PRILOGA 1B

NASLOVNA STRAN NAČRTA

STATIKA, PROJEKTIRANJE, SVETOVANJE

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OSNOVNI PODATKI O GRADNJI

naziv gradnje	**Novogradnja**
kratek opis gradnje	Predmet načrta je novogradnja dveh objektov z imenoma senik in kozolec. Senik je stanovanjski objekt s pritličjem (opeka) in nadstropjem (lesen skelet) ter neizkoriščenim podstrešjem, pri čemer je pritlična etaža delno vkopana v teren. Tlorisni gabarit konstrukcije je cca 10,7 x 6,8 m. Drugi objekt je kozolec, ki je sestavljen iz armiranobetonskega dela (servisni objekt) in lesene dvokapne nadstrešnice. Servisni objekt je pritličen in je delno vkopan v teren ter ima tlorisni gabarit 12,7 x 3,0 m, nadstrešnica pa 13,3 x 6,5 m.

Seznam objektov, ureditev površin in komunalnih naprav z navedbo vrste gradnje.

vrste gradnje	☑	**novogradnja - novozgrajen objekt**
Označiti vse ustrezne vrste gradnje	☐	**novogradnja - prizidava**
	☑	**rekonstrukcija**
	☐	**sprememba namembnosti**
	☑	**odstranitev**

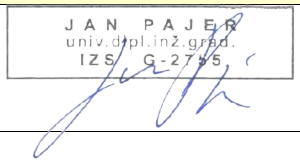
DOKUMENTACIJA

vrsta dokumentacije	**PZI**
(IZP, DGD, PZI, PID)	
številka projekta	**A198**
☐	**sprememba dokumentacije**

PODATKI O NAČRTU

strokovno področje načrta	**2 - GRADBENE KONSTRUKCIJE**
številka načrta	**JP-12/22**
datum izdelave	**december 2022**

PODATKI O IZDELOVALCU NAČRTA

ime in priimek pooblaščenega arhitekta, pooblaščenega inženirja	**Jan Pajer, univ.dipl.inž.grad.**
identifikacijska številka	**IZS G-2755**
podpis pooblaščenega inženirja	

PODATKI O PROJEKTANTU

projektant (naziv družbe)	**Studio abiro, d.o.o.**
naslov	**Igriška ulica 3, 1000 Ljubljana**
vodja projekta	**dr. Matej Blenkuš, u.d.i.a.**
identifikacijska številka	**ZAPS A-1093**
podpis vodje projekta	

odgovorna oseba projektanta	**dr. Matej Blenkuš, u.d.i.a.**
podpis odgovorne osebe projektanta	

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2.1	KLJUČNI PODATKI O NAČRTU

ŠTEVILČNA OZNAKA NAČRTA IN VRSTA NAČRTA

»2« NAČRT GRADBENIH KONSTRUKCIJ

INVESTITOR

OBČINA BISTRICA OB SOTLI
Bistrica ob Sotli 17, 3256 Bistrica ob Sotli

OBJEKT

BRATUŠEVA DOMAČIJA
Medgeneracijski center z varovanimi stanovanji

VRSTA PROJEKTNE DOKUMENTACIJE

PZI

ZA GRADNJO

Novogradnja

PROJEKTANT

SPS, Jan Pajer s.p., Trnoveljska cesta 68, Celje

Jan Pajer, u.d.i.g

ODGOVORNI PROJEKTANT

Jan Pajer, u.d.i.g,
IZS G-2755

ŠTEVILKA NAČRTA, KRAJ IN DATUM IZDELAVE NAČRTA

JP-12/22, Celje, december 2022

ODGOVORNI VODJA PROJEKTA

dr. Matej Blenkuš, u.d.i.a,
ZAPS A-1093

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2.2	**KAZALO VSEBINE NAČRTA GRADBENIH KONSTRUKCIJ št. JP-12/22**

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2.3	TEHNIČNO POROČILO

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2.3.1	TEHNIČNI OPIS

SPLOŠNO

Lokacija: Bistrica ob Sotli
Konstrukcija: opečna in lesena (senik)
lesena in AB (kozolec)

Karakteristične vrednosti vplivov:

Vpliv snega:	- karakteristična obtežba snega na tleh (s_k)	1,40 kN/m^2
Vpliv vetra:	- osnovna hitrost vetra ($v_{b,0}$)	**20 m/s**
Koristni vplivi:	- plošča nad pritličjem (q)	2,00 kN/m2
Projektni pospešek tal:	0,20g	
Kategorija objekta:	II. kategorija – običajne stavbe	
Kvaliteta tal:	C kategorija tal	

Predmet načrta je novogradnja dveh objektov z imenoma senik in kozolec. Senik je stanovanjski objekt s pritličjem (opeka) in nadstropjem (lesen skelet) ter neizkoriščenim podstrešjem, pri čemer je pritlična etaža delno vkopana v teren. Tlorisni gabarit konstrukcije je 10,7 x 6,8 m. Drugi objekt je kozolec, ki je sestavljen iz armiranobetonskega dela (servisni objekt) in lesene dvokapne nadstrešnice. Servisni objekt je pritličen in je delno vkopan v teren ter ima tlorisni gabarit 12,7 x 3,0 m. Tlorisni gabarit nadstrešnice je 13,3 x 6,5 m.

ZASNOVA KONSTRUKCIJE IN OPIS RAČUNSKE METODE

Nosilna konstrukcija senika je v pritličju masivna opečna, v nadstropju pa lesena skeletna. Lesena konstrukcija je dimenzionirana ločeno, njen vpliv je zajet kot dodatna obtežba na pritlično etažo, ki je analizirana z metodo statične nelinearne analize (push-over). Nosilna konstrukcija kozolca je delno masivna armiranobetonska (servisni objekt) v katero je sidrana lesena nadstrešnica. Celoten objekt kozolca je analiziran v enem računskem modelu. Pri kozolcu je od horizontalnih vplivov merodajen veter, pri seniku pa potres.

Za statične in seizmične izračune so bili uporabljeni programi Tower 3D, Scia Engineer, 3Muri. Jekleni in leseni spoji do bili dimenzionirani s programskima paketoma Idea Statica in Frilo.

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SENIK

Objekt je temeljen na temeljni plošči debeline 25 cm. Zunanji zidovi pritlične etaže so iz modularne opeke s toplotno izolacijo v skupni debelini 32 cm (Porotherm 32 IZO Profi), notranji nosilni zidovi pa so debeline 20 cm. Opečni zidovi so med seboj povezani z vertikalnimi in horizontalnimi AB vezmi. Vertikalne vezi so armirane z armaturnimi palicami 4Φ14 in stremeni Φ8/15 cm, horizontalne vezi pa s 4Φ12 in stremeni Φ8/15 cm. Vertikalne vezi so dimenzij 20/20 cm in se izvedejo v vseh vogalih, križanjih nosilnih zidov in na zaključkih zidov. Največja razdalja med vertikalnimi vezmi ne sme nikjer presegati 5,0 m. V višini stropne konstrukcije (AB plošče) se nad nosilnimi zidovi izdelajo horizontalne vezi, dimenzij 20/20 cm. Nad okenskim odprtinami se izvedejo prefabricrane opečne preklade, ki prevzemajo le obtežbo zidu do višine plošče, preostalo obtežbo pa prevzema ojačan rob plošče. Vkopana kletna stena je armiranobetonska in je debeline 20 cm. Plošča nad pritličjem je armiranobetonska z debelino 15 cm.

Nosilne stene nadstropne etaže so lesene skeletne. Sestavljene so iz vertikalnih elementov (pokončnikov) dimenzij 8/14 cm, ki so sidrani v AB ploščo nad pritličjem s kotniki WHT in WBR. (glej dispozicijo sidranja). Med vertikalnimi elementi so diagonale dimenzij 10/10 cm, ki zagotavljajo horizontalno zavetrovanje etaže v vzdolžni in prečni smeri. Tudi njihova razporeditev je prikazana v dispoziciji sidranja sten.

V delu nadstropja nad katerim se nahaja neizkoriščeno podstrešje je lesen strop s stropniki dimenzij 10/16 cm, ki so sidrani v lesene skeletne stene.

Streha je dvokapnica s špirovci dimenzij 8/18 cm, ki so podprti s slemensko in kapnima legama. Slemenska lega je dimenzij 20/24 cm in je podprta s sohami dimenzij 16/16 cm, ki se nadaljujejo skozi skeletne stene do plošče nad pritličjem v katero so sidrani s kotniki 2xWBR100. Ker je ostrešje delno zasnovano brez škarij, so kapne lege dimenzionirane na dodatne horizontalne sile, zato so dimenzij 24/26 cm in so sidrane v lesene stene z navojnimi palicami M12/1,2 m. Steber pod kapno lego na ganku je dimenzij 16/16 cm in je sidran v ploščo nad pritličjem preko jeklenega čevlja (kot npt. Rothoblaas R20). Pod slemensko lego se v dvovišinskem prostoru nahaja vertikalno zavetrovanje s tlačnimi diagonalami dimenzij 16/16 cm, ki zagotavlja stabilnost ostrešja v vzdolžni smeri.

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KOZOLEC

Objekt sestavljata dve konstrukcijski enoti: armiranobeotnski del (servisni objekt), ki je pritličen in delno vkopan v teren ter lesena nadstrešnica, ki je preko dveh jeklenih nosilcev IPE 300 povezana s servisnim objektom.

Servisni objekt je temeljen na temeljni plošči debeline 25 cm. Škatlasta konstrukcija servisnega objekta je sestavljena iz AB sten debeline 22 cm in plošče nad pritličjem, ki je debela 16 cm. Nad odprtinami se nahaja AB nosilec, ki je obrnjen navzgor in je dimenzij 22/66 cm.

Konstrukcija nadstrešnice je lesena, podprta pa je z dvema jeklenima križnima stebroma (2xIPE330), ki sta sidrana v točkovna temelja dimenzij 200x200x40 cm. Križni stebri imajo dodane dekorativne elemente iz med seboj zvarjenih pločevin 160/15 mm v katere so vijačeni leseni pokončni profili dimenzij cca 14/14 cm. Dekorativni elementi niso nosilni. Stebri so do višine 1,11 m od vrha temeljev obbetonirani.

Stabilnost celotne konstrukcije nadstrešnice je zagotovljena z dvema dodatnima prečnima nosilcema IPE 300, ki sta na eni strani sidrana v stebre nadstrešnice, na drugi pa v AB konstrukcijo servisnega objekta. Prečna nosilca podpirata vzdolžni jeklen nosilec HEB 220, ki predstavlja kapno lego v katero so sidrani špirovci. V vzdolžni jeklen nosilec je sidrana tudi pločevinasta izvedba žlebu oz. žlote (glej arhitekturo). Špirovci so dimenzij 14/26 cm in so v slemenu podprti z vzdolžnim lesenim paličnim nosilcem, ki je sestavljen iz masivnih profilov 20/20 cm (zgornji in spodnji pas ter diagonale) in 14/20 cm (vertikale). Vsak špirovec je povezan s horizontalnim poveznikom dimenzij 14/20 cm, ki poteka v ravnini spodnjega pasu paličnega nosilca, ki skupaj z jeklenimi nosilci preprečujejo rotacijo ostrešja. Med špirovci potekajo tudi križi horizontalnega zavetrovanja, ki so dimenzij 8/16 cm. Na prostem robu so špirovci vzdolžno povezani z zaključnim kapnim profilom dimenzij 10/26 cm. Vsi glavni spoji (leseni in jekleni) so prikazani v statičnem izračunu in risbah z detajli (obvezno upoštevati pri izdelavi delavniških risb).

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TEMELJENJE OBJEKTOV

Pri dimenzioniranju temeljev objektov je bilo upoštevano »Geološko – geomehansko poročilo o sestavi temeljih tal, geoloških razmerah in geotehničnih pogojih gradnje«, ki ga je izdelalo podjetje Geomet iz Celja (št. 312-10/2022, oktober 2022).

Karakteristike tal:

- specifična teža zemljine 21 kN/m^3
- strižni kot 31°
- kontaktne napetosti 130 kPa (za nefaktorirano obtežbo)
- modul reakcije tal 10000 kN/m^3

Objekt senik bo temeljen na kompaktni podlagi (laporju), ki se nahaja plitvo pod površjem. Objekt kozolec bo temljen na glini. Pri izkopu je potrebno zagotoviti, da bo pod celotnim tlorisom temeljne plošče enaka sestava materiala zaradi preprečevanja diferenčnih posedkov. Tako se naj izvede cca 40 cm debel sloj tamponskega nasutja, ki se ga utrdi do dinamičnega deformacijskega modula E_{vd} minimalno 40 MPa. V kolikor se med izkopom v zaledju objekta naleti na lapor, naj se izvede poglobitev s taponskim nasutjem ustrezne zbitosti ($E_{vd} \geq 40$ MPa) ali s pustim betonom.

Pod temeljnima ploščama obeh objektov je predvidena toplotna izolacija, zato drugi ukrepi za preprečevanje neugodnih vplivov zmrzovanja tal niso potrebni. Iz istega razloga naj se toplotna izolacija izvede tudi pod temelji opornih zidov neposredno ob seniku. Pod točkovnimi temelji kozolca naj se izvede gramozno nasutje iz zmrzlinsko odpornega gramoza v skupni debelini min. 30 cm. Gramozno nasutje se utrdi do dinamičnega deformacijskega modula $E_{vd} \geq 40$ MPa.

Izkop in temeljenje objekta naj se izvaja ob stalnem geomehanskem nadzoru, ki bo podal potrebna dodatna navodila za doseganje projektnih zahtev.

NAČIN IZPOLNJEVANJA BISTVENE ZAHTEVE

Nosilne konstrukcije so projektirane v skladu z načeli in pravili Evrokodov.

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PREDPISI IN MATERIALI

Kvaliteta vseh materialov je označena skladno s slovenskimi in evropskimi standardi. Vgrajeni materiali morajo biti opremljeni s potrdili o kvaliteti v skladu z zakonom o standardizaciji.

IZBRANI MATERIALI

beton (SIST EN 206:2013, SIST EN 1026:2016)

konstrukcijski element	oznaka
temeljna plošča (senik in kozolec)	C25/30 XC2 Cl 0,2 D_{max} 16
točkovni temelji (kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16
stene (senik in kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16
oporni zidovi (senik) in obbetoniran del stebrov (kozolec)	C30/37 XC3 Cl 0,2 D_{max} 16
plošča nad pritličjem (senik)	C30/37 XC3 Cl 0,2 D_{max} 16
plošča nad pritličjem (kozolec)	C30/37 XD3 XF4 Cl 0,2 D_{max} 16

armaturno jeklo (SIST EN 10080:2005)	S500 B
konstrukcijsko jeklo	S235 JR
masiven les	C24

POGOJI IN NAVODILA ZA IZVEDBO

Armiranobetonske konstrukcije je potrebno izvajati v skladu s standardom SIST EN 13670:2010 in nacionalnim dodatkom (1. izvedbeni razred).

Izvajalec mora za leseno konstrukcijo senika in kozolca ter za jekleno konstrukcijo kozolca izdelati delavniške risbe v skladu s PZI projektom, pri čemer mora posebej upoštevati statični izračun in risbe glavnih detajlov. Skladnost delavniških risb s PZI načrtom gradbenih konstrukcij mora pred izvedbo potrditi odgovorni projektant gradbenih konstrukcij. Zaščitni premaz lesene konstrukcije predlaga izvajalec, potrdi ga projektant.

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IZDELAVA IN MONTAŽA JEKLENIH ELEMENTOV

Jekleni elementi morajo biti izdelani in montirani v skladu s standardom SIST EN 1090-2. Razred izdelave konstrukcije je EXC2. Kontrolo zvarov izvajati v skladu s standardom SIST 1090-2 in predpisanim razredom izdelave konstrukcije. Vsi jekleni elementi se antikorozijsko zaščitijo z vročim cinkanjem.

ZAKLJUČEK

Gradnja objekta se mora izvajati skladno s projektom za izvedbo (PZI). Izvajalec del mora v času gradnje voditi vso dokumentacijo, ki jo zahtevajo predpisi.
Pred pričetkom gradnje mora izvajalec pregledati projektno dokumentacijo in obvestiti projektanta o morebitnih nejasnostih. Izvajalec mora upoštevati vse predpise o varnosti pri delu. Tekom izvajanja gradbenih del mora investitor zagotoviti strokovni nadzor nad izvajanjem del. Vse eventualne spremembe in dopolnitve projekta morajo biti opravljene z vednostjo in soglasjem odgovornega projektanta in nadzornika.

Celje, december 2022 Izdelal: Jan Pajer, u.d.i.g.

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2.3.2	STATIČNI IZRAČUN

OBJEKT : ***BRATUŠEVA DOMAČ****IJA*
(OBJEKTA SENIK IN KOZOLEC)

PROJEKT : *PZI*

Izračunal: Jan Pajer, u.d.i.g.

Karakteristične vrednosti vplivov

Program samu pošteva lastno težo elementa glede na dimenzijo prereza in specifično težo materiala.

PLOŠČA NAD PRITLIČJEM — POZ P100

cm	Stalni vplivi	γ [kN/m3]	Vpliv[kN/m2]
	Tlaki (keramika, parket)		0,2
6,0	Cementni estrih	25	1,50
15,0	Zvočna in toplotna izolacija	1	0,15
1,0	Omet	21	0,21
		Skupaj [kN/m2]	**2,06**

POKRITA TERASA

cm	Stalni vplivi	γ [kN/m3]	Vpliv[kN/m2]
2,0	Talna obloga	27	0,54
5,0	Cementni estrih	25	1,25
15,0	Zvočna in toplotna izolacija	1	0,15
4,0	Naklonski beton	24	0,96
1,0	Omet	21	0,21
		Skupaj [kN/m2]	**3,11**

	Koristni vplivi	γ [kN/m3]	Vpliv[kN/m2]
kat. A	Bivalni prostori		**2,00**
kat. A	Pokrita terasa		**3,00**

TEMELJNA PLOŠČA — POZ TP

cm	Stalni vplivi	γ [kN/m3]	Vpliv[kN/m2]
	Tlaki		0,20
6,0	Cementni estrih	25	1,50
15,0	Toplotna izolacija	1	0,15
1,0	Hidroizolacija	16	0,16
		Skupaj [kN/m2]	**2,01**

	Koristni vplivi	γ [kN/m3]	Vpliv[kN/m2]
kat. A	Bivalni prostori		**2,00**

Karakteristične vrednosti vplivov

Program samu pošteva lastno težo elementa glede na dimenzijo prereza in specifično težo materiala.

STREHA

cm	Stalni vplivi	γ [kN/m3]	Vpliv[kN/m2]
	Opečna kritina		0,60
	Letve		0,08
2,4	Deske	5	0,12
	Špirovci (*lastna teža upoštevana v programu*)		0,00
	Fotovoltaika		0,25
		Skupaj [kN/m2]	**1,05**

	Koristni vplivi	γ [kN/m3]	Vpliv[kN/m2]
sneg	Cona A2, A = 214 m n.m., sk = 1,40 kN/m2		**1,15**
veter	Cona 1, kat. terena III, vb = 20 m/s, qref = 0,25kN/m2, višina objekta = 9,5 m, c		**0,42**
	Dvokapnica — Področje G,H (Cpe,10) 0,7		0,29
	Dvokapnica — Področje I,J (Cpe,10) -0,3		-0,13

RAVNA STREHA

cm	Stalni vplivi	γ [kN/m3]	Vpliv[kN/m2]
25,0	Zemljina	21	5,25
5,0	Nasutje	16	0,80
1,0	Filc	3,5	0,04
10,0	Toplotna izolacija	1	0,10
1,0	Hidro izolacija	16	0,16
7,0	Naklonski beton	24	1,68
		Skupaj[kN/m2]	**8,03**

	Koristni vplivi	γ [kN/m3]	Vpliv[kN/m2]
	Ploščadi		**5,00**
sneg	Cona A2, A = 214 m n.m., sk = 1,40 kN/m2		**1,40**

TEMELJNA PLOŠČA — POZ TP

cm	Stalni vplivi	γ [kN/m3]	Vpliv[kN/m2]
	Tlaki		0,20
6,0	Cementni estrih	25	1,50
15,0	Toplotna izolacija	1	0,15
1,0	Hidroizolacija	16	0,16
		Skupaj [kN/m2]	**2,01**

	Koristni vplivi	γ [kN/m3]	Vpliv[kN/m2]
	Servisni prostori		**3,00**

Vpliv vetra v skladu s SIST EN 1991-1-4

Osnovne vrednosti (4.2)

vetrovna cona (1, 2, 3):		1	
tem. vrednost osnovne hitrosti vetra:	$v_{b,0}$ =	20	m/s
smerni faktor:	C_{dir} =	1	
faktor letnega časa:	C_{season} =	1	
osnovna hitrost vetra:	v_b =	20	m/s
osnovni tlak vetra:	**q_b =**	**0,25**	**kN/m²**

Srednji veter (4.3)

kategorija terena (0, 1, 2, 3, 4): 3

Preglednica 4.1: Kategorije terena in terenski parametri

Kategorija terena	z_0 m	z_{min} m
0 Morsko ali obalno področje, izpostavljeno proti odprtemu morju	0,003	1
I Jezersko ali ravninsko področje z zanemarljivim rastlinjem in brez ovir	0,01	1
II Področje z nizkim rastlinjem (trava) in posameznimi ovirami (drevesi, stavbami) na razdalji najmanj 20 višin ovir	0,05	2
III Področja z običajnim rastlinjem ali stavbami ali s posameznimi ovirami na razdalji največ 20 višin ovir (vasi, podeželsko okolje, stalni gozd)	0,3	5
IV Področje, kjer je najmanj 15 % površine pokrite s stavbami s povprečno višino več kot 15 m	1,0	10
OPOMBA: Kategorije terena so ilustrirane v A.1.		

