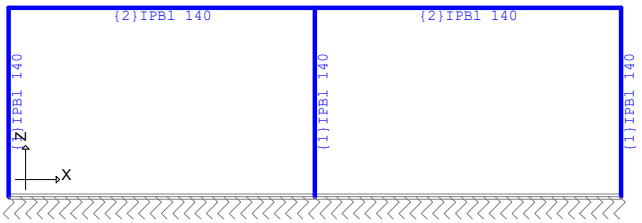
Seti numeričnih podatkov
Greda (1-5)

2. Načrt gradbeništva

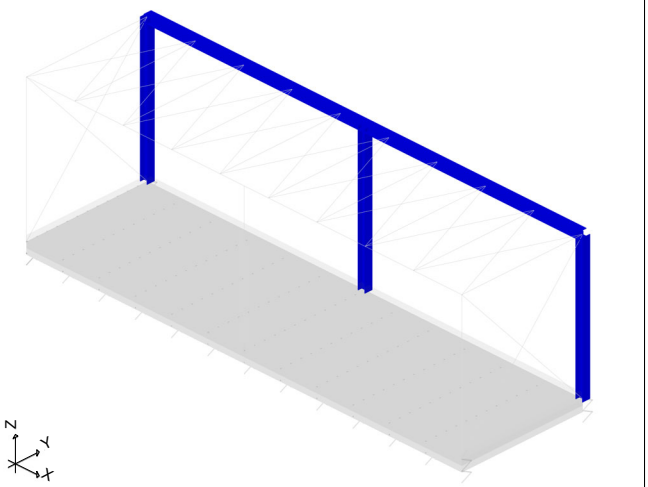


Seti numeričnih podatkov
Greda (1,2)

Okvir: H_1

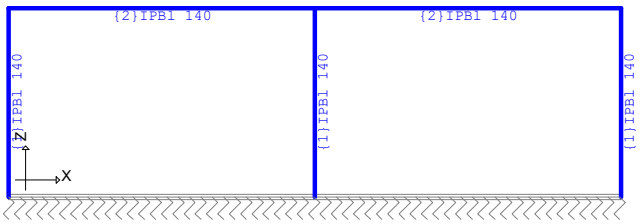


Seti numeričnih podatkov
Greda (1,2)



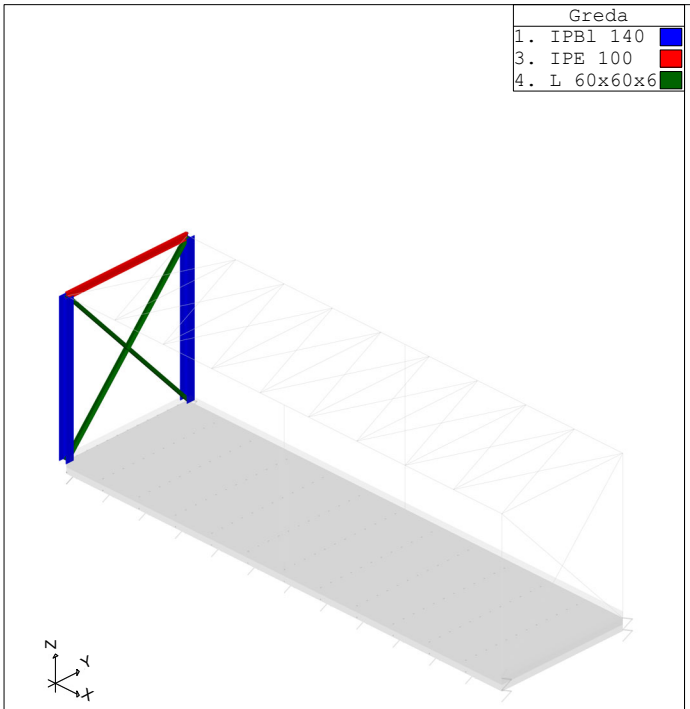
Seti numeričnih podatkov
Greda (1,2)

Okvir: H_2



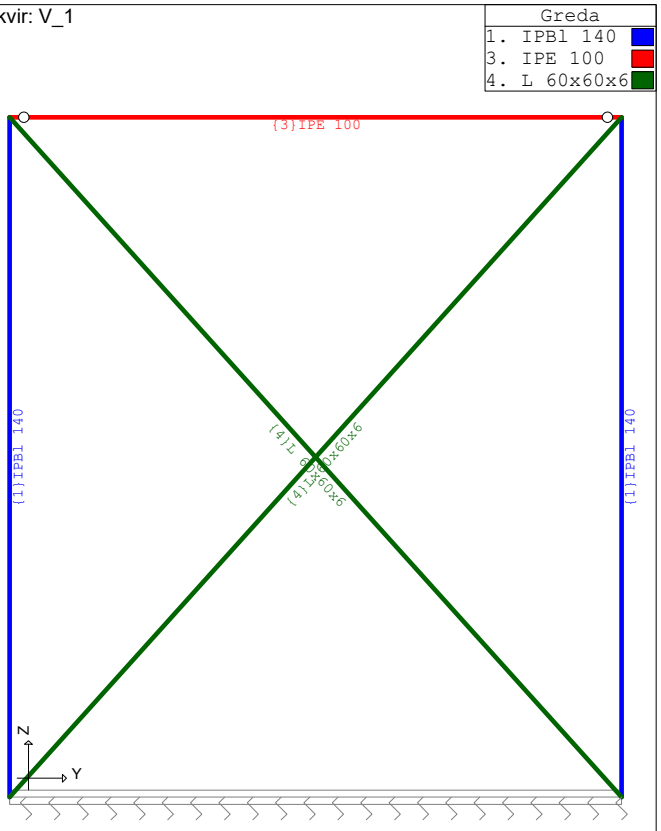
Seti numeričnih podatkov
Greda (1,2)

2. Načrt gradbeništva

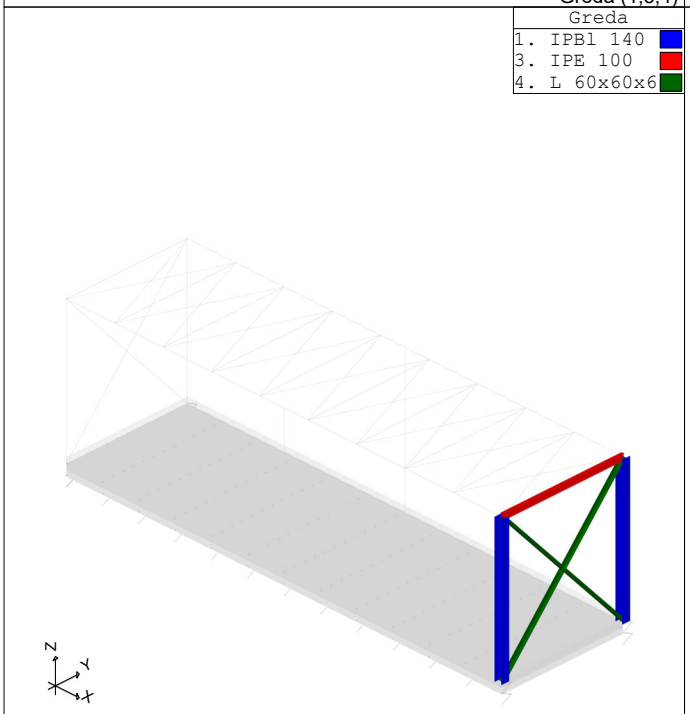


Seti numeričnih podatkov
Greda (1,3,4)

Okvir: V_1

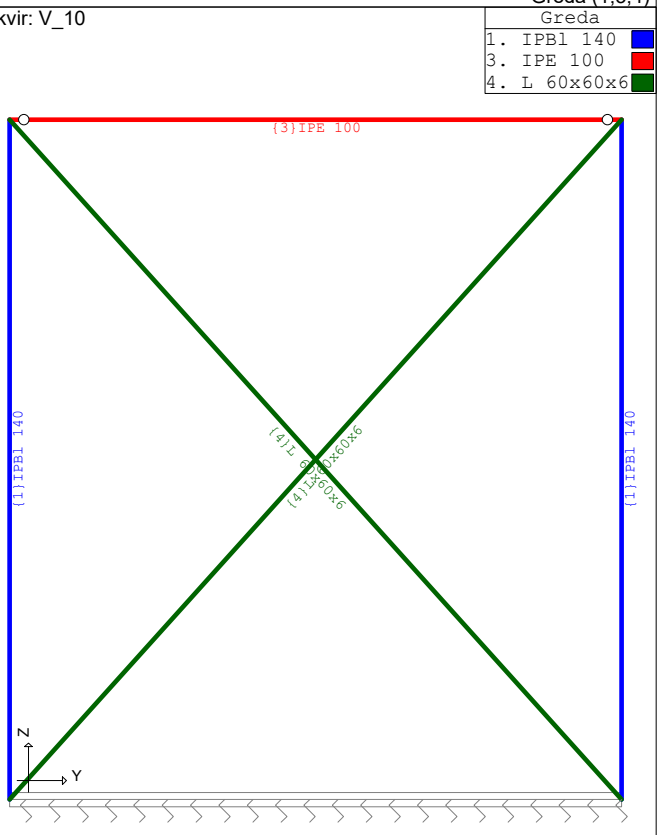


Seti numeričnih podatkov
Greda (1,3,4)



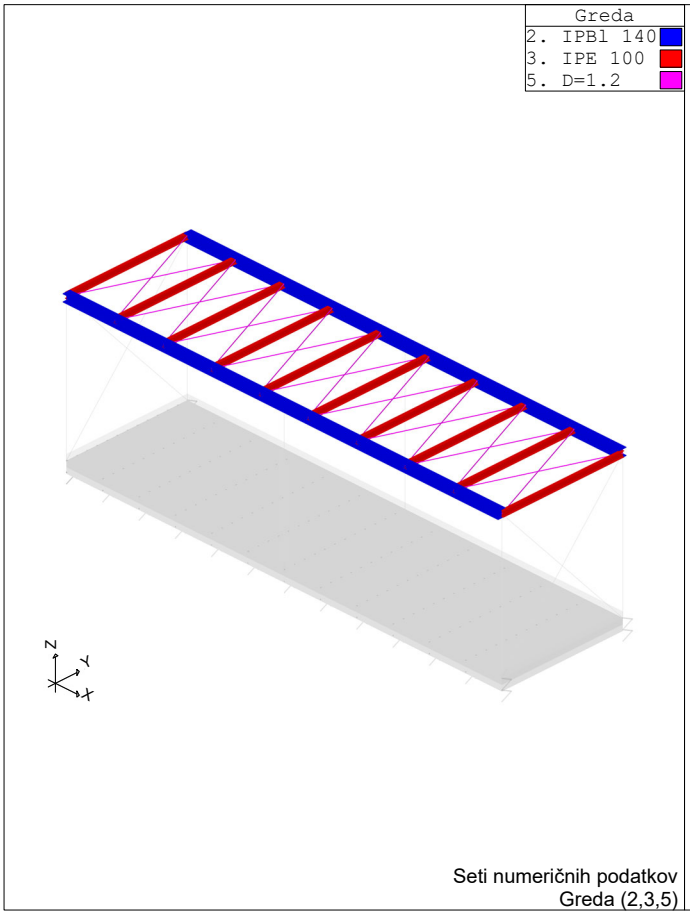
Seti numeričnih podatkov
Greda (1,3,4)

Okvir: V_10

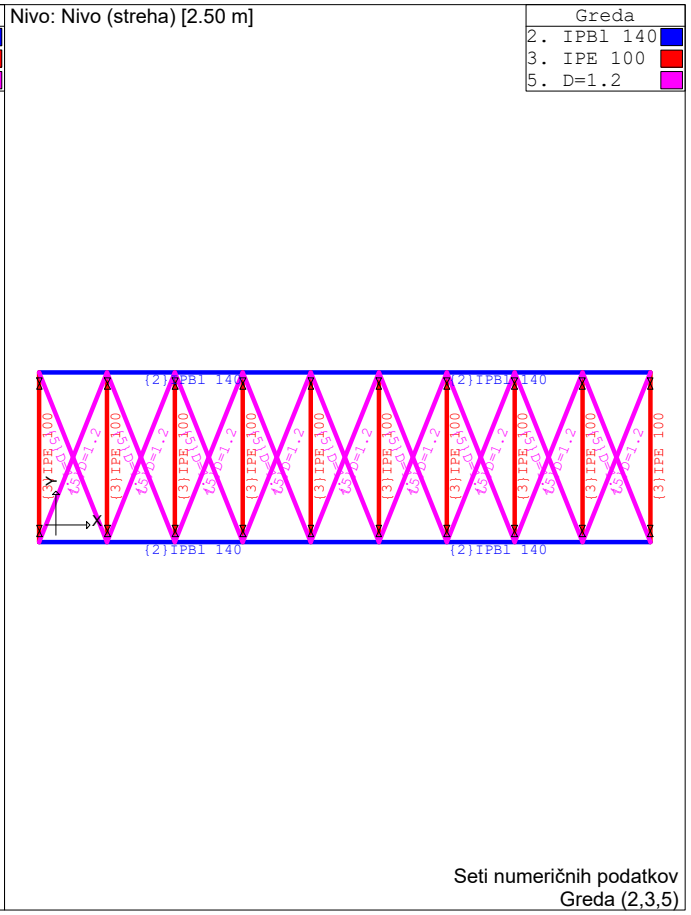


Seti numeričnih podatkov
Greda (1,3,4)

2. Načrt gradbeništva



Seti numeričnih podatkov
Greda (2,3,5)



Seti numeričnih podatkov
Greda (2,3,5)

Grede - predizmere po setih

Set	Prerez/Material	γ [kN/m³]	L [m]	O [m²]	V [m³]	m [T]
1	IPBl 140 Jeklo	78.500	15.000	11.916	0.047	0.377
2	IPBl 140 Jeklo	78.500	16.200	12.869	0.051	0.407
3	IPE 100 Jeklo	78.500	22.500	8.995	0.023	0.186
4	L 60x60x6 Jeklo	78.500	13.454	3.136	0.009	0.074
5	D=1.2 Jeklo	78.500	43.620	1.644	0.005	0.039
		Skupno:	110.77	38.561	0.135	1.084

Grede - predizmera po prečnih prerezih

Prerez/Material	γ [kN/m³]	L [m]	O [m²]	V [m³]	m [T]
IPBl 140 Jeklo	78.500	31.200	24.785	0.098	0.784
IPE 100 Jeklo	78.500	22.500	8.995	0.023	0.186
L 60x60x6 Jeklo	78.500	13.454	3.136	0.009	0.074
D=1.2 Jeklo	78.500	43.620	1.644	0.005	0.039
	Skupno:	110.77	38.561	0.135	1.084

Rekapitulacija količine materiala

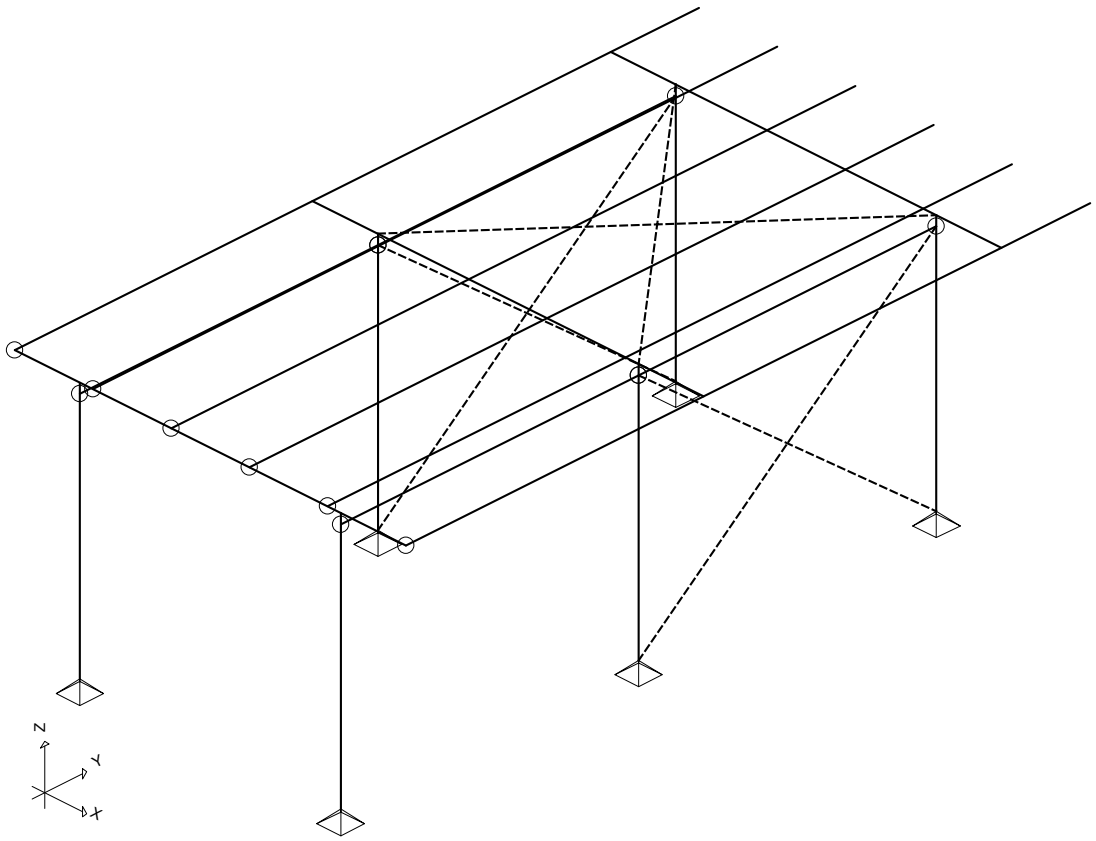
Material	γ [kN/m³]	O [m²]	V [m³]	m [T]
Jeklo	78.500	38.561	0.135	1.084

GRADBENI BIRO
Vrvarska pot 1a
1310 Ribnica, Slovenija
T 01 836 90 60
info@zasnova.si
www.zasnova.si

2.7.4. Dispozicija jeklene nadstrešnice - vhod

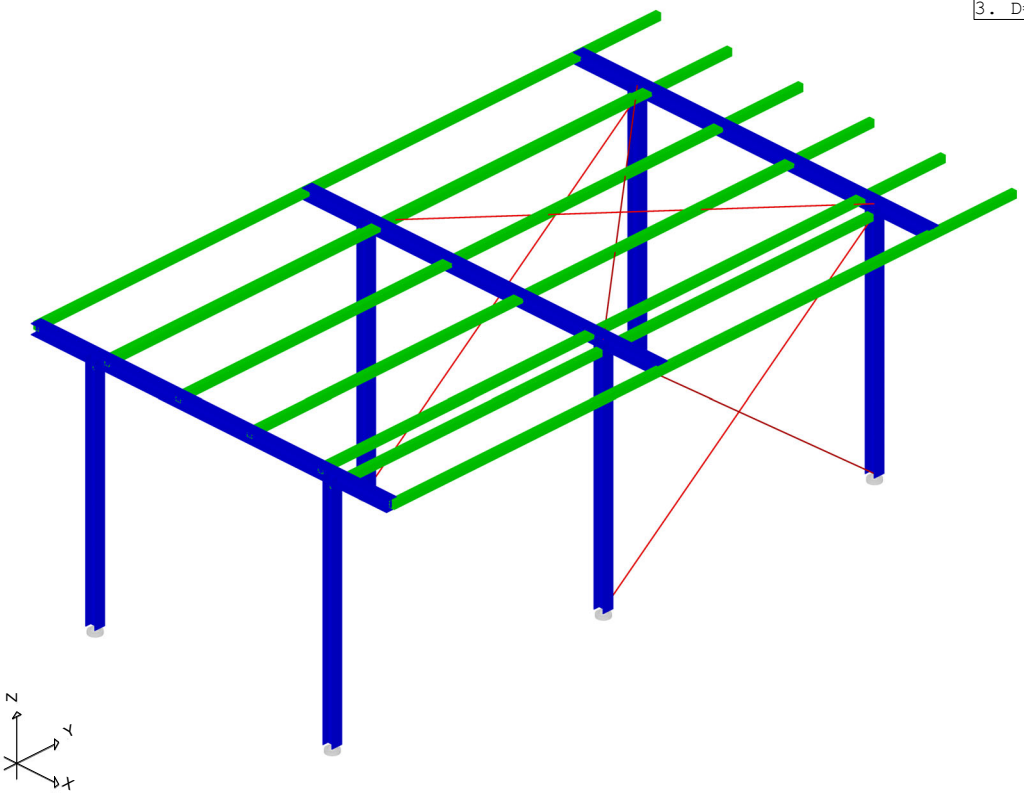
2. Načrt gradbeništva

Vhodni podatki - Konstrukcija



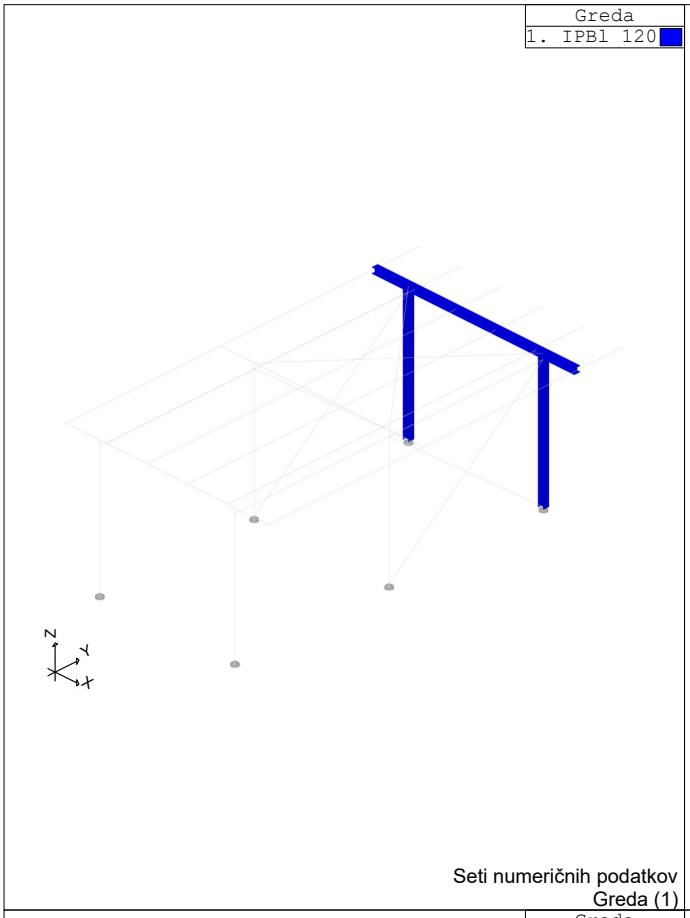
Izometrija

Greda
1. IPBl 120
2. HOP [] 80x60x4
3. D=1.2



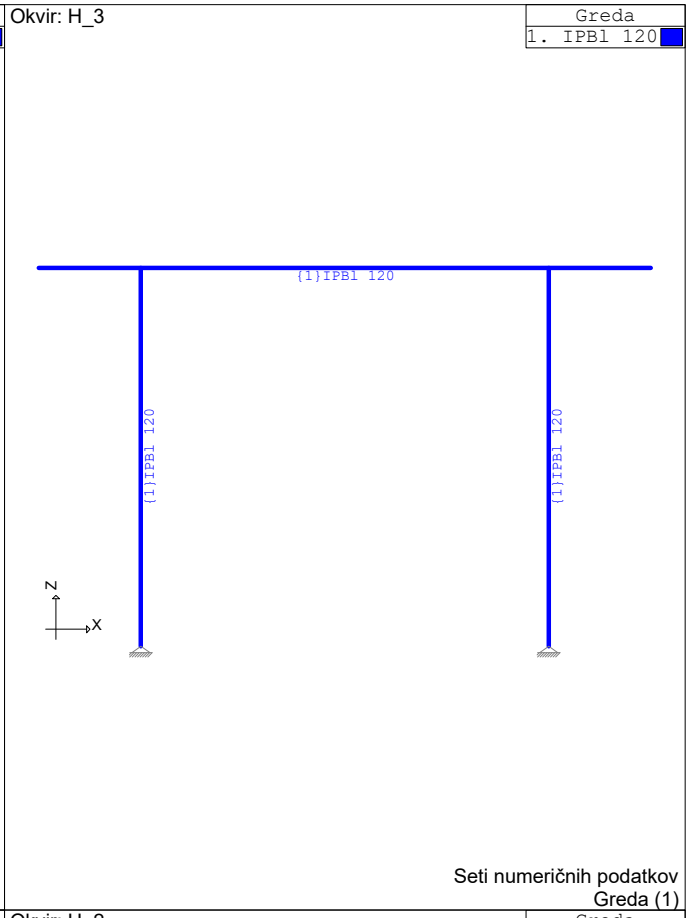
Seti numeričnih podatkov
Greda (1-3)

2. Načrt gradbeništva

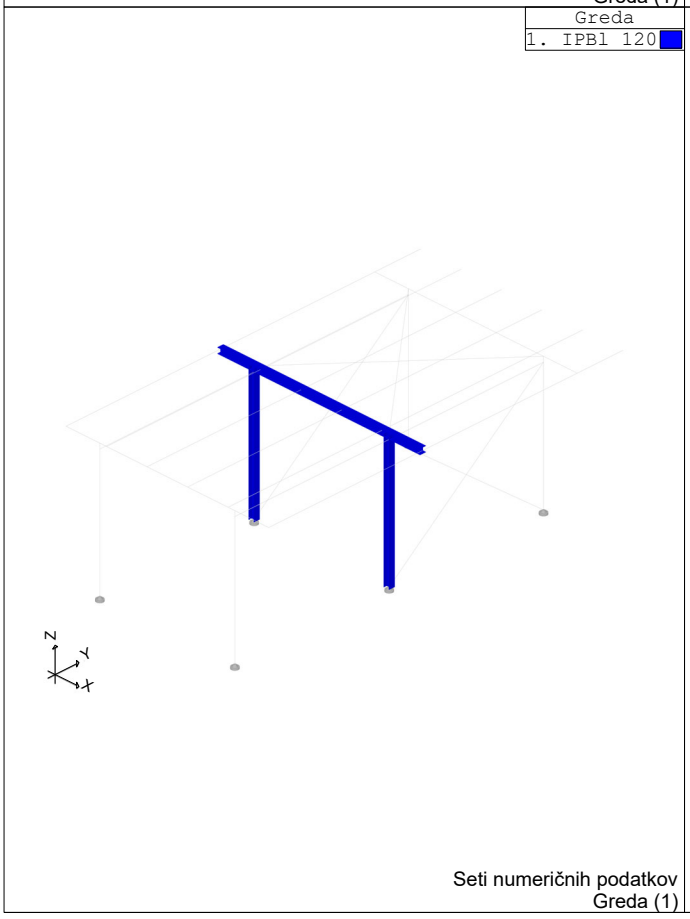


Seti numeričnih podatkov
Greda (1)

Okvir: H_3

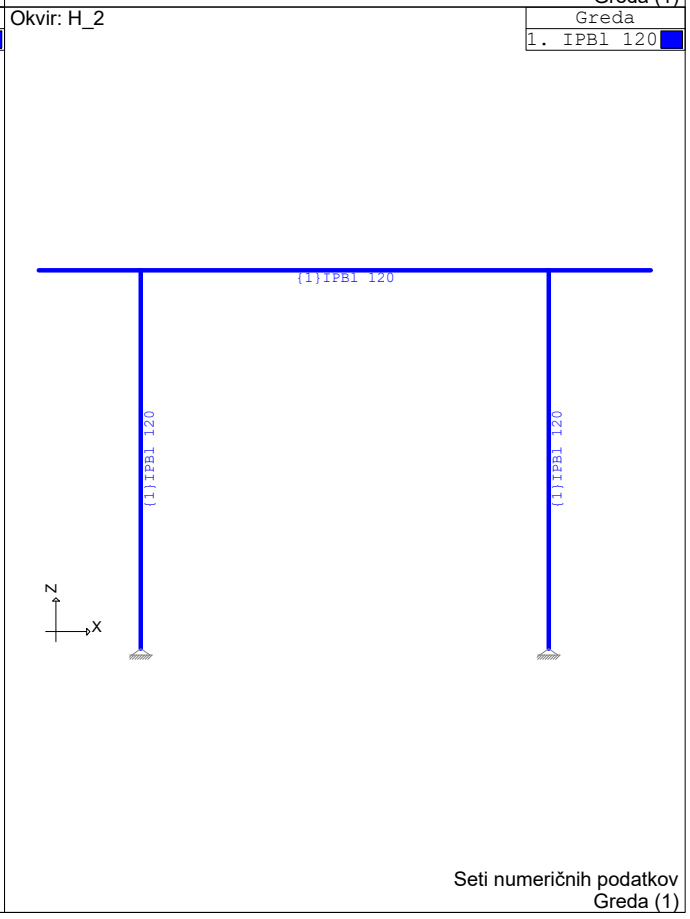


Seti numeričnih podatkov
Greda (1)



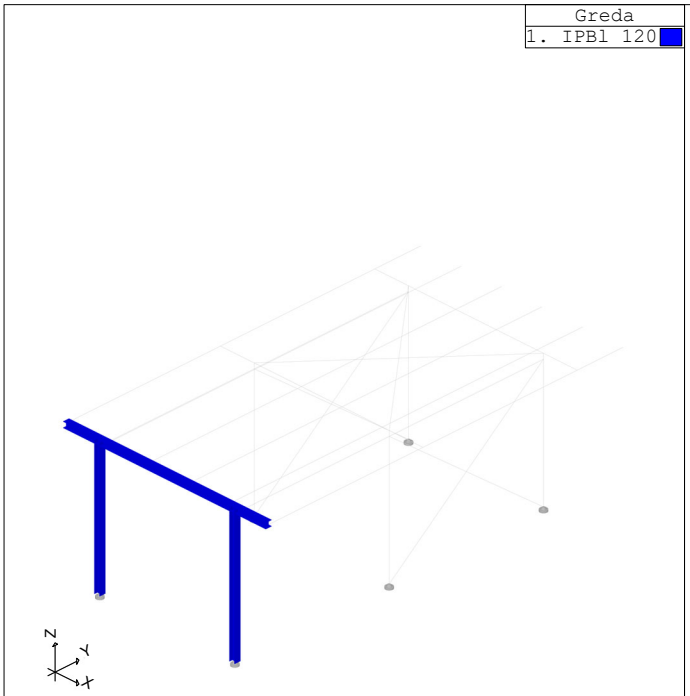
Seti numeričnih podatkov
Greda (1)

Okvir: H_2



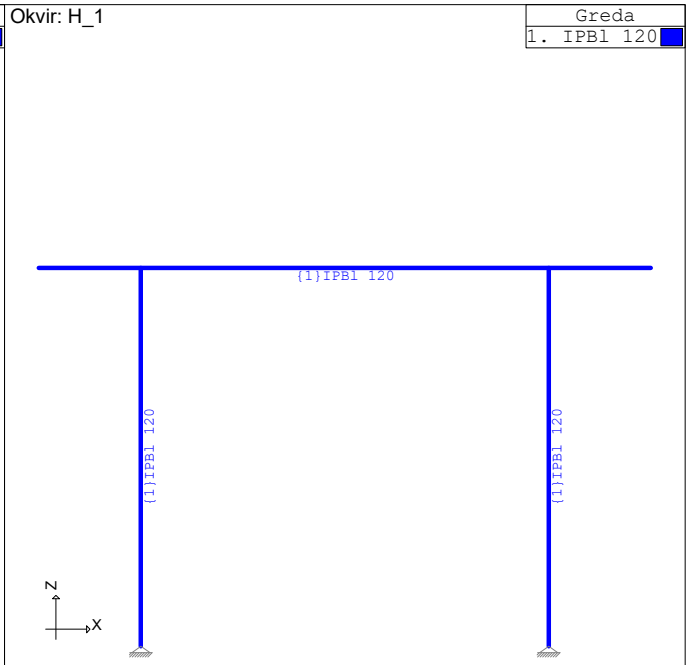
Seti numeričnih podatkov
Greda (1)

2. Načrt gradbeništva

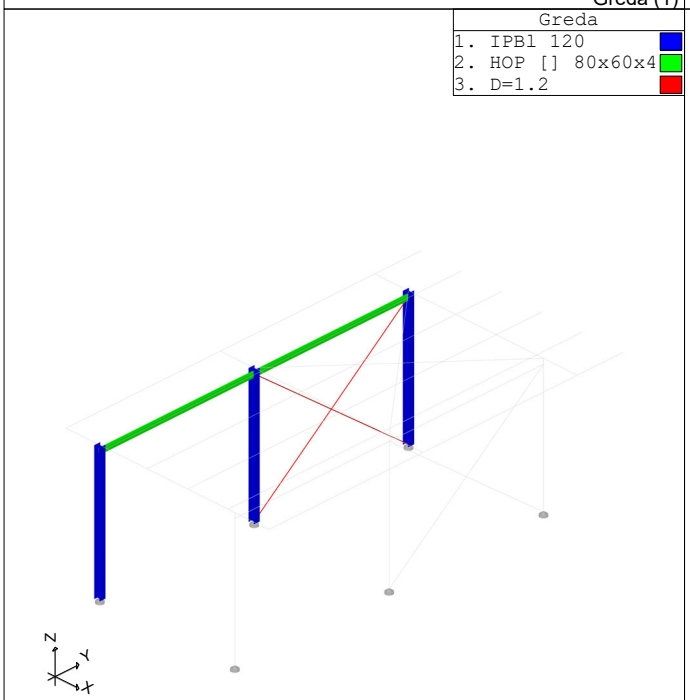


Seti numeričnih podatkov
Greda (1)

Okvir: H_1

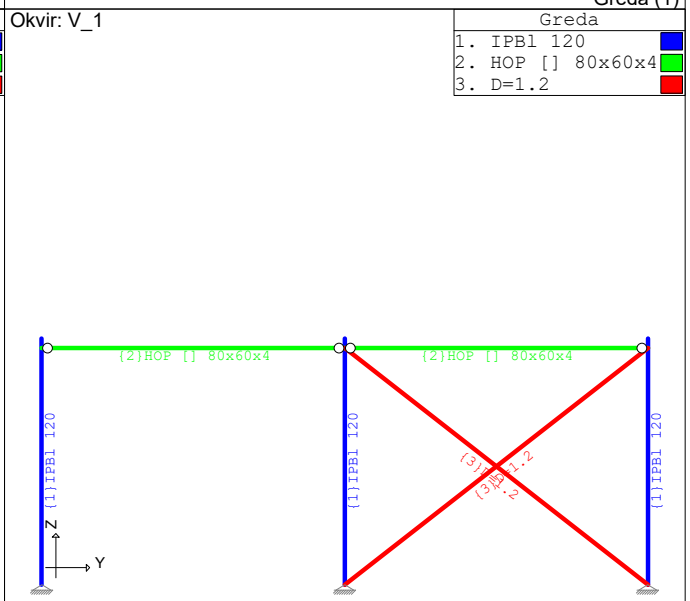


Seti numeričnih podatkov
Greda (1)



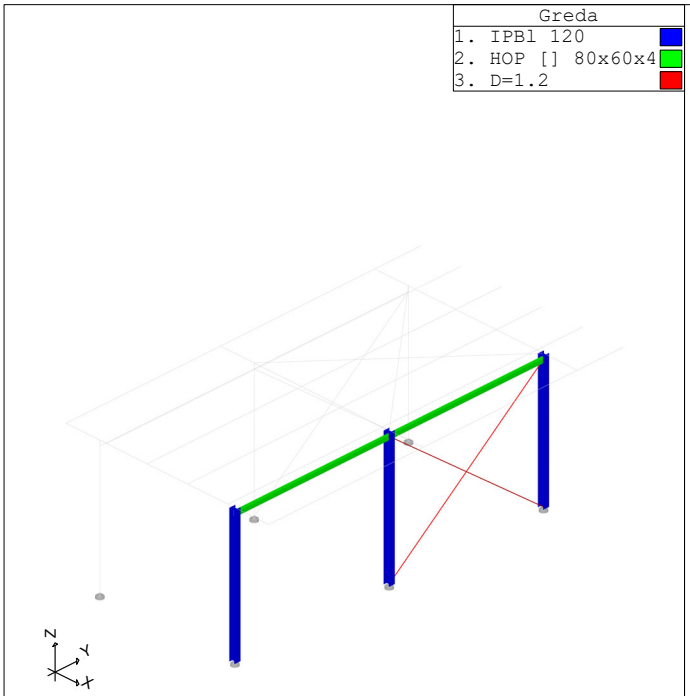
Seti numeričnih podatkov
Greda (1-3)

Okvir: V_1



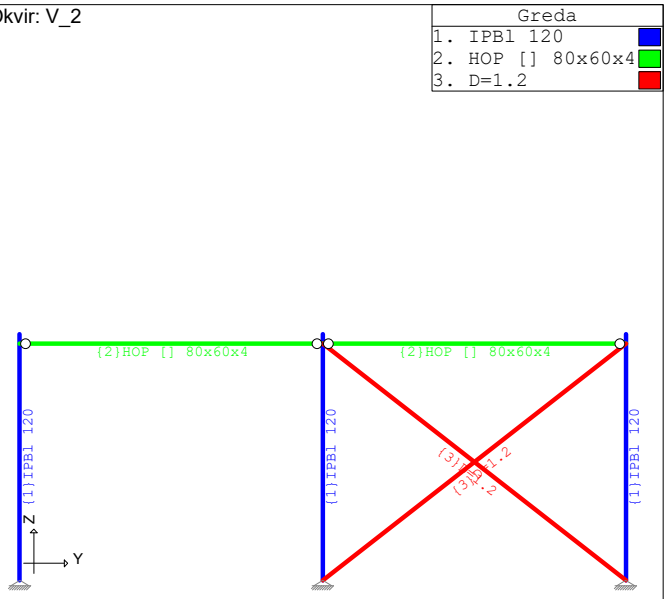
Seti numeričnih podatkov
Greda (1-3)

2. Načrt gradbeništva

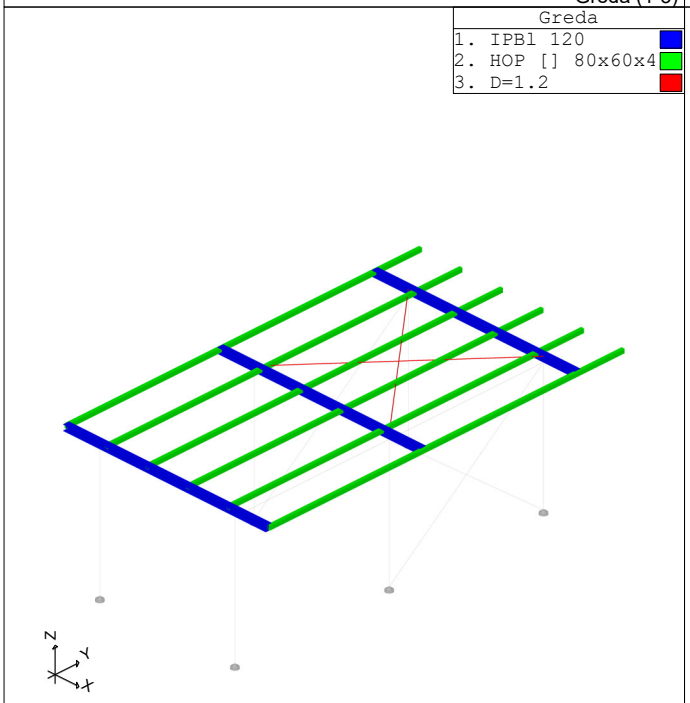


Seti numeričnih podatkov
Greda (1-3)

Okvir: V_2

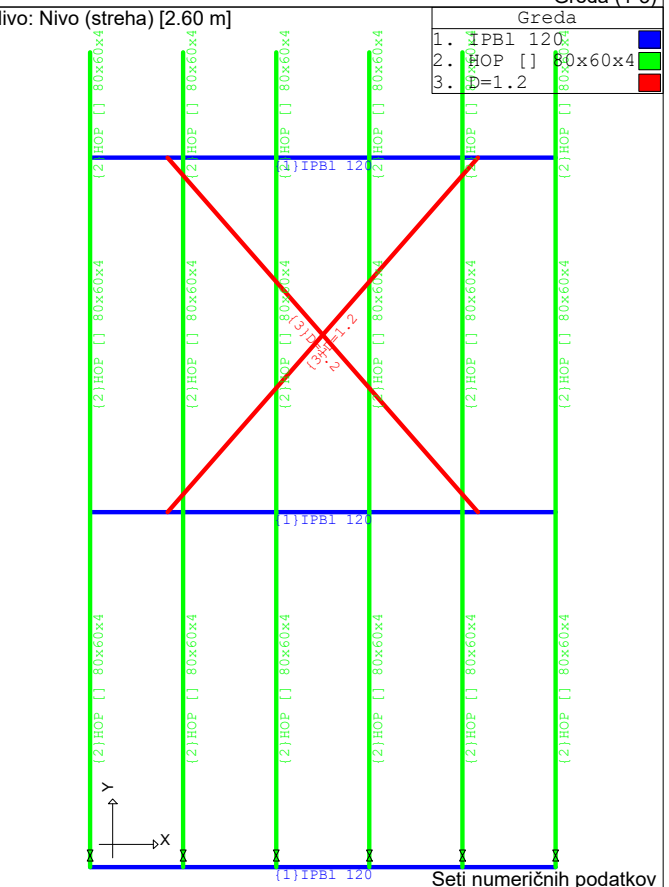


Seti numeričnih podatkov
Greda (1-3)



Seti numeričnih podatkov
Greda (1-3)

Nivo: Nivo (streha) [2.60 m]



Seti numeričnih podatkov
Greda (1-3)

2. Načrt gradbeništva

Grede - predizmere po setih						
Set	Prerez/Material	γ [kN/m³]	L [m]	O [m²]	V [m³]	m [T]
1	IPBl 120 Jeklo	78.500	28.200	19.103	0.071	0.571
2	HOP [] 80x60x4 Jeklo	78.500	56.900	15.151	0.058	0.462
3	D=1.2 Jeklo	78.500	24.747	0.933	0.003	0.022
		Skupno:	109.85	35.186	0.132	1.056

Rekapitulacija količine materiala				
Material	γ [kN/m³]	O [m²]	V [m³]	m [T]
Jeklo	78.500	35.186	0.132	1.056

GRADBENI BIRO
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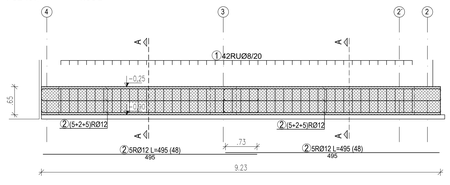
www.zasnova.si

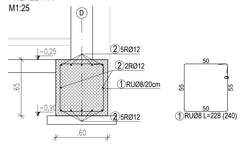
2.8. ARMATURNI NAČRT / SPECIFIKACIJA ARMATURE

2.8.1. Armatura osnovne stavbe

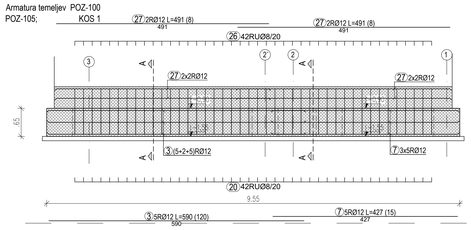
Armatura temeljev POZ-100
POZ-101; KOS 2



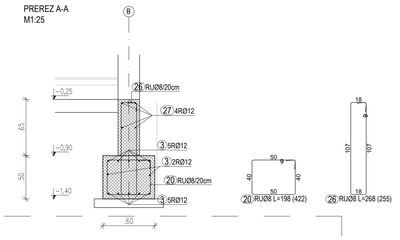
PREREZ A-A
M1:25



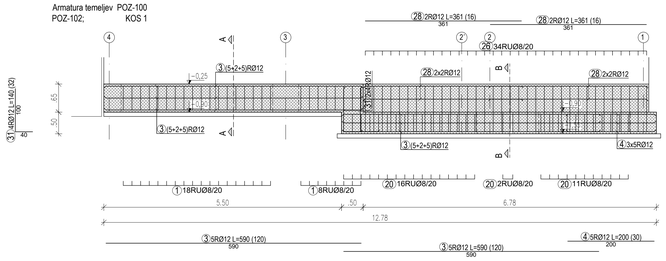
Armatura temeljev POZ-100
POZ-105; KOS 1



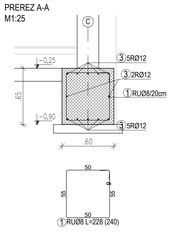
PREREZ A-A
M1:25



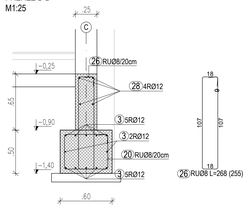
Armatura temeljev POZ-100
POZ-102; KOS 1



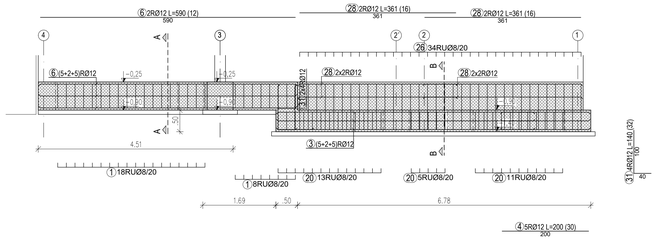
PREREZ A-A
M1:25



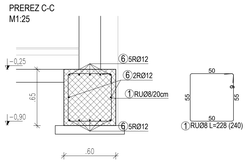
PREREZ B-B
M1:25



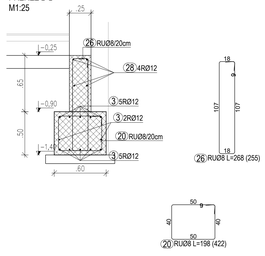
Armatura temeljev POZ-100
POZ-104; KOS 1

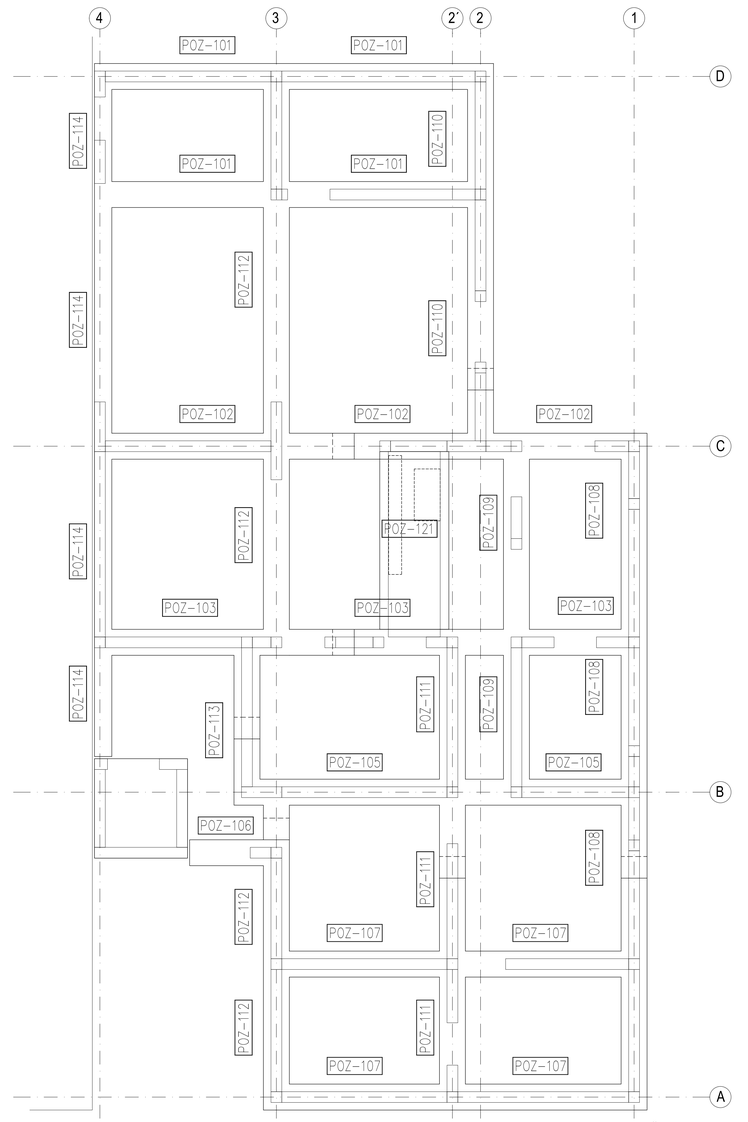


PREREZ C-C
M1:25



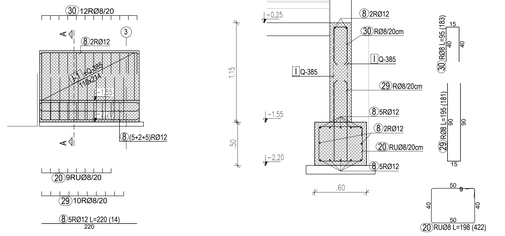
PREREZ B-B
M1:25





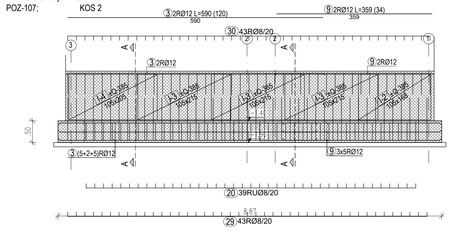
POZICIJSKI NAČRT:
PASOVNI TEMELJI

Armatura temeljev POZ-100
POZ-106; KOS 1

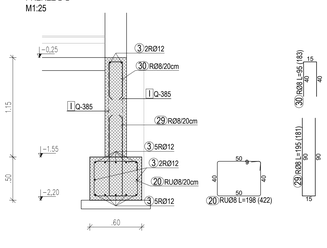


PREREZ A-A
M1:25

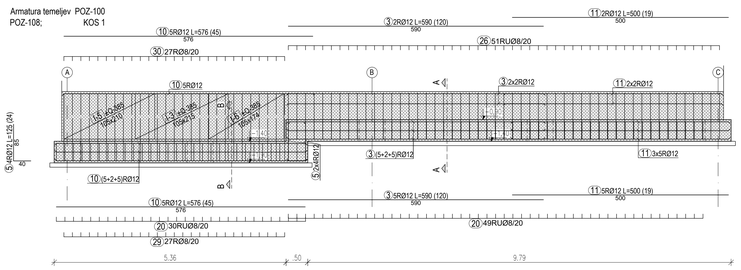
Armatura temeljev POZ-100
POZ-107; KOS 2



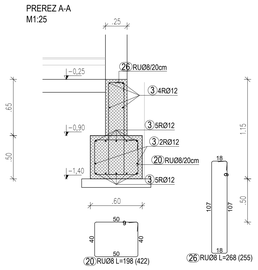
PREREZ B-B
M1:25



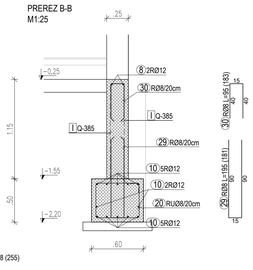
Armatura temeljev POZ-100
POZ-108; KOS 1



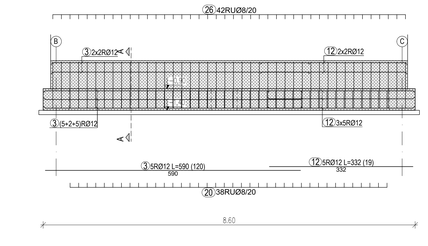
PREREZ A-A
M1:25



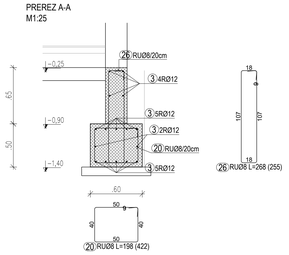
PREREZ B-B
M1:25



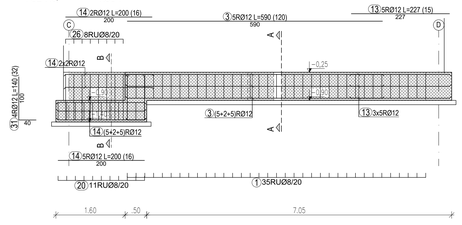
Armatura temeljev POZ-100
POZ-109; KOS 1



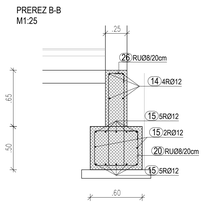
PREREZ A-A
M1:25



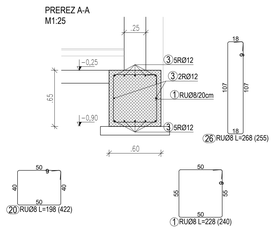
Armatura temeljev POZ-100
POZ-110; KOS 1



PREREZ B-B
M1:25



PREREZ A-A
M1:25



SIDRA ZA VV VEZI IN STEBRE PRIKAZANE NA LISTU 2.7.3.

MATERIALI:
- BETON: C 25/30
- JEKLO: S-500 A (mrežna armatura) in S-500 B (ostala armatura)

PREKLOPI:
- OKROGLO JEKLO 60 x Ø
- MREŽNA ARMATURA 40-45cm (min 3 okence mreže)

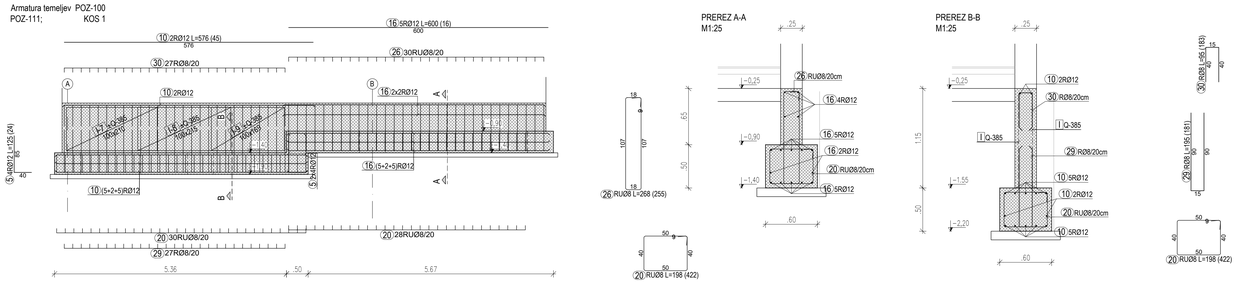
ZAŠČITNE PLASTI BETONA:
- KONSTRUKCIJE, KI SO V STIKU Z ZEMLJIŠČO min 3cm
- OSTALE KONSTRUKCIJE min 2,5cm

OPOMBE:
- Poleg pogojev iz projekta je potrebno upoštevati vse zahteve standardov SIST EN 206, SIST EN 1026 in SIST EN 10080
- Izvajanje armirano - betonskih konstrukcij mora biti skladno s standardom SIST EN 13670
- Poleg tega načrta potrebno upoštevati tudi ostale načrte kot npr. načrt inštalacij
- POSAMEZNE POZICIJE POTREBNO PRILAGODITI (pokritvi, porezati,..)
- VSE DIMEZIJE PREVERITI IN JIH USKLADITI NA LICU MESTA
- Preboje manjši od Ø 20cm niso v načrtu armature. Preboje uskladiti z ostalimi načrti
- Na mestu kjer se prekrivajo mreže je potrebno mreže obrniti tako, da se mreža vleže ena v drugo

POZ-101; POZ-102; POZ-103; POZ-104 POZ-105; POZ-106; POZ-107; POZ-108 POZ-109; POZ-110;

ZAS NOVA	GRADBENI BIRO Lovšin Tone s.p. Vrvarska pot 1a 1310 Ribnica, Slovenija	
	ARMATURA: PASOVNI TEMELJI	M 1:50 / 1:25
sestavni del:	2. Načrt gradbeništva	št. projekta: 04-2019-PZI
		št. načrta: 04-2019-PZI-Gk
objekt:	Prenova in širitev kuhinje - OŠ PT VL	
vodja projekta:	Miha Novina, univ. dipl. inž. arh., ZAPS A 1654	faza projekta: PZI
pooblaščeni inž.arh.:	Tone Lovšin, dipl. inž. grad., IZS G - 0379	datum: julij 2024
sodelavec:	Sandi Mohar, dipl. inž. grad., IZS G - 4126	št. lista: 2.7.1.