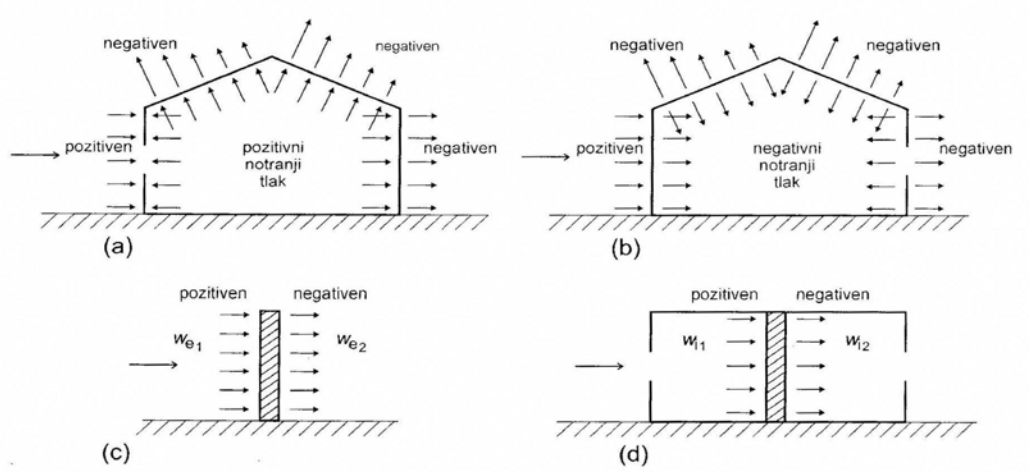
višina objekta:	z =	10	m
	z_0 =	0,300	m
	z_{min} =	5	m
	z_{max} =	200	m
faktor terena:	k_r =	0,215	
faktor hrapavosti:	$C_r(z)$ =	0,755	
faktor hribovitosti:	$C_0(z)$ =	1	
srednja hitrost vetra:	**$v_m(z)$ =**	**15,1**	**m/s**

Vetrna turbulenca (4.4)

turbulenčni faktor:	k_i =	1	
intenziteta turbulence na višini z:	**$I_v(z)$ =**	**0,285**	

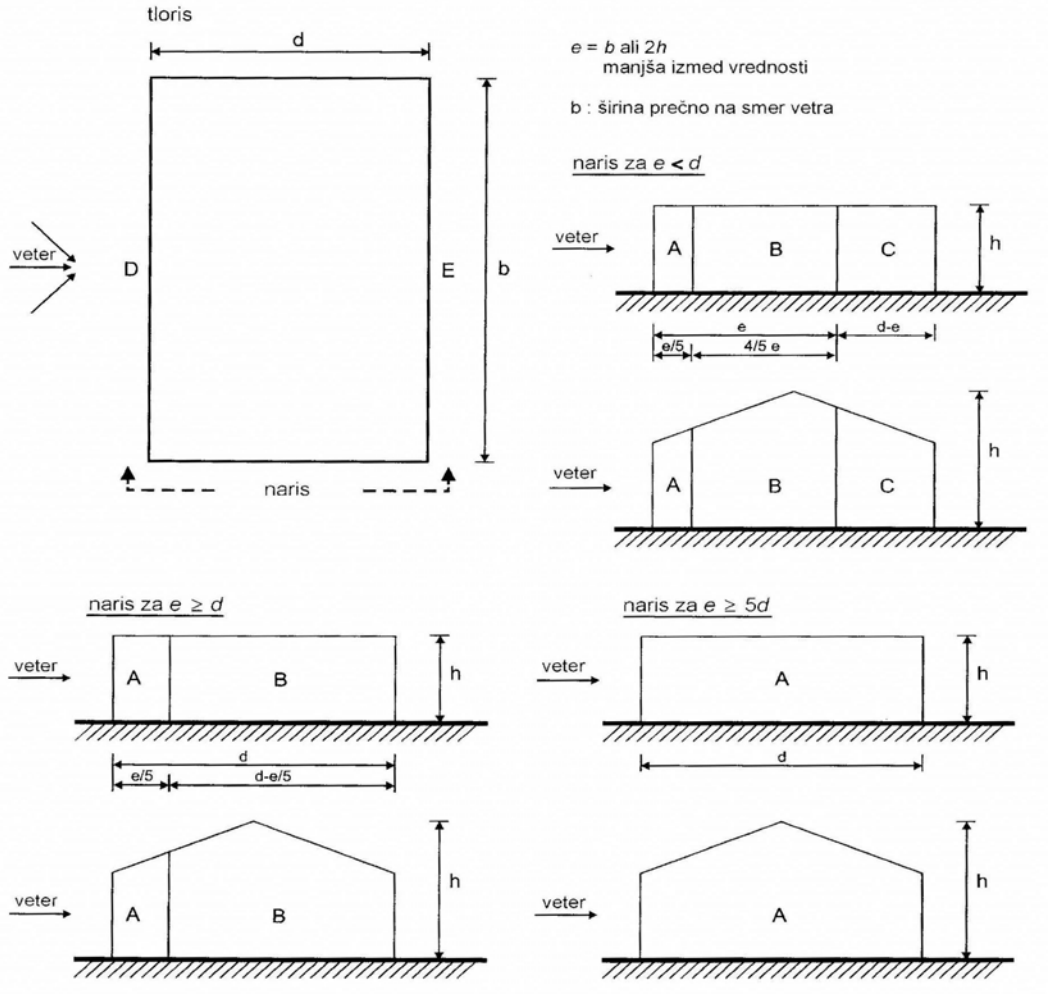
Tlak pri največji hitrosti ob sunkih vetra (4.5)

faktor izpostavljenosti:	$c_e(z)$ =	1,71	
največja hitrost ob sunkih vetra:	v_p =	26,1	m/s
tlak pri največji hitrosti ob sunkih vetra:	**$q_p(z)$ =**	**0,43**	**kN/m²**



Navpične stene stavb s pravokotnim tlorisom (7.2.2)

SIST EN 1991-1-4 : 2005



Preglednica 7.1: Priporočene vrednosti koeficientov zunanjega tlaka za navpične stene stavb s pravokotnim tlorisom

Področje	A		B		C		D		E	
h/d	$c_{pe,10}$	$c_{pe,1}$	$c_{pe,10}$	$c_{pe,1}$	$c_{pe,10}$	$c_{pe,1}$	$c_{pe,10}$	$c_{pe,1}$	$c_{pe,10}$	$c_{pe,1}$
5	−1,2	−1,4	−0,8	−1,1	−0,5		+0,8	+1,0	−0,7	
1	−1,2	−1,4	−0,8	−1,1	−0,5		+0,8	+1,0	−0,5	
≤ 0,25	−1,2	−1,4	−0,8	−1,1	−0,5		+0,7	+1,0	−0,3	

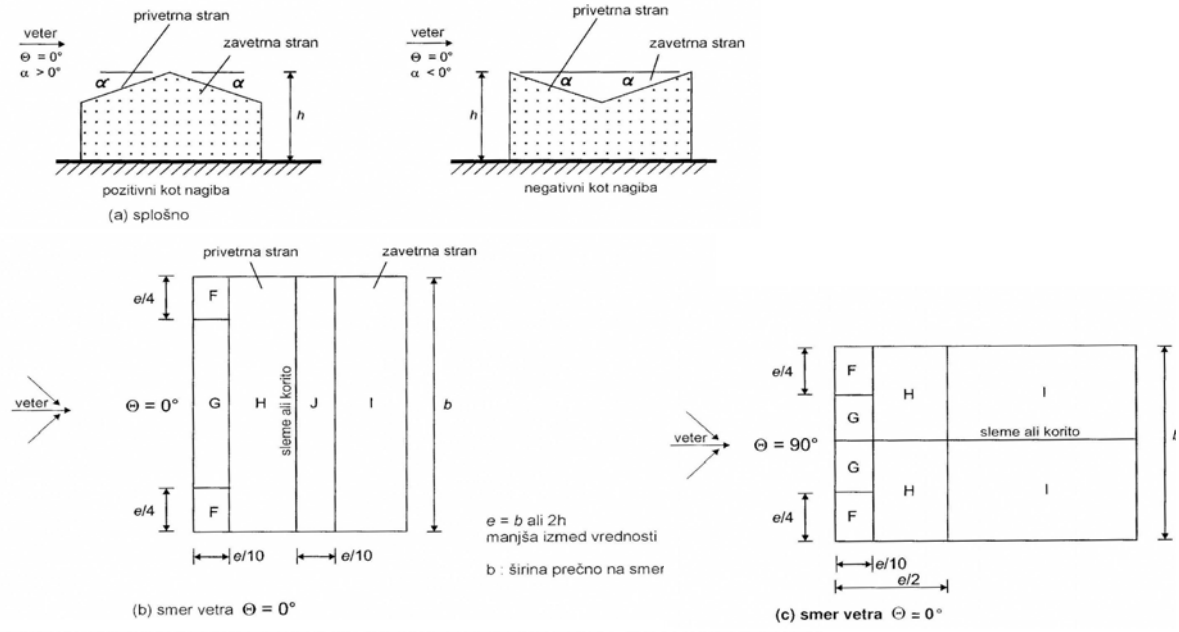
OPOMBA 2: Za stavbe s *h/d* > 5 se lahko celotna obtežba vetra določi po pravilih v 7.6 do 7.8 in 7.9.2.

področje	A	B	C	D	E
$C_{pe,10}$	-1,2	-0,8	-0,5	0,8	-0,5
w_e [kN/m^2]	**-0,51**	**-0,34**	**-0,21**	**0,34**	**-0,21**

opomba:
(+) tlak, (-) srk

Dvokapnice in koritaste strehe (7.2.5)

SIST EN 1991-1-4 : 2005



Preglednica 7.4a: Koeficienti zunanjega tlaka za dvokapnice

Nagib α	Področja za smer vetra $\theta = 0°$									
	F		G		H		I		J	
	$C_{pe,10}$	$C_{pe,1}$	$C_{pe,10}$	$C_{pe,1}$	$C_{pe,10}$	$C_{pe,1}$	$C_{pe,10}$	$C_{pe,1}$	$C_{pe,10}$	$C_{pe,1}$
−45°	−0,6		−0,6		−0,8		−0,7		−1,0	−1,5
−30°	−1,1	−2,0	−0,8	−1,5	−0,8		−0,6		−0,8	−1,4
−15°	−2,5	−2,8	−1,3	−2,0	−0,9	−1,2	−0,5		−0,7	−1,2
−5°	−2,3	−2,5	−1,2	−2,0	−0,8	−1,2	+0,2		+0,2	
							−0,6		−0,6	
5°	−1,7	−2,5	−1,2	−2,0	−0,6	−1,2	−0,6		+0,2	
	+0,0		+0,0		+0,0				−0,6	
15°	−0,9	−2,0	−0,8	−1,5	−0,3		−0,4		−1,0	−1,5
	+0,2		+0,2		+0,2		+0,0		+0,0	+0,0
30°	−0,5	−1,5	−0,5	−1,5	−0,2		−0,4		−0,5	
	+0,7		+0,7		+0,4		+0,0		+0,0	
45°	−0,0		−0,0		−0,0		−0,2		−0,3	
	+0,7		+0,7		+0,6		+0,0		+0,0	
60°	+0,7		+0,7		+0,7		−0,2		−0,3	
75°	+0,8		+0,8		+0,8		−0,2		−0,3	

OPOMBA 1: Pri $\theta = 0°$ in kotu nagiba $\alpha = +5°$ do $+45°$ se tlak na privetrni strani lahko spreminja med pozitivno in negativno vrednostjo. Zato so dane pozitivne in negativne vrednosti. Za take strehe je treba obravnavati štiri primere, kjer so največje ali najmanjše vrednosti za področja F, G in H kombinirane z največjimi in najmanjšimi vrednostmi v področjih I in J. Mešanje pozitivnih in negativnih vrednosti na isti strešini ni dovoljeno.

OPOMBA 2: Za vmesne kote nagiba se lahko uporabi linearna interpolacija med vrednostmi istega predznaka. (Med vrednostmi $\alpha = +5°$ in $\alpha = -5°$ se ne interpolira, ampak se uporabijo vrednosti za ravno streho v 7.2.3). Vrednosti, enake 0,0, so dane za uporabo pri interpolaciji.

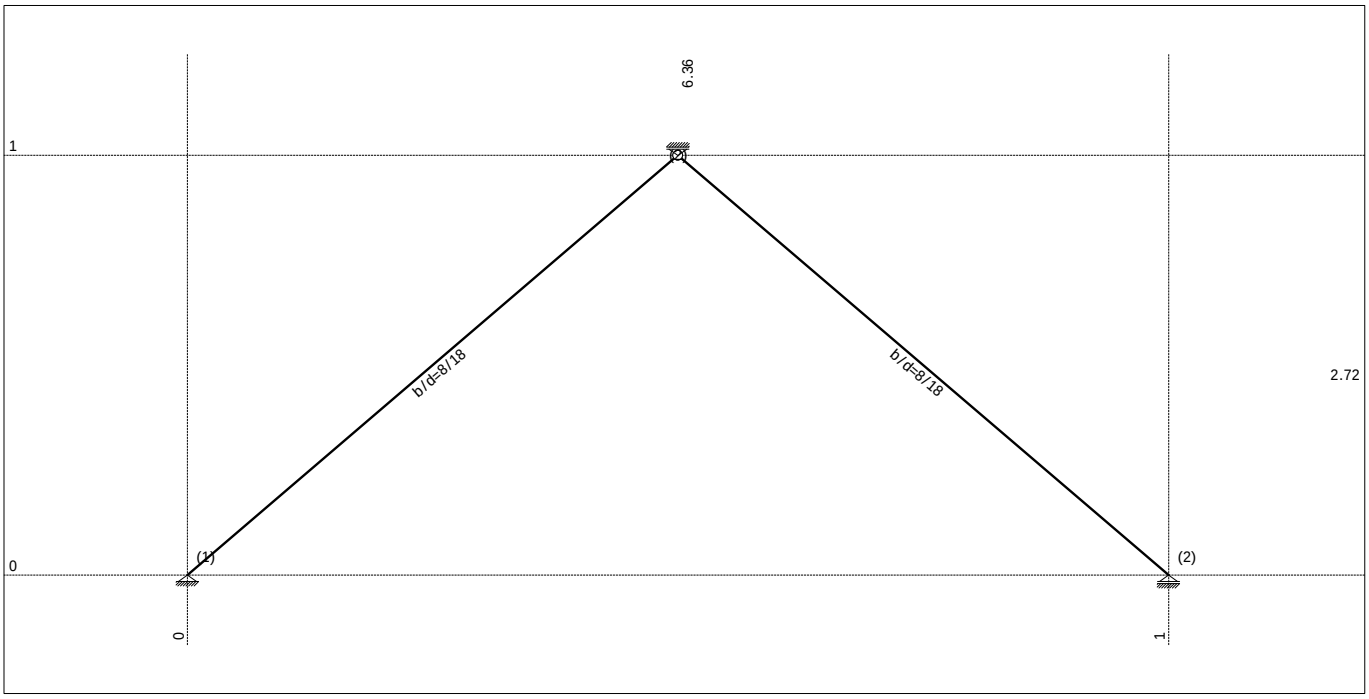
Preglednica 7.4b: Koeficienti zunanjega tlaka za dvokapnice

Nagib α	Področja za smer vetra $\theta = 90°$							
	F		G		H		I	
	$C_{pe,10}$	$C_{pe,1}$	$C_{pe,10}$	$C_{pe,1}$	$C_{pe,10}$	$C_{pe,1}$	$C_{pe,10}$	$C_{pe,1}$
−45°	−1,4	−2,0	−1,2	−2,0	−1,0	−1,3	−0,9	−1,2
−30°	−1,5	−2,1	−1,2	−2,0	−1,0	−1,3	−0,9	−1,2
−15°	−1,9	−2,5	−1,2	−2,0	−0,8	−1,2	−0,8	−1,2
−5°	−1,8	−2,5	−1,2	−2,0	−0,7	−1,2	−0,6	−1,2
5°	−1,6	−2,2	−1,3	−2,0	−0,7	−1,2	−0,6	
15°	−1,3	−2,0	−1,3	−2,0	−0,6	−1,2	−0,5	
30°	−1,1	−1,5	−1,4	−2,0	−0,8	−1,2	−0,5	
45°	−1,1	−1,5	−1,4	−2,0	−0,9	−1,2	−0,5	
60°	−1,1	−1,5	−1,2	−2,0	−0,8	−1,0	−0,5	
75°	−1,1	−1,5	−1,2	−2,0	−0,8	−1,0	−0,5	

opomba:
(+) tlak, (-) srk

področje	F	G	H	I	J
$C_{pe,10}$	0,7	0,7	0,6	-0,3	-0,3
w_e [kN/m^2]	**0,30**	**0,30**	**0,26**	**-0,13**	**-0,13**

ŠPIROVCI (SENIK)



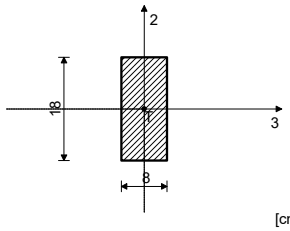
Tabele materialov

No	Naziv materiala	E[kN/m2]	μ	γ[kN/m3]	αt[1/C]	Em[kN/m2]	μm
1	Les-Iglavci-Masiven les	1.000e+7	0.20	5.00	1.000e-5	1.000e+7	0.20

Seti gred

Set: 1 Prerez: b/d=8/18, Fiktivna ekscentričnost

Mat.	A1	A2	A3	I1	I2	I3
1 - Les-Iglavci-M...	1.440e-2	1.200e-2	1.200e-2	2.215e-5	7.680e-6	3.888e-5



[cm]

Seti točkovnih podpor

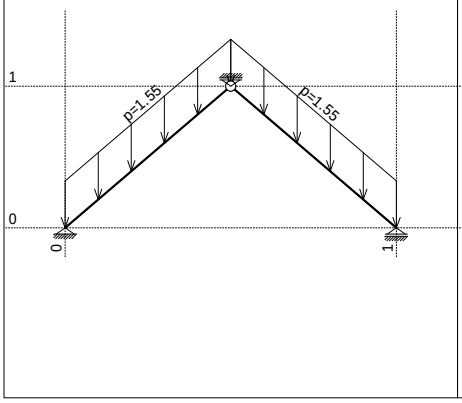
Set	K,R1	K,R2	K,R3	K,M1	K,M2	K,M3
1	1.000e+10	1.000e+10	1.000e+10			
2		1.000e+10	1.000e+10			

Lista obtežnih primerov

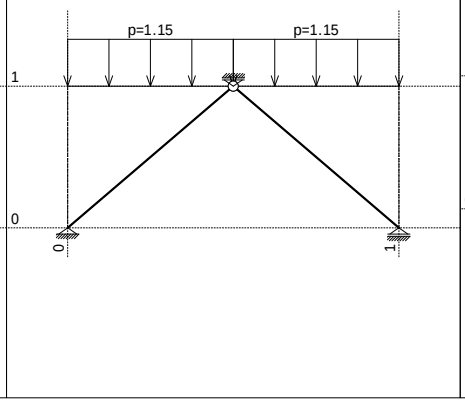
LC	Naziv
1	Stalna (g)
2	Sneg
3	Veter
4	Komb.: 1.35xI+1.5xII
5	Komb.: 1.35xI+1.5xIII
6	Komb.: 1.35xI+1.5xII+0.9xIII

LC	Naziv
7	Komb.: 1.35xI+0.75xII+1.5xIII
8	Komb.: I+II
9	Komb.: I+III
10	Komb.: I+II+0.6xIII
11	Komb.: I+0.5xII+III

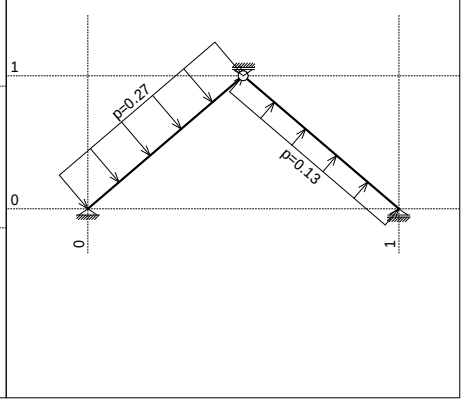
Obt. 1: Stalna (g)



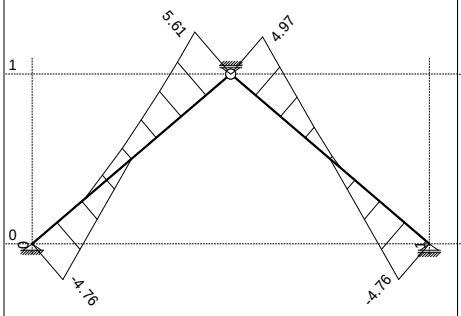
Obt. 2: Sneg



Obt. 3: Veter

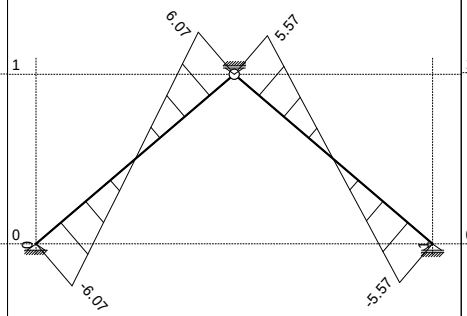


Obt. 12: [MSN] 4-7



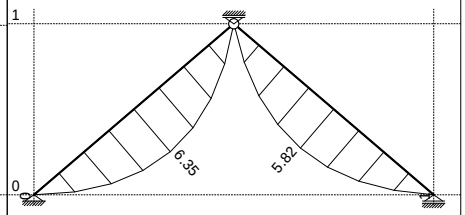
Vplivi v gredi: max N1= 5.61 / min N1= -4.76 kN

Obt. 12: [MSN] 4-7



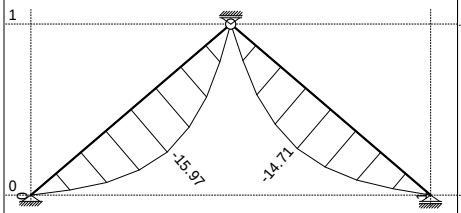
Vplivi v gredi: max T2= 6.07 / min T2= -6.07 kN

Obt. 12: [MSN] 4-7



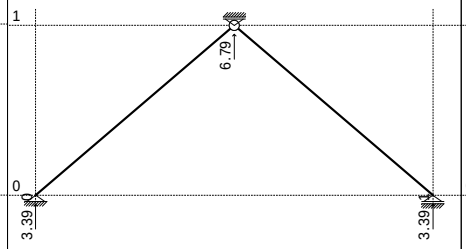
Vplivi v gredi: max M3= 6.35 / min M3= -0.00 kNm

Obt. 13: [MSU] 8-11



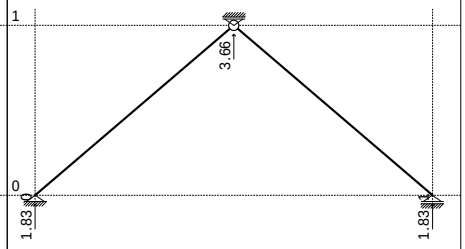
Vplivi v gredi: max Zp= -0.00 / min Zp= -15.97 m...

Obt. 1: Stalna (g)



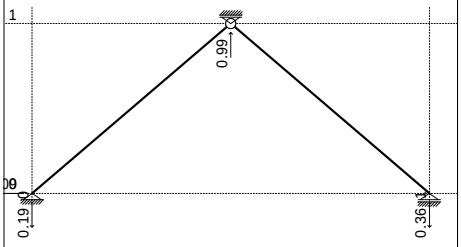
Reakcije podpor

Obt. 2: Sneg

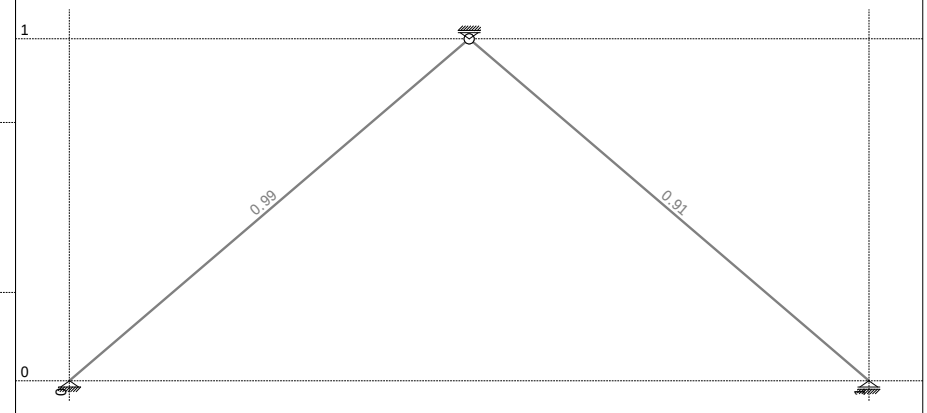


Reakcije podpor

Obt. 3: Veter



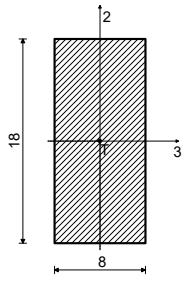
Reakcije podpor



Kontrola stabilnosti

PALICA 1-2

Monoliten les - iglavci in mehki listavci - C24
Eksploatacijski razred 1
EUROCODE (EN 1995-1-1)



[cm]

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

6. γ=0.99	4. γ=0.91	7. γ=0.88
5. γ=0.71	10. γ=0.70	8. γ=0.65

11. γ=0.63 9. γ=0.52

KONTROLA NORMALNIH NAPETOSTI
(obtežni primer 6, na 219.2 cm od začetka palice)

Računska osna sila	Ned =	1.080 kN
Prečna sila v smeri osi 2	V2ed =	0.289 kN
Upogibni moment okoli osi 3	M3ed =	-6.279 kNm

KONTROLA NAPETOSTI - NATEG IN UPOGIB

Vrsta obtežbe: osnovno - srednjetrajno		
Korekcijski koeficient	Kmod =	0.800
Parcialni koef. za karakteristike materiala	γm =	1.300
Dodatek za elemente z malimi dimenzijami - os 2		
	Kh_2 =	1.134
Dodatek za elemente z malimi dimenzijami - os 3		
	Kh_3 =	1.000
Dodatek za elemente z malimi dimenzijami - nateg		
	Kh_t =	1.134
Karakteristična natezna trdnost	ft,0,k =	14.000 MPa
Računska natezna trdnost	ft,0,d =	9.770 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 =	16.748 MPa
Računska upogibna trdnost - os 3	fm,3,d =	14.769 MPa
Normalna natezna napetost	σt,0,d =	0.075 MPa
Odpornostni moment	W3 =	432.00 cm3
Normalna upogibna napetost okoli osi 3	σm3,d =	14.535 MPa

σm3,d <= fm,3,d (14.535 <= 14.769)
Izkoriščenost prereza je 98.4%

σt,0,d / ft,0,d + km x (σm3,d / fm,3,d) + σm2,d / fm,2,d <= 1
(0.697 <= 1)
Izkoriščenost prereza je 69.7%

σt,0,d / ft,0,d + σm3,d / fm,3,d + km x (σm2,d / fm,2,d) <= 1
(0.992 <= 1)
Izkoriščenost prereza je 99.2%

KONTROLA STRIŽNIH NAPETOSTI
(obtežni primer 6, začetek palice)

Prečna sila v smeri osi 2	V2ed =	-6.074 kN

KONTROLA NAPETOSTI - STRIG

Vrsta obtežbe: osnovno - srednjetrajno		
Korekcijski koeficient	Kmod =	0.800
Parcialni koef. za karakteristike materiala	γm =	1.300
Karakteristična strižna napetost	fv,k =	4.000 MPa
Računska strižna trdnost	fv,d =	2.462 MPa
Površina prečnega prereza	A =	144.00 cm2
Dejanska strižna napetost(os 2)	τ2,d =	0.633 MPa

τ2,d <= fv,d (0.633 <= 2.462)
Izkoriščenost prereza je 25.7%

DOKAZ STABILNOSTI ELEMENTA
(obtežni primer 6, na 199.3 cm od začetka palice)

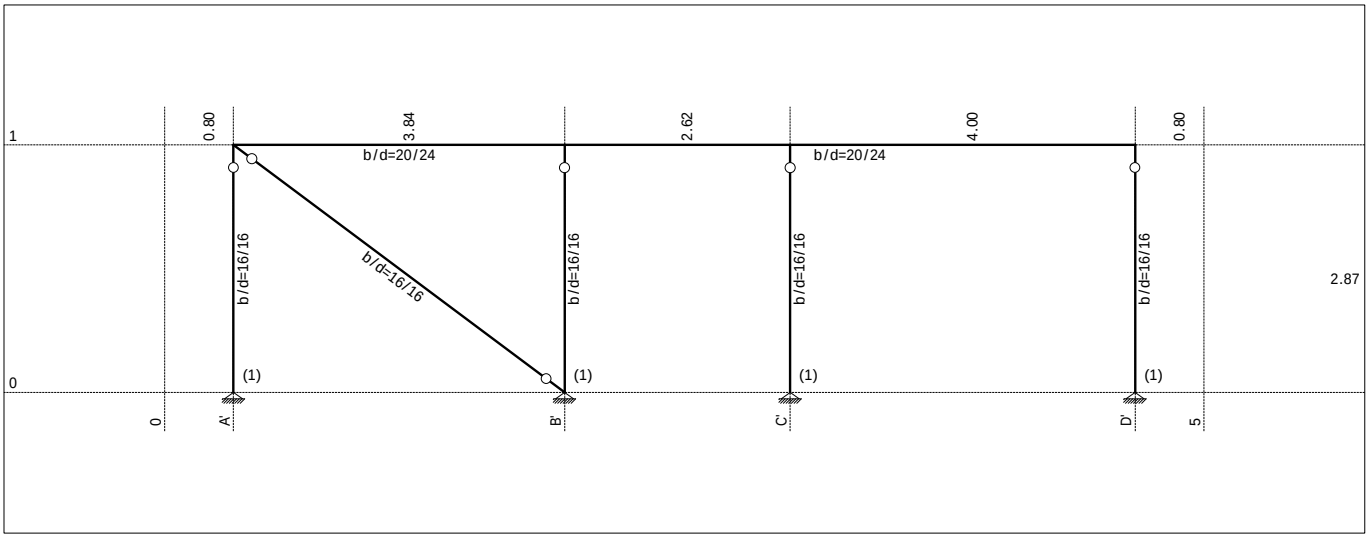
Računska osna sila	Ned =	0.627 kN
Prečna sila v smeri osi 2	V2ed =	-0.289 kN
Upogibni moment okoli osi 3	M3ed =	-6.279 kNm

DOKAZ BOČNE STABILNOSTI

Vrsta obtežbe: osnovno - srednjetrajno		
Korekcijski koeficient	Kmod =	0.800
Parcialni koef. za karakteristike materiala	γm =	1.300
Razmak pridržanih točk pravokotno na smer osi 2		
	lef =	418.46 cm
5% fraktil modula E paralelno z vlakni	E0.05 =	7400.0 MPa
5% fraktil strižnega modula G	G0.05 =	460.00 MPa
Torzijski vztrajnostni moment	Itor =	2204.7 cm4
Vztrajnostni moment	I2 =	768.00 cm4
Odpornostni moment	W3 =	432.00 cm3
Kritična napetost uklona	σm,crit =	41.721 MPa
Relativna vitkost za uklon	λrel =	0.758
Koeficient	k_krit =	0.991
Normalna upogibna napetost okoli osi 3	σm3,d =	14.535 MPa

σm,3,d <= k_krit x fm,3,d (14.535 <= 14.639)
Izkoriščenost prereza je 99.3%

SLEMENSKA LEGA (SENIK)



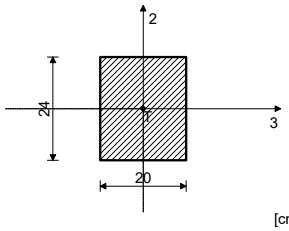
Tabele materialov

No	Naziv materiala	E[kN/m2]	μ	γ[kN/m3]	αt[1/C]	Em[kN/m2]	μm
1	Les-Iglavci-Masiven les	1.000e+7	0.20	5.00	1.000e-5	1.000e+7	0.20

Seti gred

Set: 1 Prerez: b/d=20/24, Fiktivna ekscentričnost

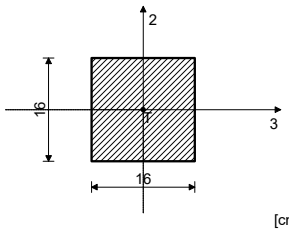
Mat.	A1	A2	A3	I1	I2	I3
1 - Les-Iglavci-M...	4.800e-2	4.000e-2	4.000e-2	3.175e-4	1.600e-4	2.304e-4



[cm]

Set: 2 Prerez: b/d=16/16, Fiktivna ekscentričnost

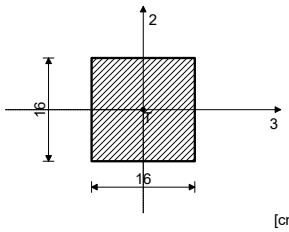
Mat.	A1	A2	A3	I1	I2	I3
1 - Les-Iglavci-M...	2.560e-2	2.133e-2	2.133e-2	9.230e-5	5.461e-5	5.461e-5



[cm]

Set: 3 Prerez: b/d=16/16, Fiktivna ekscentričnost

Mat.	A1	A2	A3	I1	I2	I3
1 - Les-Iglavci-M...	2.560e-2	2.133e-2	2.133e-2	9.230e-5	5.461e-5	5.461e-5



[cm]

Seti točkovnih podpor

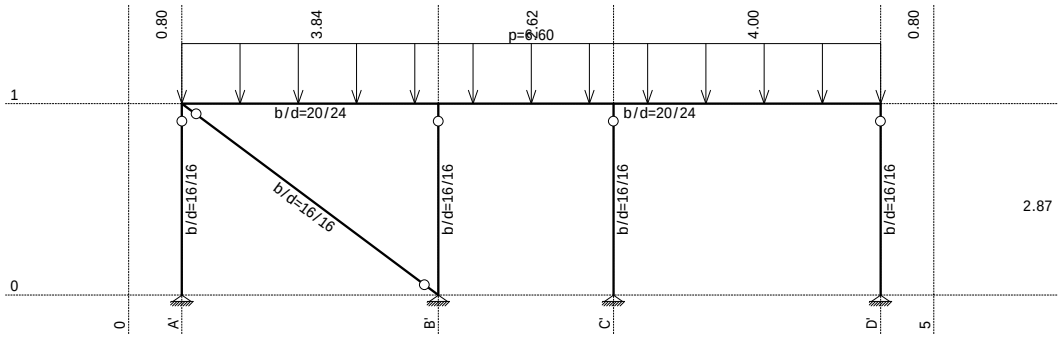
Set	K,R1	K,R2	K,R3	K,M1	K,M2	K,M3
1	1.000e+10	1.000e+10	1.000e+10			

Lista obtežnih primerov

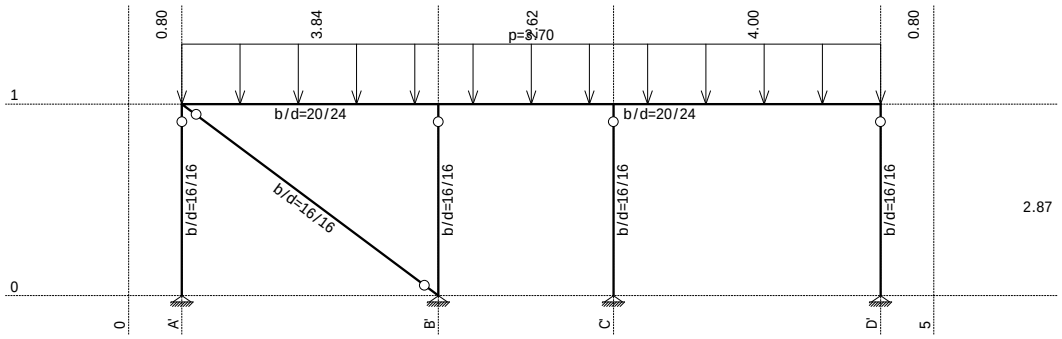
LC	Naziv
1	Stalna (g)
2	Sneg
3	Veter
4	Komb.: 1.35xI+1.5xII+0.9xIII
5	Komb.: 1.35xI+0.75xII+1.5xIII
6	Komb.: I+1.5xII+0.9xIII
7	Komb.: I+0.75xII+1.5xIII
8	Komb.: 1.35xI+1.5xIII
9	Komb.: 1.35xI+1.5xII

LC	Naziv
10	Komb.: I+1.5xIII
11	Komb.: I+1.5xII
12	Komb.: 1.35xI
13	Komb.: I
14	Komb.: I+II+0.6xIII
15	Komb.: I+0.5xII+III
16	Komb.: I+III
17	Komb.: I+II
18	Komb.: I

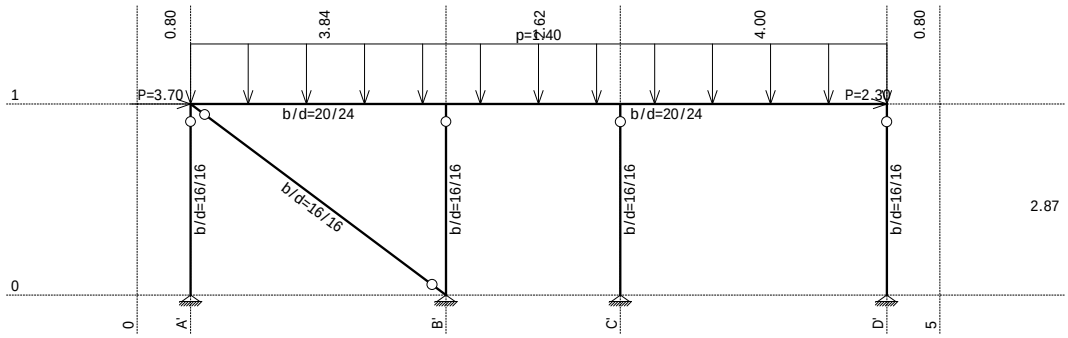
Obt. 1: Stalna (g)



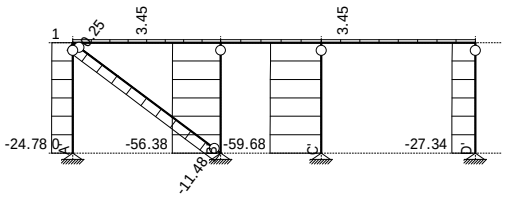
Obt. 2: Sneg



Obt. 3: Veter

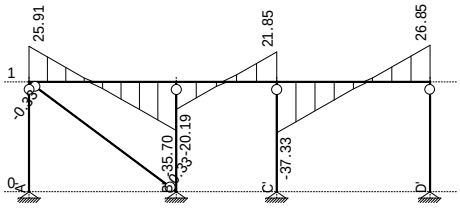


Obt. 19: [MSN] 4-12



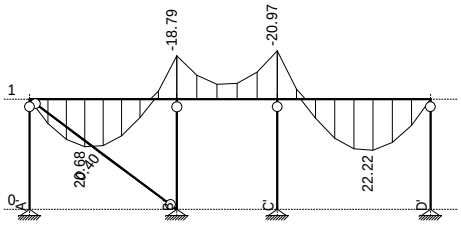
Vplivi v gredi: max N1= 3.45 / min N1= -59.68 kN

Obt. 19: [MSN] 4-12



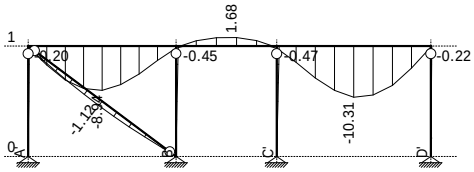
Vplivi v gredi: max T2= 26.85 / min T2= -37.33 kN

Obt. 19: [MSN] 4-12



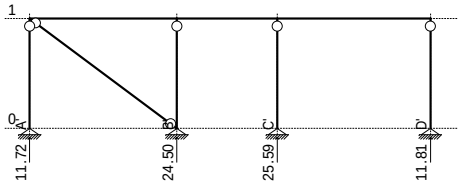
Vplivi v gredi: max M3= 22.22 / min M3= -20.97 kNm

Obt. 20: [MSU] 13-18



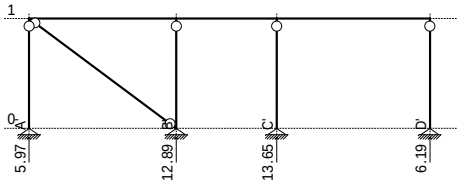
Vplivi v gredi: max Zp= 1.68 / min Zp= -10.31 m / 1000

Obt. 1: Stalna (g)