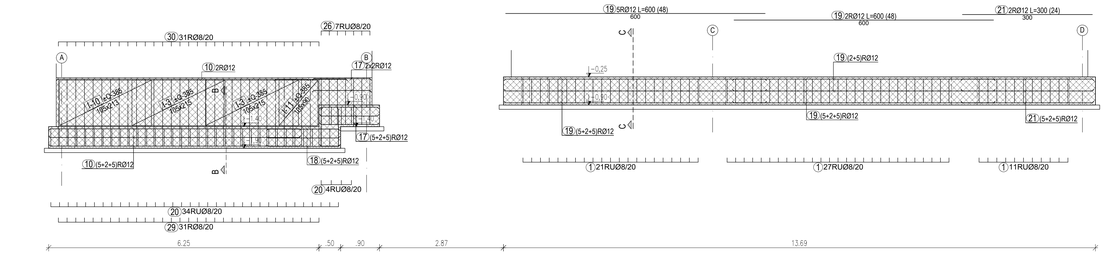
Armatura temeljev POZ-100
POZ-111; KOS 1



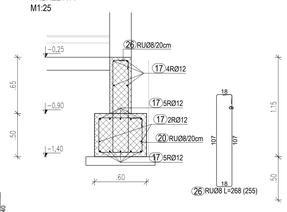
PREREZ A-A
M1:25

PREREZ B-B
M1:25

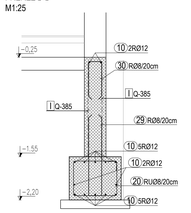
Armatura temeljev POZ-100
POZ-112; KOS 1



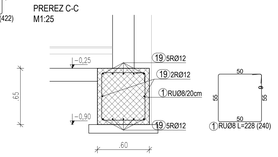
PREREZ A-A
M1:25



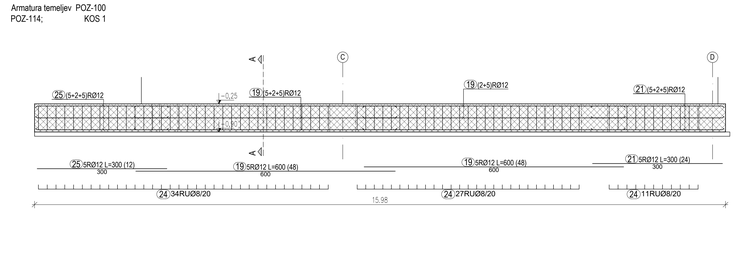
PREREZ B-B
M1:25



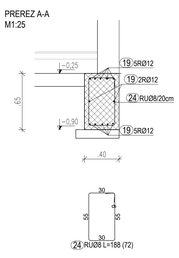
PREREZ C-C
M1:25

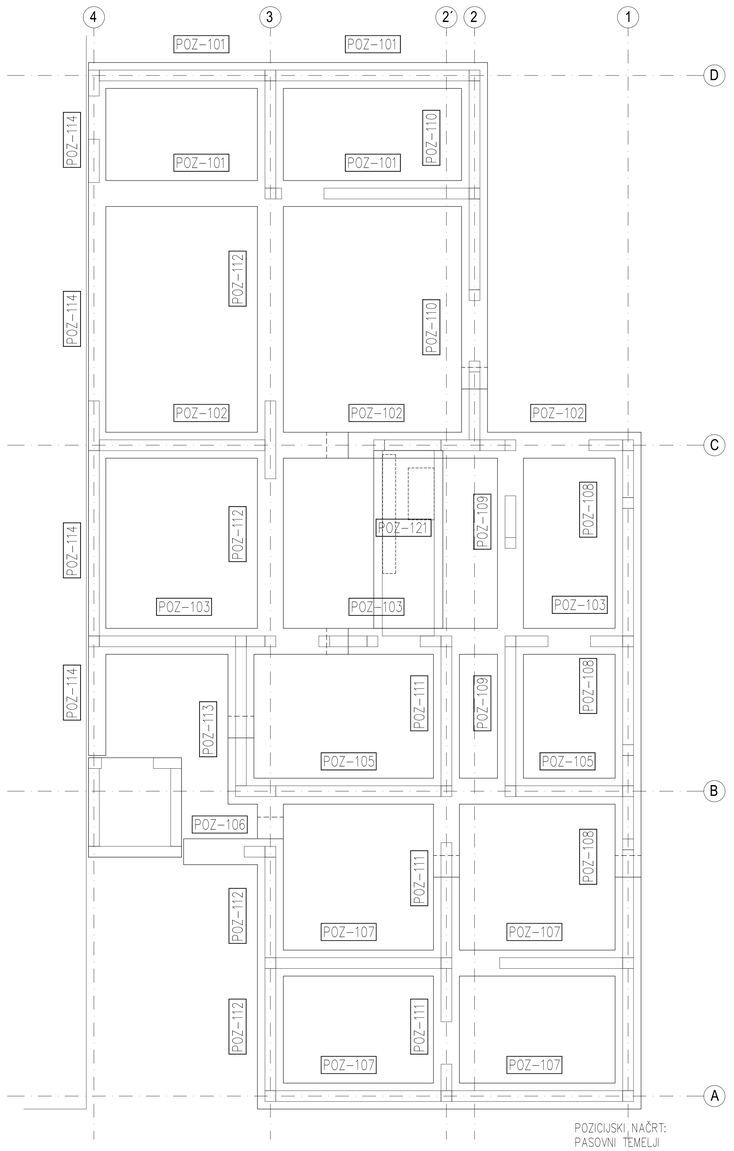


Armatura temeljev POZ-100
POZ-114; KOS 1



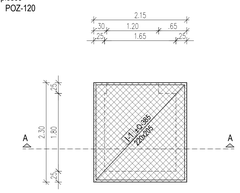
PREREZ A-A
M1:25



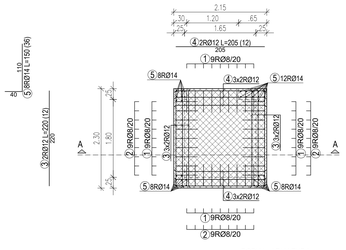


POZICIJSKI NAČRT:
PASOVNI TEMELJI

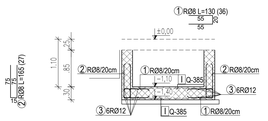
Armatura temeljne plošče -
dvignjenega jaška POZ-120
KOS 1



MREŽNA ARMATURA

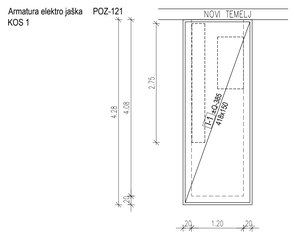


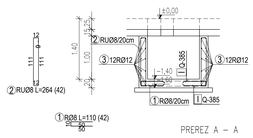
ROBNA ARMATURA



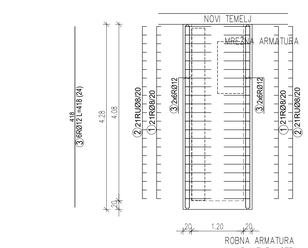
PREREZ A – A

Armatura elektro jaška POZ-121
KOS 1





PREREZ A – A



ROBNA ARMATURA
in ARMATURA STEN

SIDRA ZA VV VEZI IN STEBRE PRIKAZANE NA LISTU 2.7.3.

MATERIALI:
- BETON: C 25/30
- JEKLO: S-500 A (mrežna armatura) in S-500 B (ostala armatura)

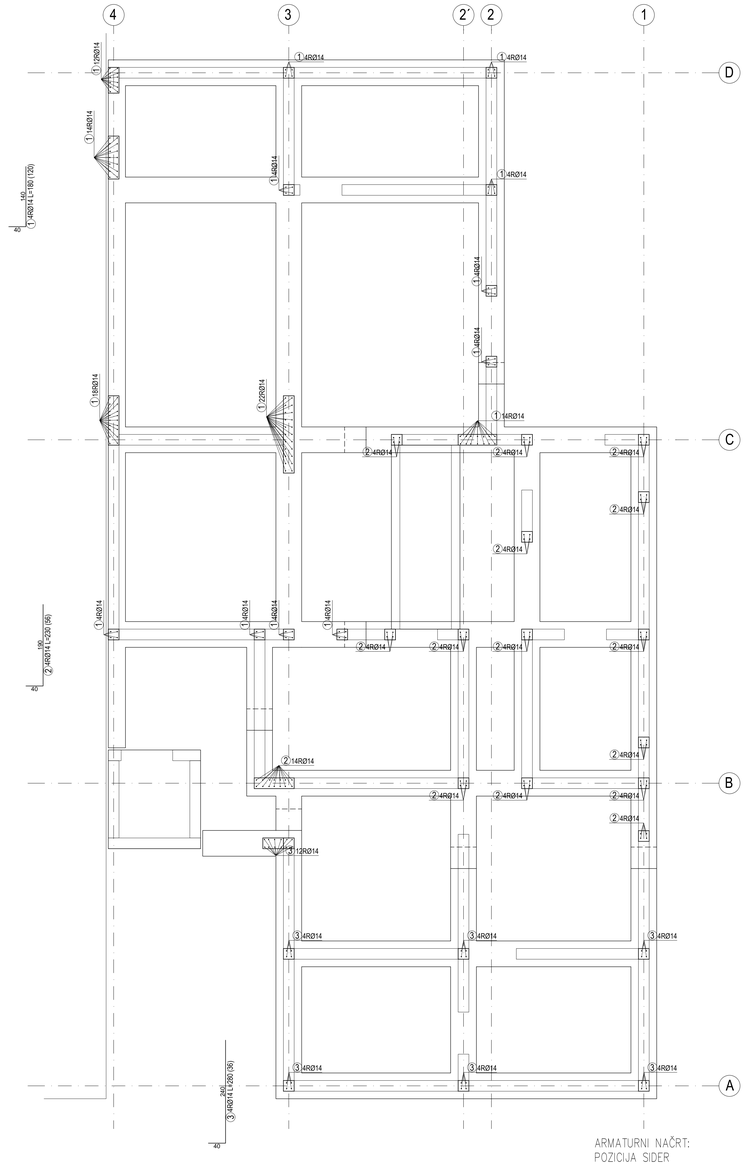
PREKLOPI:
- OKROGLO JEKLO 60 x Ø
- MREŽNA ARMATURA 40-45cm (min 3 okence mreže)

ZAŠČITNE PLASTI BETONA:
- KONSTRUKCIJE, KI SO V STIKU Z ZEMLJIŠČO min 3cm
- OSTALE KONSTRUKCIJE min 2,5cm

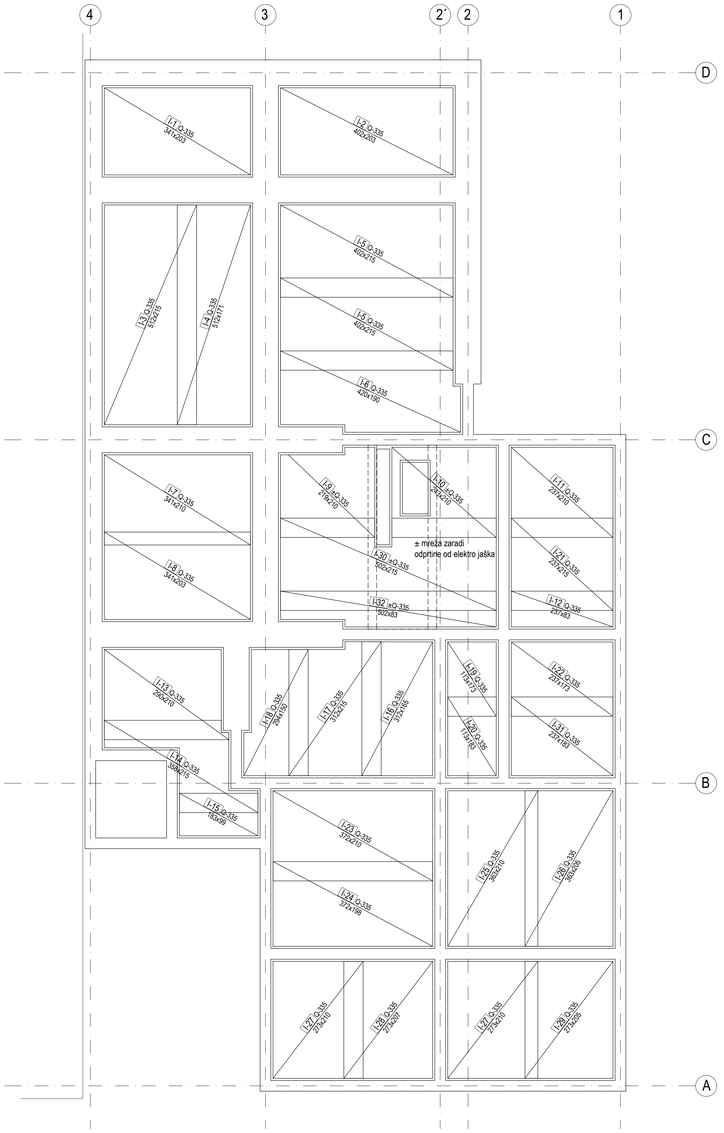
OPOMBE:
- Poleg pogojev iz projekta je potrebno upoštevati vse zahteve standardov SIST EN 206, SIST EN 1026 in SIST EN 10080
- Izvajanje armirano - betonskih konstrukcij mora biti skladno s standardom SIST EN 13670
- Poleg tega načrta potrebno upoštevati tudi ostale načrte kot npr. načrt inštalacij
- POSAMEZNE POZICIJE POTREBNO PRILAGODITI (pokriviti, porezati,..)
- VSE DIMEZIJE PREVERITI IN JIH USKLADITI NA LICU MESTA
- Preboje manjši od Ø 20cm niso v načrtu armature. Preboje uskladiti z ostalimi načrti
- Na mestu kjer se prekrivajo mreže je potrebno mreže obrniti tako, da se mreža uleže ena v drugo

POZ-111; POZ-112; POZ-113; POZ-114
POZ-120; POZ-xxx; POZ-xxx; POZ-xxx

ZAS NOVA	GRADBENI BIRO Lovšin Tone s.p. Vrvarska pot 1a 1310 Ribnica, Slovenija		
sestavni del:	ARMATURA: PASOVNI TEMELJI 2. Načrt gradbeništva	M 1:50 / 1:25 št. projekta:	04-2019-PZI
		št. načrta:	04-2019-PZI-GK
objekt:	Prenova in širitev kuhinje - OŠ PT VL		
vodja projekta:	Miha Novina, univ. dipl. inž. arh., ZAPS A 1654	faza projekta:	PZI
pooblaščeni inž.arh:	Tone Lovšin, dipl. inž. grad., IZS G - 0379	datum:	julij 2024
sodelavec:	Sandi Mohar, dipl. inž. grad., IZS G - 4126	št. lista:	2.7.2.



ARMATURNI NAČRT:
POZICIJA SIDER



ARMATURNI NAČRT:
MREŽE TALNE PLOŠČE

SIDRA ZA VV VEZI IN STEBRE PRIKAZANE NA LISTU 2.7.3.

MATERIALI:
- BETON: C 25/30
- JEKLO: S-500 A (mrežna armatura) in S-500 B (ostala armatura)

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- Preboje manjši od Ø 20cm niso v načrtu armature. Preboje uskladiti z ostalimi načrti
- Na mestu kjer se prekrivajo mreže je potrebno mreže obrniti tako, da se mreža leže ena v drugo

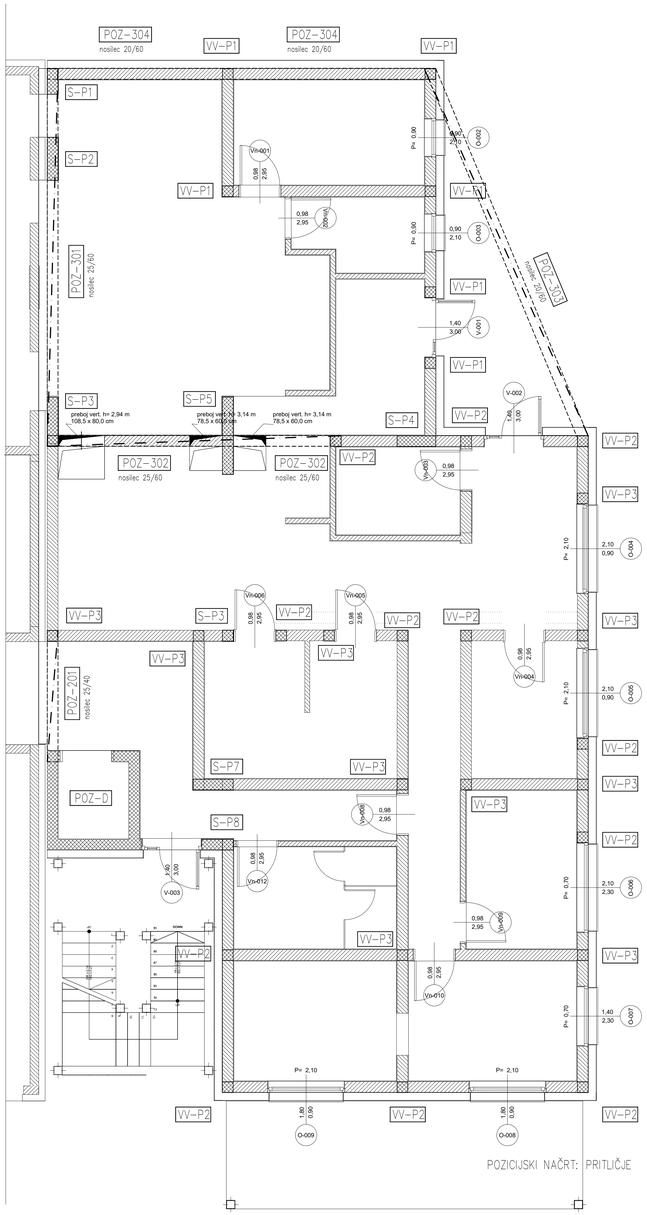
SIDRA IZ TEMELJEV
TALNA PLOŠČA

ZAS NOV A
GRADBENI BIRO
Lovšin Tone s.p.
Vrvarska pot 1a
1310 Ribnica, Slovenija

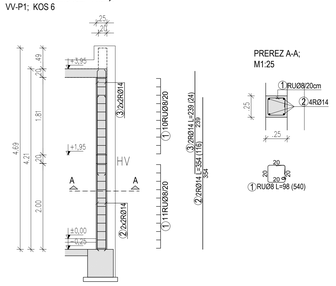
ARMATURA: SIDRA IN MREŽE

M 1:50 / 1:25

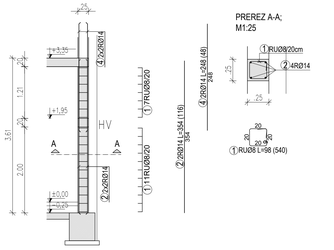
sestavni del:	2. Načrt gradbeništva	št. projekta:	04-2019-PZI
		št. načrta:	04-2019-PZI-GA
objekt:	Prenova in širitev kuhinje - OŠ PT VL		
vodja projekta:	Miha Novina, univ. dipl. inž. arh., ZAPS A 1654	faza projekta:	PZI
pooblaščeni arž.arh.:	Tone Lovšin, dipl. inž. grad., IZS G - 0379	datum:	julij 2024
sodelavec:	Sandi Mohar, dipl. inž. grad., IZS G - 4126	št. lista:	2.7.3.



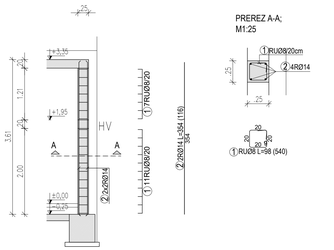
Armatura vertikalne vezi - Pritličje
VV-P1; KOS 6



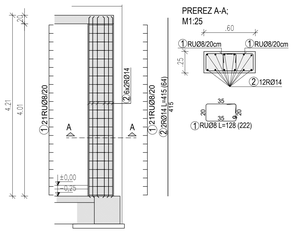
Armatura vertikalne vezi - Pritličje
VV-P2; KOS 12



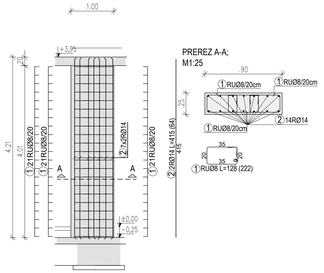
Armatura vertikalne vezi - Pritličje
VV-P3; KOS 11



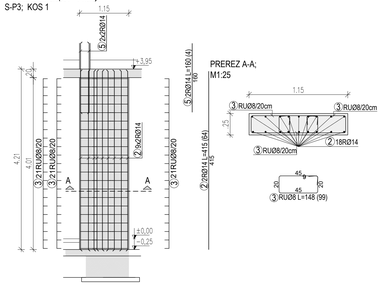
Armatura AB slopov - Pritličje
S-P1; KOS 1



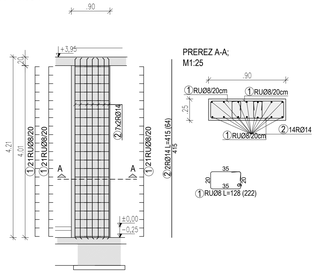
Armatura AB slopov - Pritličje
S-P2; KOS 1



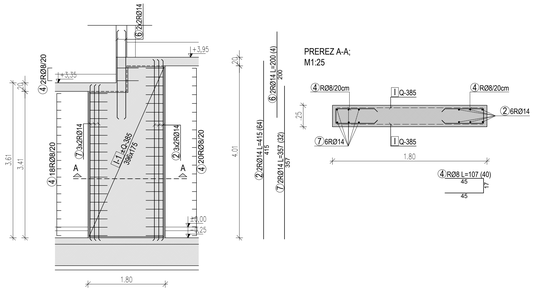
Armatura AB slopov - Pritličje
S-P3; KOS 1



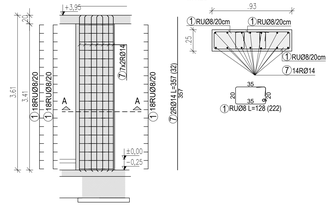
Armatura AB slopov - Pritličje
S-P4; KOS 1



Armatura AB slopov - Pritličje
S-P5; KOS 1



Armatura AB slopov - Pritličje
S-P7; KOS 1



MATERIALI:
- BETON: C 25/30
- JEKLO: S-500 A (mrežna armatura) in S-500 B (ostala armatura)

PREKLOPI:
- OKROGLO JEKLO 60 x Ø
- MREŽNA ARMATURA 40-45cm (min 3 okence mreže)

ZAŠČITNE PLASTI BETONA:
- KONSTRUKCIJE, KI SO V STIKU Z ZEMLJINO min 3cm
- OSTALE KONSTRUKCIJE min 2,5cm

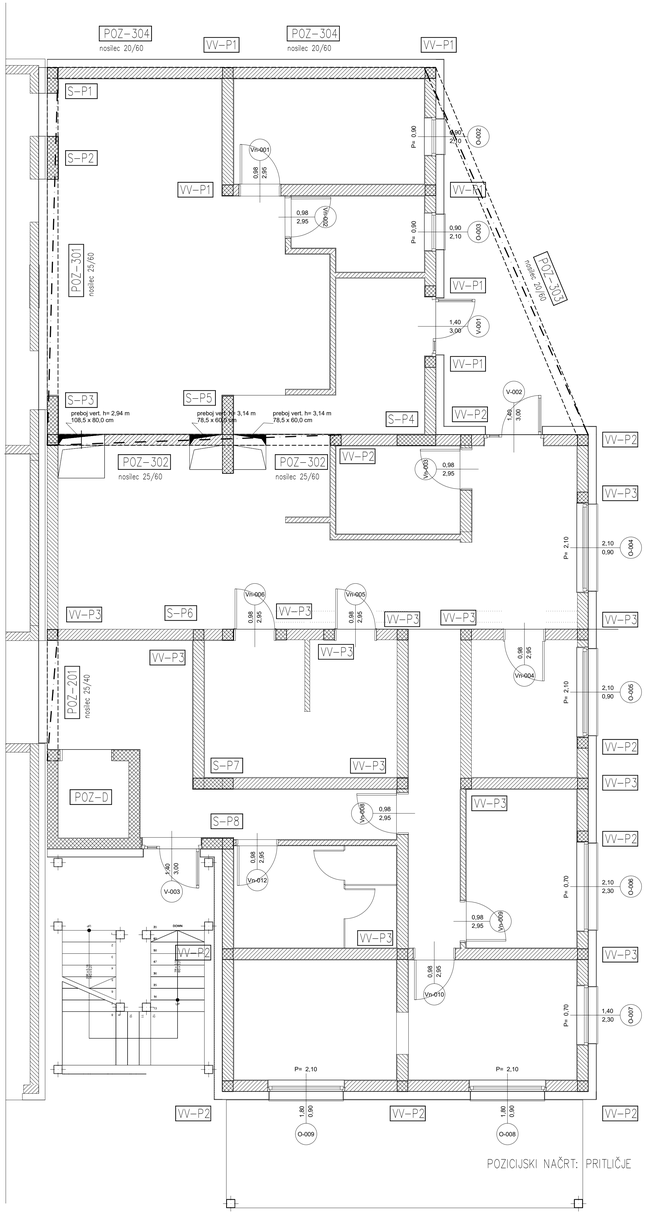
OPOMBE:
- Poleg pogojev iz projekta je potrebno upoštevati vse zahteve standardov SIST EN 206, SIST EN 1026 in SIST EN 10080
- Izvajanje armirano - betonskih konstrukcij mora biti skladno s standardom SIST EN 13670
- Poleg tega načrta potrebno upoštevati tudi ostale načrte kot npr. načrt inštalacij
- POSAMEZNE POZICIJE POTREBNO PRILAGODITI (pokriviti, porezati,...)
- VSE DIMEZIJE PREVERITI PA JIH USKLADITI NA LICU MESTA
- Preboje manjši od Ø 20cm niso v načrtu armature. Preboje uskladiti z ostalimi načrti
- Na mestu kjer se prekrivajo mreže je potrebno mreže obrniti tako, da se mreža leže ena v drugo

ARMATURA PRITLIČJA
VV,HV in NOSILCI

ZAS NOV A
GRADBENI BIRO
Lovšin Tone s.p.
Vrvarska pot 1a
1310 Ribnica, Slovenija

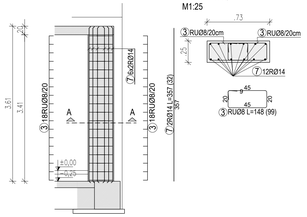
ARMATURA: ARMATURA PRITLIČJA — M 1:50 / 1:25

sestavni del:	2. Načrt gradbeništva	št. projekta:	04-2019-PZI
		št. načrta:	04-2019-PZI-GA
objekt:	Prenova in širitev kuhinje - OŠ PT VL		
vodja projekta:	Miha Novina, univ. dipl. inž. arh., ZAPS A 1654	faza projekta:	PZI
pooblaščeni inž.arh.:	Tone Lovšin, dipl. inž. grad., IZS G - 0379	datum:	julij 2024
sodelavec:	Sandi Mohar, dipl. inž. grad., IZS G - 4126	št. lista:	2.7.4.