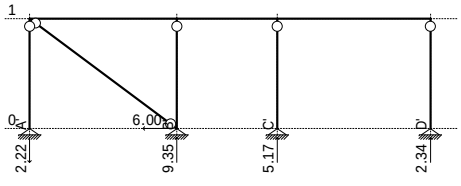
Reakcije podpor

Obt. 2: Sneg

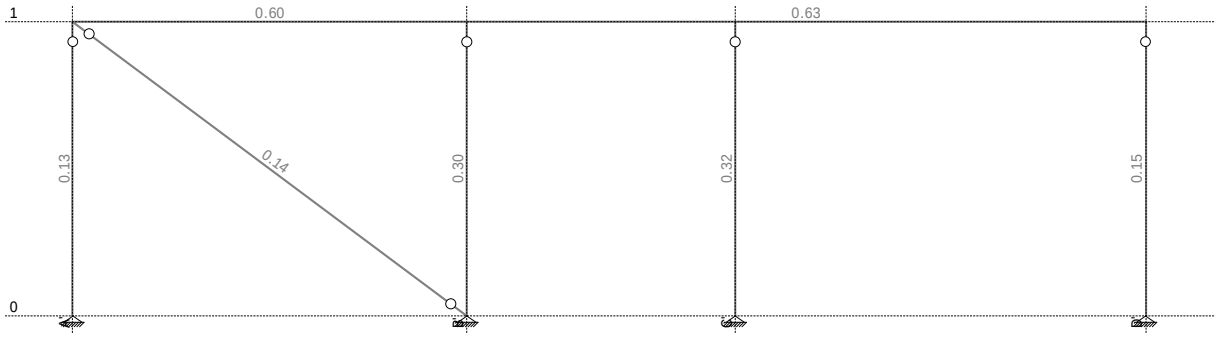


Reakcije podpor

Obt. 3: Veter

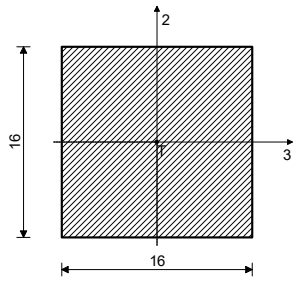


Reakcije podpor



Kontrola stabilnosti

PALICA 6-4
Monoliten les - iglavci in mehki listavci - C24
Eksploatacijski razred 1
EUROCODE (EN 1995-1-1)



[cm]

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

4. γ=0.32	9. γ=0.29	5. γ=0.28
6. γ=0.27	11. γ=0.25	7. γ=0.23
8. γ=0.23	14. γ=0.23	17. γ=0.21
15. γ=0.20	12. γ=0.19	10. γ=0.18
16. γ=0.17	13. γ=0.14	18. γ=0.14

KONTROLA NORMALNIH NAPETOSTI
(obtežni primer 4, konec palice)

Računska osna sila	Ned =	-59.675 kN

KONTROLA NAPETOSTI - TLAK		
Vrsta obtežbe: osnovno - srednjetrajno		
Korekcijski koeficient	Kmod =	0.800
Parcialni koef. za karakteristike materiala	γm =	1.300
Dodatek za elemente z malimi dimenzijami - os 2		
	Kh_2 =	1.000
Dodatek za elemente z malimi dimenzijami - os 3		
	Kh_3 =	1.000
Faktor oblik (za pravokotni prerez)	km =	0.700
Karakteristična tlačna trdnost	fc,0,k =	21.000 MPa
Računska tlačna trdnost	fc,0,d =	12.923 MPa
Karakteristična upogibna trdnost	fm,k =	24.000 MPa
Računska upogibna trdnost	fm,d =	14.769 MPa
Relativna vitkost	λrel,2 =	1.175
Relativna vitkost	λrel,3 =	1.175
Normalne tlačne napetosti	σc,0,d =	2.331 MPa
TLAK IN UPOGIB - VELIKA VITKOST		
Začetna imperfekcija	βc =	0.200
Koeficient	k3 =	1.278
Koeficient	k2 =	1.278
Koeficient	kc,3 =	0.562
Koeficient	kc,2 =	0.562

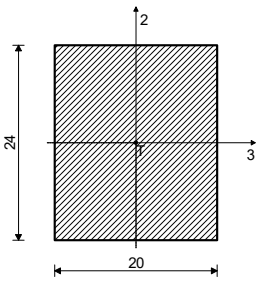
(σc,0,d / (kc_2 x fc,0,d)) + km x (σm3,d / fm,d) +
+ σm2,d / fm,d <= 1 (0.321 <= 1)

Izkoriščenost prereza je 32.1%

(σc,0,d / (kc_3 x fc,0,d)) + σm3,d / fm,d +
+ km x (σm2,d / fm,d) <= 1 (0.321 <= 1)

Izkoriščenost prereza je 32.1%

PALICA 5-8
Monoliten les - trdi les. - D30
Eksploatacijski razred 1
EUROCODE (EN 1995-1-1)



[cm]

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

4. γ=0.63	9. γ=0.58	5. γ=0.56
6. γ=0.54	11. γ=0.49	7. γ=0.46
14. γ=0.45	8. γ=0.45	17. γ=0.41
15. γ=0.40	12. γ=0.36	10. γ=0.35
16. γ=0.32	13. γ=0.27	18. γ=0.27

KONTROLA NORMALNIH NAPETOSTI
(obtežni primer 4, na 502.0 cm od začetka palice)

Računska osna sila	Ned =	2.070 kN
Prečna sila v smeri osi 2	V2ed =	1.175 kN
Upogibni moment okoli osi 3	M3ed =	-22.096 kNm

KONTROLA NAPETOSTI - NATEG IN UPOGIB

Vrsta obtežbe: osnovno - srednjetrajno		
Korekcijski koeficient	Kmod =	0.800
Parcialni koef. za karakteristike materiala	γm =	1.300
Dodatek za elemente z malimi dimenzijami - os 2	Kh_2 =	1.000
Dodatek za elemente z malimi dimenzijami - os 3	Kh_3 =	1.000
Dodatek za elemente z malimi dimenzijami - nateg	Kh_t =	1.000
Karakteristična natezna trdnost	ft,0,k =	18.000 MPa
Računska natezna trdnost	ft,0,d =	11.077 MPa
Faktor oblik (za pravokotni prerez)	km =	0.700
Karakteristična upogibna trdnost	fm,k =	30.000 MPa
Računska upogibna trdnost	fm,d =	18.462 MPa
Normalna natezna napetost	σt,0,d =	0.043 MPa
Odpornostni moment	W3 =	1920.0 cm3
Normalna upogibna napetost okoli osi 3	σm3,d =	11.508 MPa

σm3,d <= fm,d (11.508 <= 18.462)
Izkoriščenost prereza je 62.3%

σt,0,d / ft,0,d + km x (σm3,d / fm,d) + σm2,d / fm,d <= 1
(0.440 <= 1)
Izkoriščenost prereza je 44.0%

σt,0,d / ft,0,d + σm3,d / fm,d + km x (σm2,d / fm,d) <= 1
(0.627 <= 1)
Izkoriščenost prereza je 62.7%

DOKAZ BOČNE STABILNOSTI

Vrsta obtežbe: osnovno - srednjetrajno		
Korekcijski koeficient	Kmod =	0.800
Parcialni koef. za karakteristike materiala	γm =	1.300
Razmak pridržanih točk pravokotno na smer osi 2	lef =	662.00 cm
5% fraktil modula E paralelno z vlakni	E0.05 =	8000.0 MPa
5% fraktil strižnega modula G	G0.05 =	400.00 MPa
Torzijski vztrajnostni moment	Itor =	31706 cm4
Vztrajnostni moment	I2 =	16000 cm4
Odpornostni moment	W3 =	1920.0 cm3
Kritična napetost uklona	σm,crit =	99.586 MPa
Relativna vitkost za uklon	λrel =	0.549
Koeficient	k_krit =	1.000
Normalna upogibna napetost okoli osi 3	σm3,d =	11.508 MPa

σm,3,d <= k_krit x fm,3,d (11.508 <= 18.462)
Izkoriščenost prereza je 62.3%

KONTROLA STRIŽNIH NAPETOSTI
(obtežni primer 4, na 262.0 cm od začetka palice)

Prečna sila v smeri osi 2	V2ed =	-37.330 kN

KONTROLA NAPETOSTI - STRIG

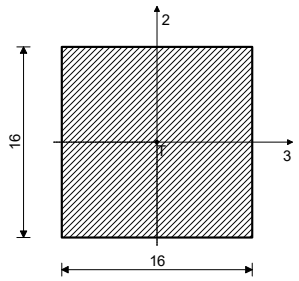
Vrsta obtežbe: osnovno - srednjetrajno		
Korekcijski koeficient	Kmod =	0.800
Parcialni koef. za karakteristike materiala	γm =	1.300
Karakteristična strižna napetost	fv,k =	3.000 MPa
Računska strižna trdnost	fv,d =	1.846 MPa
Površina prečnega prereza	A =	480.00 cm2
Dejanska strižna napetost(os 2)	τ2,d =	1.167 MPa

τ2,d <= fv,d (1.167 <= 1.846)

Izkoriščenost prereza je 63.2%

PALICA 2-3

Monoliten les - trdi les. - D30
Eksploatacijski razred 1
EUROCODE (EN 1995-1-1)



[cm]

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

5. γ=0.14	8. γ=0.14	7. γ=0.13
10. γ=0.13	4. γ=0.10	15. γ=0.10
16. γ=0.10	6. γ=0.09	14. γ=0.07
12. γ=0.03	9. γ=0.03	13. γ=0.02
11. γ=0.02	17. γ=0.02	18. γ=0.02

KONTROLA NORMALNIH NAPETOSTI
(obtežni primer 5, na 239.7 cm od začetka palice)

Računska osna sila	Ned =	-11.236 kN
Upogibni moment okoli osi 3	M3ed =	-0.398 kNm

KONTROLA NAPETOSTI - TLAK IN UPOGIB

Vrsta obtežbe: osnovno - srednjetrajno		
Korekcijski koeficient	Kmod =	0.800
Parcialni koef. za karakteristike materiala	γm =	1.300
Dodatek za elemente z malimi dimenzijami - os 2		
	Kh_2 =	1.000
Dodatek za elemente z malimi dimenzijami - os 3		
	Kh_3 =	1.000
Faktor oblik (za pravokotni prerez)	km =	0.700
Karakteristična tlačna trdnost	fc,0,k =	23.000 MPa
Računska tlačna trdnost	fc,0,d =	14.154 MPa
Karakteristična upogibna trdnost	fm,k =	30.000 MPa
Računska upogibna trdnost	fm,d =	18.462 MPa
Relativna vitkost	λrel,2 =	1.771
Relativna vitkost	λrel,3 =	1.771
Normalne tlačne napetosti	σc,0,d =	0.439 MPa
Odpornostni moment	W3 =	682.67 cm3
Normalna upogibna napetost okoli osi 3	σm3,d =	0.582 MPa

σm3,d <= fm,d (0.582 <= 18.462)

Izkoriščenost prereza je 3.2%

TLAK IN UPOGIB - VELIKA VITKOST

Začetna imperfekcija	βc =	0.200
Koeficient	k3 =	2.216
Koeficient	k2 =	2.216
Koeficient	kc,3 =	0.282
Koeficient	kc,2 =	0.282

(σc,0,d / (kc_2 x fc,0,d)) + km x (σm3,d / fm,d) +
+ σm2,d / fm,d <= 1 (0.132 <= 1)

Izkoriščenost prereza je 13.2%

(σc,0,d / (kc_3 x fc,0,d)) + σm3,d / fm,d +
+ km x (σm2,d / fm,d) <= 1 (0.142 <= 1)

Izkoriščenost prereza je 14.2%

KONTROLA STRIŽNIH NAPETOSTI
(obtežni primer 4, začetek palice)

Prečna sila v smeri osi 2	V2ed =	-0.332 kN

KONTROLA NAPETOSTI - STRIG

Vrsta obtežbe: osnovno - srednjetrajno		
Korekcijski koeficient	Kmod =	0.800
Parcialni koef. za karakteristike materiala	γm =	1.300
Karakteristična strižna napetost	fv,k =	3.000 MPa
Računska strižna trdnost	fv,d =	1.846 MPa
Površina prečnega prereza	A =	256.00 cm2
Dejanska strižna napetost(os 2)	τ2,d =	0.019 MPa

τ2,d <= fv,d (0.019 <= 1.846)

Izkoriščenost prereza je 1.1%

DOKAZ STABILNOSTI ELEMENTA
(obtežni primer 4, na 239.7 cm od začetka palice)

Računska osna sila	Ned =	-6.742 kN
Upogibni moment okoli osi 3	M3ed =	-0.398 kNm

DOKAZ BOČNE STABILNOSTI

Vrsta obtežbe: osnovno - srednjetrajno		
Korekcijski koeficient	Kmod =	0.800
Parcialni koef. za karakteristike materiala	γm =	1.300
Razmak pridržanih točk pravokotno na smer osi 2		
	lef =	479.40 cm
5% fraktil modula E paralelno z vlakni	E0.05 =	8000.0 MPa
5% fraktil strižnega modula G	G0.05 =	400.00 MPa
Torzijski vztrajnostni moment	Itor =	9230.4 cm4
Vztrajnostni moment	I2 =	5461.3 cm4
Odpornostni moment	W3 =	682.67 cm3
Kritična napetost uklona	σm,crit =	121.92 MPa
Relativna vitkost za uklon	λrel =	0.496
Koeficient	k_krit =	1.000
Normalna upogibna napetost okoli osi 3	σm3,d =	0.582 MPa

σm,3,d <= k_krit x fm,3,d (0.582 <= 18.462)

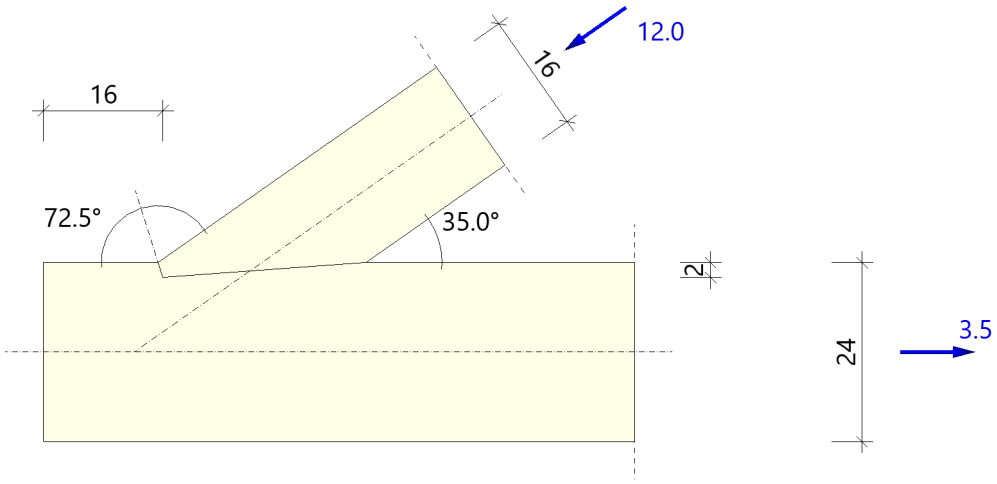
Izkoriščenost prereza je 3.2%

Item: Zasek diagonal vertikalnega zavetrovanja ostrešja_Senik

Skew Notch Joint (x64) HO2+ 02/22 (FRILO R-2022-2/P07)

System

Graphics



Basis of calculation

Design codes: Consequence class	EN 1995-1-1/A2:2014 2

Material

Softwood C24, Service class: 2 (roofed, open; AH<85%; BMC<20%)
acc.to EN 338:2016

$f_{c,0,k}$ = 21.00 N/mm²	$f_{c,90,k}$ = 2.50 N/mm²	$f_{c,17.5,k}$ = 12.58 N/mm²	$f_{c,35,k}$ = 6.11 N/mm²
$f_{t,0,k}$ = 14.50 N/mm²	$f_{m,y,k}$ = 24.00 N/mm²	$f_{v,z,k}$ = 4.00 N/mm²	γ_M = 1.30
$f_{c,0,d}$ = 12.92 N/mm²	$f_{c,90,d}$ = 1.54 N/mm²	$f_{c,17.5,d}$ = 7.74 N/mm²	$f_{c,35,d}$ = 3.76 N/mm²
$f_{t,0,d}$ = 8.92 N/mm²	$f_{m,y,d}$ = 14.77 N/mm²	$f_{v,z,d}$ = 2.46 N/mm²	

Front skew-notch

Dimension Compres.strut	b_1 = 16.0 cm	h_1 = 16.0 cm
Dimension Chord	b_2 = 20.0 cm	h_2 = 24.0 cm
Connection angle	γ = 35.0 °	one-sided
Buckling length	l_{ef} = 4.60 m	

Loads

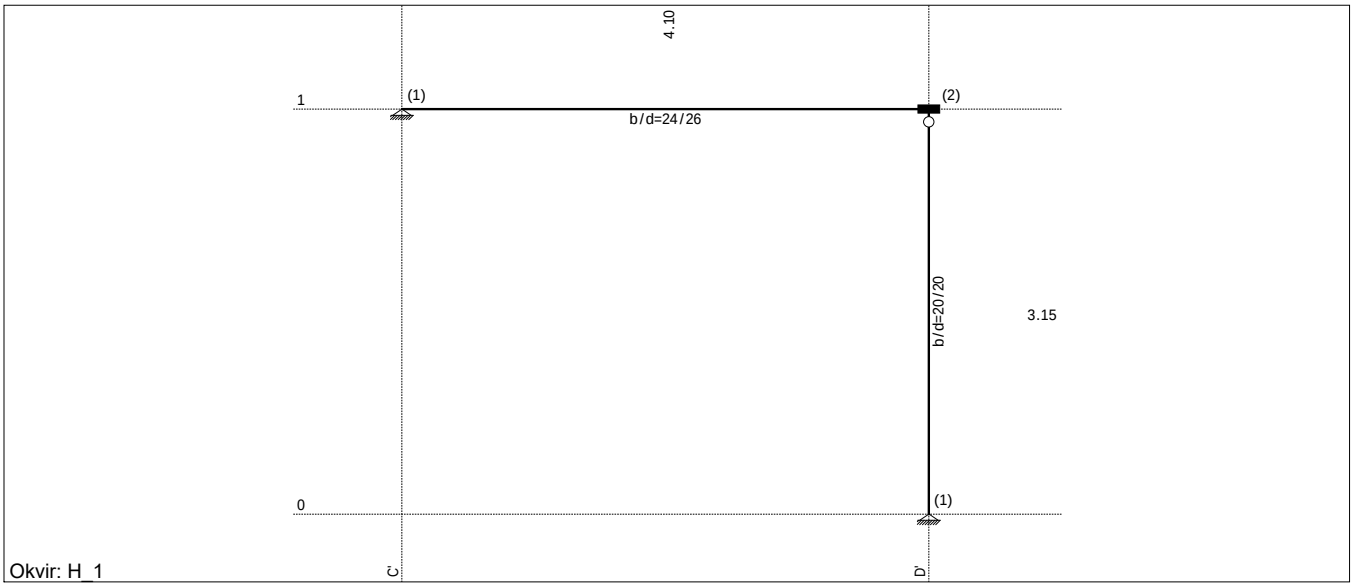
Force in strut	$F_{strut,d}$ = 12.0 kN	LDC = medium
Chord force	$F_{chord,d}$ = 3.5 kN	k_{mod} = 0.80

Results

Front skew-notch depth	$t_{v,1}$ = 2.0 cm	req $t_{v,1}$ ≥ 0.9 cm	max $t_{v,1}$ ≤ 6.0 cm
Forepart, front length	$L_{v,1}$ = 16.0 cm	req $L_{v,1}$ ≥ 3.7 cm	max $L_{v,1}$ ≤ 16.0 cm
	$b_{ef,1}$ = 10.7 cm	$k_{cr,1}$ = 0.67	
Force in strut front	$R_{1,d}$ = 27.2 kN	$F_{1,d}$ = 12.0 kN	e_1 = 7.0 cm
Check strut force	$R_{strut,d}$ = 27.2 kN	$F_{strut,d}$ = 12.0 kN	η = **0.44**
Forepart force front	$R_{\tau,1,d}$ = 51.5 kN	$F_{\tau,1,d}$ = 12.0 kN	η = **0.23**
Cut stress		$\sigma_{1,d}$ = 3.41 N/mm²	η = **0.44**
Forepart shear		$\tau_{1,d}$ = 0.57 N/mm²	η = **0.23**
Strut stress	$\sigma_{c,0,d}$ = -0.47 N/mm²	$\sigma_{m,d}$ = -1.23 N/mm²	η = **0.08**
	F_d = -12.0 kN	ΔM_d = -0.84 kNm	e_{mean} = 7.0 cm
	A = 256.0 cm²	W_y = 683 cm³	I_z = 5461 cm⁴
Strut stability	$\sigma_{c,0,d}$ = -0.47 N/mm²	$\sigma_{m,d}$ = -1.23 N/mm²	η = **0.20**
	$k_{c,y}$ = 0.307	$k_{crit,y}$ = 1.000	
	$k_{c,z}$ = 0.307	$k_{crit,z}$ = 1.000	
Chord	$\sigma_{t,0,d}$ = 0.08 N/mm²	$\sigma_{m,d}$ = 0.02 N/mm²	η = **0.01**
	F_d = 3.5 kN	ΔM_d = 0.04 kNm	e = 1.0 cm
	A_{ef} = 440.0 cm²	$W_{y,ef}$ = 1613 cm³	$I_{z,ef}$ = 14667 cm⁴

Skew-notch must be protected by bolts, straps etc.

KAPNA LEGA (SENIK)



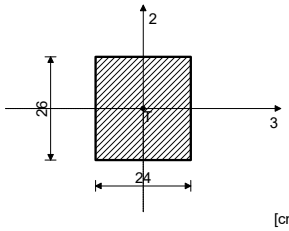
Tabele materialov

No	Naziv materiala	E[kN/m2]	μ	γ[kN/m3]	αt[1/C]	Em[kN/m2]	μm
1	Les-Iglavci-Masiven les	1.000e+7	0.20	5.00	1.000e-5	1.000e+7	0.20

Seti gred

Set: 1 Prerez: b/d=24/26, Fiktivna ekscentričnost

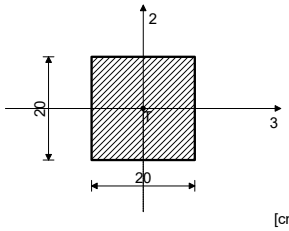
Mat.	A1	A2	A3	I1	I2	I3
1 - Les-Iglavci-M...	6.240e-2	5.200e-2	5.200e-2	5.435e-4	2.995e-4	3.515e-4



[cm]

Set: 2 Prerez: b/d=20/20, Fiktivna ekscentričnost

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



[cm]

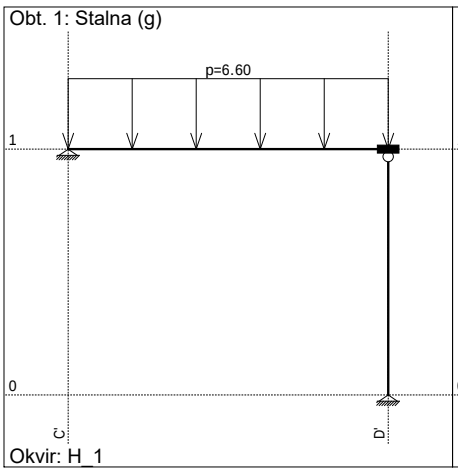
Seti točkovnih podpor

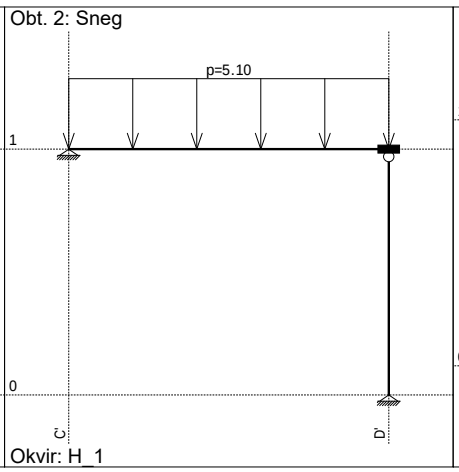
Set	K,R1	K,R2	K,R3	K,M1	K,M2	K,M3
1	1.000e+10	1.000e+10	1.000e+10			
2		1.000e+10				

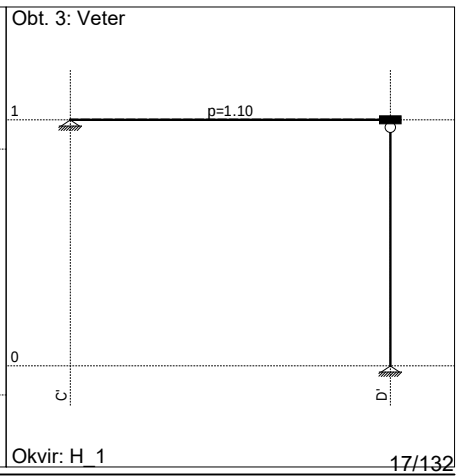
Lista obtežnih primerov

LC	Naziv
1	Stalna (g)
2	Sneg
3	Veter
4	Komb.: 1.35xI+1.5xII
5	Komb.: 1.35xI+1.5xIII
6	Komb.: 1.35xI+1.5xII+0.9xIII

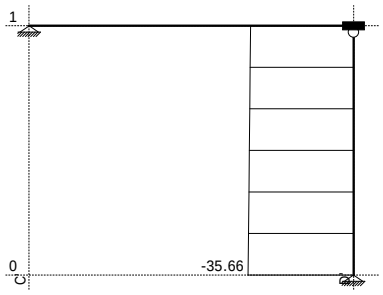
LC	Naziv
7	Komb.: 1.35xI+0.75xII+1.5xIII
8	Komb.: I+II
9	Komb.: I+III
10	Komb.: I+II+0.6xIII
11	Komb.: I+0.5xII+III





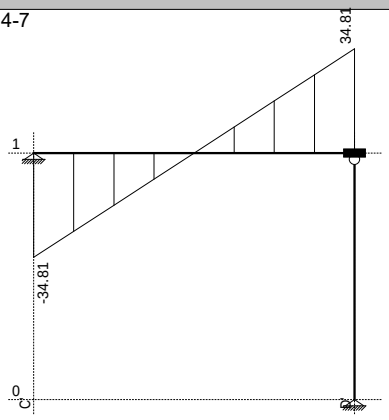


Obt. 12: [MSN] 4-7



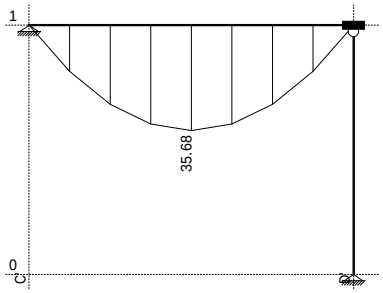
Okvir: H_1
Vplivi v gredi: max N1= 0.00 / min N1= -35.66 kN

Obt. 12: [MSN] 4-7



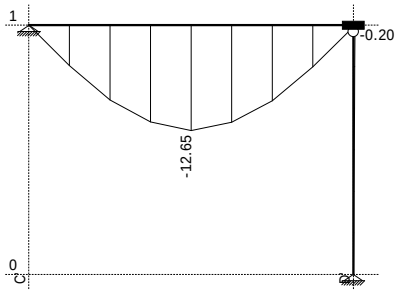
Okvir: H_1
Vplivi v gredi: max T2= 34.81 / min T2= -34.81 kN

Obt. 12: [MSN] 4-7



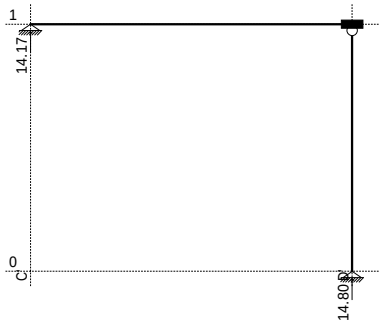
Okvir: H_1
Vplivi v gredi: max M3= 35.68 / min M3= -0.00 kNm

Obt. 13: [MSU] 8-11



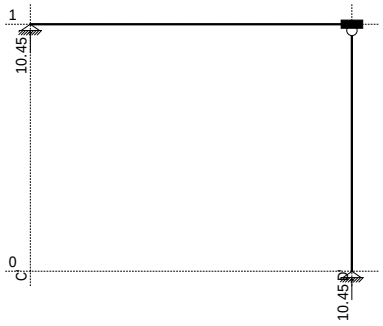
Okvir: H_1
Vplivi v gredi: max Zp= -0.00 / min Zp= -12.65 m / 1000

Obt. 1: Stalna (g)



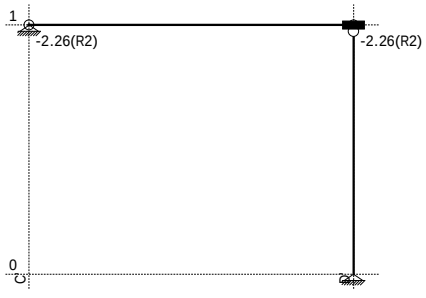
Okvir: H_1
Reakcije podpor

Obt. 2: Sneg

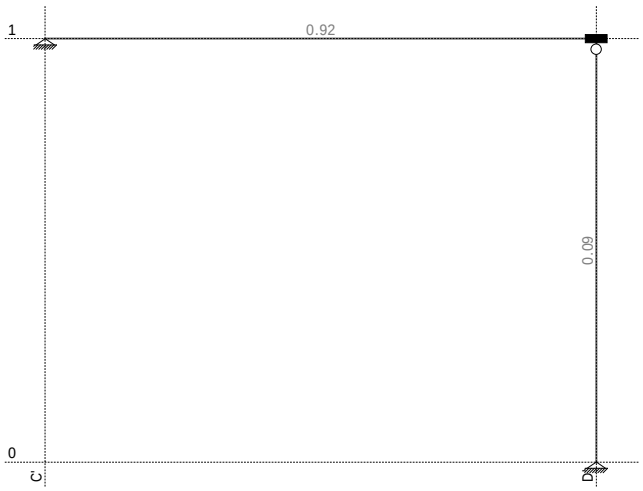


Okvir: H_1
Reakcije podpor

Obt. 3: Veter

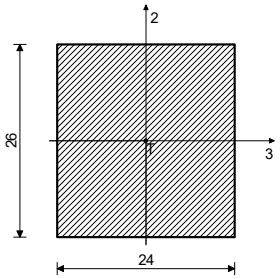


Okvir: H_1
Reakcije podpor



Okvir: H_1
Kontrola stabilnosti

PALICA 1-3
Monoliten les - iglavci in mehki listavci - C24
Eksploatacijski razred 1
EUROCODE (EN 1995-1-1)



[cm]

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

6. γ=0.92	4. γ=0.88	7. γ=0.75
10. γ=0.65	8. γ=0.62	5. γ=0.55
11. γ=0.54	9. γ=0.40	

KONTROLA NORMALNIH NAPETOSTI
(obtežni primer 6, na 195.2 cm od začetka palice)

Prečna sila v smeri osi 2	V2ed =	-1.658 kN
Prečna sila v smeri osi 3	V3ed =	0.097 kN
Upogibni moment okoli osi 2	M2ed =	-2.055 kNm
Upogibni moment okoli osi 3	M3ed =	-35.257 kNm

KONTROLA NAPETOSTI - UPOGIB

Vrsta obtežbe: osnovno - srednjetrajno		
Korekcijski koeficient	Kmod =	0.800
Parcialni koef. za karakteristike materiala	γm =	1.300
Dodatek za elemente z malimi dimenzijami - os 2		
	Kh_2 =	1.000
Dodatek za elemente z malimi dimenzijami - os 3		
	Kh_3 =	1.000
Faktor oblik (za pravokotni prerez)	km =	0.700
Karakteristična upogibna trdnost	fm,k =	24.000 MPa
Računska upogibna trdnost	fm,d =	14.769 MPa
Odpornostni moment	W2 =	2496.0 cm3
Normalna upogibna napetost okoli osi 2	σm2,d =	0.824 MPa
Odpornostni moment	W3 =	2704.0 cm3
Normalna upogibna napetost okoli osi 3	σm3,d =	13.039 MPa

km x (σm3,d / fm,3,d) + σm2,d / fm,2,d <= 1 (0.674 <= 1)
Izkoriščenost prereza je 67.4%

σm3,d / fm,3,d + km x (σm2,d / fm,2,d) <= 1 (0.922 <= 1)
Izkoriščenost prereza je 92.2%

KONTROLA STRIŽNIH NAPETOSTI
(obtežni primer 4, začetek palice)

Prečna sila v smeri osi 2	V2ed =	-34.811 kN

KONTROLA NAPETOSTI - STRIG

Vrsta obtežbe: osnovno - srednjetrajno		
Korekcijski koeficient	Kmod =	0.800
Parcialni koef. za karakteristike materiala	γm =	1.300
Karakteristična strižna napetost	fv,k =	4.000 MPa
Računska strižna trdnost	fv,d =	2.462 MPa
Površina prečnega prereza	A =	624.00 cm2
Dejanska strižna napetost(os 2)	τ2,d =	0.837 MPa

τ2,d <= fv,d (0.837 <= 2.462)

Izkoriščenost prereza je 34.0%

DOKAZ STABILNOSTI ELEMENTA
(obtežni primer 4, na 195.2 cm od začetka palice)

Prečna sila v smeri osi 2	V2ed =	-1.658 kN
Upogibni moment okoli osi 3	M3ed =	-35.257 kNm

DOKAZ BOČNE STABILNOSTI

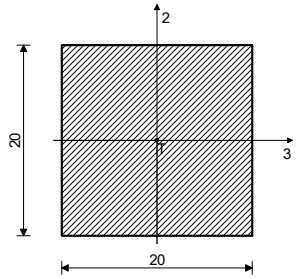
Vrsta obtežbe: osnovno - srednjetrajno		
Korekcijski koeficient	Kmod =	0.800
Parcialni koef. za karakteristike materiala	γm =	1.300
Razmak pridržanih točk pravokotno na smer osi 2		
	lef =	410.00 cm
5% fraktil modula E paralelno z vlakni	E0.05 =	7400.0 MPa
5% fraktil strižnega modula G	G0.05 =	460.00 MPa
Torzijski vztrajnostni moment	Itor =	54458 cm4
Vztrajnostni moment	I2 =	29952 cm4
Odpornostni moment	W3 =	2704.0 cm3
Kritična napetost uklona	σm,crit =	211.15 MPa
Relativna vitkost za uklon	λrel =	0.337
Koeficient	k_krit =	1.000
Normalna upogibna napetost okoli osi 3	σm3,d =	13.039 MPa

σm,3,d <= k_krit x fm,3,d (13.039 <= 14.769)

Izkoriščenost prereza je 88.3%

PALICA 3-2

Monoliten les - iglavci in mehki listavci - C24
Eksploatacijski razred 1
EUROCODE (EN 1995-1-1)



[cm]

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB

4. γ=0.09	6. γ=0.09	7. γ=0.07
8. γ=0.07	10. γ=0.07	11. γ=0.05
5. γ=0.05	9. γ=0.04	

KONTROLA NORMALNIH NAPETOSTI
(obtežni primer 4, konec palice)

Računska osna sila	Ned =	-35.662 kN

KONTROLA NAPETOSTI - TLAK

Vrsta obtežbe: osnovno - srednjetrajno		
Korekcijski koeficient	Kmod =	0.800
Parcialni koef. za karakteristike materiala	γm =	1.300
Dodatek za elemente z malimi dimenzijami - os 2		
	Kh_2 =	1.000
Dodatek za elemente z malimi dimenzijami - os 3		
	Kh_3 =	1.000
Faktor oblik (za pravokotni prerez)	km =	0.700
Karakteristična tlačna trdnost	fc,0,k =	21.000 MPa
Računska tlačna trdnost	fc,0,d =	12.923 MPa
Karakteristična upogibna trdnost	fm,k =	24.000 MPa
Računska upogibna trdnost	fm,d =	14.769 MPa
Relativna vitkost	λrel,2 =	0.925
Relativna vitkost	λrel,3 =	0.925
Normalne tlačne napetosti	σc,0,d =	0.892 MPa
TLAK IN UPOGIB - VELIKA VITKOST		
Začetna imperfekcija	βc =	0.200
Koeficient	k3 =	0.990
Koeficient	k2 =	0.990
Koeficient	kc,3 =	0.744
Koeficient	kc,2 =	0.744

(σc,0,d / (kc_2 x fc,0,d)) + km x (σm3,d / fm,d) +
+ σm2,d / fm,d <= 1 (0.093 <= 1)

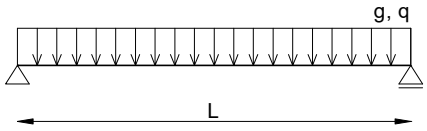
Izkoriščenost prereza je 9.3%

(σc,0,d / (kc_3 x fc,0,d)) + σm3,d / fm,d +
+ km x (σm2,d / fm,d) <= 1 (0.093 <= 1)

Izkoriščenost prereza je 9.3%

LESEN STROP NAD NADSTROPJEM

Material les: C 24
statična razpetina stropnikov L = 3,84 m
razdalja med stropniki e_s = 0,63 m



OBTEŽBE

a. stalna

toplotna izolacija			*0,23*	x	*1*	*kN/m³*	=	*0,23 kN/m²*
OSB plošče			*0,05*	x	*7*	*kN/m³*	=	*0,35 kN/m²*
stropniki	*0,10*	x	0,16	x	*5*	*/ e*	=	*0,13 kN/m²*
mavčnokartonske plošče			*0,015*	x	*16*	*kN/m³*	=	*0,24 kN/m²*
						g	=	***0,95 kN/m²***

b. koristna

q = ***0,50 kN/m²***

obtežbe na stropnik

stalna obtežba g' = 0,6 kN/m
koristna obtežba q' = 0,3 kN/m

projektna obtežba

MSN M $q_d^M = 1{,}35g' + 1{,}5q'$ q_d^M = 1,3 kN/m
MSU $q_d = 1{,}0g' + 1{,}0q'$ q_d = 0,9 kN/m

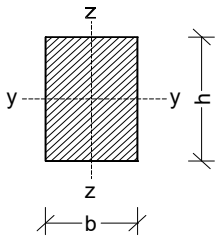
OBREMENITVE

$M_d = qL^2 / 8$ → M_d = 2,34 kNm
$V_d = qL / 2$ V_d = 2,44 kN

DIMENZIONIRANJE

začetne dimenzije

širina: b = 10 cm
višina: h = 16 cm



kontrola napetosti (MSN)

upogib:	$\sigma_{m,d}$ =	0,548	kN/cm²	<	$f_{m,d}$ =	1,477	kN/cm²
strig:	$\tau_{v,d}$ =	0,023	kN/cm²	<	$f_{v,d}$ =	0,154	kN/cm²

kontrola deformacij (MSU) kN/cm²

dovoljen začetni poves: $w_{inst,\,dop}$ = L / 300 $E_{0,mean}$ = 1100
začetna deformacija: $w_{max,\,inst}$ = 0,68 cm < $w_{inst,\,dop}$ = 1,28 cm
stalna obtežba: $w_{g,\,inst}$ = 0,45 cm
koristna obtežba: $w_{q,\,inst}$ = 0,24 cm 0,8
$\Psi_{2,g}$ = 0,8 $\Psi_{2,q}$ = 0,3 k_{def} =
dovoljen končni poves: $w_{inst,\,dop}$ = L / 250
končna deformacija: w_{fin} = 1,02 cm < $w_{fin,\,dop}$ = 1,54 cm

DIMENZIJE STROPNIKA

b / h = 10 / 16 cm A_{dej} = 160 cm²

VERTIKALNA POVEZJA
(horizontalno zavetrovanje lesenih sten) POZ VZ1

Potres

$\boldsymbol{a_g = 0,2g}$

$S = 1{,}15$ (tip tal C)

$\boldsymbol{q = 1,5}$

$$S_d = a_g \cdot S \cdot \frac{2{,}5}{q} = 0{,}2 \cdot 1{,}15 \cdot \frac{2{,}5}{1{,}5} = 0{,}383$$

teža objekta:

streha: $96m^2 \cdot 1{,}55\ kN/m^2 / \cos 41^\circ = 197{,}2\ kN$

strop nad nadstopjem: $35m^2 \cdot (1{,}0\frac{kN}{m^2} + 0{,}30 \cdot 0{,}5\frac{kN}{m^2} = 40{,}3\ kN$

nosilne stene: $(2 \cdot 10{,}6\ m \cdot 1{,}6\ m + 2 \cdot 6{,}4\ m\ \cdot 1{,}6\ m + 2 \cdot 6{,}4\ m \cdot 2{,}5\ m) \cdot \frac{1{,}0kN}{m^2} = 86{,}4\ kN$

$$\sum V = 323{,}9\ kN$$

$$E = \sum V \cdot S_d = 323{,}9 \cdot 0{,}383 = 124{,}2\ kN$$

smer X,Y: 6 x VZ1 → $E_{VZ1(VZ1')} = \frac{E}{n} = \frac{124{,}2kN}{4} = 20{,}7\ kN$

Opomba: Vpliv vetra v primerjavi s potresom ni merodajen za dimenzioniranje povezij.