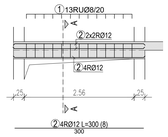


Armatura AB slopov - Pritličje
S-P8; KOS 1

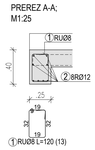
PREREZ A-A;
M1:25



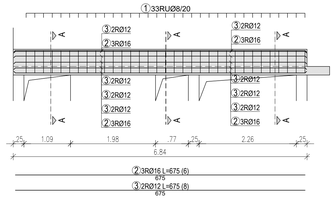
Armatura nosilca - Pritličje
POZ - 201; KOS 1 (25/40cm)



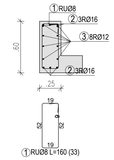
PREREZ A-A;
M1:25



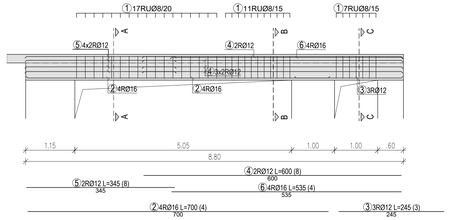
Armatura nosilca - Pritličje
POZ - 302; KOS 1 (25/60cm)



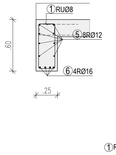
PREREZ A-A;
M1:25



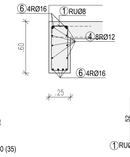
Armatura nosilca - Pritličje
POZ - 301; KOS 1 (25/60cm)



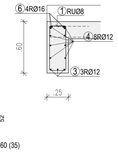
PREREZ A-A;
M1:25



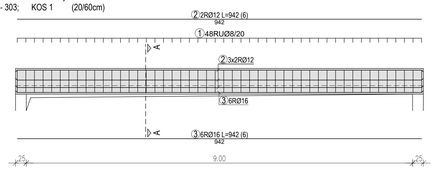
PREREZ B-B;
M1:25



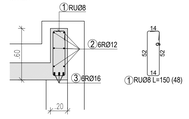
PREREZ C-C;
M1:25



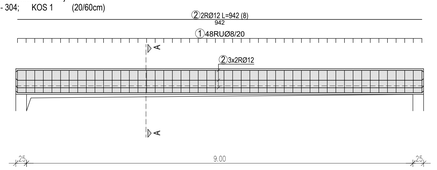
Armatura nosilca - Pritličje
POZ - 303; KOS 1 (20/60cm)



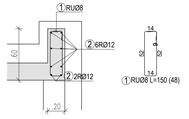
PREREZ A-A;
M1:25



Armatura nosilca - Pritličje
POZ - 304; KOS 1 (20/60cm)

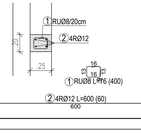


PREREZ A-A;
M1:25



Horizontalna vez na višini 200cm na vseh nosilnih zidovih pritličja

PREREZ A-A;
M1:25



MATERIALI:
- BETON: C 25/30
- JEKLO: S-500 A (mrežna armatura) in S-500 B (ostala armatura)

PREKLOPI:
- OKROGLO JEKLO 60 x Ø
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OPOMBE:
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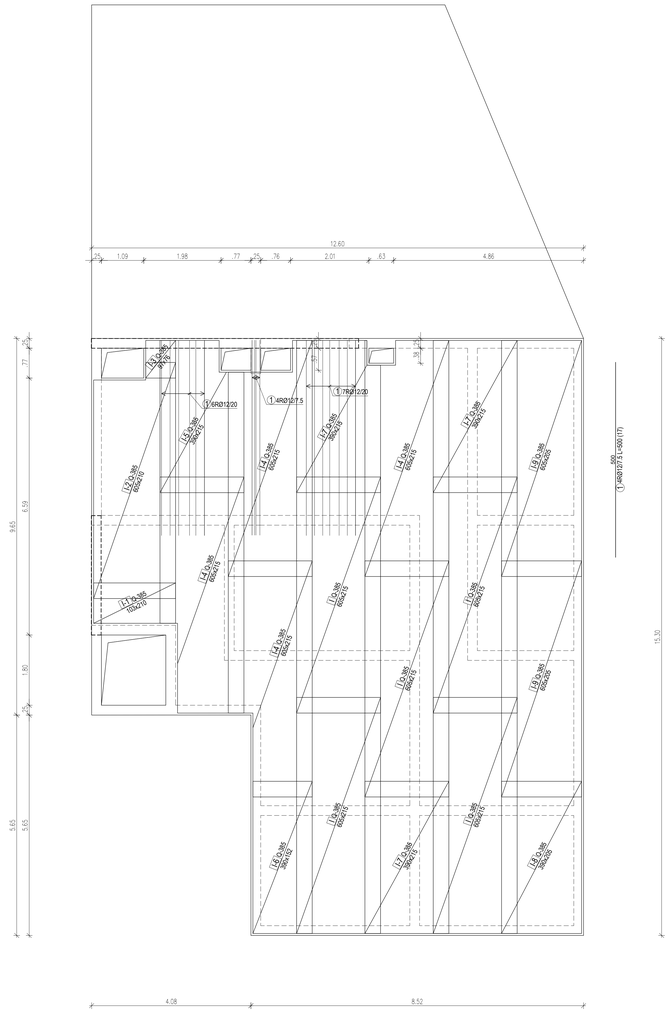
- Izvajanje armirano - betonskih konstrukcij mora biti skladno s standardom SIST EN 13670
- Poleg tega načrta potrebno upoštevati tudi ostale načrte kot npr. načrt inštalacij
- POSAMEZNE POZICIJE POTREBNO PRILAGODITI (pokriviti, porezati,...)
- VSE DIMENZIJE PREVERITI PA JIH USKLADITI NA LICU MESTA
- Preboje manjši od Ø 20cm niso v načrtu armature. Preboje uskladiti z ostalimi načrti
- Na mestu kjer se prekrivajo mreže je potrebno mreže obrniti tako, da se mreža leže ena v drugo

ARMATURA PRITLIČJA
VV,HV in NOSILCI

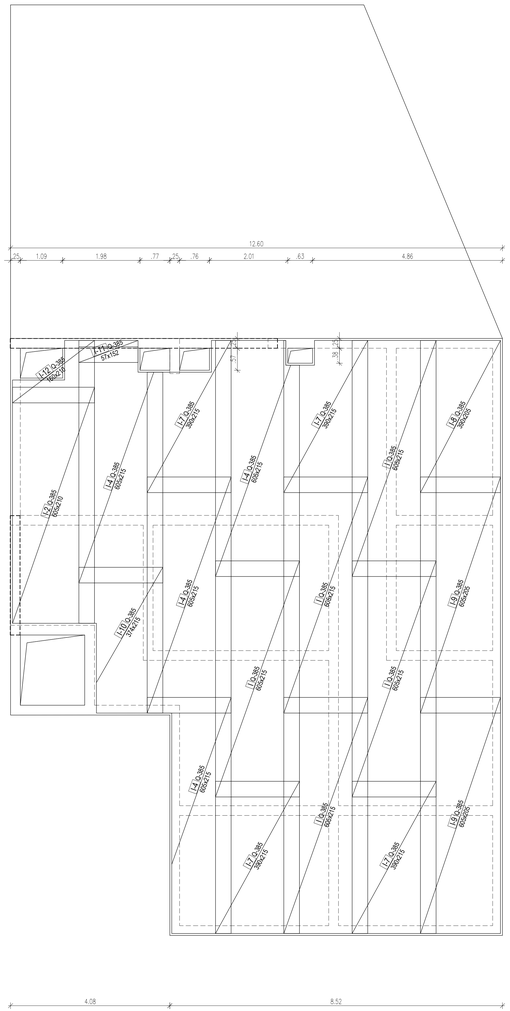
ZAS NOV A
GRADBENI BIRO
Lovšin Tone s.p.
Vrvarska pot 1a
1310 Ribnica, Slovenija

ARMATURA: ARMATURA PRITLIČJA M 1:50 / 1:25

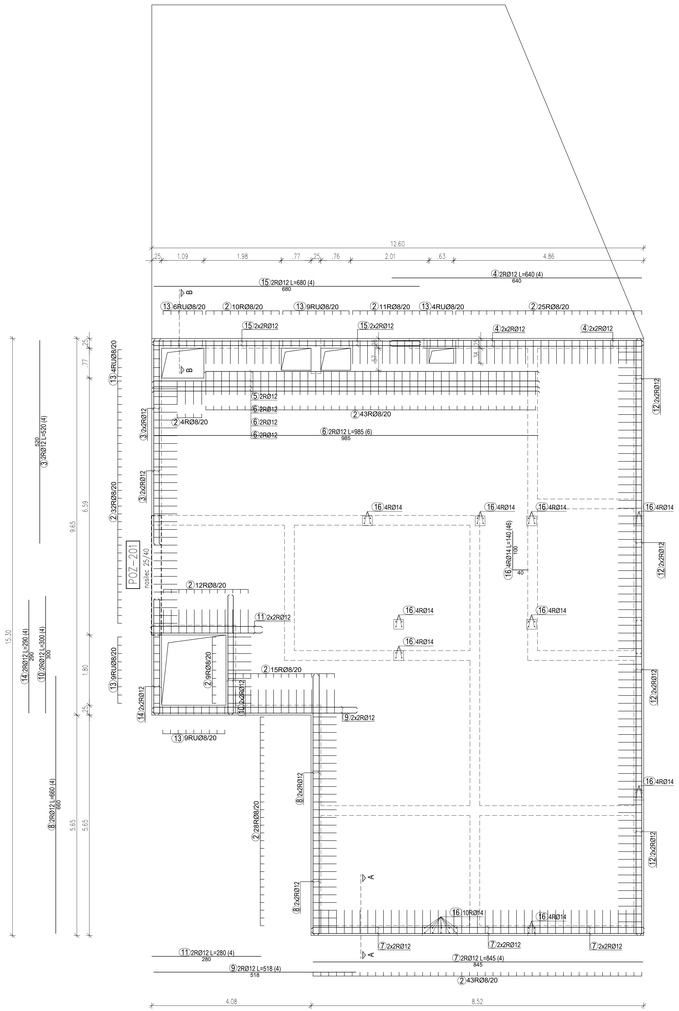
sestavni del:	2. Načrt gradbeništva	št. projekta:	04-2019-PZI
		št. načrta:	04-2019-PZI-GA
objekt:	Prenova in širitev kuhinje - OŠ PT VL		
vodja projekta:	Miha Novina, univ. dipl. inž. arh., ZAPS A 1654	faza projekta:	PZI
pooblaščeni inž.arh.:	Tone Lovšin, dipl. inž. grad., IZS G - 0379	datum:	julij 2024
sodelavec:	Sandi Mohar, dipl. inž. grad., IZS G - 4126	št. lista:	2.7.5.



ARMATURNI NAČRT: PLOŠČA NAD PRITLIČJEM
SPODNJA ARMATURA
POZ – 200

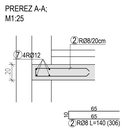


ARMATURNI NAČRT: PLOŠČA NAD PRITLIČJEM
SPODNJA ARMATURA
POZ – 200

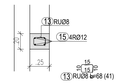


ARMATURNI NAČRT: PLOŠČA NAD PRITLIČJEM
SPODNJA ARMATURA
POZ – 200

PREREZ A-A;
M1:25



PREREZ A-A;
M1:25



MATERIALI:
- BETON: C 25/30
- JEKLO: S-500 A (mrežna armatura) in S-500 B (ostala armatura)

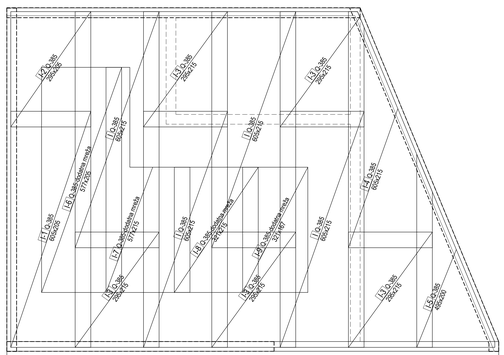
PREKLOPI:
- OKROGLO JEKLO 60 x Ø
- MREŽNA ARMATURA 40-45cm (min 3 okence mreže)

ZAŠČITNE PLASTI BETONA:
- KONSTRUKCIJE, KI SO V STIKU Z ZEMLJINO min 3cm
- OSTALE KONSTRUKCIJE min 2,5cm

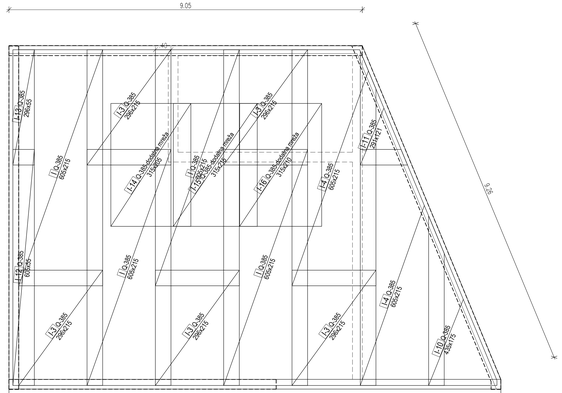
OPOMBE:
- Poleg pogojev iz projekta je potrebno upoštevati vse zahteve standardov SIST EN 206, SIST EN 1026 in SIST EN 10080
- Izvajanje armirano - betonskih konstrukcij mora biti skladno s standardom SIST EN 13670
- Poleg tega načrta potrebno upoštevati tudi ostale načrte kot npr. načrt inštalacij
- POSAMEZNE POZICIJE POTREBNO PRILAGODITI (pokrivti, porezati, ...)
- VSE DIMEZIJE PREVERITI IN JIH USKLADITI NA LICU MESTA
- Preboje manjši od Ø 20cm niso v načrtu armature. Preboje uskladiti z ostalimi načrti
- Na mestu kjer se prekrivajo mreže je potrebno mreže obrniti tako, da se mreža uležе ena v drugo

PLOŠČA NAD PRITLIČJEM - UPRAVNI DEL

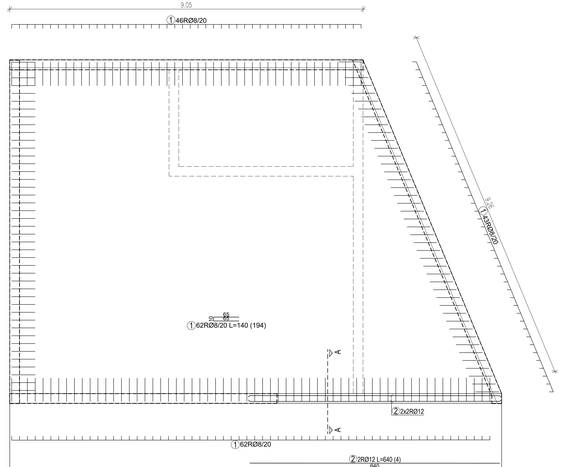
ZAS NOV A	GRADBENI BIRO Lovšin Tone s.p. Vrvarska pot 1a 1310 Ribnica, Slovenija	
ARMATURA:	PLOŠČA NAD PRITLIČJEM	M 1:50 / 1:25
sestavni del:	2. Načrt gradbenifiva	št. projekta: 04-2018/PZI št. načrta: 04-2018-PZI-GK
objekt:	Prenova in širitev kuhinje - OŠ PT VL	
vodja projekta:	Miha Novina, univ. dipl. inž. arh., ZAPS A 1654	faza projekta: PZI
pooblaščeni inž.arh.:	Tone Lovšin, dipl. inž. grad., IZS G - 0379	datum: julij 2024
sodelavec:	Sandi Mohar, dipl. inž. grad., IZS G - 4126	št. lista: 2.7.6.



ARMATURNI NAČRT: PLOŠČA NAD PRITLIČJEM
SPODNJA ARMATURA
POZ – 300



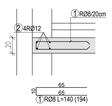
ARMATURNI NAČRT: PLOŠČA NAD PRITLIČJEM
SPODNJA ARMATURA
POZ – 300



ARMATURNI NAČRT: PLOŠČA NAD PRITLIČJEM
SPODNJA ARMATURA
POZ – 300

OSTALE PALICE OBRAČUNANE PRI NOSILCIH

PREREZ A-A;
M1:25



MATERIALI:
- BETON: C 25/30
- JEKLO: S-500 A (mrežna armatura) in S-500 B (ostala armatura)

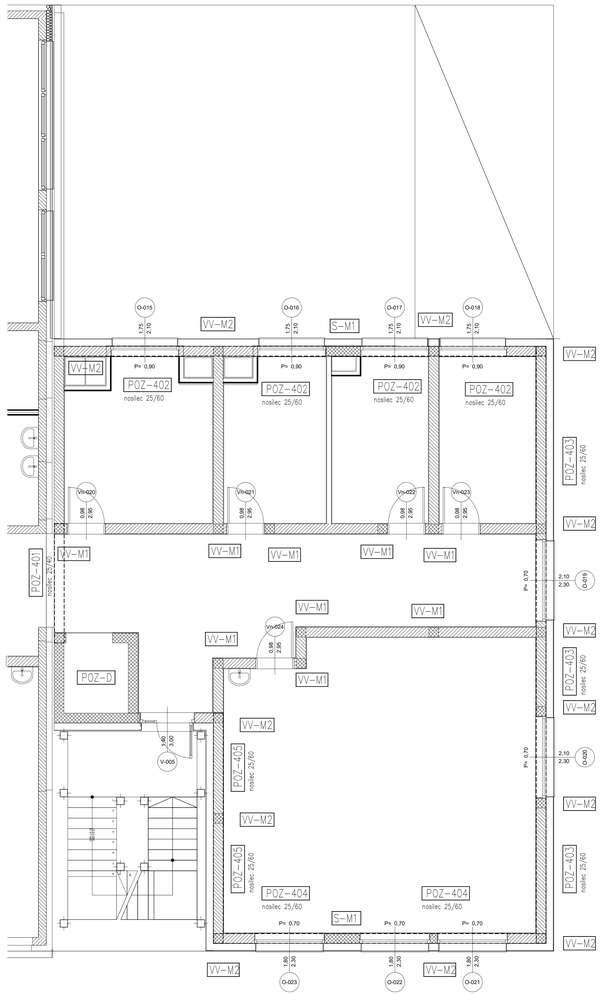
PREKLOPI:
- OKROGLO JEKLO 60 x Ø
- MREŽNA ARMATURA 40-45cm (min 3 okence mreže)

ZAŠČITNE PLASTI BETONA:
- KONSTRUKCIJE, KI SO V STIKU Z ZEMLJINO min 3cm
- OSTALE KONSTRUKCIJE min 2,5cm

OPOMBE:
- Poleg pogojev iz projekta je potrebno upoštevati vse zahteve standardov SIST EN 206, SIST EN 1026 in SIST EN 10080
- Izvajanje armirano - betonskih konstrukcij mora biti skladno s standardom SIST EN 13670
- Poleg tega načrta potrebno upoštevati tudi ostale načrte kot npr. načrt inštalacij
- POSAMEZNE POZICIJE POTREBNO PRILAGODITI (pokrivši, porezati,..)
- VSE DIMEZIJE PREVERITI IN JIH USKLADITI NA LICU MESTA
- Preboje manjši od Ø 20cm niso v načrtu armature. Preboje uskladiti z ostalimi načrti
- Na mestu kjer se prekrivajo mreže je potrebno mrežo obrniti tako, da se mreža uleže ena v drugo

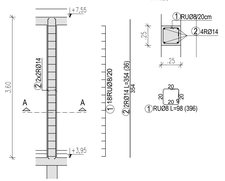
PLOŠČA NAD PRITLIČJEM - KUHINJA

ZAS NOV A	GRADBENI BIRO Lovšin Tone s.p. Vrvarska pot 1a 1310 Ribnica, Slovenija		
	ARMATURA: PLOŠČA NAD PRITLIČJEM		M 1:50 / 1:25
sestavni del:	2. Načrt gradbeništva	št. projekta:	04-2019/PZI
		št. načrta:	04-2019-PZI-Gk
objekt:	Prenova in širitev kuhinje - OŠ PT VL		
vodja projekta:	Miha Novina, univ. dipl. inž. arh., ZAPS A 1654	faza projekta:	PZI
pooblaščeni inž.arh.:	Tone Lovšin, dipl. inž. grad., IZS G - 0379	datum:	julij 2024
arhitektonic:	Sandi Mohar, dipl. inž. grad., IZS G - 4126	št. lista:	2.7.1.

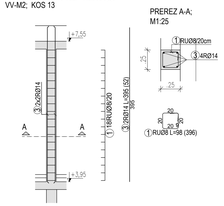


POZICIJSKI NAČRT: NADSTROPJE

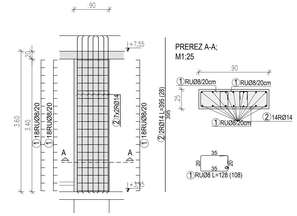
Armatura vertikalne vezi - Nadstropje
VV-M1; KOS 9



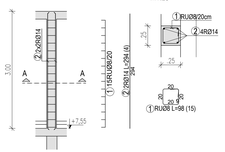
Armatura vertikalne vezi - Nadstropje
VV-M2; KOS 13



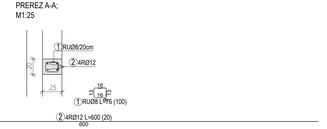
Armatura AB slopov - Mansarda
S-M1; KOS 2



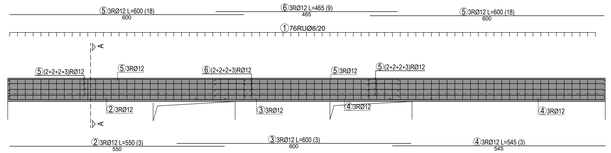
Armatura vertikalne vezi - Podstrešje
VV-POD 1; KOS 4



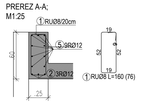
Horizontalna vez na vseh nosilnih zidovih podstrešja



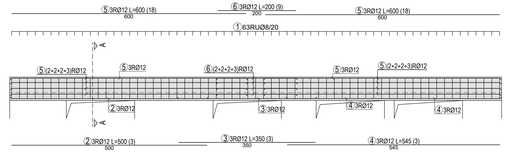
Armatura nosilca - Nadstropje
POZ - 403; KOS 1 (25/60cm)



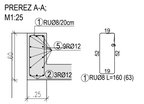
PREREZ A-A;
M1:25



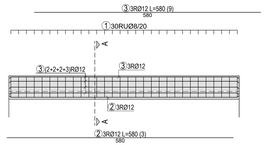
Armatura nosilca - Nadstropje
POZ - 402; KOS 1 (25/60cm)



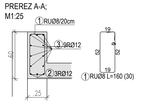
PREREZ A-A;
M1:25



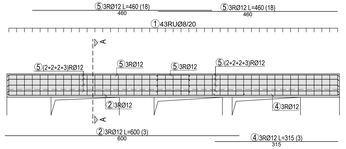
Armatura nosilca - Nadstropje
POZ - 405; KOS 1 (25/60cm)



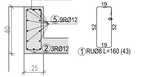
PREREZ A-A;
M1:25



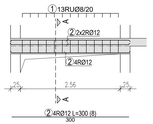
Armatura nosilca - Nadstropje
POZ - 404; KOS 1 (25/60cm)



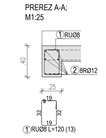
PREREZ A-A;
M1:25



Armatura nosilca - Nadstropje
POZ - 401; KOS 1 (25/40cm)



PREREZ A-A;
M1:25



MATERIALI:
- BETON: C 25/30
- JEKLO: S-500 A (mrežna armatura) in S-500 B (ostala armatura)

PREKLOPI:
- OKROGLO JEKLO 60 x Ø
- MREŽNA ARMATURA 40-45cm (min 3 okence mreže)

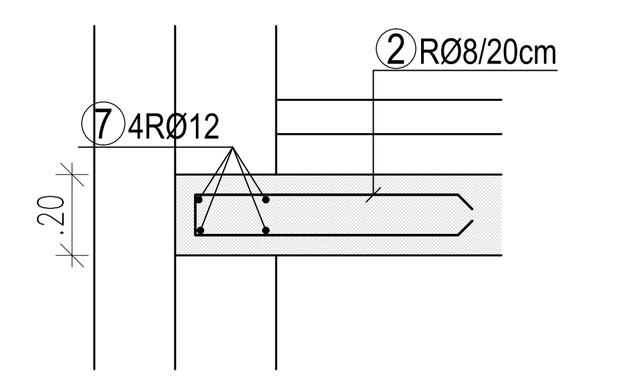
ZAŠČITNE PLASTI BETONA:
- KONSTRUKCIJE, KI SO V STIKU Z ZEMLJINO min 3cm
- OSTALE KONSTRUKCIJE min 2,5cm

OPOMBE:
- Poleg pogojev iz projekta je potrebno upoštevati vse zahteve standardov SIST EN 206, SIST EN 1026 in SIST EN 10080
- Izvajanje armirano - betonskih konstrukcij mora biti skladno s standardom SIST EN 13670
- Poleg tega načrta potrebno upoštevati tudi ostale načrte kot npr. načrt inštalacij
- POSAMEZNE POZICIJE POTREBNO PRILAGODITI (pokrivši, porezati,...)
- VSE DIMEZIJE PREVERITI IN JIH USKLADITI NA LICU MESTA
- Preboje manjših od Ø 20cm niso v načrtu armature. Preboje uskladiti z ostalimi načrti
- Na mestu kjer se prekrivajo mreže je potrebno mreže obrniti tako, da se mreža uležе ena v drugo

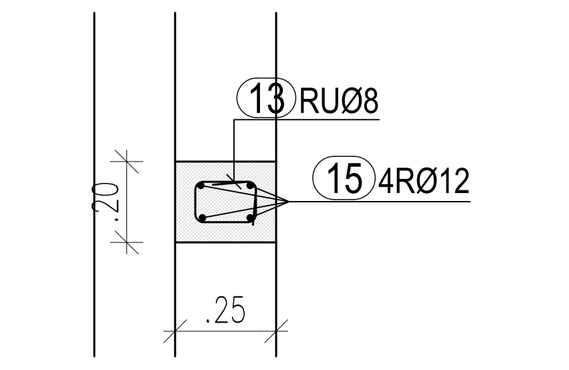
ARMATURA NADSTROPJE

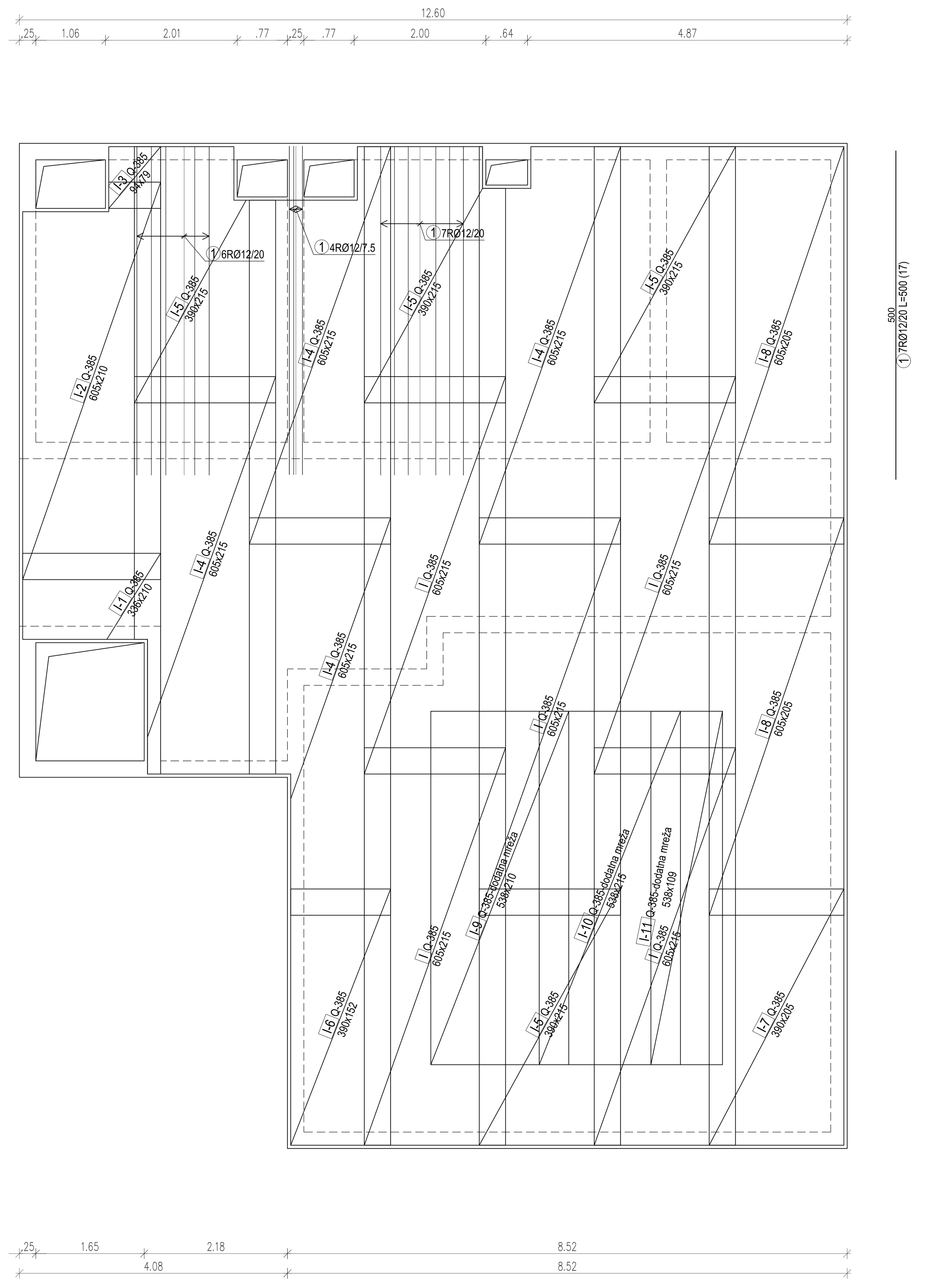
ZAS NOV A	GRADBENI BIRO Lovšin Tone s.p. Vrvarska pot 1a 1310 Ribnica, Slovenija		
	ARMATURA: NADSTROPJE		M 1:50 / 1:25
sestavni del:	2. Načrt gradbenišva	št. projekta:	04-2019/PZI
		št. načrta:	04-2019-PZI-Gk
objekt:	Prenova in širitev kuhinje - OŠ PT VL		
vodja projekta:	Miha Novina, univ. dipl. inž. arh., ZAPS A 1654	faza projekta:	PZI
pooblaščeni inž.arh.:	Tone Lovšin, dipl. inž. grad., IZS G - 0379	datum:	julij 2024
projektanti:	Sandi Mohar, dipl. inž. grad., IZS G - 4126	št. lista:	2.7.a