SIDRANJE SKELETNE KONSTRUKCIJE

Na vseh koncih sten z diagonalami (vertikalnimi zavetrovanji):

$$\boldsymbol{R_{d,max}(izpis\ \ Tower) = 55{,}7\ kN}$$

izberem: kotnik 1 x WHT 440 ϕ4x40 mm (42 kom. – celostna pritrditev z žeblji)
vsak robni steber kratkega povezja pritrditi s kotnikom WHT 540

$\boldsymbol{R_k = 63{,}3\ kN \rightarrow\ R_{d,WHT} = \frac{R_k \cdot k_{mod}}{\gamma_M \frac{63{,}3 \cdot 1{,}1}{1{,}3}}}$

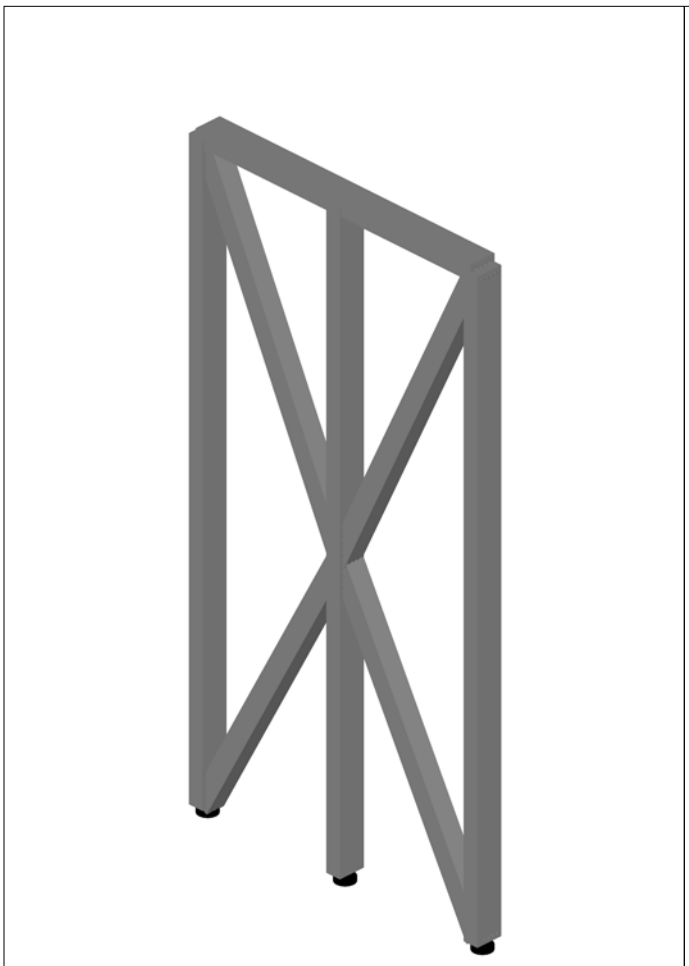
$k_{\text{mod}} = 1{,}1$ (potres = trenutna obtežba)

$$\boldsymbol{R_d = 55{,}7\ kN < R_{d,WHT} = 55{,}8\ kN}$$

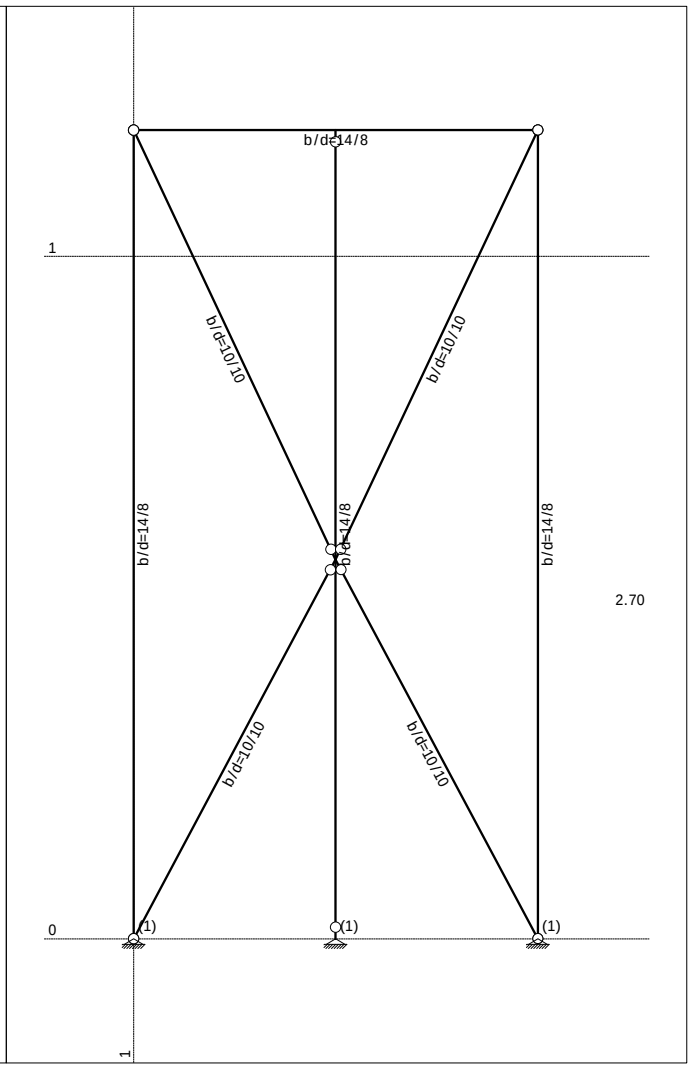
Med povezji skeletne stene v pritličju sidrati s kotniki TITAN TCF200/1,0 m. Lesene stebre in sohe sidrati s kotniki WBR100.

VERTIKALNO POVEZJE

POZ VZ1



Izometrija



Shema nivojev

Naziv	z [m]	h [m]
	3.00	3.00

Naziv	z [m]	h [m]
	0.00	

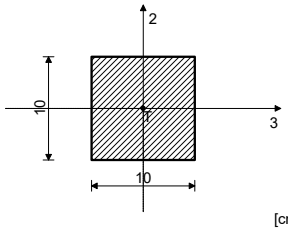
Tabele materialov

No	Naziv materiala	E[kN/m2]	μ	γ[kN/m3]	αt[1/C]	Em[kN/m2]	μm
1	Les-Iglavci-Masiven les	1.000e+7	0.20	5.00	1.000e-5	1.000e+7	0.20

Seti gred

Set: 1 Prerez: b/d=10/10, Fiktivna ekscentričnost

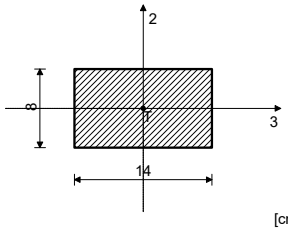
Mat.	A1	A2	A3	I1	I2	I3
1 - Les-Iglavci-M...	1.000e-2	8.333e-3	8.333e-3	1.408e-5	8.333e-6	8.333e-6



[cm]

Set: 2 Prerez: b/d=14/8, Fiktivna ekscentričnost

Mat.	A1	A2	A3	I1	I2	I3
1 - Les-Iglavci-M...	1.120e-2	9.333e-3	9.333e-3	1.537e-5	1.829e-5	5.973e-6



[cm]

Seti točkovnih podpor

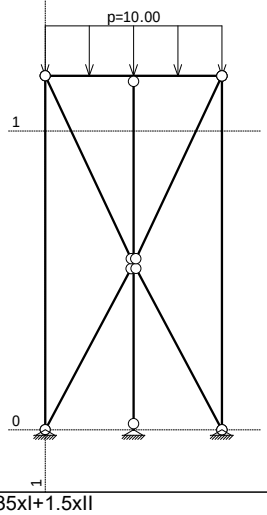
Set	K,R1	K,R2	K,R3	K,M1	K,M2	K,M3
1	1.000e+10	1.000e+10	1.000e+10			

Lista obtežnih primerov

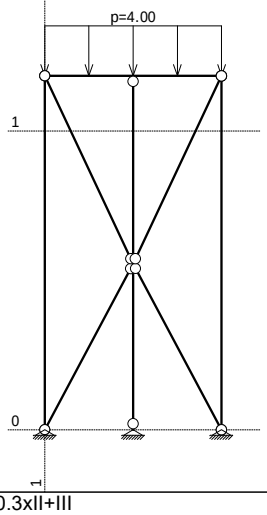
LC	Naziv
1	G (g)
2	Q
3	E

LC	Naziv
4	Komb.: 1.35xI+1.5xII
5	Komb.: I+0.3xII+III

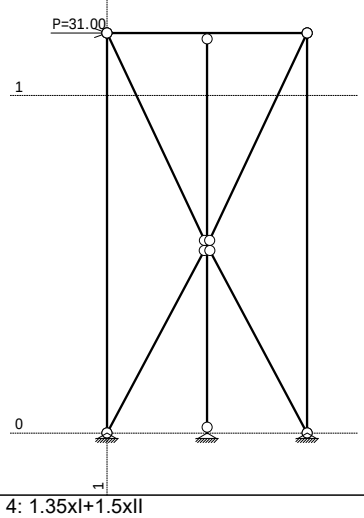
Obt. 1: G (g)



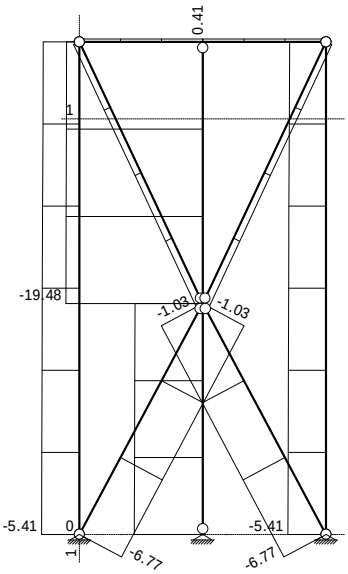
Obt. 2: Q



Obt. 3: E

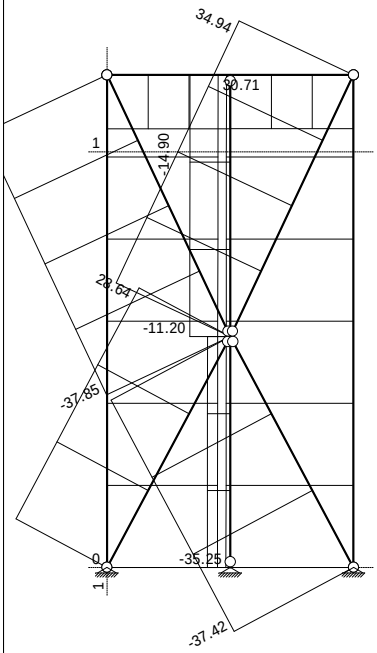


Obt. 4: 1.35xI+1.5xII



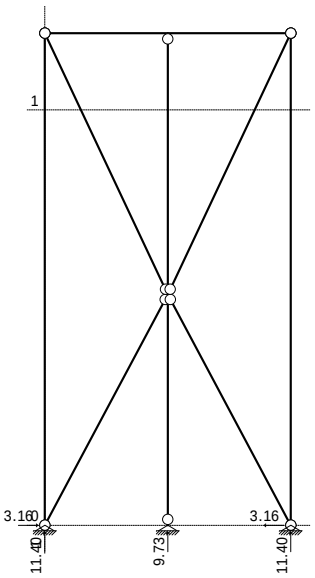
Vplivi v gredi: max N1= 0.41 / min N1= -19.48 kN

Obt. 5: I+0.3xII+III



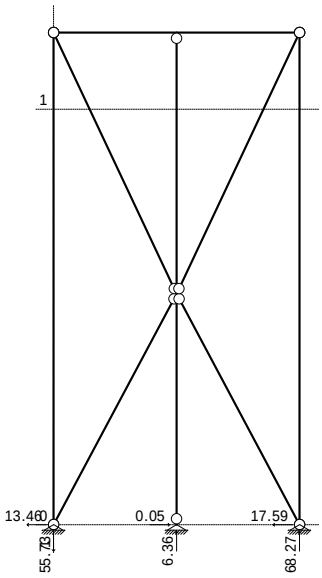
Vplivi v gredi: max N1= 34.94 / min N1= -37.85 kN

Obt. 4: 1.35xI+1.5xII

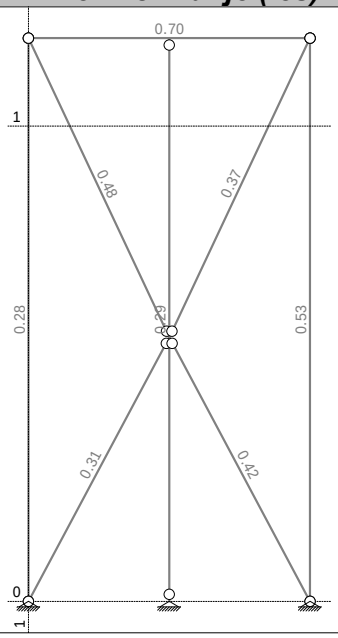


Reakcije podpor

Obt. 5: I+0.3xII+III



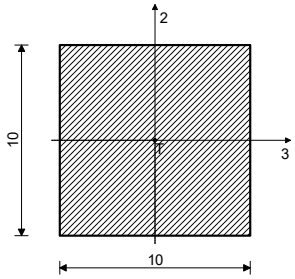
Reakcije podpor



Kontrola stabilnosti

PALICA 5-4

Monoliten les - iglavci in mehki listavci - C24
Eksploatacijski razred 1
EUROCODE (EN 1995-1-1)



[cm]

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB
5. γ=0.48 4. γ=0.01

KONTROLA NORMALNIH NAPETOSTI
(obtežni primer 5, konec palice)

Računska osna sila	Ned =	-37.851 kN
Prečna sila v smeri osi 2	V2ed ≈	0.000 kN

KONTROLA NAPETOSTI - TLAK

Vrsta obtežbe: osnovno - srednjetrajno		
Korekcijski koeficient	Kmod =	0.800
Parcialni koef. za karakteristike materiala	γm =	1.300
Dodatek za elemente z malimi dimenzijami - os 2		
	Kh_2 =	1.084
Dodatek za elemente z malimi dimenzijami - os 3		
	Kh_3 =	1.084
Faktor oblik (za pravokotni prerez)	km =	0.700
Karakteristična tlačna trdnost	fc,0,k =	21.000 MPa
Računska tlačna trdnost	fc,0,d =	12.923 MPa
Karakteristična upogibna trdnost	fm,k =	24.000 MPa
Računska upogibna trdnost	fm,d =	16.017 MPa
Relativna vitkost	λrel,2 =	1.104
Relativna vitkost	λrel,3 =	1.104
Normalne tlačne napetosti	σc,0,d =	3.785 MPa
TLAK IN UPOGIB - VELIKA VITKOST		
Začetna imperfekcija	βc =	0.200
Koeficient	k3 =	1.189
Koeficient	k2 =	1.189
Koeficient	kc,3 =	0.612
Koeficient	kc,2 =	0.612

(σc,0,d / (kc_2 x fc,0,d)) + km x (σm3,d / fm,d) +
+ σm2,d / fm,d <= 1 (0.478 <= 1)

Izkoriščenost prereza je 47.8%

(σc,0,d / (kc_3 x fc,0,d)) + σm3,d / fm,d +
+ km x (σm2,d / fm,d) <= 1 (0.478 <= 1)

Izkoriščenost prereza je 47.8%

KONTROLA NOSILNOSTI VERTIKAL V SKELETNIH STENAH

Material: les: C 24 M (trajanje obtežbe)

karakteristična upogibna trdnost:	$f_{m,k}$ =	2,400	kN/cm^2
karakteristična tlačna trdnost:	$f_{c,0,k}$ =	2,100	kN/cm^2
karakteristična tlačna trdnost:	$f_{v,k}$ =	0,250	kN/cm^2
računska strižna trdnost:	$f_{m,d}$ =	1,477	kN/cm^2
računska tlačna trdnost:	$f_{c,0,d}$ =	1,292	kN/cm^2
računska strižna trdnost:	$f_{v,d}$ =	0,154	kN/cm^2
elastični modul:	$E_{0,05}$ =	740	kN/cm^2

Uklonske dolžine: L_{uy} = 320 cm

L_{uz} = 320 cm

Obremenitve:

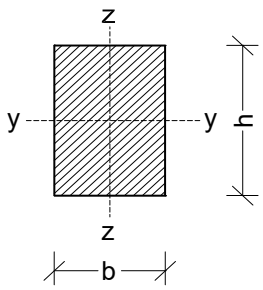
N_{sd} =	16,0	kN
V_{sd} =	1,20	kN
$M_{y,sd}$ =	100	kNcm
$M_{z,sd}$ =	0,0	kNcm

Karakteristike prečnega prereza:

b = 8 cm

h = 14 cm

A =	112	cm^2
W_y =	261	cm^3
I_y =	1829	cm^4
W_z =	149	cm^3
I_z =	597	cm^4



Račun relativnih vitkosti

vitkost okrog osi y:	λ_y =	79,2		
vitkost okrog osi z:	λ_z =	138,6		
relativna vitkost okrog osi y:	$\lambda_{rel,y}$ =	1,34	>	0,5
relativna vitkost okrog osi z:	$\lambda_{rel,z}$ =	2,35	>	0,5

Kontrola napetosti (upogib z osno silo)

a) Brez upoštevanja uklona

os y: $\left(\frac{\sigma_{c,0,d}}{f_{c,0,d}}\right)^2 + \frac{\sigma_{m,y,d}}{f_{m,y,d}} + k_m \frac{\sigma_{m,z,d}}{f_{m,z,d}}$ = 0,27 ≤ 1,0

os z: $\left(\frac{\sigma_{c,0,d}}{f_{c,0,d}}\right)^2 + k_m \frac{\sigma_{m,y,d}}{f_{m,y,d}} + \frac{\sigma_{m,z,d}}{f_{m,z,d}}$ = 0,19 ≤ 1,0

b) Z upoštevanjem uklona

os y: $\frac{\sigma_{c,0,d}}{k_{c,y} f_{c,0,d}} + \frac{\sigma_{m,y,d}}{f_{m,y,d}} + k_m \frac{\sigma_{m,z,d}}{f_{m,z,d}}$ = 0,49 ≤ 1,0

os z: $\frac{\sigma_{c,0,d}}{k_{c,y} f_{c,0,d}} + k_m \frac{\sigma_{m,y,d}}{f_{m,y,d}} + \frac{\sigma_{m,z,d}}{f_{m,z,d}}$ = 0,84 ≤ 1,0

Merodajna je kontrola napetosti z upoštevanjem uklona.

Kontrola strižnih napetosti: $\tau_{v,d}$ = 0,016 kN/cm^2 < $f_{v,d}$ = 0,154 kN/cm^2

KONTROLA NOSILNOSTI HORIZONALNIH ZAKLJUČKOV SKELETNIH STEN

Material: les: C 24 M (trajanje obtežbe)

karakteristična upogibna trdnost:	$f_{m,k}$ =	2,400	kN/cm^2
karakteristična tlačna trdnost:	$f_{c,0,k}$ =	2,100	kN/cm^2
karakteristična tlačna trdnost:	$f_{v,k}$ =	0,250	kN/cm^2
računska strižna trdnost:	$f_{m,d}$ =	1,477	kN/cm^2
računska tlačna trdnost:	$f_{c,0,d}$ =	1,292	kN/cm^2
računska strižna trdnost:	$f_{v,d}$ =	0,154	kN/cm^2
elastični modul:	$E_{0,05}$ =	740	kN/cm^2

Uklonske dolžine:

L_{uy} = 100 cm

L_{uz} = 100 cm

Obremenitve:

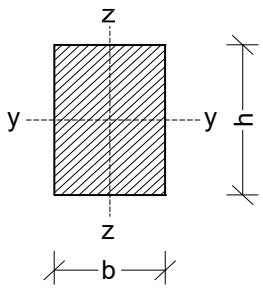
N_{sd} =	0,0	kN
V_{sd} =	3,90	kN
$M_{y,sd}$ =	183	kNcm
$M_{z,sd}$ =	0,0	kNcm

Karakteristike prečnega prereza:

b = 14 **cm**

h = 8 **cm**

A =	112	cm^2
W_y =	149	cm^3
I_y =	597	cm^4
W_z =	261	cm^3
I_z =	1829	cm^4



Račun relativnih vitkosti

vitkost okrog osi y:	λ_y =	43,3		
vitkost okrog osi z:	λ_z =	24,7		
relativna vitkost okrog osi y:	$\lambda_{rel,y}$ =	0,73	>	0,5
relativna vitkost okrog osi z:	$\lambda_{rel,z}$ =	0,42	<	0,5

Kontrola napetosti (upogib z osno silo)

a) Brez upoštevanja uklona

os y: $\left(\frac{\sigma_{c,0,d}}{f_{c,0,d}}\right)^2 + \frac{\sigma_{m,y,d}}{f_{m,y,d}} + k_m \frac{\sigma_{m,z,d}}{f_{m,z,d}}$ = 0,83 ≤ 1,0

os z: $\left(\frac{\sigma_{c,0,d}}{f_{c,0,d}}\right)^2 + k_m \frac{\sigma_{m,y,d}}{f_{m,y,d}} + \frac{\sigma_{m,z,d}}{f_{m,z,d}}$ = 0,58 ≤ 1,0

b) Z upoštevanjem uklona

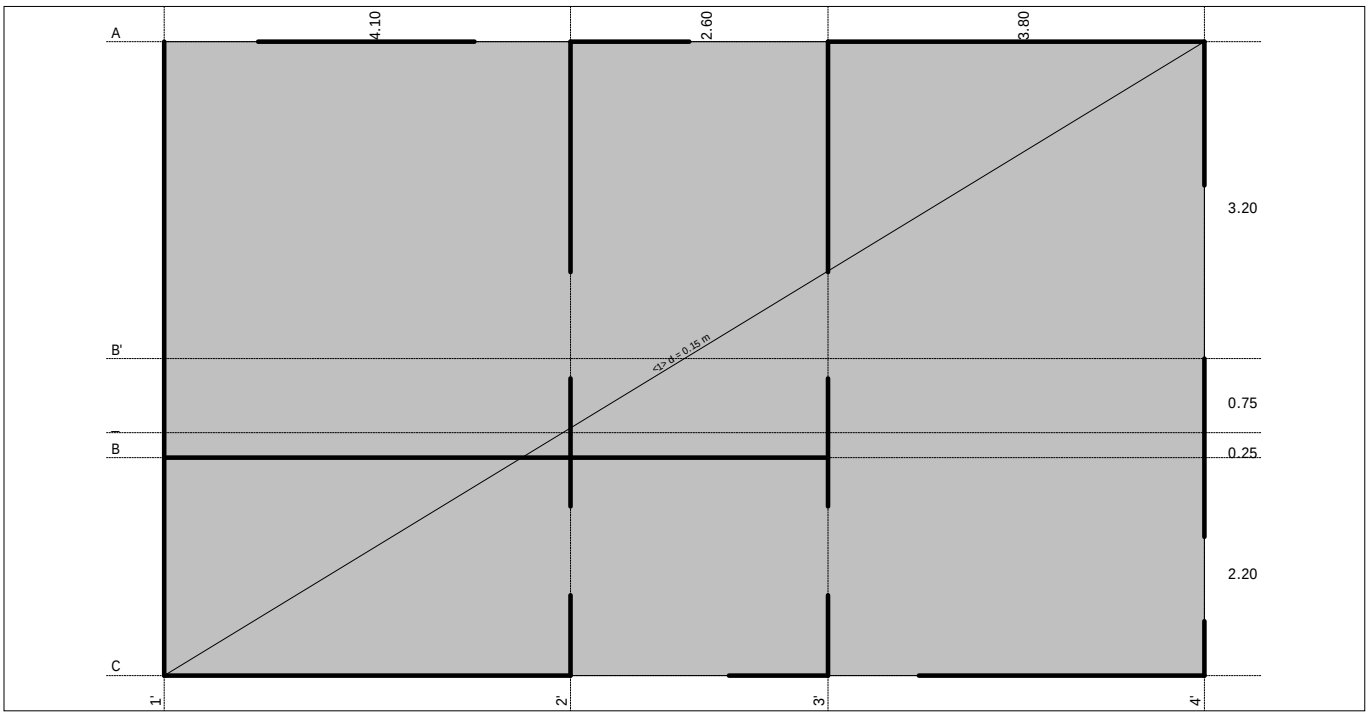
os y: $\frac{\sigma_{c,0,d}}{k_{c,y} f_{c,0,d}} + \frac{\sigma_{m,y,d}}{f_{m,y,d}} + k_m \frac{\sigma_{m,z,d}}{f_{m,z,d}}$ = 0,83 ≤ 1,0

os z: $\frac{\sigma_{c,0,d}}{k_{c,y} f_{c,0,d}} + k_m \frac{\sigma_{m,y,d}}{f_{m,y,d}} + \frac{\sigma_{m,z,d}}{f_{m,z,d}}$ = 0,58 ≤ 1,0

Merodajna je kontrola napetosti brez upoštevanja uklona.