PREREZ A-A;
M1:25

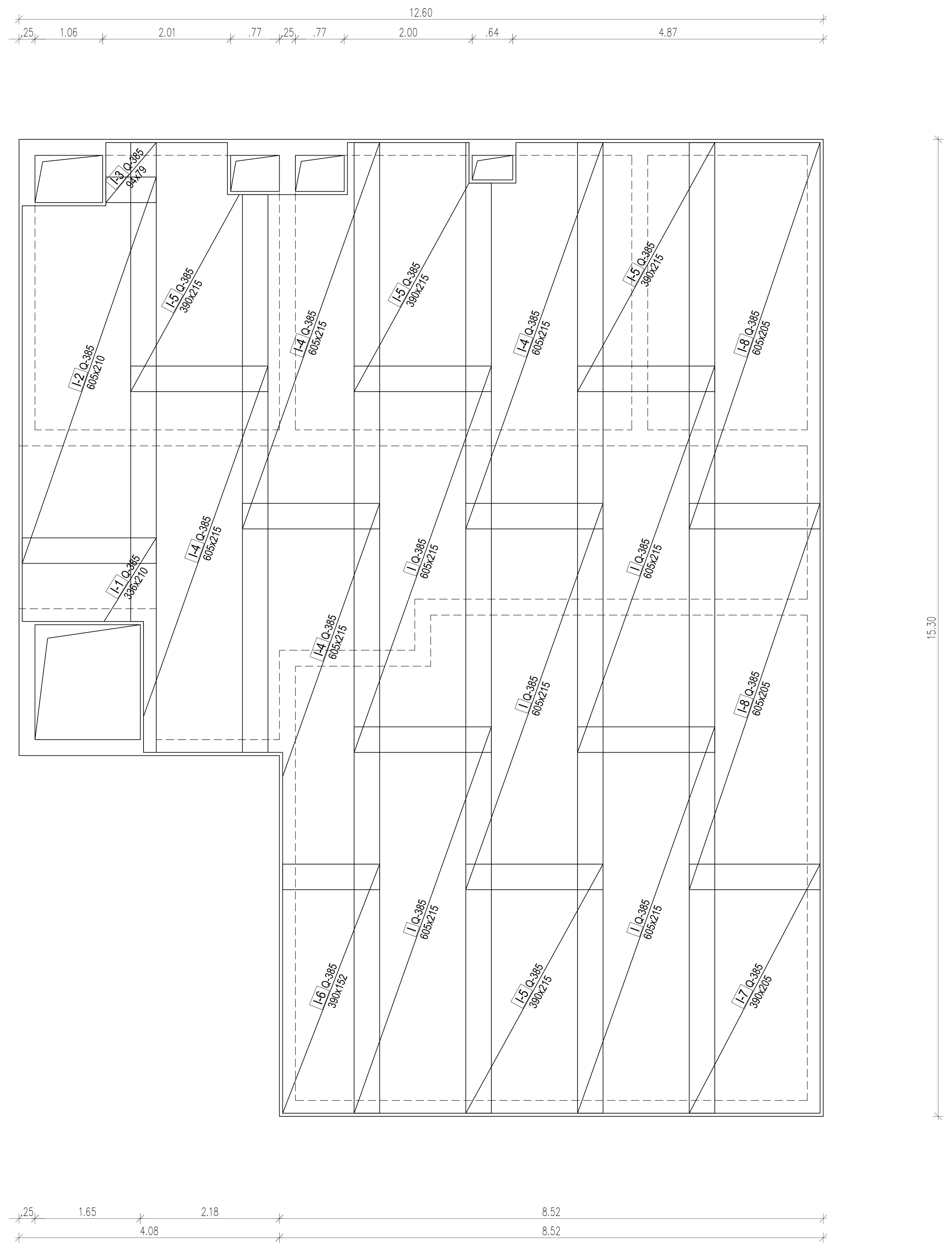


PREREZ A-A;
M1:25

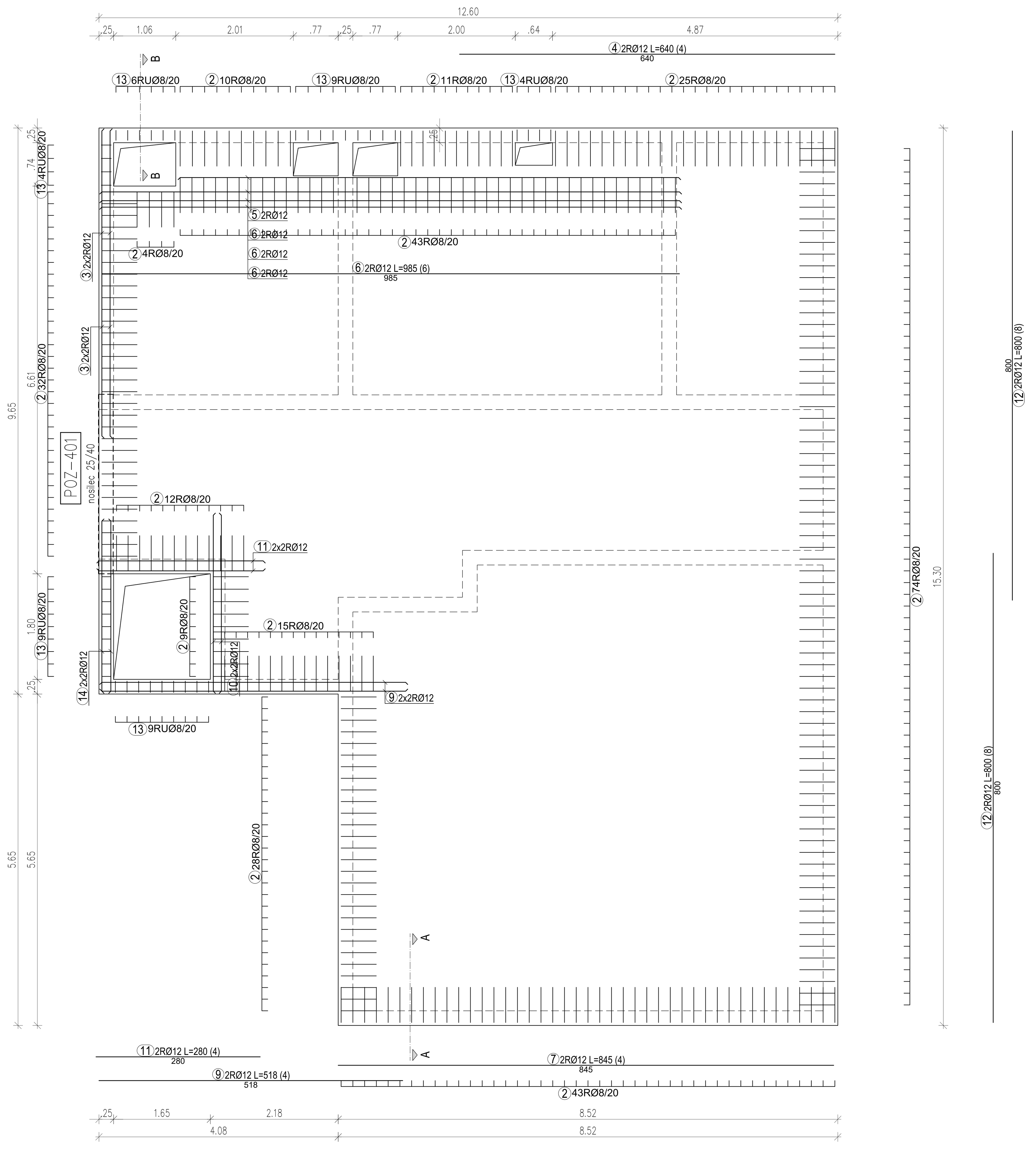




ARMATURNI NAČRT: PLOŠČA NAD NADSTROPJEM
SPODNJA ARMATURA
POZ – 400



ARMATURNI NAČRT: PLOŠČA NAD NADSTROPJEM
ZGORNJA ARMATURA
POZ – 400



ARMATURNI NAČRT: PLOŠČA NAD NADSTROPJEM
ROBNA ARMATURA
POZ – 400

OSTALE PALICE SO PRIKZANE V ARMATURI NOSILCEV NAD.

MATERIALI:
- BETON: C 25/30
- JEKLO: S-500 A (mrežna armatura) in S-500 B (ostala armatura)

PREKLOPI:
- OKROGLO JEKLO 60 x Ø
- MREŽNA ARMATURA 40-45cm (min 3 okence mreže)

ZAŠČITNE PLASTI BETONA:
- KONSTRUKCIJE, KI SO V STIKU Z ZEMLJINO min 3cm
- OSTALE KONSTRUKCIJE min 2,5cm

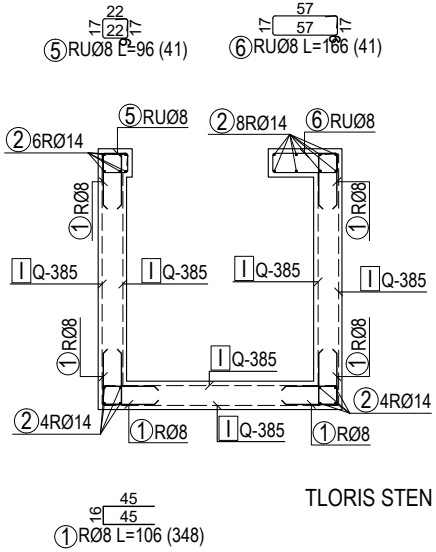
OPOMBE:
- Poleg pogojev iz projekta je potrebno upoštevati vse zahteve standardov SIST EN 206, SIST EN 1026 in SIST EN 10080
- Izvajanje armirano - betonskih konstrukcij mora biti skladno s standardom SIST EN 13670
- Poleg tega načrta potrebno upoštevati tudi ostale načrte kot npr. načrt inštalacij
- POSAMEZNE POZICIJE POTREBNO PRILAGODITI (pokriviti, porezati,..)
- VSE DIMEZIJE PREVERITI IN JIH USKLADITI NA LICU MESTA
- Preboje manjši od Ø 20cm niso v načrtu armature. Preboje uskladiti z ostalimi načrti
- Na mestu kjer se prekrivajo mreže je potrebno mreže obrniti tako, da se mreža uleže ena v drugo

PLOŠČA NAD NADSTROPJEM

ZASNOVA
GRADBENI BIRO
Lovšin Tone s.p.
Vrvarska pot 1a
1310 Ribnica, Slovenija

ARMATURA: PLOŠČA NAD NADSTROPJEM M 1:50 / 1:25

sestavni del:	2. Načrt gradbeništva	št. projekta:	04-2019-PZI
		št. načrta:	04-2019-PZI-Gk
objekt:	Prenova in širitev kuhinje - OŠ PT VL		
vodja projekta:	Miha Novina, univ. dipl. inž. arh., ZAPS A 1654	faza projekta:	PZI
pooblaščeni inž./arh.:	Tone Lovšin, dipl. inž. grad., IZS G - 0379	datum:	julij 2024
sodelavec:	Sandi Mohar, dipl. inž. grad., IZS G - 4126	št. lista:	2.7.9.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17 22 17
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57
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⑥RUØ8 L=166 (41)
②6RØ14
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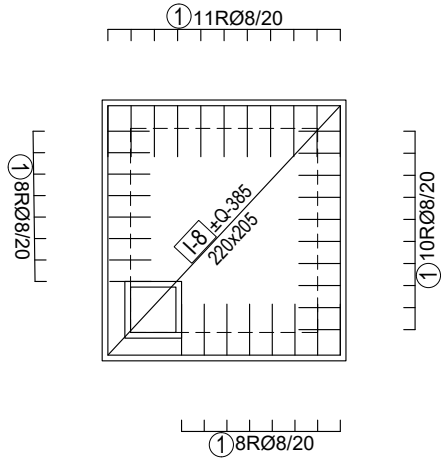
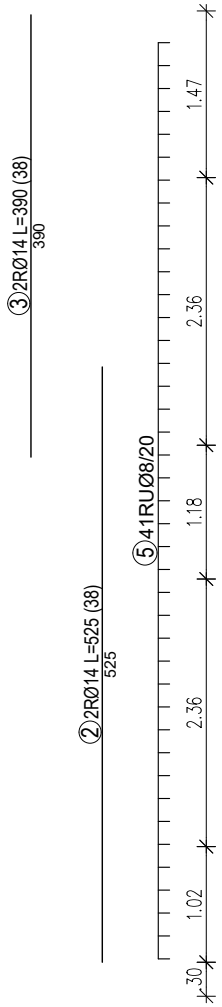
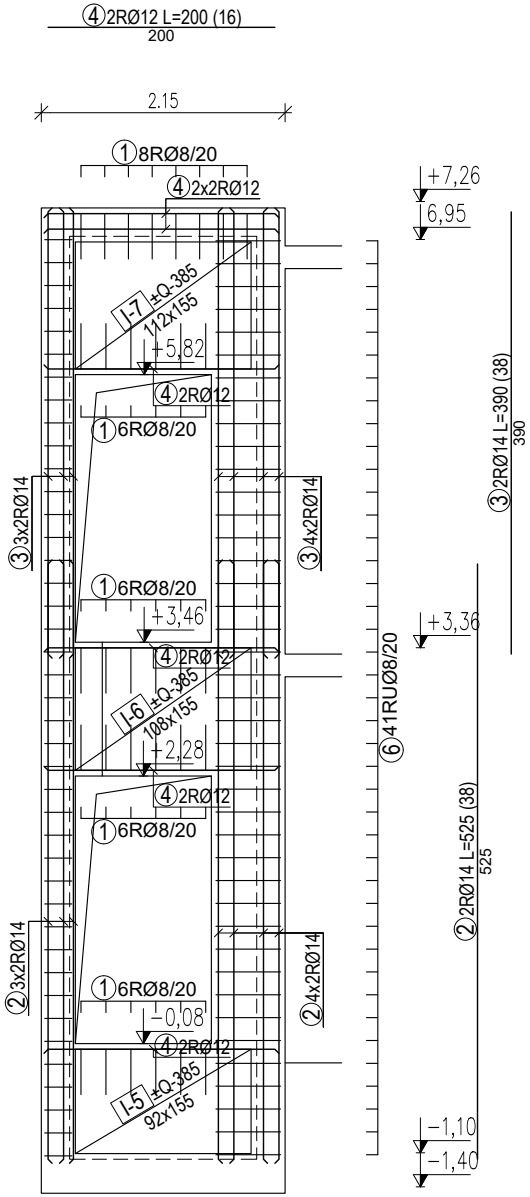
16 45
①RØ8 L=106 (348)

TLORIS STEN

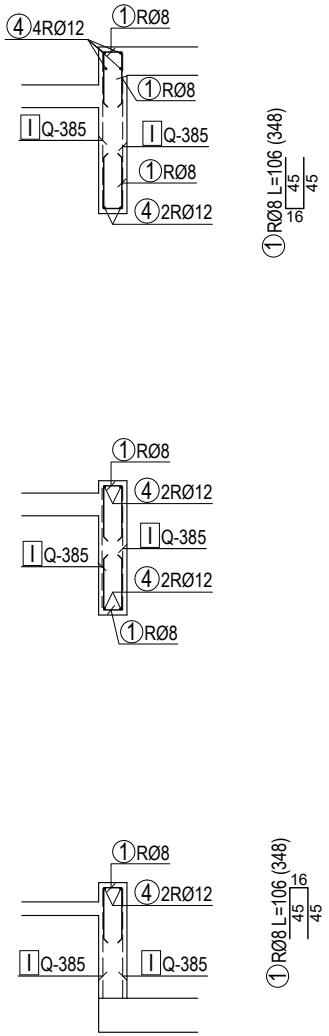

①11RØ8/20
①8RØ8/20
I-8 ±Q-385
220x205
①10RØ8/20
①8RØ8/20

TLORIS STREŠNE
PLOŠČE

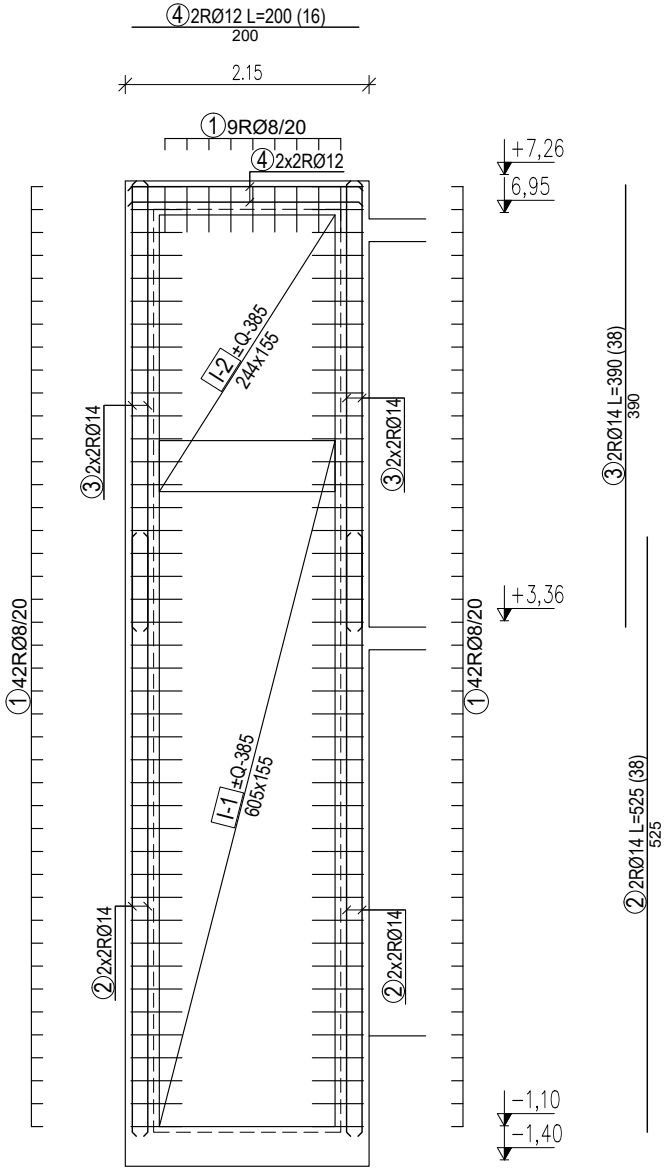

③2RØ14 L=390 (38)
390
②2RØ14 L=525 (38)
525
⑤41RUØ8/20
1.47
2.36
1.18
2.36
1.02
30


④2RØ12 L=200 (16)
200
2.15
①8RØ8/20
④2x2RØ12
I-7 ±Q-385
112x155
+5,82
④2RØ12
①6RØ8/20
③3x2RØ14
③4x2RØ14
①6RØ8/20
+3,46
④2RØ12
I-6 ±Q-385
108x155
+2,28
④2RØ12
①6RØ8/20
②3x2RØ14
②4x2RØ14
①6RØ8/20
−0,08
④2RØ12
I-5 ±Q-385
92x155
⑥41RUØ8/20
+7,26
6,95
③2RØ14 L=390 (38)
390
+3,36
②2RØ14 L=525 (38)
525
−1,10
−1,40

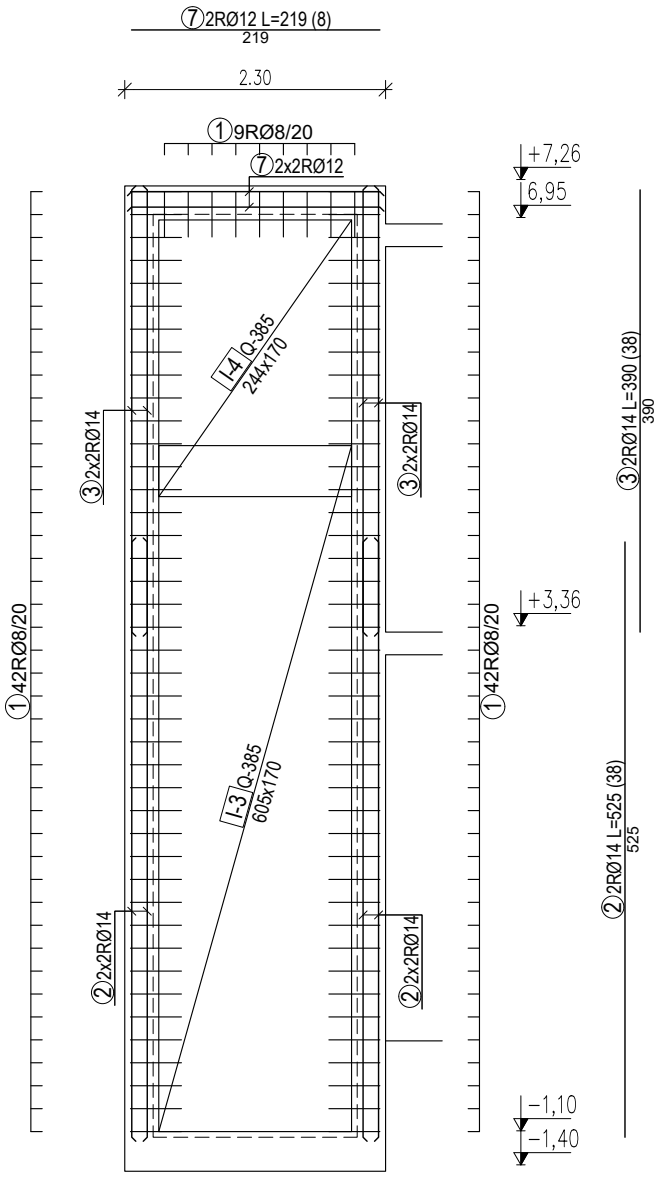
POGLED NA
STENO Z
ODPRTINAMI


④4RØ12
①RØ8
①RØ8
I Q-385
I Q-385
①RØ8
④2RØ12
①RØ8 L=106 (348)
45
45
16
①RØ8
④2RØ12
I Q-385
I Q-385
④2RØ12
①RØ8
①RØ8
④2RØ12
I Q-385
I Q-385
①RØ8 L=106 (348)
16
45
45

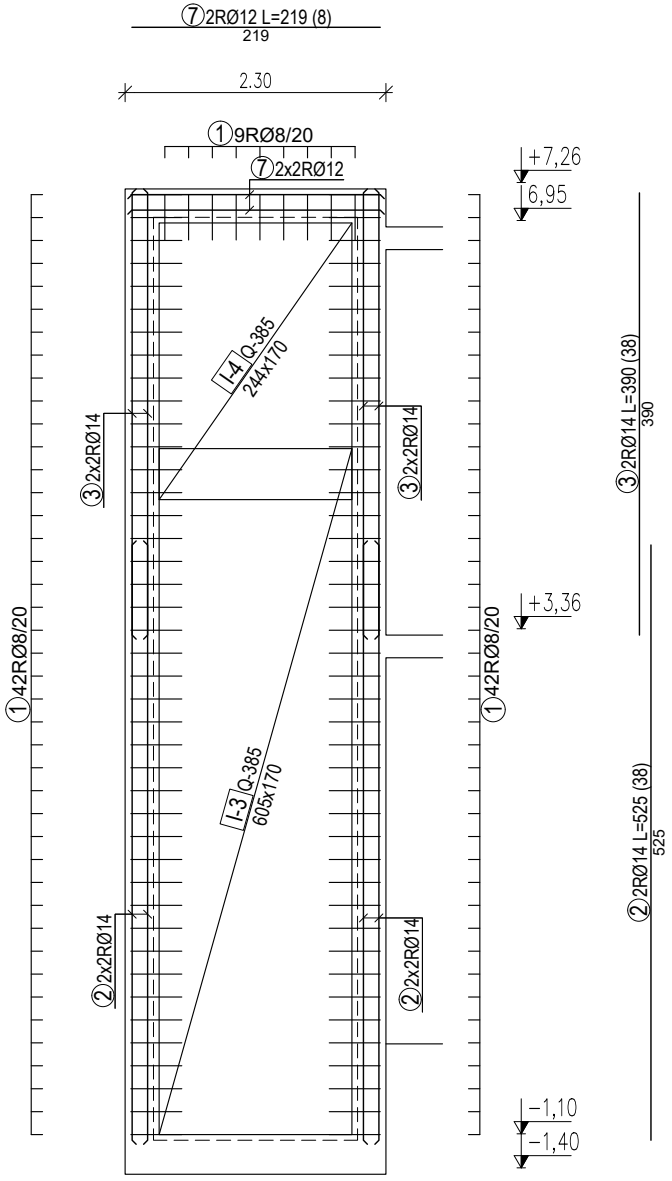
PREREZ PREKO
VRAT DVIGALA


④2RØ12 L=200 (16)
200
2.15
①9RØ8/20
④2x2RØ12
+7,26
6,95
I-2 ±Q-385
244x155
③2x2RØ14
③2x2RØ14
③2RØ14 L=390 (38)
390
①42RØ8/20
①42RØ8/20
+3,36
I-1 ±Q-385
605x155
②2x2RØ14
②2x2RØ14
②2RØ14 L=525 (38)
525
−1,10
−1,40

POGLED NA
STENO NASPROTI
ODPRTIN


⑦2RØ12 L=219 (8)
219
2.30
①9RØ8/20
⑦2x2RØ12
+7,26
6,95
I-4 Q-385
244x170
③2x2RØ14
③2x2RØ14
③2RØ14 L=390 (38)
390
①42RØ8/20
①42RØ8/20
+3,36
I-3 Q-385
605x170
②2RØ14 L=525 (38)
525
②2x2RØ14
②2x2RØ14
−1,10
−1,40

POGLED NA
STRANSKO
STENO


⑦2RØ12 L=219 (8)
219
2.30
①9RØ8/20
⑦2x2RØ12
+7,26
6,95
I-4 Q-385
244x170
③2x2RØ14
③2x2RØ14
③2RØ14 L=390 (38)
390
①42RØ8/20
①42RØ8/20
+3,36
I-3 Q-385
605x170
②2RØ14 L=525 (38)
525
②2x2RØ14
②2x2RØ14
−1,10
−1,40

POGLED NA
STRANSKO
STENO

MATERIALI:
- BETON: C 25/30
- JEKLO: S-500 A (mrežna armatura) in S-500 B (ostala armatura)

PREKLOPI:
- OKROGLO JEKLO 60 x Ø
- MREŽNA ARMATURA 40-45cm (min 3 okence mreže)

ZAŠČITNE PLASTI BETONA:
- KONSTRUKCIJE, KI SO V STIKU Z ZEMLJINO min 3cm
- OSTALE KONSTRUKCIJE min 2,5cm

OPOMBE:
- Poleg pogojev iz projekta je potrebno upoštevati vse zahteve standardov SIST EN 206, SIST EN 1026 in SIST EN 10080
- Izvajanje armirano - betonskih konstrukcij mora biti skladno s standardom SIST EN 13670
- Poleg tega načrta potrebno upoštevati tudi ostale načrte kot npr. načrt inštalacij
- POSAMEZNE POZICIJE POTREBNO PRILAGODITI (pokriviti, porezati,..)
- VSE DIMEZIJE PREVERITI IN JIH USKLADITI NA LICU MESTA
- Preboje manjši od Ø 20cm niso v načrtu armature. Preboje uskladiti z ostalimi načrti
- Na mestu kjer se prekrivajo mreže je potrebno mreže obrniti tako, da se mreža uleže ena v drugo

DVIGALNI JAŠEK

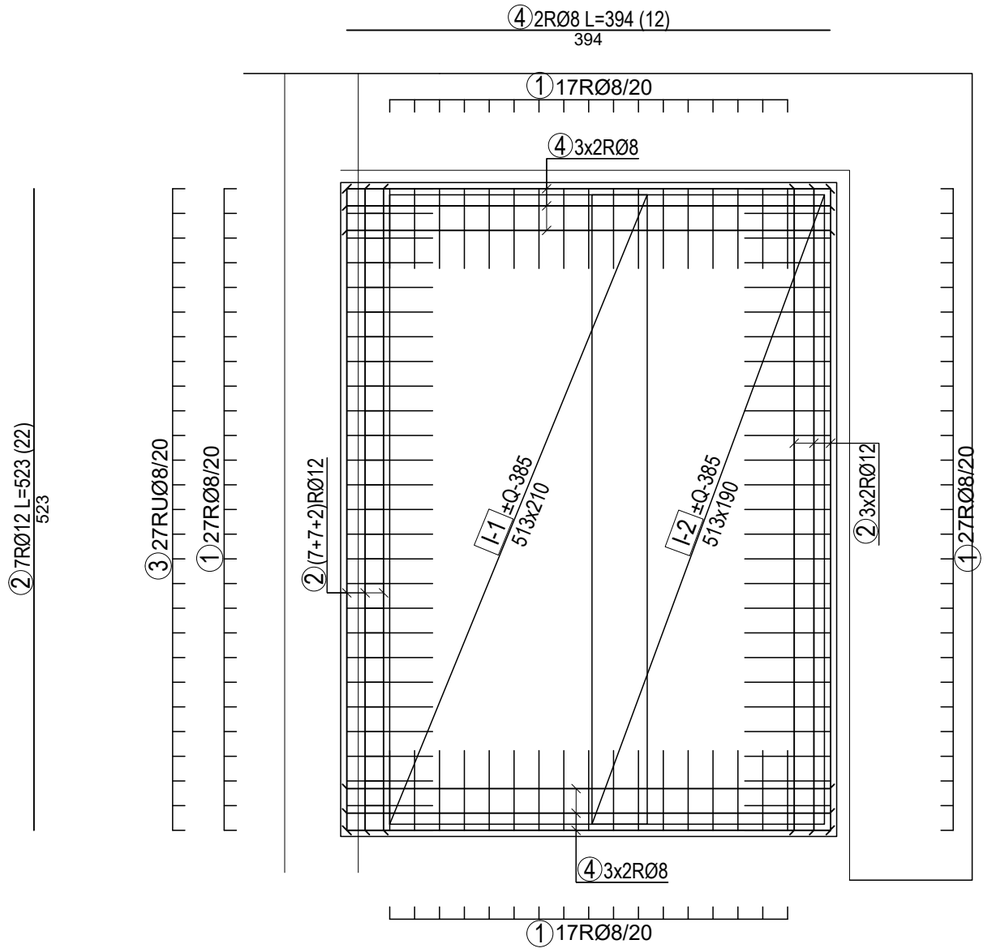
ZAS
NOV
A

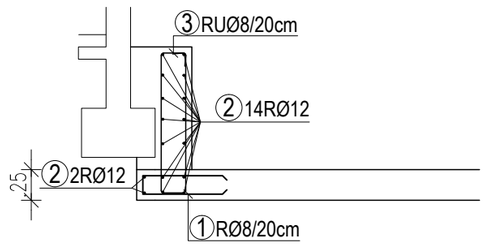
GRADBENI BIRO
Lovšin Tone s.p.
Vrvarska pot 1a
1310 Ribnica, Slovenija

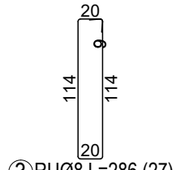
ARMATURA: DVIGALNI JAŠEK

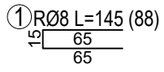
M 1:50 / 1:25

sestavni del:	2. Načrt gradbeništva	št. projekta:	04-2019-PZI
		št. načrta:	04-2019-PZI-Gk
objekt:	Prenova in širitev kuhinje - OŠ PT VL		
vodja projekta:	Miha Novina, univ. dipl. inž. arh., ZAPS A 1654	faza projekta:	PZI
pooblaščeni inž./arh.:	Tone Lovšin, dipl. inž. grad., IZS G - 0379	datum:	julij 2024
sodelavec:	Sandi Mohar, dipl. inž. grad., IZS G - 4126	št. lista:	2.7.10.