Kontrola strižnih napetosti: $\tau_{v,d}$ = 0,052 kN/cm^2 < $f_{v,d}$ = 0,154 kN/cm^2

OBJEKT SENIK
AB PLOŠČA NAD PRITLIČJEM



Tabele materialov

No	Naziv materiala	E[kN/m2]	μ	γ[kN/m3]	αt[1/C]	Em[kN/m2]	μm
1	Beton 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>	0.150	0.075	1	Tanka plošča	Izotropna			

Seti linijskih podpor

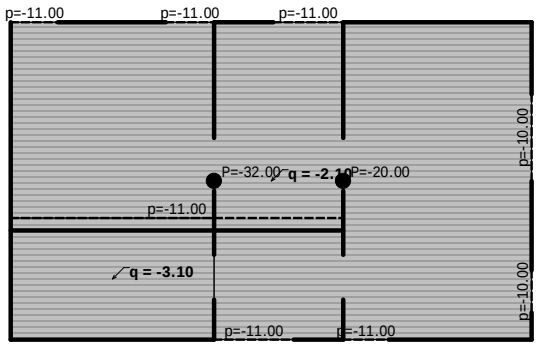
Set	K,R1	K,R2	K,R3	K,M1	Tla [m]
1	1.000e+10	1.000e+10	1.000e+10		

Lista obtežnih primerov

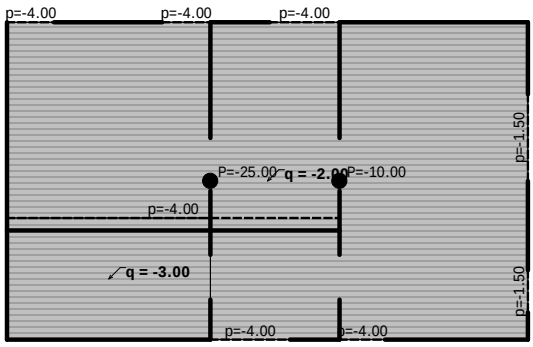
LC	Naziv
1	Stalna (g)
2	Koristna

LC	Naziv
3	Komb.: 1.35xI+1.5xII
4	Komb.: I+II

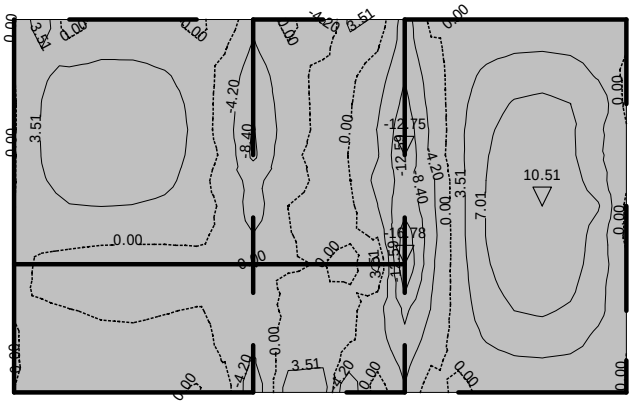
Obt. 1: Stalna (g)



Obt. 2: Koristna

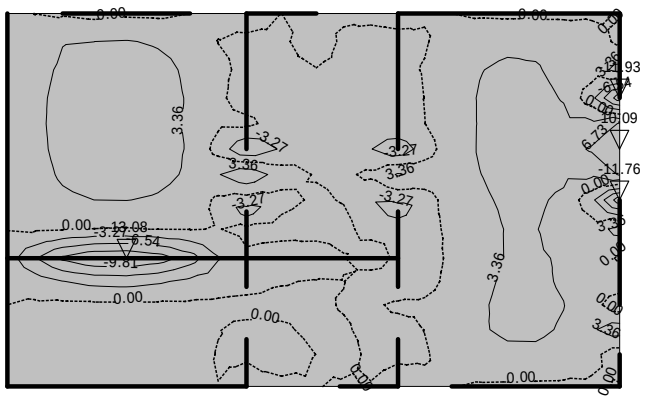


Obt. 3: 1.35xI+1.5xII



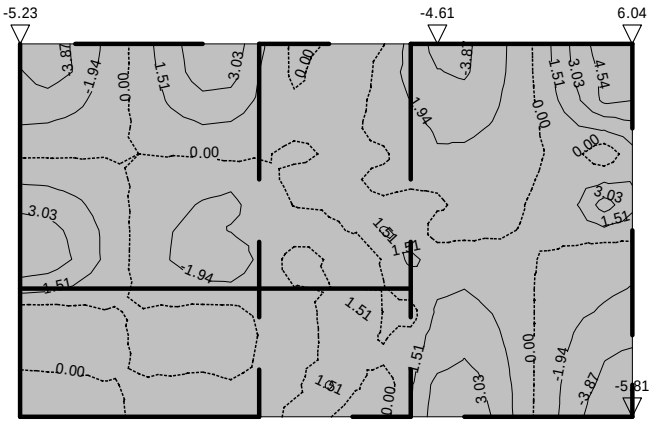
Vplivi v plošči: max Mx= 10.51 / min Mx= -16.78 kNm/m

Obt. 3: 1.35xI+1.5xII



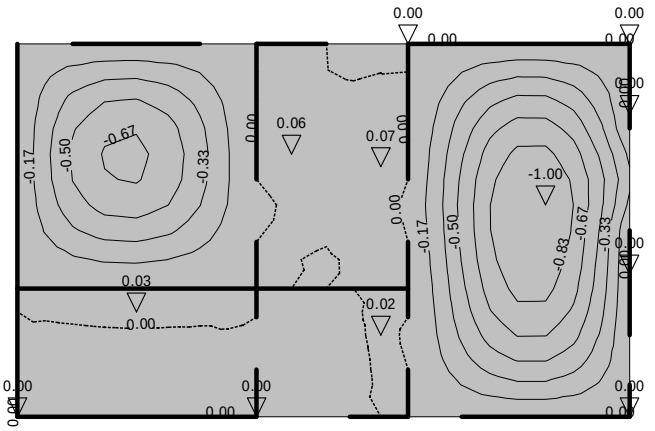
Vplivi v plošči: max My= 10.09 / min My= -13.08 kNm/m

Obt. 3: 1.35xI+1.5xII



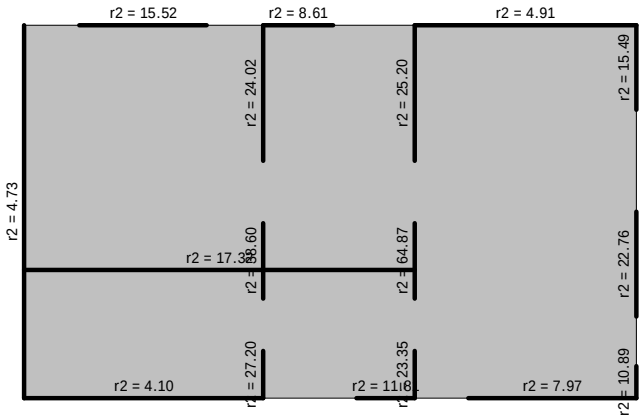
Vplivi v plošči: max Mxy= 6.04 / min Mxy= -5.81 kNm/m

Obt. 4: I+II



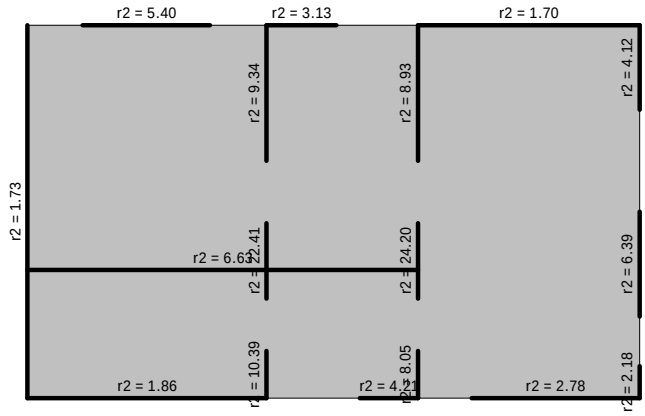
Vplivi v plošči: max Zp= 0.07 / min Zp= -1.00 m / 1000

Obt. 1: Stalna (g)



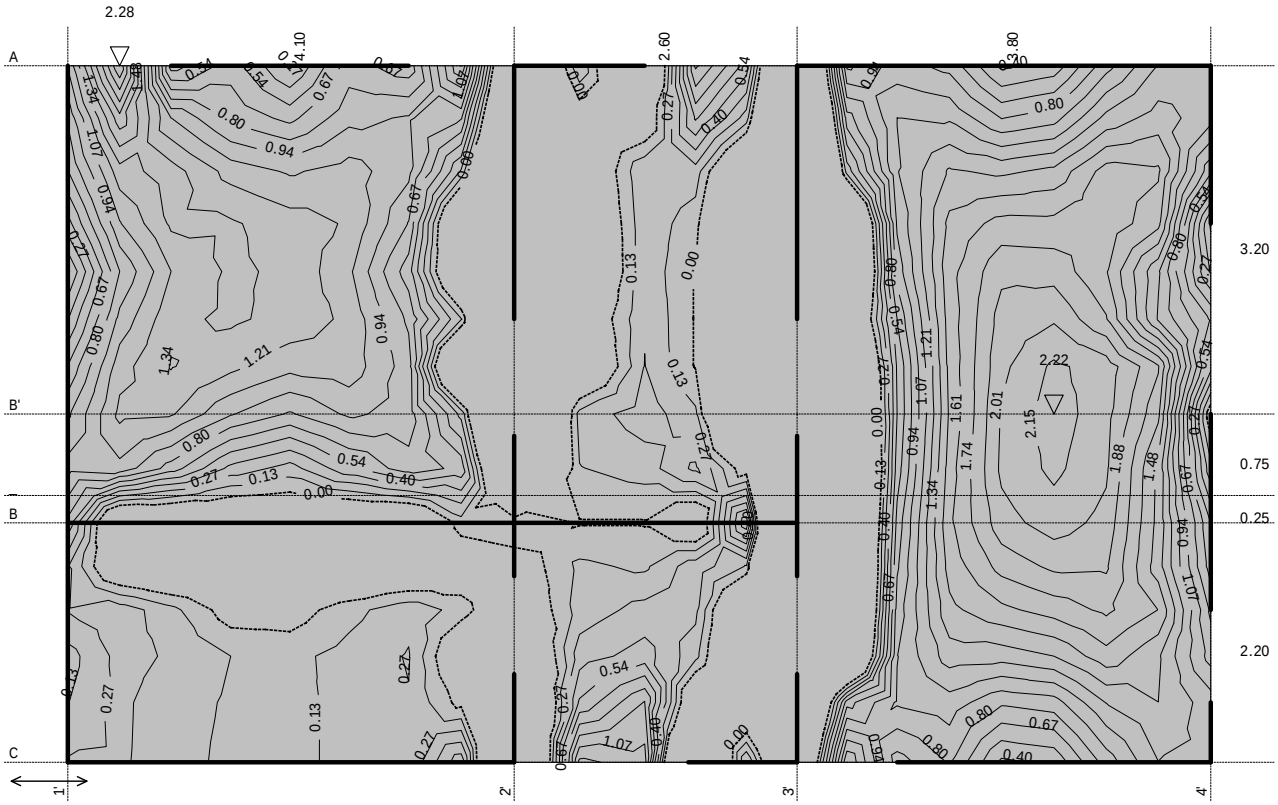
Reakcije podpor

Obt. 2: Koristna



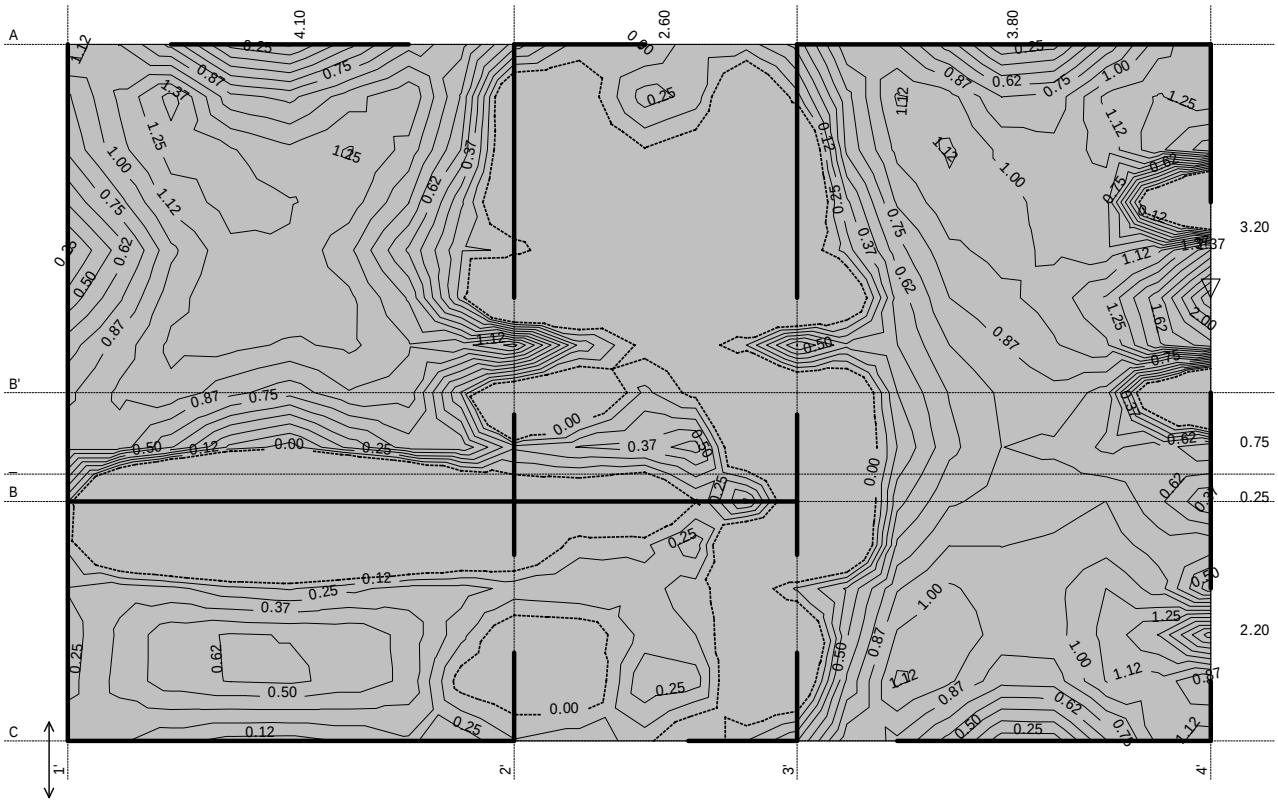
Reakcije podpor

Merodajna obtežba: 1.35xI+1.50xII
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=3.50 cm



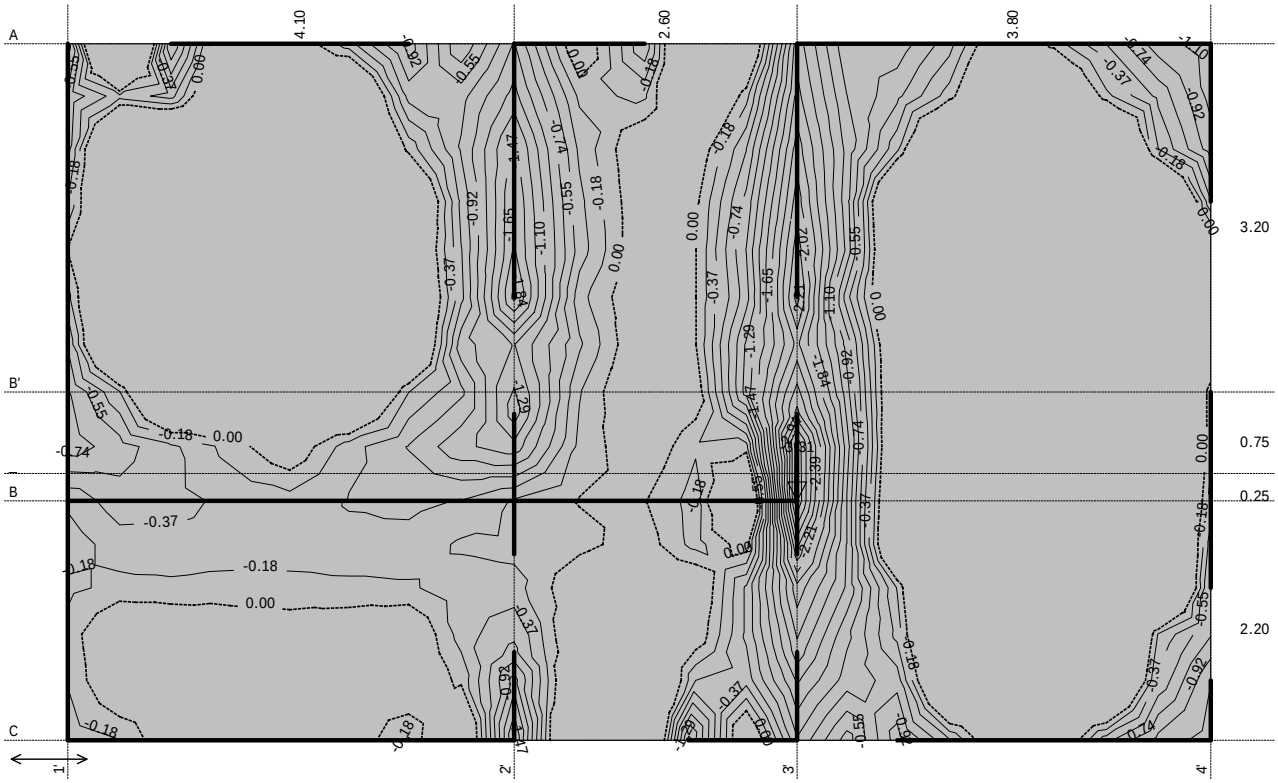
Aa - sp.cona - Smer 1 - max Aa1,s= 2.28 cm²/m

Merodajna obtežba: 1.35xI+1.50xII
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=3.50 cm