MATERIALI:

- BETON:	C 25/30		
- JEKLO:	S-500 A (mrežna armatura)	in	S-500 B (ostala armatura)

PREKLOPI:

- OKROGLO JEKLO	60 x Ø
- MREŽNA ARMATURA	40-45cm (min 3 okence mreže)

ZAŠČITNE PLASTI BETONA:

- KONSTRUKCIJE, KI SO V STIKU Z ZEMLJINO	min 3cm
- OSTALE KONSTRUKCIJE	min 2,5cm

OPOMBE:

- Poleg pogojev iz projekta je potrebno upoštevati vse zahteve standardov SIST EN 206, SIST EN 1026 in SIST EN 10080
- Izvajanje armirano - betonskih konstrukcij mora biti skladno s standardom SIST EN 13670
- Poleg tega načrta potrebno upoštevati tudi ostale načrte kot npr. načrt inštalacij
- POSAMEZNE POZICIJE POTREBNO PRILAGODITI (pokriviti, porezati,..)
- VSE DIMEZIJE PREVERITI IN JIH USKLADITI NA LICU MESTA
- Preboje manjši od Ø 20cm niso v načrtu armature. Preboje uskladiti z ostalimi načrti
- Na mestu kjer se prekrivajo mreže je potrebno mreže obrniti tako, da se mreža uleže ena v drugo

TEMLJNA PLOŠČA STOPNIŠČEM

ZASNOVA
GRADBENI BIRO
Lovšin Tone s.p.
Vrvarska pot 1a
1310 Ribnica, Slovenija

ARMATURA: TP STOPNIŠČE

M 1:50 / 1:25

sestavni del:	2. Načrt gradbeništva	št. projekta:	04-2019-PZI
		št. načrta:	04-2019-PZI-Gk
objekt:	Prenova in širitev kuhinje - OŠ PT VL		
vodja projekta:	Miha Novina, univ. dipl. inž. arh., ZAPS A 1654	faza projekta:	PZI
pooblaščeni inž./arh.:	Tone Lovšin, dipl. inž. grad., IZS G - 0379	datum:	julij 2024
sodelavec:	Sandi Mohar, dipl. inž. grad., IZS G - 4126	št. lista:	2.7.11.

ZASNOVA

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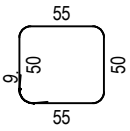
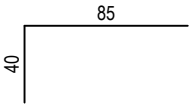
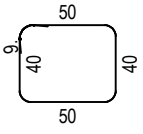
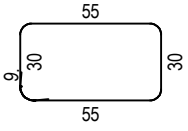
www.zasnova.si

Palice - specifikacija

ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]	Opomba
POZ-100; pasovni temelji objekta (1 kos)						
1		8	2.28	240	547.20	
2	495	12	4.95	48	237.60	
3	590	12	5.90	120	708.00	
4	200	12	2.00	30	60.00	
5		12	1.25	24	30.00	
6	590	12	5.90	12	70.80	
7	427	12	4.27	15	64.05	
8	220	12	2.20	14	30.80	
9	359	12	3.59	34	122.06	
10	576	12	5.76	45	259.20	
11	500	12	5.00	19	95.00	
12	332	12	3.32	19	63.08	
13	227	12	2.27	15	34.05	
14	200	12	2.00	16	32.00	
16	600	12	6.00	16	96.00	
17	130	12	1.30	16	20.80	
18	163	12	1.63	14	22.82	
19	600	12	6.00	48	288.00	
20		8	1.98	422	835.56	
21	300	12	3.00	24	72.00	
22	243	12	2.43	15	36.45	
23	192	12	1.92	12	23.04	
24		8	1.88	72	135.36	

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Palice - specifikacija

ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]	Opomba
25	300	12	3.00	12	36.00	
26	107; 9; 18; 18; 107	8	2.68	255	683.40	
27	491	12	4.91	8	39.28	
28	361	12	3.61	16	57.76	
29	90; 15; 90	8	1.95	181	352.95	
30	40; 15; 40	8	0.95	183	173.85	
31	100; 40	12	1.40	32	44.80	
32	125	12	1.25	4	5.00	
POZ-120; temeljna plošča dvigala (1 kos)						
1	55; 20; 55	8	1.30	36	46.80	
2	75; 15; 75	8	1.65	27	44.55	
3	220	12	2.20	12	26.40	
4	205	12	2.05	12	24.60	
5	110; 40	14	1.50	36	54.00	

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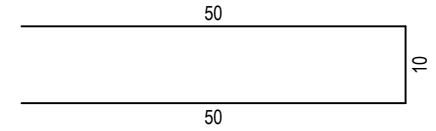
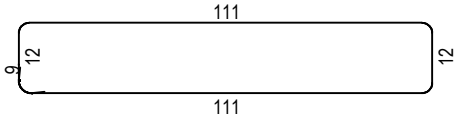
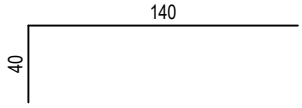
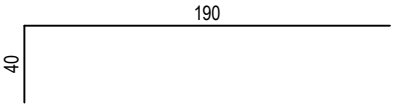
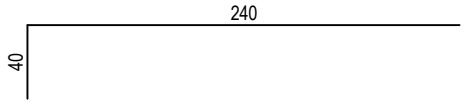
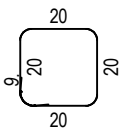
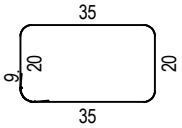
Palice - specifikacija

ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]	Opomba
POZ-121; elektro jašek (1 kos)						
1		8	1.10	42	46.20	
2		8	2.64	42	110.88	
3		12	4.18	24	100.32	
POZ-130; sidra iz temeljev (1 kos)						
1		14	1.80	120	216.00	
2		14	2.30	56	128.80	
3		14	2.80	36	100.80	
POZ-VV-P; vertikalne vezi pritličje (1 kos)						
1		8	0.98	540	529.20	
2		14	3.54	116	410.64	
3		14	2.39	24	57.36	
4		14	2.48	48	119.04	
POZ-S-P;ab slopi pritličje (1 kos)						
1		8	1.28	222	284.16	

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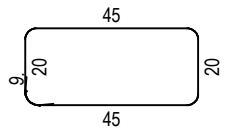
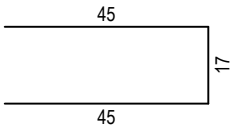
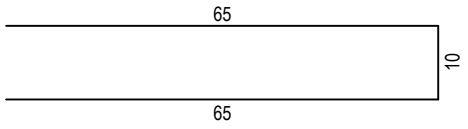
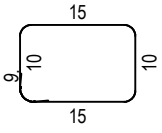
Palice - specifikacija

ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]	Opomba
2	415	14	4.15	64	265.60	
3		8	1.48	99	146.52	
4		8	1.07	40	42.80	
5	160	14	1.60	4	6.40	
6	200	14	2.00	4	8.00	
7	357	14	3.57	32	114.24	
POZ-200; ab plošča nad pritličjem (1 kos)						
1	500	12	5.00	17	85.00	
2		8	1.40	306	428.40	
3	520	12	5.20	4	20.80	
4	640	12	6.40	4	25.60	
5	850	12	8.50	2	17.00	
6	985	12	9.85	6	59.10	
7	845	12	8.45	4	33.80	
8	660	12	6.60	4	26.40	
9	518	12	5.18	4	20.72	
10	300	12	3.00	4	12.00	
11	280	12	2.80	4	11.20	
12	800	12	8.00	8	64.00	
13		8	0.68	41	27.88	
14	290	12	2.90	4	11.60	
15	680	12	6.80	4	27.20	

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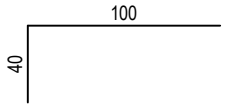
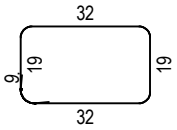
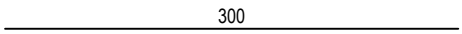
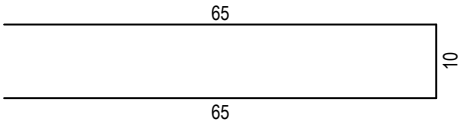
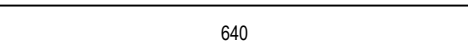
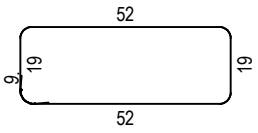
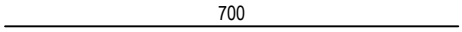
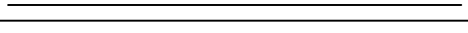
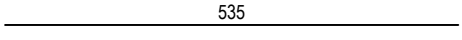
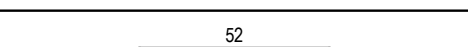
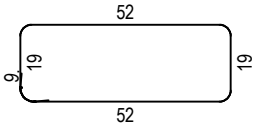
Palice - specifikacija

ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]	Opomba
16		14	1.40	46	64.40	
POZ-201; ab nosilec (1 kos)						
1		8	1.20	13	15.60	
2		12	3.00	8	24.00	
POZ-300; ab plošča nad kuhinjo (1 kos)						
1		8	1.40	194	271.60	
2		12	6.40	4	25.60	
POZ-301; ab nosilec (1 kos)						
1		8	1.60	35	56.00	
2		16	7.00	4	28.00	
3		12	2.45	3	7.35	
4		12	6.00	8	48.00	
5		12	3.45	8	27.60	
6		16	5.35	4	21.40	
POZ-302; ab nosilec (1 kos)						
1		8	1.60	33	52.80	

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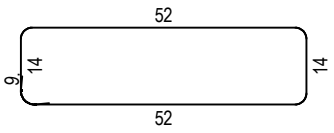
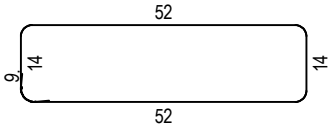
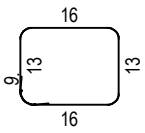
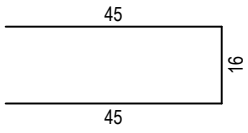
Palice - specifikacija

ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]	Opomba
2	675	16	6.75	6	40.50	
3	675	12	6.75	8	54.00	
POZ-303; ab nosilec (1 kos)						
1		8	1.50	48	72.00	
2	942	12	9.42	6	56.52	
3	942	16	9.42	6	56.52	
POZ-304;ab nosilec (1 kos)						
1		8	1.50	48	72.00	
2	942	12	9.42	8	75.36	
POZ-HV-01; horizontalna vez na višini cca 220cm (1 kos)						
1		8	0.76	400	304.00	
2	600	12	6.00	60	360.00	
POZ-D; dvigalni jašek (1 kos)						
1		8	1.06	348	368.88	
2	525	14	5.25	38	199.50	
3	390	14	3.90	38	148.20	
4	200	12	2.00	16	32.00	

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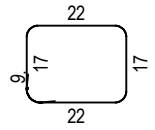
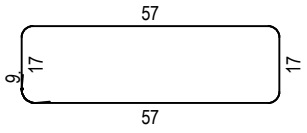
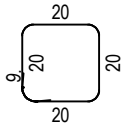
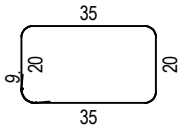
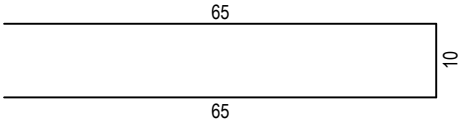
ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]	Opomba
5		8	0.96	41	39.36	
6		8	1.66	41	68.06	
7	219	12	2.19	8	17.52	
POZ-VV-N; vertikalne vezi nadstropja (1 kos)						
1		8	0.98	396	388.08	
2	354	14	3.54	36	127.44	
3	395	14	3.95	52	205.40	
POZ-S-M; slopi mansarda (1 kos)						
1		8	1.28	108	138.24	
2	395	14	3.95	28	110.60	
POZ-400; ab plošča nad nadstropjem (1 kos)						
1	500	12	5.00	17	85.00	
2		8	1.40	306	428.40	
3	520	12	5.20	4	20.80	
5	850	12	8.50	2	17.00	
6	985	12	9.85	6	59.10	
9	518	12	5.18	4	20.72	

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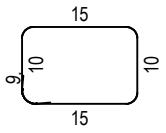
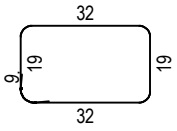
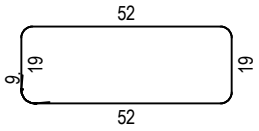
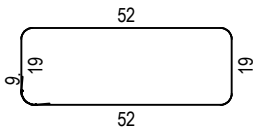
Palice - specifikacija

ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]	Opomba
10	300	12	3.00	4	12.00	
11	280	12	2.80	4	11.20	
13		8	0.68	41	27.88	
14	290	12	2.90	4	11.60	
POZ-401; ab nosilec (1 kos)						
1		8	1.20	13	15.60	
2	300	12	3.00	8	24.00	
POZ-402; ab nosilec (1 kos)						
1		8	1.60	63	100.80	
2	500	12	5.00	3	15.00	
3	350	12	3.50	3	10.50	
4	545	12	5.45	3	16.35	
5	600	12	6.00	18	108.00	
6	200	12	2.00	9	18.00	
POZ-403; ab nosilec (1 kos)						
1		8	1.60	76	121.60	
2	550	12	5.50	3	16.50	
3	600	12	6.00	3	18.00	
4	545	12	5.45	3	16.35	

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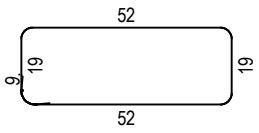
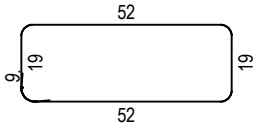
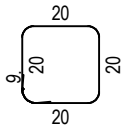
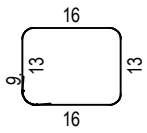
Palice - specifikacija

ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]	Opomba
5	600	12	6.00	18	108.00	
6	465	12	4.65	9	41.85	
POZ-404; ab nosilec (1 kos)						
1		8	1.60	43	68.80	
2	600	12	6.00	3	18.00	
4	315	12	3.15	3	9.45	
5	460	12	4.60	18	82.80	
POZ-405; ab nosilec (1 kos)						
1		8	1.60	30	48.00	
2	580	12	5.80	3	17.40	
3	580	12	5.80	9	52.20	
POZ-VV-M; vertilane vezi podstrešje (1 kos)						
1		8	0.98	15	14.70	
2	294	14	2.94	4	11.76	
HV - podstrešje (1 kos)						
1		8	0.76	100	76.00	

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Palice - specifikacija

ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]	Opomba
2	600	12	6.00	20	120.00	
POZ- 600; Temeljna plošča pod stopniščem (1 kos)						
1	65 / 15 / 65	8	1.45	88	127.60	
2	523	12	5.23	22	115.06	
3	114 / 9 / 20 / 20 / 114	8	2.86	27	77.22	
4	394	8	3.94	12	47.28	

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Palice - izvleček opaža (POZ-100; pasovni temelji objekta)

Ø [mm]	lgn [m]	Teža enote [kg/m']	Teža [kg]
B500B			
8	2728.32	0.40	1077.69
12	2548.59	0.89	2263.15
Skupaj			3340.83

Palice - izvleček opaža (POZ-120; temeljna plošča dvigala)

B500B			
8	91.35	0.40	36.08
12	51.00	0.89	45.29
14	54.00	1.21	65.34
Skupaj			146.71

Palice - izvleček opaža (POZ-121; elektro jašek)

B500B			
8	157.08	0.40	62.05
12	100.32	0.89	89.08
Skupaj			151.13

Palice - izvleček opaža (POZ-130; sidra iz temeljev)

B500B			
14	445.60	1.21	539.18
Skupaj			539.18

Palice - izvleček opaža (POZ-VV-P; vertikalne vezi pritličje)

B500B			
8	529.20	0.40	209.03
14	587.04	1.21	710.32
Skupaj			919.35

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Palice - izvleček opaža (POZ-S-P;ab slopi pritličje)

Ø [mm]	lgn [m]	Teža enote [kg/m']	Teža [kg]
B500B			
8	473.48	0.40	187.02
14	394.24	1.21	477.03
Skupaj			664.06

Palice - izvleček opaža (POZ-200; ab plošča nad pritličjem)

B500B			
8	456.28	0.40	180.23
12	414.42	0.89	368.00
14	64.40	1.21	77.92
Skupaj			626.16

Palice - izvleček opaža (POZ-201; ab nosilec)

B500B			
8	15.60	0.40	6.16
12	24.00	0.89	21.31
Skupaj			27.47

Palice - izvleček opaža (POZ-300; ab plošča nad kuhinjo)

B500B			
8	271.60	0.40	107.28
12	25.60	0.89	22.73
Skupaj			130.01

Palice - izvleček opaža (POZ-301; ab nosilec)

B500B			
8	56.00	0.40	22.12

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Palice - izvleček opaža (POZ-301; ab nosilec)

Ø [mm]	lgn [m]	Teža enote [kg/m']	Teža [kg]
12	82.95	0.89	73.66
16	49.40	1.58	78.05
Skupaj			173.83

Palice - izvleček opaža (POZ-302; ab nosilec)

B500B			
8	52.80	0.40	20.86
12	54.00	0.89	47.95
16	40.50	1.58	63.99
Skupaj			132.80

Palice - izvleček opaža (POZ-303; ab nosilec)

B500B			
8	72.00	0.40	28.44
12	56.52	0.89	50.19
16	56.52	1.58	89.30
Skupaj			167.93

Palice - izvleček opaža (POZ-304;ab nosilec)

B500B			
8	72.00	0.40	28.44
12	75.36	0.89	66.92
Skupaj			95.36

Palice - izvleček opaža (POZ-HV-01; horizontalna vez na višini cca 220cm)

B500B			
8	304.00	0.40	120.08

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Palice - izvleček opaža (POZ-HV-01; horizontalna vez na višini cca 220cm)

Ø [mm]	lgn [m]	Teža enote [kg/m']	Teža [kg]
12	360.00	0.89	319.68
Skupaj			439.76

Palice - izvleček opaža (POZ-D; dvigalni jašek)

B500B			
8	476.30	0.40	188.14
12	49.52	0.89	43.97
14	347.70	1.21	420.72
Skupaj			652.83

Palice - izvleček opaža (POZ-VV-N; vertikalne vezi nadstropja)

B500B			
8	388.08	0.40	153.29
14	332.84	1.21	402.74
Skupaj			556.03

Palice - izvleček opaža (POZ-S-M; slopi mansarda)

B500B			
8	138.24	0.40	54.60
14	110.60	1.21	133.83
Skupaj			188.43

Palice - izvleček opaža (POZ-400; ab plošča nad nadstropjem)

B500B			
8	456.28	0.40	180.23
12	237.42	0.89	210.83
Skupaj			391.06

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Palice - izvleček opaža (POZ-401; ab nosilec)

Ø [mm]	lgn [m]	Teža enote [kg/m']	Teža [kg]
B500B			
8	15.60	0.40	6.16
12	24.00	0.89	21.31
Skupaj			27.47

Palice - izvleček opaža (POZ-402; ab nosilec)

B500B			
8	100.80	0.40	39.82
12	167.85	0.89	149.05
Skupaj			188.87

Palice - izvleček opaža (POZ-403; ab nosilec)

B500B			
8	121.60	0.40	48.03
12	200.70	0.89	178.22
Skupaj			226.25

Palice - izvleček opaža (POZ-404; ab nosilec)

B500B			
8	68.80	0.40	27.18
12	110.25	0.89	97.90
Skupaj			125.08

Palice - izvleček opaža (POZ-405; ab nosilec)

B500B			
8	48.00	0.40	18.96

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Palice - izvleček opaža (POZ-405; ab nosilec)

Ø [mm]	lgn [m]	Teža enote [kg/m']	Teža [kg]
12	69.60	0.89	61.80
Skupaj			80.76

Palice - izvleček opaža (POZ-VV-M; vertilane vezi podstrešje)

B500B			
8	14.70	0.40	5.81
14	11.76	1.21	14.23
Skupaj			20.04

Palice - izvleček opaža (HV - podstrešje)

B500B			
8	76.00	0.40	30.02
12	120.00	0.89	106.56
Skupaj			136.58

Palice - izvleček opaža (POZ- 600; Temeljna plošča pod stopniščem)

B500B			
8	252.10	0.40	99.58
12	115.06	0.89	102.17
Skupaj			201.75

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Palice - izvleček

Ø [mm]	lgn [m]	Teža enote [kg/m']	Teža [kg]
B500B			
8	7436.21	0.40	2937.30
12	4887.16	0.89	4339.80
14	2348.18	1.21	2841.30
16	146.42	1.58	231.34
Skupaj (B500B)			10349.74
Skupaj			10349.74

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Mreže - specifikacija

Pozicija	Oznaka mreže	B [cm]	L [cm]	n	Teža enote [kg/m2]	Skupna teža [kg]	Opomba
POZ-100; pasovni temelji objekta (1 kos)							
I-1	Q-385	214	110	2	6.01	28.37	
I-2	Q-385	168	105	4	6.01	42.32	
I-3	Q-385	215	105	18	6.01	244.42	
I-4	Q-385	205	105	4	6.01	51.66	
I-5	Q-385	210	105	2	6.01	26.53	
I-6	Q-385	174	105	2	6.01	21.95	
I-7	Q-385	210	100	2	6.01	25.26	
I-8	Q-385	215	100	2	6.01	25.86	
I-9	Q-385	169	100	2	6.01	20.30	
I-10	Q-385	213	105	2	6.01	26.84	
I-11	Q-385	90	105	2	6.01	11.37	
Skupaj						524.88	
POZ-120; temeljna plošča dvigala (1 kos)							
I-1	Q-385	205	220	2	6.01	54.26	
Skupaj						54.26	
POZ-121; elektro jašek (1 kos)							
I-1	Q-385	150	418	2	6.01	75.30	
Skupaj						75.30	
POZ-140; talna plošča (1 kos)							
I-1	Q-335	203	341	1	5.26	36.36	
I-2	Q-335	203	402	1	5.26	42.92	
I-3	Q-335	215	512	1	5.26	57.90	
I-4	Q-335	171	512	1	5.26	45.92	
I-5	Q-335	215	402	2	5.26	90.92	
I-6	Q-335	190	420	1	5.26	41.81	
I-7	Q-335	210	341	1	5.26	37.61	
I-8	Q-335	203	341	1	5.26	36.45	
I-9	Q-335	210	219	2	5.26	48.49	

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Mreže - specifikacija

Pozicija	Oznaka mreže	B [cm]	L [cm]	n	Teža enote [kg/m2]	Skupna teža [kg]	Opomba
I-10	Q-335	210	243	2	5.26	53.68	
I-11	Q-335	210	237	1	5.26	26.18	
I-12	Q-335	83	237	1	5.26	10.41	
I-13	Q-335	210	290	1	5.26	32.03	
I-14	Q-335	215	358	1	5.26	40.49	
I-15	Q-335	99	183	1	5.26	9.53	
I-16	Q-335	165	312	1	5.26	27.09	
I-17	Q-335	215	312	1	5.26	35.32	
I-18	Q-335	150	294	1	5.26	23.20	
I-19	Q-335	173	113	1	5.26	10.28	
I-20	Q-335	183	113	1	5.26	10.91	
I-21	Q-335	215	237	1	5.26	26.80	
I-22	Q-335	173	237	1	5.26	21.57	
I-23	Q-335	210	372	1	5.26	41.09	
I-24	Q-335	198	372	1	5.26	38.65	
I-25	Q-335	210	363	1	5.26	40.04	
I-26	Q-335	205	363	1	5.26	39.09	
I-27	Q-335	210	273	2	5.26	60.20	
I-28	Q-335	207	273	1	5.26	29.67	
I-29	Q-335	205	273	1	5.26	29.38	
I-30	Q-335	215	502	2	5.26	113.66	
I-31	Q-335	183	237	1	5.26	22.88	
I-32	Q-335	83	502	2	5.26	44.14	
Skupaj						1224.68	
POZ-S-P;ab slopi pritličje (1 kos)							
I-1	Q-385	175	396	2	6.01	83.26	
Skupaj						83.26	
POZ-200; ab plošča nad pritličjem (1 kos)							
I	Q-385	215	605	10	6.01	782.40	

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Mreže - specifikacija

Pozicija	Oznaka mreže	B [cm]	L [cm]	n	Teža enote [kg/m2]	Skupna teža [kg]	Opomba
I-1	Q-385	210	103	1	6.01	13.07	
I-2	Q-385	210	605	2	6.01	152.84	
I-3	Q-385	76	97	1	6.01	4.44	
I-4	Q-385	215	605	8	6.01	625.92	
I-5	Q-385	215	390	1	6.01	50.45	
I-6	Q-385	152	390	1	6.01	35.66	
I-7	Q-385	215	390	7	6.01	353.05	
I-8	Q-385	205	390	2	6.01	96.18	
I-9	Q-385	205	605	4	6.01	298.40	
I-10	Q-385	215	374	1	6.01	48.32	
I-11	Q-385	152	57	1	6.01	5.15	
I-12	Q-385	210	160	1	6.01	20.21	
Skupaj						2486.10	
POZ-300; ab plošča nad kuhinjo (1 kos)							
I	Q-385	215	605	8	6.01	625.92	
I-1	Q-385	205	605	1	6.01	74.60	
I-2	Q-385	205	295	1	6.01	36.44	
I-3	Q-385	215	295	10	6.01	382.15	
I-4	Q-385	215	605	3	6.01	234.72	
I-5	Q-385	200	495	1	6.01	59.55	
I-6	Q-385	205	577	1	6.01	71.15	
I-7	Q-385	215	577	1	6.01	74.62	
I-8	Q-385	215	321	1	6.01	41.51	
I-9	Q-385	167	321	1	6.01	32.24	
I-10	Q-385	175	435	1	6.01	45.76	
I-11	Q-385	121	291	1	6.01	21.20	
I-12	Q-385	55	605	1	6.01	20.01	
I-13	Q-385	55	296	1	6.01	9.78	
I-14	Q-385	205	315	1	6.01	38.84	
I-15	Q-385	215	315	1	6.01	40.74	

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Mreže - specifikacija

Pozicija	Oznaka mreže	B [cm]	L [cm]	n	Teža enote [kg/m2]	Skupna teža [kg]	Opomba
I-16	Q-385	210	315	1	6.01	39.79	
Skupaj						1849.02	
POZ-D; dvigalni jašek (1 kos)							
I-1	Q-385	155	605	2	6.01	112.81	
I-2	Q-385	155	244	2	6.01	45.50	
I-3	Q-385	170	605	2	6.01	123.73	
I-4	Q-385	170	244	2	6.01	49.90	
I-5	Q-385	155	92	2	6.01	17.15	
I-6	Q-385	155	108	2	6.01	20.14	
I-7	Q-385	155	112	2	6.01	20.88	
I-8	Q-385	205	220	2	6.01	54.26	
Skupaj						444.37	
POZ-400; ab plošča nad nadstropjem (1 kos)							
I	Q-385	215	605	10	6.01	782.40	
I-1	Q-385	210	336	2	6.01	84.88	
I-2	Q-385	210	605	2	6.01	152.84	
I-3	Q-385	79	94	2	6.01	8.93	
I-4	Q-385	215	605	8	6.01	625.92	
I-5	Q-385	215	390	8	6.01	403.49	
I-6	Q-385	152	390	2	6.01	71.31	
I-7	Q-385	205	390	2	6.01	96.18	
I-8	Q-385	205	605	4	6.01	298.40	
I-9	Q-385	210	538	1	6.01	67.96	
I-10	Q-385	215	538	1	6.01	69.58	
I-11	Q-385	109	538	1	6.01	35.27	
Skupaj						2697.17	
POZ- 600; Temeljna plošča pod stopniščem (1 kos)							
I-1	Q-385	210	513	2	6.01	129.60	

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Mreže - specifikacija

Pozicija	Oznaka mreže	B [cm]	L [cm]	n	Teža enote [kg/m2]	Skupna teža [kg]	Opomba
I-2	Q-385	190	513	2	6.01	116.97	
Skupaj						246.57	

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Mreže - rakapitulacija opaža

Oznaka mreže	B [cm]	L [cm]	n	Teža enote [kg/m2]	Skupna teža celih mrež [kg]	Neto vgrajena teža [kg]
POZ-100; pasovni temelji objekta						
Q-385	215	605	8	6.01	625.92	524.88
Skupaj					625.92	524.88
POZ-120; temeljna plošča dvigala						
Q-385	215	605	1	6.01	78.24	54.26
Skupaj					78.24	54.26
POZ-121; elektro jašek						
Q-385	215	605	2	6.01	156.48	75.30
Skupaj					156.48	75.30
POZ-140; talna plošča						
Q-335	215	605	22	5.26	1505.23	1179.74
Skupaj					1505.23	1179.74
POZ-S-P;ab slopi pritličje						
Q-385	215	605	2	6.01	156.48	76.78
Skupaj					156.48	76.78
POZ-200; ab plošča nad pritličjem						
Q-385	215	605	36	6.01	2816.64	2402.30
Skupaj					2816.64	2402.30
POZ-300; ab plošča nad kuhinjo						
Q-385	215	605	28	6.01	2190.72	1726.56
Skupaj					2190.72	1726.56
POZ-D; dvigalni jašek						
Q-385	215	605	8	6.01	625.92	441.36
Skupaj					625.92	441.36

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Mreže - rakapitulacija opaža

Oznaka mreže	B [cm]	L [cm]	n	Teža enote [kg/m2]	Skupna teža celih mrež [kg]	Neto vgrajena teža [kg]
POZ-400; ab plošča nad nadstropjem						
Q-385	215	605	41	6.01	3207.84	2591.35
Skupaj					3207.84	2591.35
POZ- 600; Temeljna plošča pod stopniščem						
Q-385	215	605	4	6.01	312.96	246.57
Skupaj					312.96	246.57

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Mreže - izvleček

Oznaka mreže	B [cm]	L [cm]	n	Teža enote [kg/m2]	Skupna teža celih mrež [kg]	Neto vgrajena teža [kg]
Q-335	215	605	22	5.26	1505.23	1179.74
Q-385	215	605	130	6.01	10171.21	8139.37
Skupaj					11676.44	9319.11

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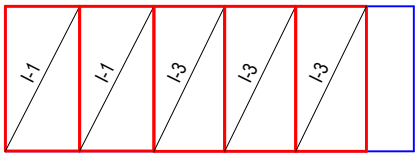
Mreže - načrt razreza (POZ-100; pasovni temelji objekta)

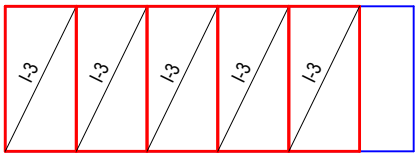
Q-385 (605 cm x 215 cm)

1x



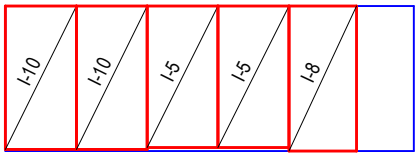
I-1 110 x 214
I-1 110 x 214
I-3 105 x 215
I-3 105 x 215
I-3 105 x 215

3x



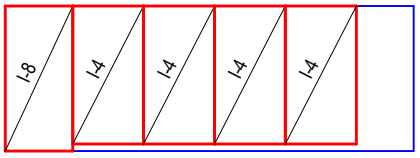
I-3 105 x 215
I-3 105 x 215
I-3 105 x 215
I-3 105 x 215
I-3 105 x 215

1x



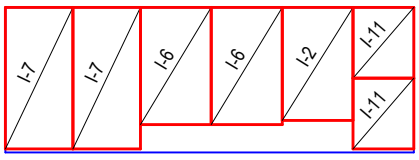
I-10 105 x 213
I-10 105 x 213
I-5 105 x 210
I-5 105 x 210
I-8 100 x 215

1x



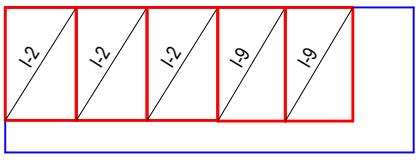
I-8 100 x 215
I-4 105 x 205
I-4 105 x 205
I-4 105 x 205
I-4 105 x 205

1x



I-7 100 x 210
I-7 100 x 210
I-6 105 x 174
I-6 105 x 174
I-2 105 x 168
I-11 105 x 90
I-11 105 x 90

1x



I-2 105 x 168
I-2 105 x 168
I-2 105 x 168
I-9 100 x 169
I-9 100 x 169

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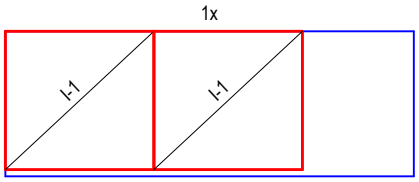
Mreže - načrt razreza (POZ-120; temeljna plošča dvigala)

Q-385 (605 cm x 215 cm)



I-1 220 x 205
I-1 220 x 205

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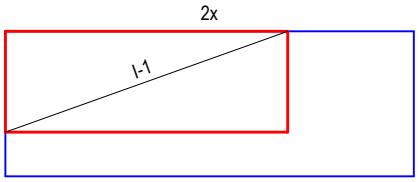
Mreže - načrt razreza (POZ-121; elektro jašek)

Q-385 (605 cm x 215 cm)



I-1 418 x 150

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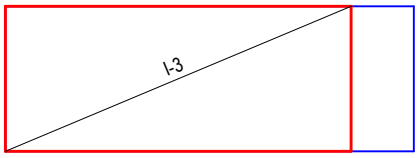
Mreže - načrt razreza (POZ-140; talna plošča)

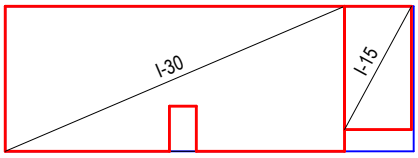
Q-335 (605 cm x 215 cm)

1x



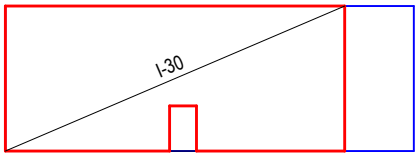
I-3 512 x 215

1x



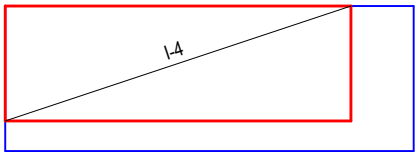
I-30 502 x 215
I-15 183 x 99

1x



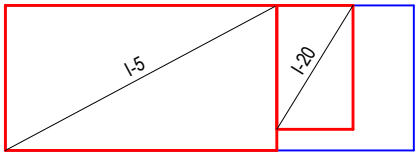
I-30 502 x 215

1x



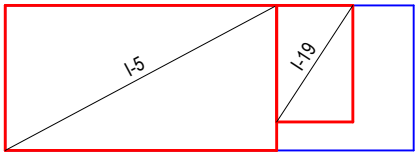
I-4 512 x 171

1x



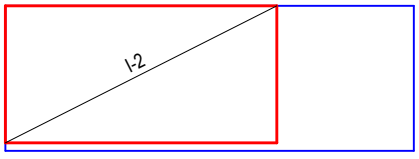
I-5 402 x 215
I-20 113 x 183

1x



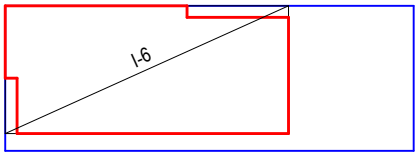
I-5 402 x 215
I-19 113 x 173

1x



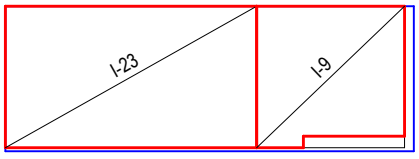
I-2 402 x 203

1x



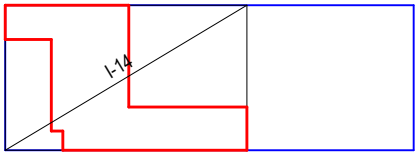
I-6 420 x 190

1x



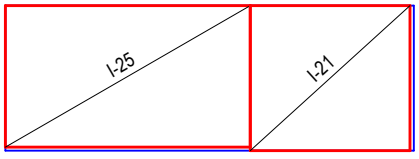
I-23 372 x 210
I-9 219 x 210

1x



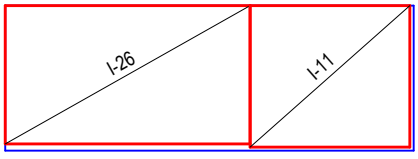
I-14 358 x 215

1x



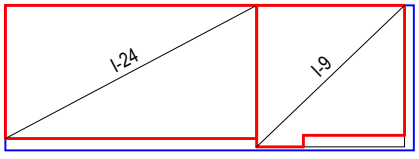
I-25 363 x 210
I-21 237 x 215

1x



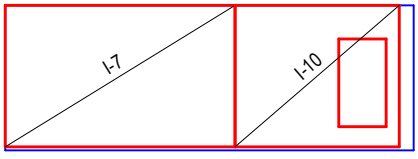
I-26 363 x 205
I-11 237 x 210

1x



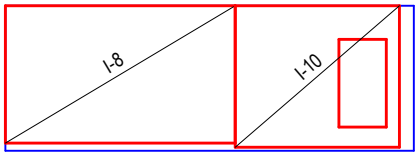
I-24 372 x 198
I-9 219 x 210

1x



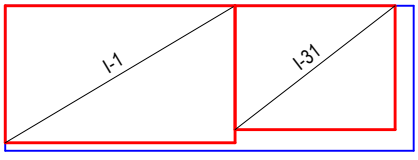
I-7 341 x 210
I-10 243 x 210

1x



I-8 341 x 203
I-10 243 x 210

1x



I-1 341 x 203
I-31 237 x 183

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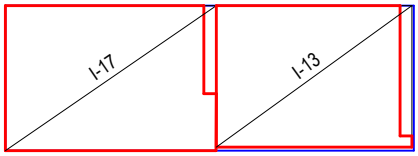
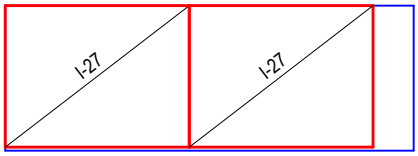
Mreže - načrt razreza (POZ-140; talna plošča)

1x



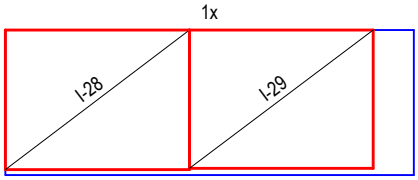
I-17 312 x 215
I-13 290 x 210

1x



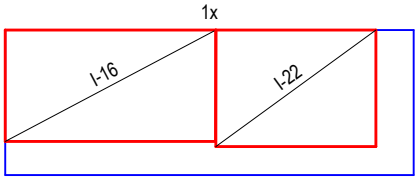
I-27 273 x 210
I-27 273 x 210

1x



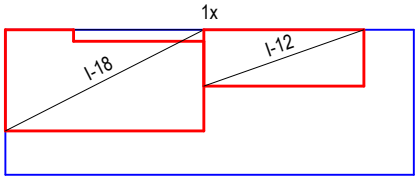
I-28 273 x 207
I-29 273 x 205

1x



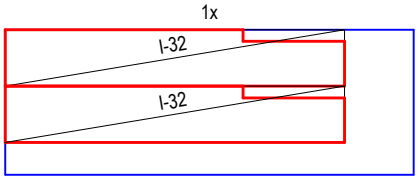
I-16 312 x 165
I-22 237 x 173

1x



I-18 294 x 150
I-12 237 x 83

1x



I-32 502 x 83
I-32 502 x 83

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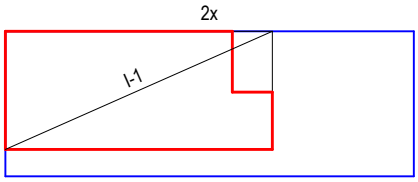
Mreže - načrt razreza (POZ-S-P;ab slopi pritličje)

Q-385 (605 cm x 215 cm)



I-1 396 x 175

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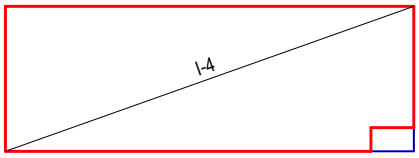
Mreže - načrt razreza (POZ-200; ab plošča nad pritličjem)

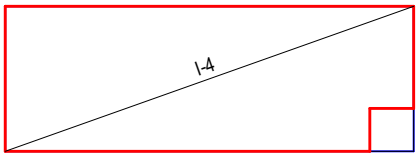
Q-385 (605 cm x 215 cm)

1x



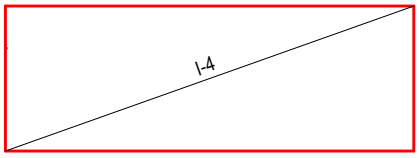
I-4 605 x 215

1x



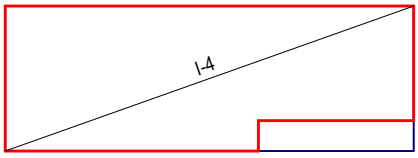
I-4 605 x 215

1x



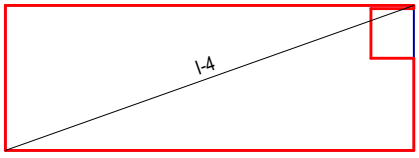
I-4 605 x 215

1x



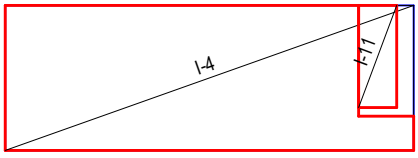
I-4 605 x 215

1x



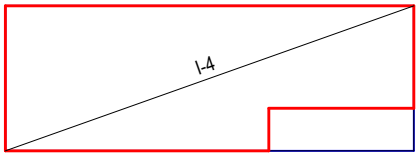
I-4 605 x 215

1x



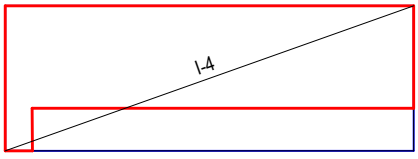
I-4 605 x 215
I-11 57 x 152

1x



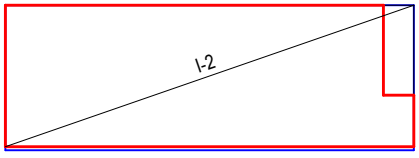
I-4 605 x 215

1x



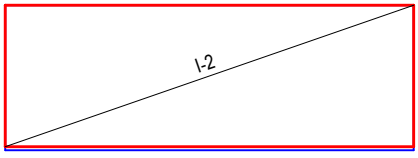
I-4 605 x 215

1x



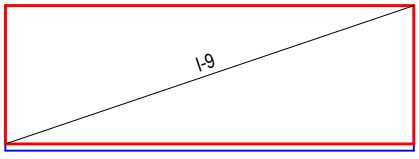
I-2 605 x 210

1x



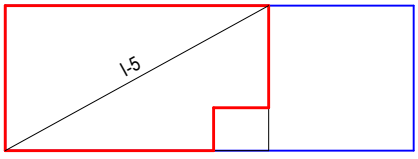
I-2 605 x 210

4x



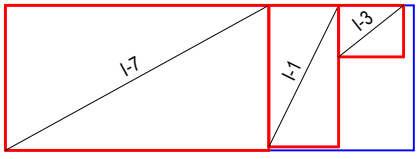
I-9 605 x 205

1x



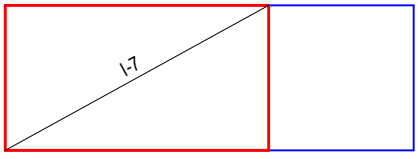
I-5 390 x 215

1x



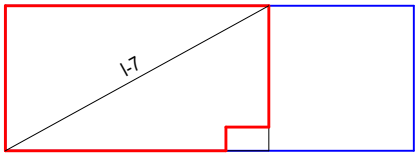
I-7 390 x 215
I-1 103 x 210
I-3 97 x 76

2x



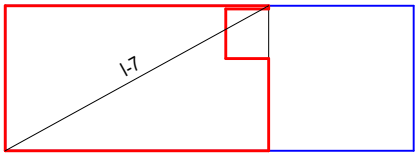
I-7 390 x 215

1x



I-7 390 x 215

1x



I-7 390 x 215

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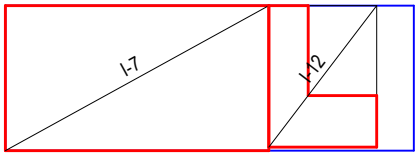
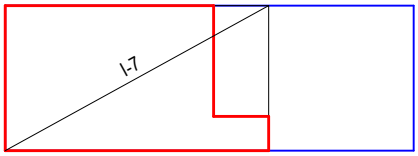
Mreže - načrt razreza (POZ-200; ab plošča nad pritličjem)

1x



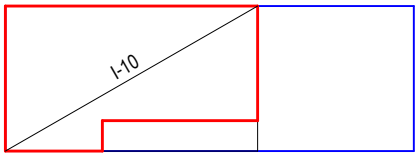
I-7 390 x 215
I-12 160 x 210

1x



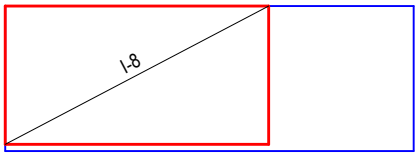
I-7 390 x 215

1x



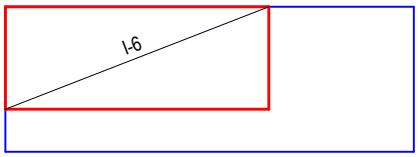
I-10 374 x 215

2x



I-8 390 x 205

1x



I-6 390 x 152

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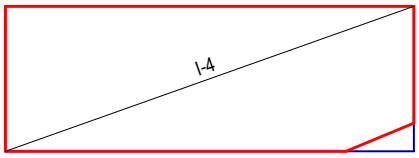
Mreže - načrt razreza (POZ-300; ab plošča nad kuhinjo)

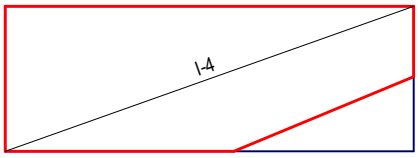
Q-385 (605 cm x 215 cm)

1x



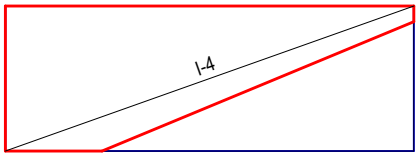
I-4 605 x 215

1x



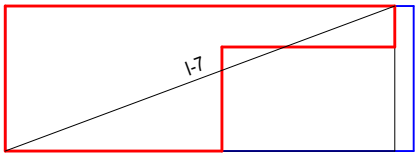
I-4 605 x 215

1x



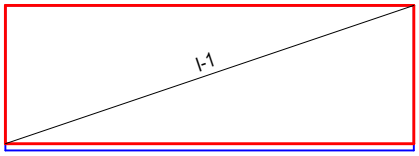
I-4 605 x 215

1x



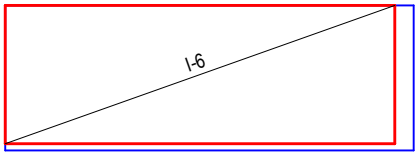
I-7 577 x 215

1x



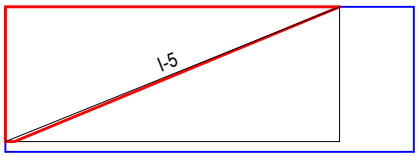
I-1 605 x 205

1x



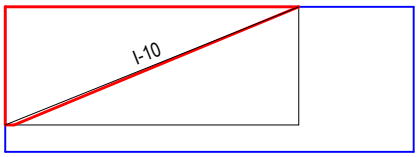
I-6 577 x 205

1x



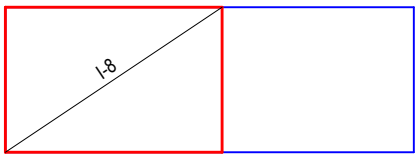
I-5 495 x 200

1x



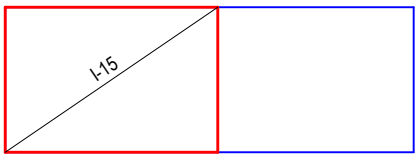
I-10 435 x 175

1x



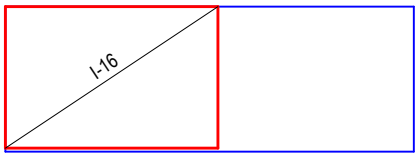
I-8 321 x 215

1x



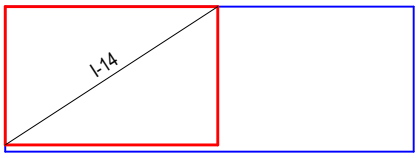
I-15 315 x 215

1x



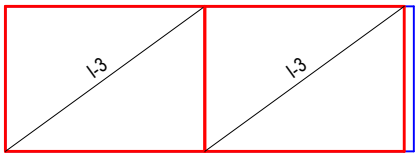
I-16 315 x 210

1x



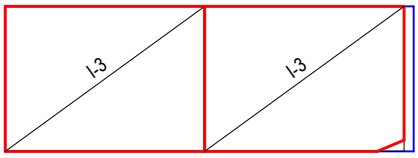
I-14 315 x 205

4x



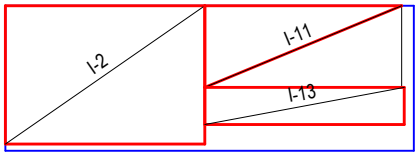
I-3 295 x 215
I-3 295 x 215

1x



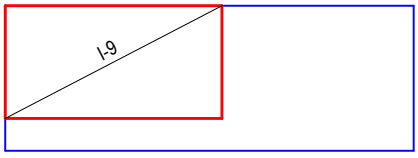
I-3 295 x 215
I-3 295 x 215

1x



I-2 295 x 205
I-11 291 x 121
I-13 296 x 55

1x



I-9 321 x 167

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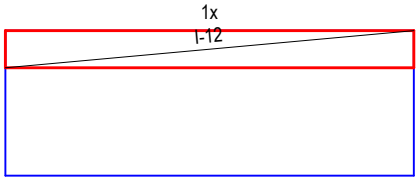
Mreže - načrt razreza (POZ-300; ab plošča nad kuhinjo)



I-12 605 x 55

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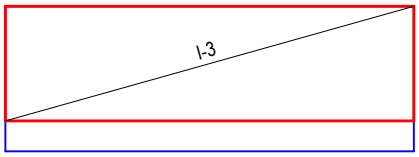
Mreže - načrt razreza (POZ-D; dvigalni jašek)

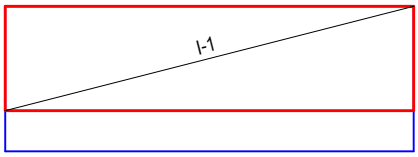
Q-385 (605 cm x 215 cm)

2x



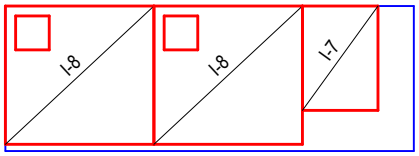
I-3 605 x 170

2x



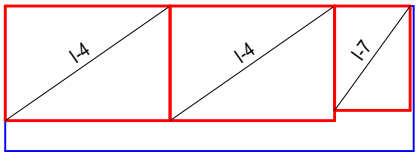
I-1 605 x 155

1x



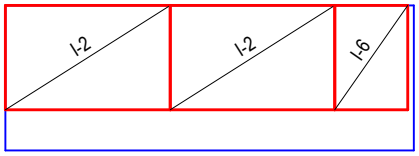
I-8 220 x 205
I-8 220 x 205
I-7 112 x 155

1x



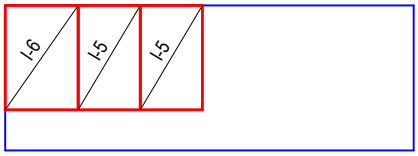
I-4 244 x 170
I-4 244 x 170
I-7 112 x 155

1x



I-2 244 x 155
I-2 244 x 155
I-6 108 x 155

1x



I-6 108 x 155
I-5 92 x 155
I-5 92 x 155

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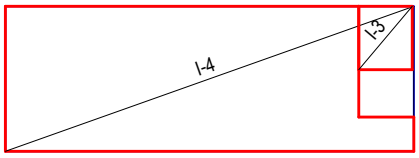
Vrvarska pot 1a
1310 Ribnica, Slovenija
T 01 836 90 60
info@zasnova.si
www.zasnova.si

Mreže - načrt razreza (POZ-400; ab plošča nad nadstropjem)

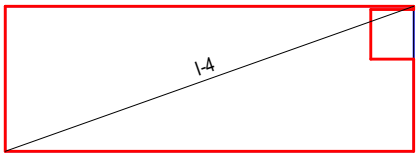
Q-385 (605 cm x 215 cm)

2x



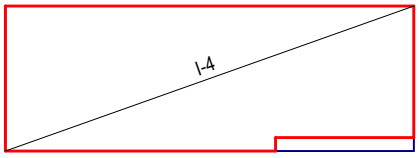
I-4 605 x 215
I-3 94 x 79

2x



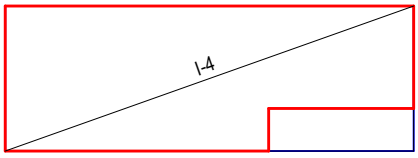
I-4 605 x 215

2x



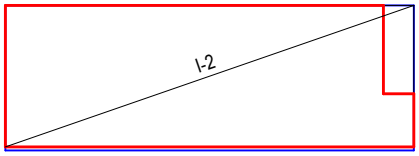
I-4 605 x 215

2x



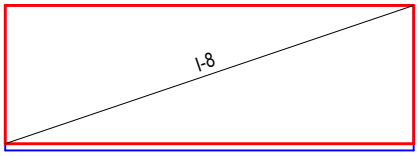
I-4 605 x 215

2x



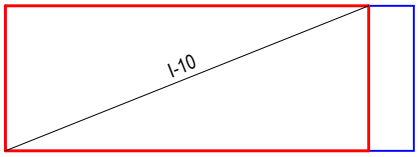
I-2 605 x 210

4x



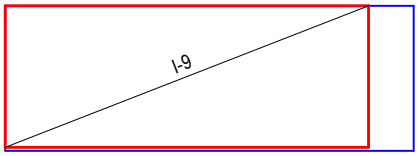
I-8 605 x 205

1x



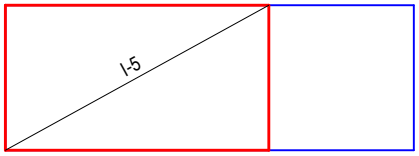
I-10 538 x 215

1x



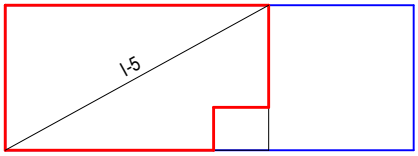
I-9 538 x 210

4x



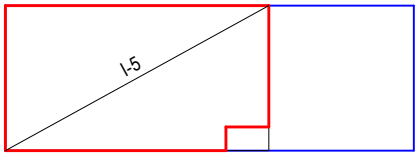
I-5 390 x 215

2x



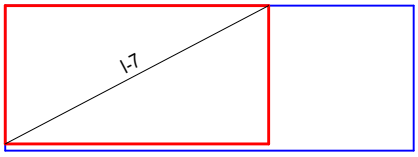
I-5 390 x 215

2x



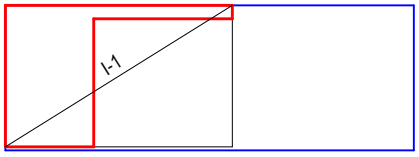
I-5 390 x 215

2x



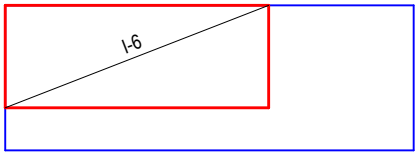
I-7 390 x 205

2x



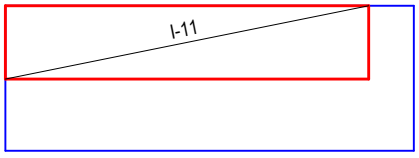
I-1 336 x 210

2x



I-6 390 x 152

1x



I-11 538 x 109

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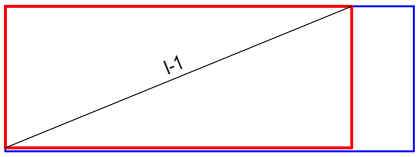
www.zasnova.si

Mreže - načrt razreza (POZ- 600; Temeljna plošča pod stopniščem)

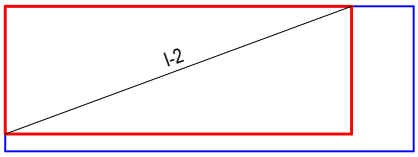
Q-385 (605 cm x 215 cm)

2x



I-1 513 x 210

2x



I-2 513 x 190

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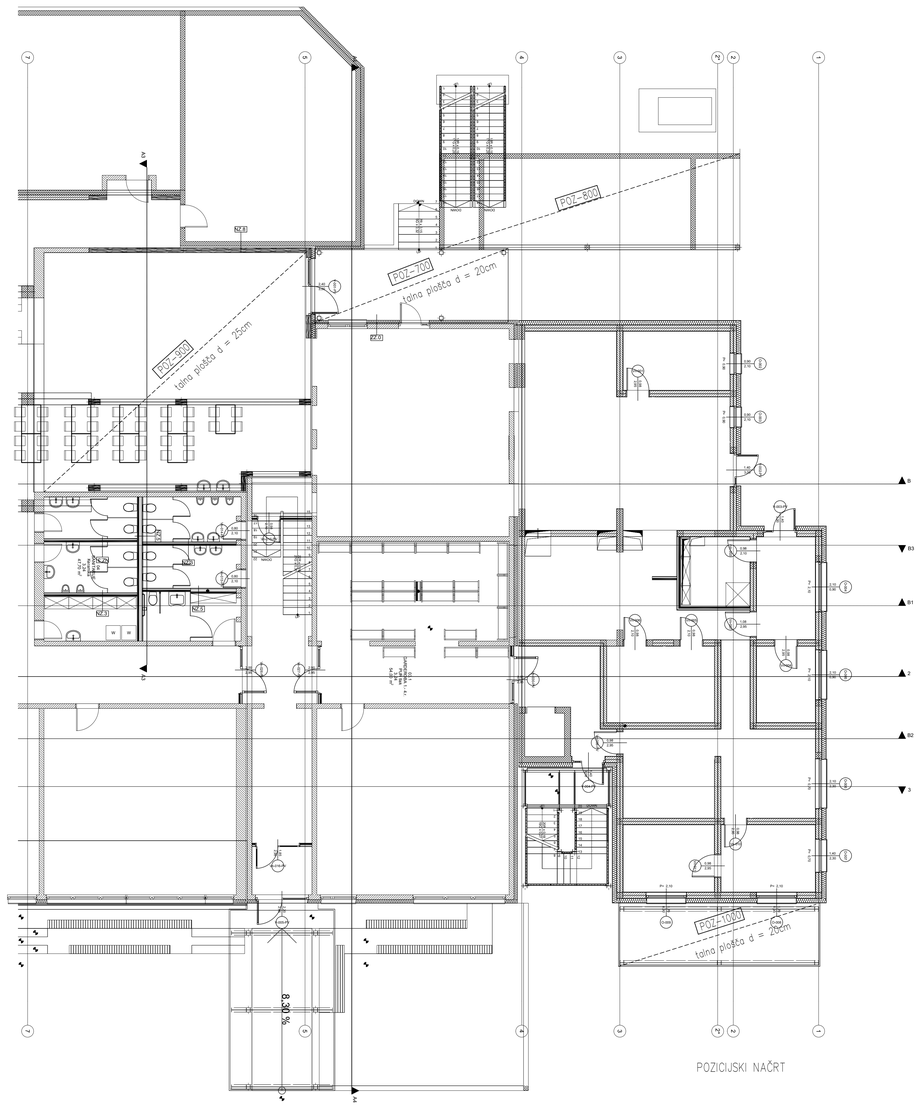
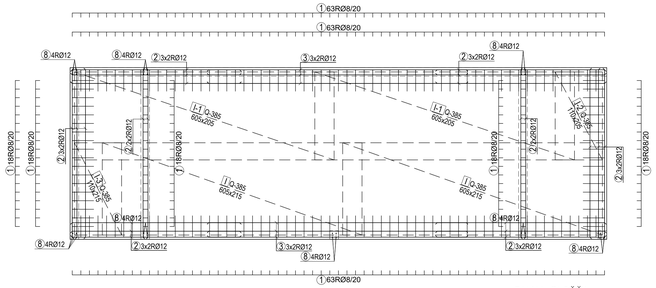
2.8.2. Armatura pomožnih objektov

ARMATURNI NAČRT: OBJEKT ZA SMETI

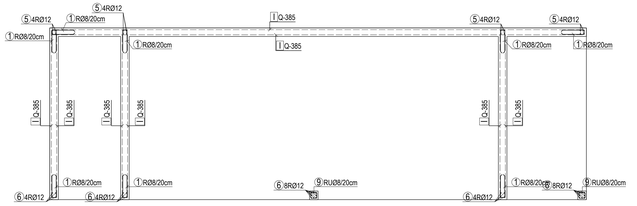
POZ – 800



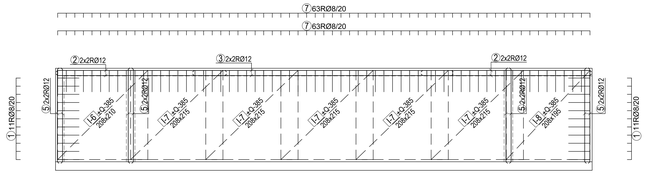
POZICIJSKI NAČRT



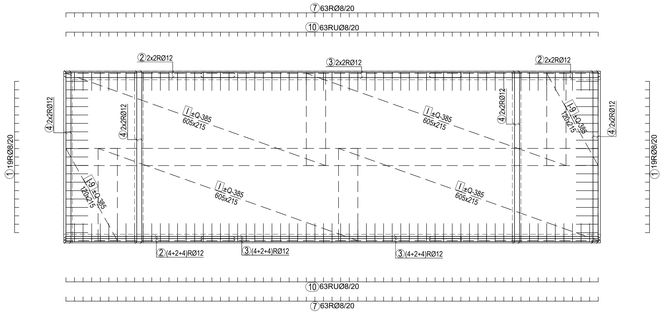
TALNA PLOŠČA

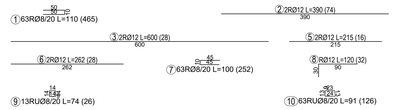


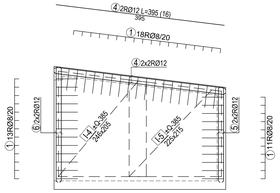
TLORIS STEN



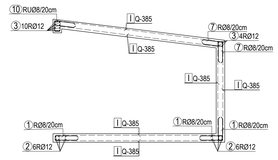
POGLED NA ZADNJO STENO







POGLED NA PREČNE STENE; KOS 3



PREČNI PREREZ

MATERIALI:
- BETON: C 25/30
- JEKLO: S-500 A (mrežna armatura) in S-500 B (ostala armatura)

PREKLOPI:
- OKROGLO JEKLO 60 x Ø
- MREŽNA ARMATURA 40-45cm (min 3 okence mreže)

ZAŠČITNE PLASTI BETONA:
- KONSTRUKCIJE, KI SO V STIKU Z ZEMLJINO min 3cm
- OSTALE KONSTRUKCIJE min 2,5cm

OPOMBE:
- Poleg pogojev iz projekta je potrebno upoštevati vse zahteve standardov SIST EN 206, SIST EN 1026 in SIST EN 10080
- Izvajanje armirano - betonskih konstrukcij mora biti skladno s standardom SIST EN 13670
- Poleg tega načrta potrebno upoštevati tudi ostale načrte kot npr. načrt inštalacij
- POSAMEZNE POZICIJE POTREBNO PRILAGODITI (pokriviti, porezati,..)
- VSE DIMEZIJE PREVERITI PA JIH USKLADITI NA LICU MESTA
- Preboje manjši od Ø 20cm niso v načrtu armature. Preboje uskladiti z ostalimi načrti
- Na mestu kjer se prekrivajo mreže je potrebno mreže obrniti tako, da se mreža leže ena v drugo

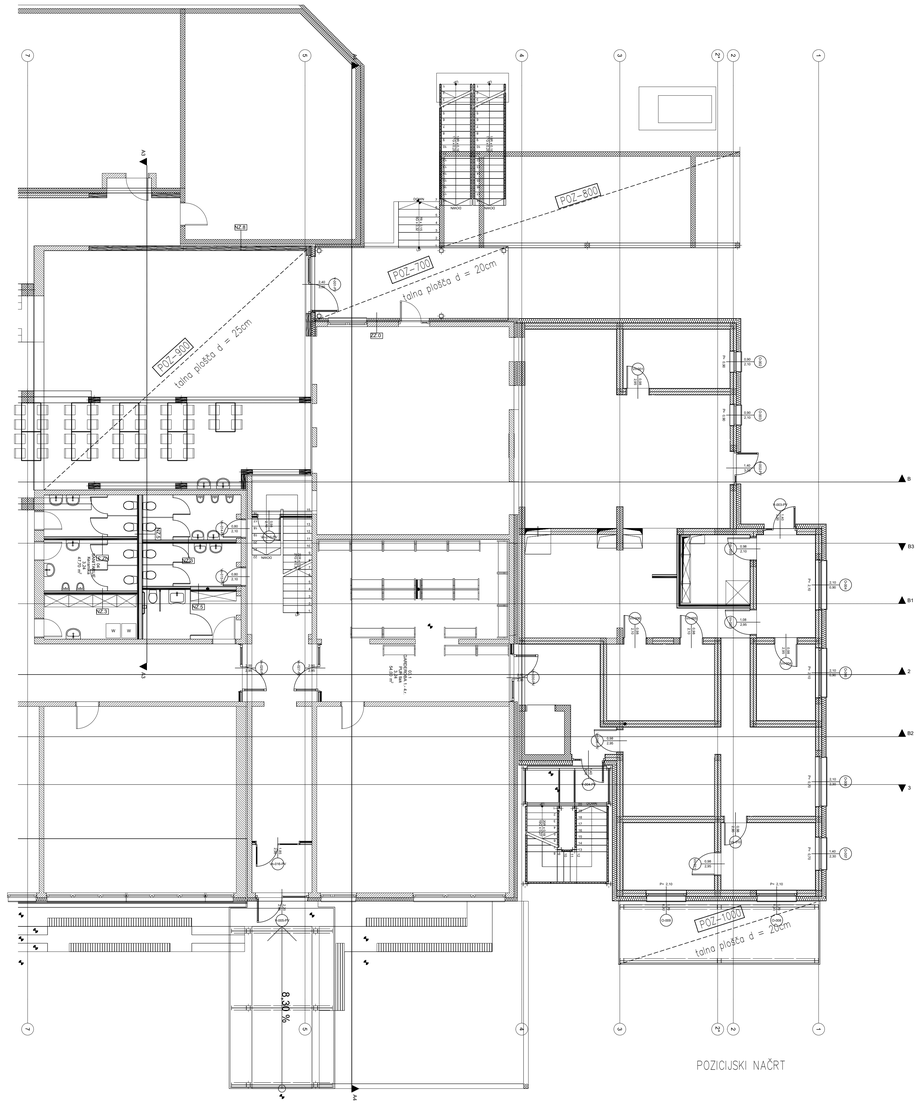
ARMATURA PROSTORA ZA SMETI

ZAS NOV A
GRADBENI BIRO
Lovšin Tone s.p.
Vrvarska pot 1a
1310 Ribnica, Slovenija

ARMATURA: ARMATURA

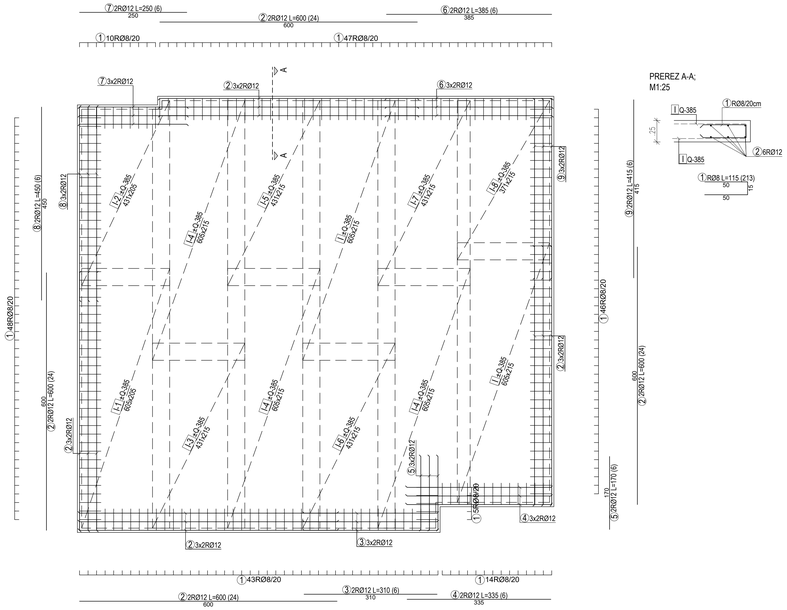
M 1:50 / 1:25

sestavni del:	2. Načrt gradbeništva	št. projekta:	04-2019-PZI
		št. načrta:	04-2019-PZI-GA
objekt:	Prenova in širitev kuhinje - OŠ PT VL		
vodja projekta:	Miha Novina, univ. dipl. inž. arh., ZAPS A 1654	faza projekta:	PZI
pooblaščeni inž.arh.:	Tone Lovšin, dipl. inž. grad., IZS G - 0379	datum:	julij 2024
sodelavec:	Sandi Mohar, dipl. inž. grad., IZS G - 4126	št. lista:	2.7.12.



ARMATURNI NAČRT: VMESTNI DEL OBJEKTA

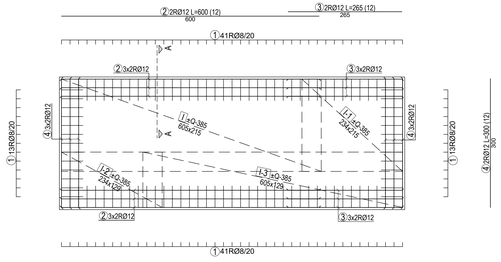
POZ – 900



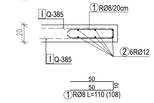
PREREZ A-A;
M1:25

ARMATURNI NAČRT: POŽARNO STOPNICE

POZ – 700

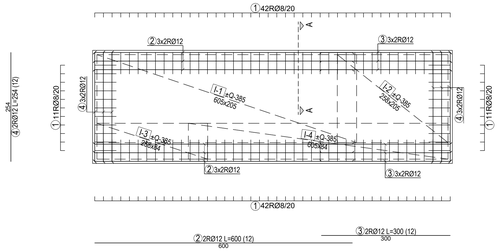


PREREZ A-A;
M1:25

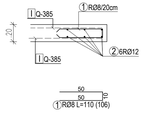


ARMATURNI NAČRT: POŽARNO STOPNICE

POZ – 1000



PREREZ A-A;
M1:25



MATERIALI:
- BETON: C 25/30
- JEKLO: S-500 A (mrežna armatura) in S-500 B (ostala armatura)

PREKLOPI:
- OKROGLO JEKLO 60 x Ø
- MREŽNA ARMATURA 40-45cm (min 3 okence mreže)

ZAŠČITNE PLASTI BETONA:
- KONSTRUKCIJE, KI SO V STIKU Z ZEMLJINO min 3cm
- OSTALE KONSTRUKCIJE min 2,5cm

OPOMBE:
- Poleg pogojev iz projekta je potrebno upoštevati vse zahteve standardov SIST EN 206, SIST EN 1026 in SIST EN 10080
- Izvajanje armirano - betonskih konstrukcij mora biti skladno s standardom SIST EN 13670
- Poleg tega načrta potrebno upoštevati tudi ostale načrte kot npr. načrt inštalacij
- POSAMEZNE POZICIJE POTREBNO PRILAGODITI (pokritviti, porezati,...)
- VSE DIMEZIJE PREVERITI PA JIH USKLADITI NA LICU MESTA
- Preboje manjši od Ø 20cm niso v načrtu armature. Preboje uskladiti z ostalimi načrti
- Na mestu kjer se prekrivajo mreže je potrebno mreže obrniti tako, da se mreža leže ena v drugo

TALNE PLOŠČE OSTALIH OBJEKTOV

ZAS NOV A

GRADBENI BIRO
Lovšin Tone s.p.
Vrvarska pot 1a
1310 Ribnica, Slovenija

ARMATURA: ARMATURA

M 1:50 / 1:25

sestavni del:	2. Načrt gradbeništva	št. projekta:	04-2019-PZI
		št. načrta:	04-2019-PZI-GA
objekt:	Prenova in širitev kuhinje - OŠ PT VL		
vodja projekta:	Miha Novina, univ. dipl. inž. arh., ZAPS A 1654	faza projekta:	PZI
pooblaščeni arž./arh.:	Tone Lovšin, dipl. inž. grad., IZS G - 0379	datum:	julij 2024
sodelavec:	Sandi Mohar, dipl. inž. grad., IZS G - 4126	št. lista:	2.7.13.

ZASNOVA

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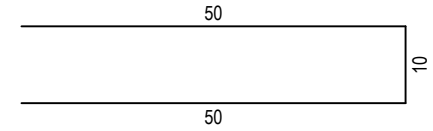
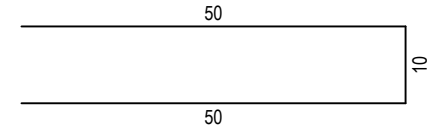
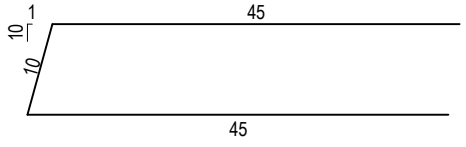
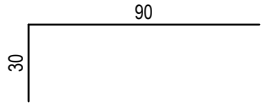
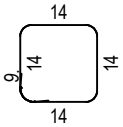
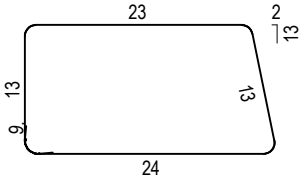
1310 Ribnica, Slovenija
T 01 836 90 60
info@zasnova.si
www.zasnova.si

Palice - specifikacija

ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]	Opomba
POZ-700; Temlji za požarno stopnišče (1 kos)						
1		8	1.10	108	118.80	
2		12	6.00	12	72.00	
3		12	2.65	12	31.80	
4		12	3.00	12	36.00	
POZ-800; Prostor za smetnjake (1 kos)						
1		8	1.10	465	511.50	
2		12	3.90	74	288.60	
3		12	6.00	28	168.00	
4		12	3.95	16	63.20	
5		12	2.15	16	34.40	
6		12	2.62	28	73.36	
7		8	1.00	252	252.00	
8		12	1.20	32	38.40	
9		8	0.74	26	19.24	
10		8	0.91	126	114.66	

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1310 Ribnica, Slovenija
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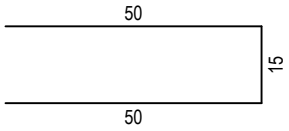
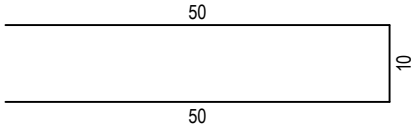
info@zasnova.si
www.zasnova.si

Palice - specifikacija

ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]	Opomba
POZ-900; Vmesni del (1 kos)						
1		8	1.15	213	244.95	
2		12	6.00	24	144.00	
3		12	3.10	6	18.60	
4		12	3.35	6	20.10	
5		12	1.70	6	10.20	
6		12	3.85	6	23.10	
7		12	2.50	6	15.00	
8		12	4.50	6	27.00	
9		12	4.15	6	24.90	
POZ-1000; Temlji kolesarnice (1 kos)						
1		8	1.10	106	116.60	
2		12	6.00	12	72.00	
3		12	3.00	12	36.00	
4		12	2.54	12	30.48	

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Palice - izvleček opaža (POZ-700; Temlji za požarno stopnišče)

Ø [mm]	lgn [m]	Teža enote [kg/m']	Teža [kg]
B500B			
8	118.80	0.40	46.93
12	139.80	0.89	124.14
Skupaj			171.07

Palice - izvleček opaža (POZ-800; Prostor za smetnjake)

B500B			
8	897.40	0.40	354.47
12	665.96	0.89	591.37
Skupaj			945.85

Palice - izvleček opaža (POZ-900; Vmesni del)

B500B			
8	244.95	0.40	96.76
12	282.90	0.89	251.22
Skupaj			347.97

Palice - izvleček opaža (POZ-1000; Temlji kolesarnice)

B500B			
8	116.60	0.40	46.06
12	138.48	0.89	122.97
Skupaj			169.03

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Palice - izvleček

Ø [mm]	lgn [m]	Teža enote [kg/m']	Teža [kg]
B500B			
8	1377.75	0.40	544.21
12	1227.14	0.89	1089.70
Skupaj (B500B)			1633.91
Skupaj			1633.91

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Mreže - specifikacija

Pozicija	Oznaka mreže	B [cm]	L [cm]	n	Teža enote [kg/m2]	Skupna teža [kg]	Opomba
POZ-700; Temlji za požarno stopnišče (1 kos)							
I	Q-385	215	605	2	6.01	156.48	
I-1	Q-385	215	234	2	6.01	60.65	
I-2	Q-385	129	234	2	6.01	36.39	
I-3	Q-385	129	605	2	6.01	93.89	
Skupaj						347.41	
POZ-800; Prostor za smetnjake (1 kos)							
I	Q-385	215	605	10	6.01	782.40	
I-1	Q-385	205	605	2	6.01	149.20	
I-2	Q-385	205	110	1	6.01	13.56	
I-3	Q-385	215	110	1	6.01	14.23	
I-4	Q-385	205	246	6	6.01	181.64	
I-5	Q-385	215	225	6	6.01	174.78	
I-6	Q-385	210	208	2	6.01	52.47	
I-7	Q-385	215	208	10	6.01	268.60	
I-8	Q-385	195	208	2	6.01	48.72	
I-9	Q-385	215	120	4	6.01	62.07	
Skupaj						1747.68	
POZ-900; Vmesni del (1 kos)							
I	Q-385	215	605	4	6.01	312.96	
I-1	Q-385	205	605	2	6.01	149.20	
I-2	Q-385	205	431	2	6.01	106.29	
I-3	Q-385	215	431	2	6.01	111.48	
I-4	Q-385	215	605	6	6.01	469.44	
I-5	Q-385	215	431	2	6.01	111.48	
I-6	Q-385	215	431	2	6.01	111.48	
I-7	Q-385	215	431	2	6.01	111.48	
I-8	Q-385	215	371	2	6.01	95.96	
Skupaj						1579.76	

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Mreže - specifikacija

Pozicija	Oznaka mreže	B [cm]	L [cm]	n	Teža enote [kg/m2]	Skupna teža [kg]	Opomba
POZ-1000; Temlji kolesarnice (1 kos)							
I-1	Q-385	205	605	2	6.01	149.20	
I-2	Q-385	205	258	2	6.01	63.63	
I-3	Q-385	84	258	2	6.01	25.92	
I-4	Q-385	84	605	2	6.01	60.77	
Skupaj						299.52	

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Mreže - rakapitulacija opaža

Oznaka mreže	B [cm]	L [cm]	n	Teža enote [kg/m2]	Skupna teža celih mrež [kg]	Neto vgrajena teža [kg]
POZ-700; Temlji za požarno stopnišče						
Q-385	215	605	6	6.01	469.44	347.41
Skupaj					469.44	347.41
POZ-800; Prostor za smetnjake						
Q-385	215	605	25	6.01	1956.00	1728.13
Skupaj					1956.00	1728.13
POZ-900; Vmesni del						
Q-385	215	605	24	6.01	1877.76	1568.95
Skupaj					1877.76	1568.95
POZ-1000; Temlji kolesarnice						
Q-385	215	605	5	6.01	391.20	299.52
Skupaj					391.20	299.52

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Mreže - izvleček

Oznaka mreže	B [cm]	L [cm]	n	Teža enote [kg/m2]	Skupna teža celih mrež [kg]	Neto vgrajena teža [kg]
Q-385	215	605	60	6.01	4694.41	3944.01
Skupaj					4694.41	3944.01

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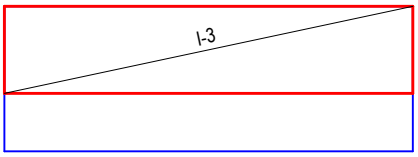
Mreže - načrt razreza (POZ-700; Temlji za požarno stopnišče)

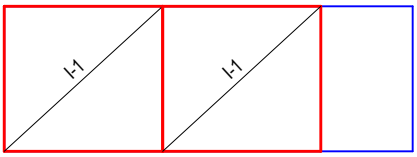
Q-385 (605 cm x 215 cm)

2x



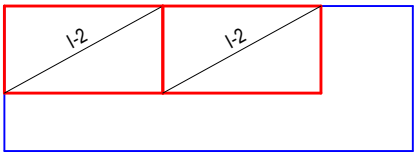
I-3 605 x 129

1x



I-1 234 x 215
I-1 234 x 215

1x



I-2 234 x 129
I-2 234 x 129

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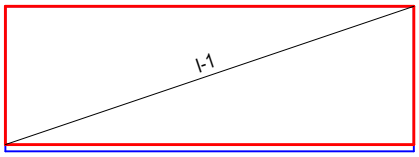
Mreže - načrt razreza (POZ-800; Prostor za smetnjake)

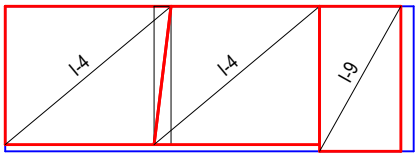
Q-385 (605 cm x 215 cm)

2x



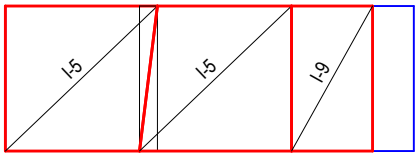
I-1 605 x 205

3x



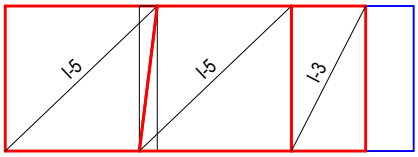
I-4 246 x 205
I-4 246 x 205
I-9 120 x 215

1x



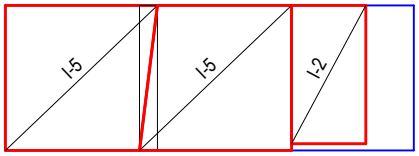
I-5 225 x 215
I-5 225 x 215
I-9 120 x 215

1x



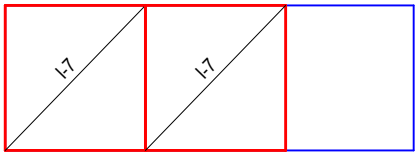
I-5 225 x 215
I-5 225 x 215
I-3 110 x 215

1x



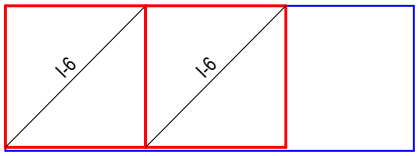
I-5 225 x 215
I-5 225 x 215
I-2 110 x 205

5x



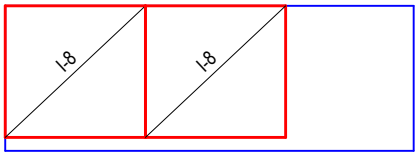
I-7 208 x 215
I-7 208 x 215

1x



I-6 208 x 210
I-6 208 x 210

1x



I-8 208 x 195
I-8 208 x 195

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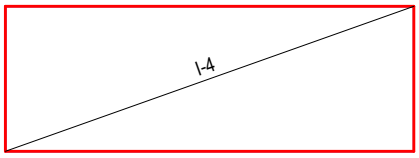
Mreže - načrt razreza (POZ-900; Vmesni del)

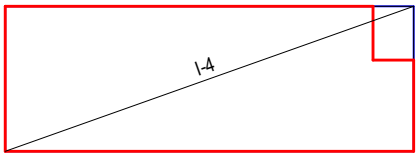
Q-385 (605 cm x 215 cm)

2x



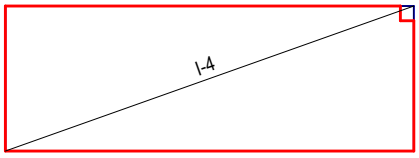
I-4 605 x 215

2x



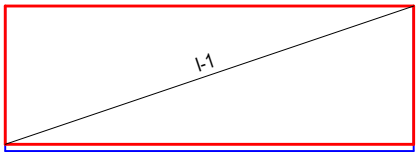
I-4 605 x 215

2x



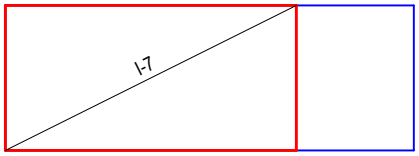
I-4 605 x 215

2x



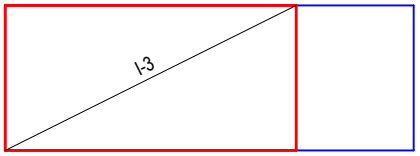
I-1 605 x 205

2x



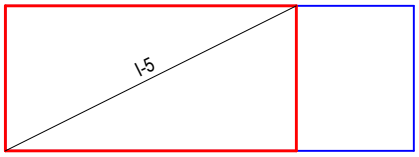
I-7 431 x 215

2x



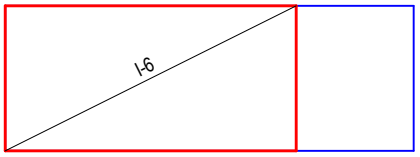
I-3 431 x 215

2x



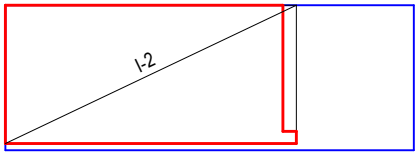
I-5 431 x 215

2x



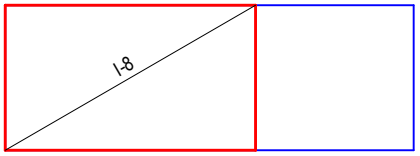
I-6 431 x 215

2x



I-2 431 x 205

2x



I-8 371 x 215

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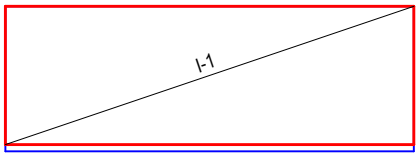
Mreže - načrt razreza (POZ-1000; Temlji kolesarnice)

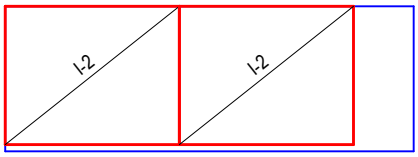
Q-385 (605 cm x 215 cm)

2x



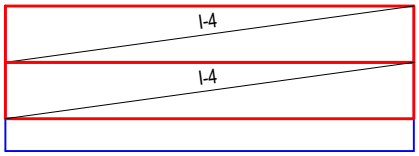
I-1 605 x 205

1x



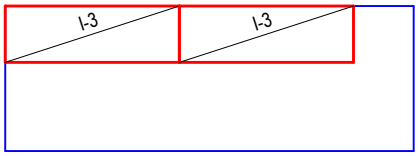
I-2 258 x 205
I-2 258 x 205

1x



I-4 605 x 84
I-4 605 x 84

1x



I-3 258 x 84
I-3 258 x 84