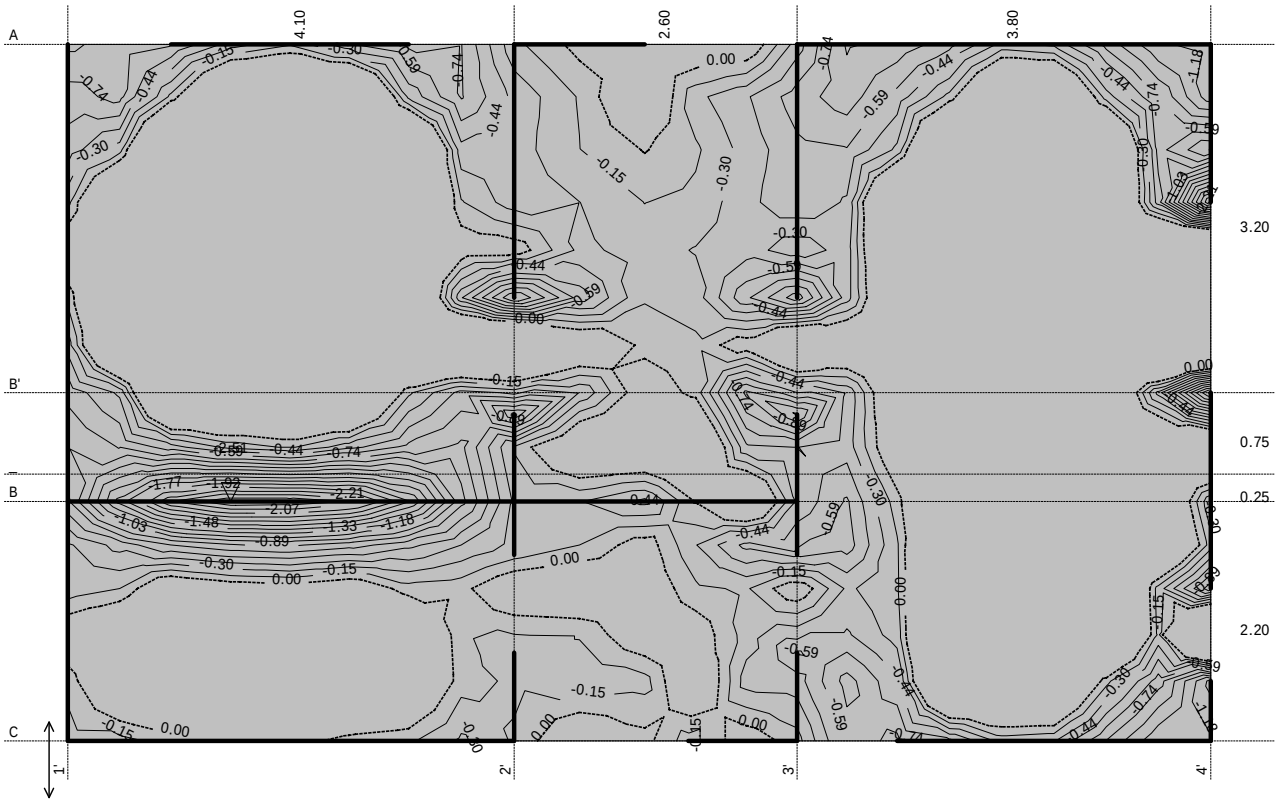
Aa - sp.cona - Smer 2 - max Aa2,s= 2.37 cm²/m

Merodajna obtežba: 1.35xI+1.50xII
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=3.50 cm



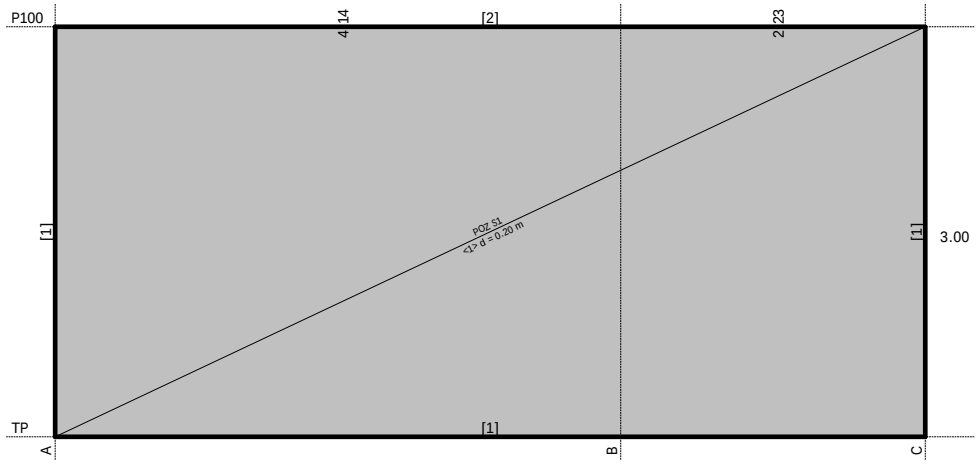
Aa - zg.cona - Smer 1 - max Aa1,z= -3.31 cm²/m

Merodajna obtežba: 1.35xI+1.50xII
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=3.50 cm



Aa - zg.cona - Smer 2 - max Aa2,z= -2.51 cm²/m

AB VKOPANA STENA V PRITLIČJU



Okvir: H_1

Tabele materialov

No	Naziv materiala	E[kN/m2]	μ	γ[kN/m3]	αt[1/C]	Em[kN/m2]	μm
1	Beton C 25	2.583e+7	0.20	25.00	1.000e-5	2.583e+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			

Seti linijskih podpor

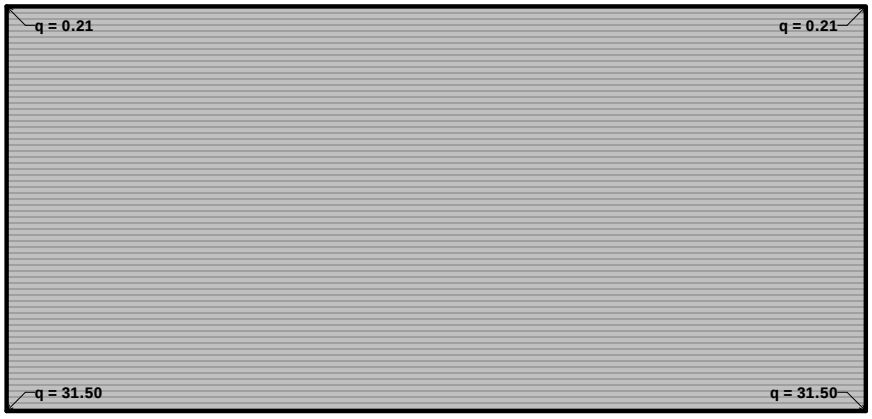
Set	K,R1	K,R2	K,R3	K,M1	Tla [m]
1	1.000e+10	1.000e+10	1.000e+10		
2			1.000e+10		

Lista obtežnih primerov

LC	Naziv
1	Stalna (g)
2	Zemljina

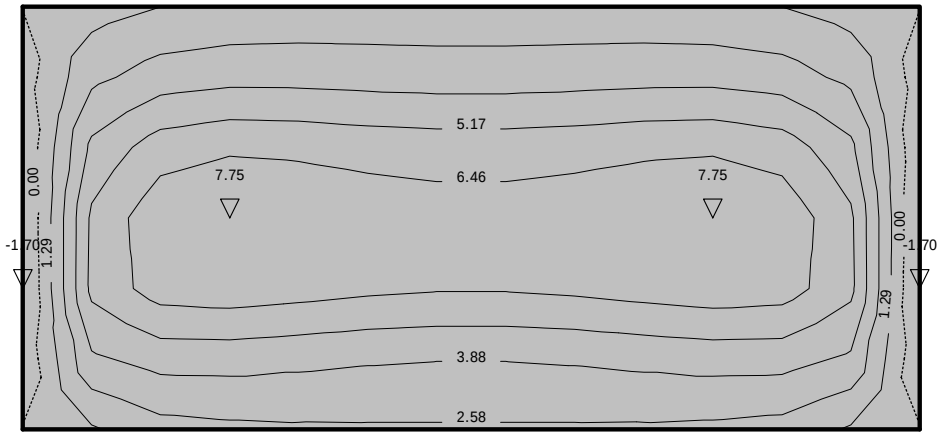
LC	Naziv
3	Komb.: I+1.5xII

Obt. 2: Zemljina



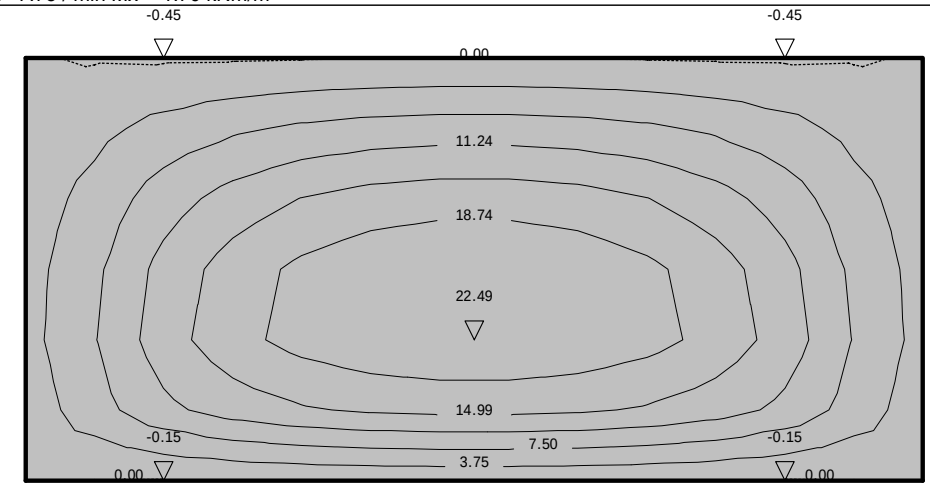
Okvir: H_1

Obt. 3: I+1.5xII



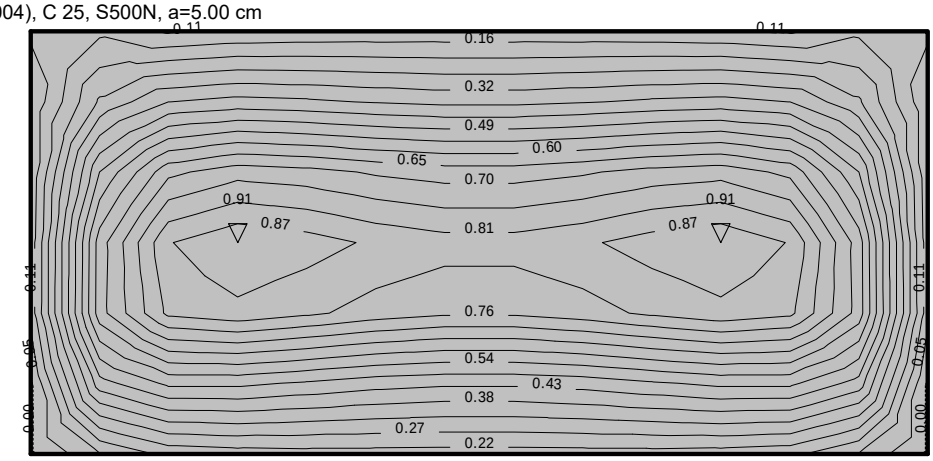
Okvir: H_1
Vplivi v plošči: max Mx= 7.75 / min Mx= -1.70 kNm/m

Obt. 3: I+1.5xII



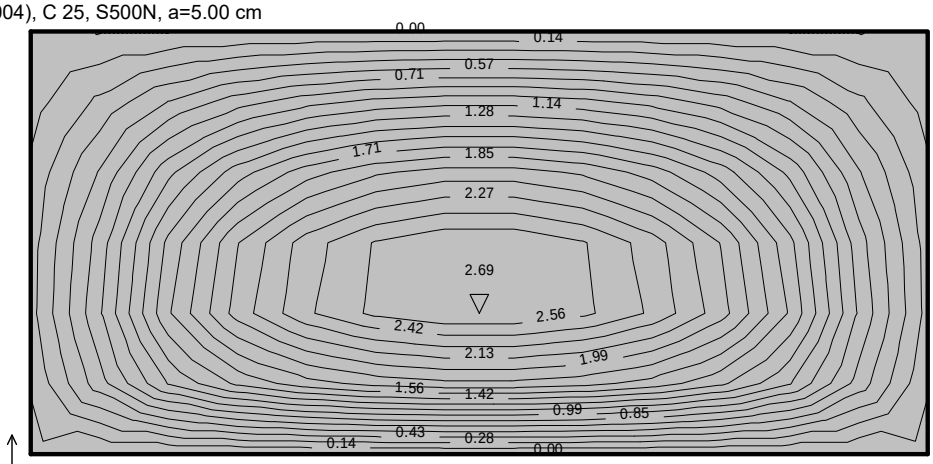
Okvir: H_1
Vplivi v plošči: max My= 22.49 / min My= -0.45 kNm/m

Merodajna obtežba: I+1.50xII
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm



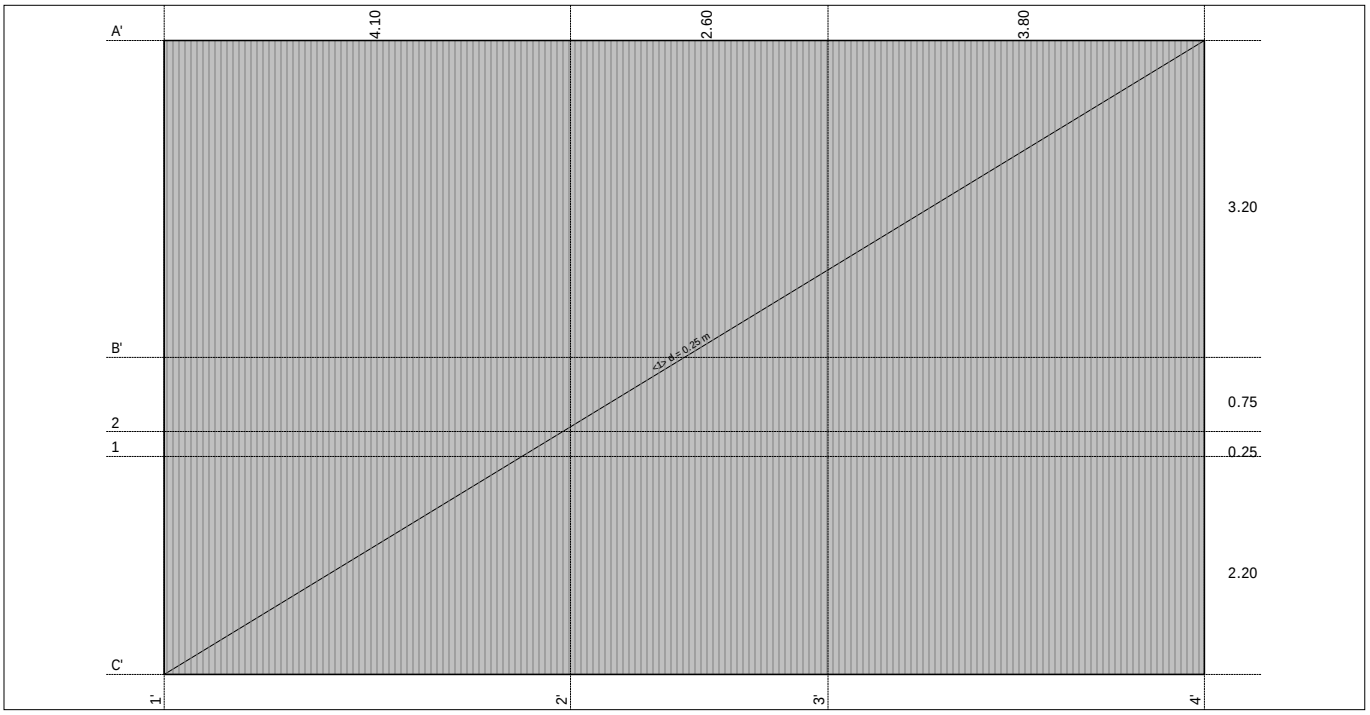
Okvir: H_1 ⟷
Aa - sp.cona - Smer 1 - max Aa1,s= 0.91 cm²/m

Merodajna obtežba: I+1.50xII
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm



Okvir: H_1 ↕
Aa - sp.cona - Smer 2 - max Aa2,s= 2.69 cm²/m

OBJEKT SENIK
AB TEMELJNA PLOŠČA



Tabele materialov

No	Naziv materiala	E[kN/m2]	μ	γ[kN/m3]	αt[1/C]	Em[kN/m2]	μm
1	Beton 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>	0.250	0.125	1	Tanka plošča	Izotropna			

Seti površinskih podpor

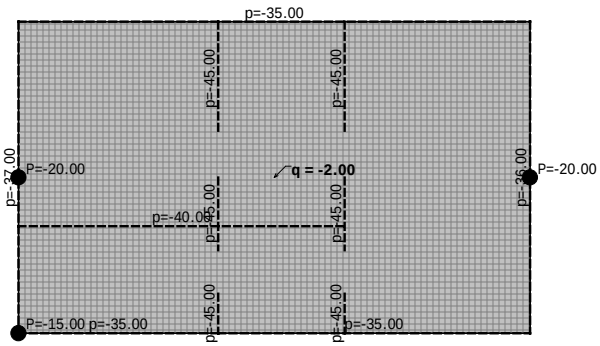
Set	K,R1	K,R2	K,R3
1	7.500e+3	7.500e+3	1.000e+4

Lista obtežnih primerov

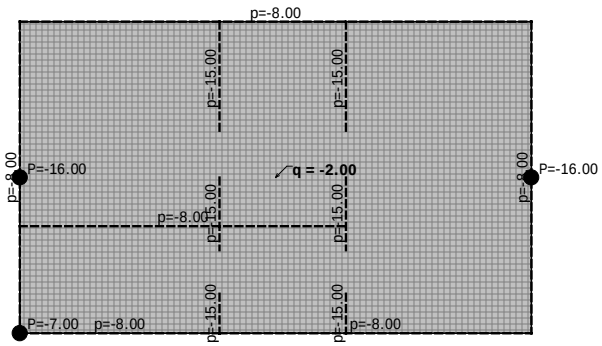
LC	Naziv
1	Stalna (g)
2	Koristna

LC	Naziv
3	Komb.: 1.35xI+1.5xII
4	Komb.: I+II

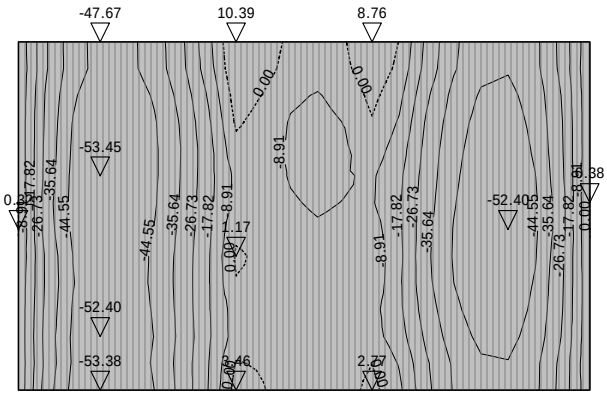
Obt. 1: Stalna (g)



Obt. 2: Koristna

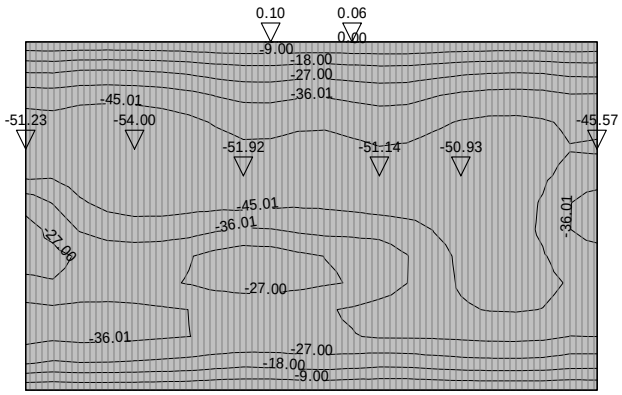


Obt. 3: 1.35xI+1.5xII



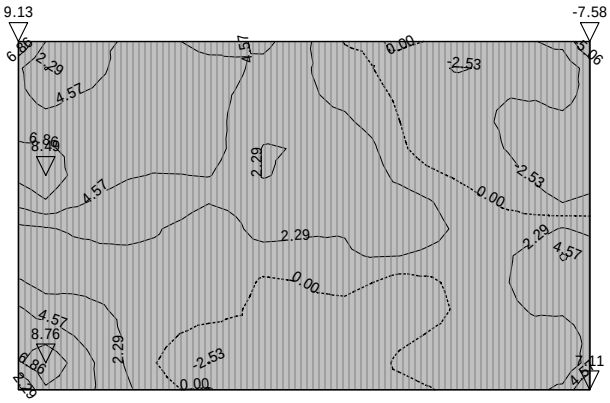
Vplivi v plošči: max Mx= 10.39 / min Mx= -53.45 kNm/m

Obt. 3: 1.35xI+1.5xII



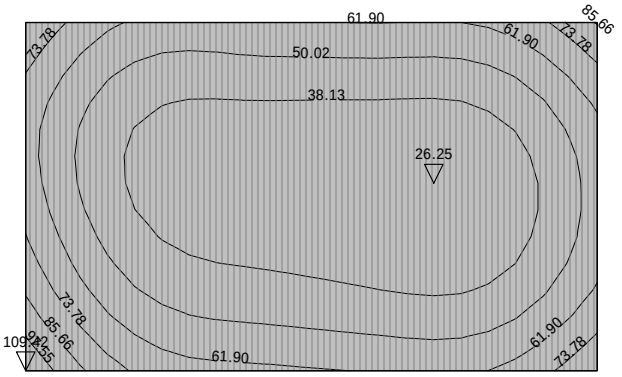
Vplivi v plošči: max My= 0.10 / min My= -54.00 kNm/m

Obt. 3: 1.35xI+1.5xII



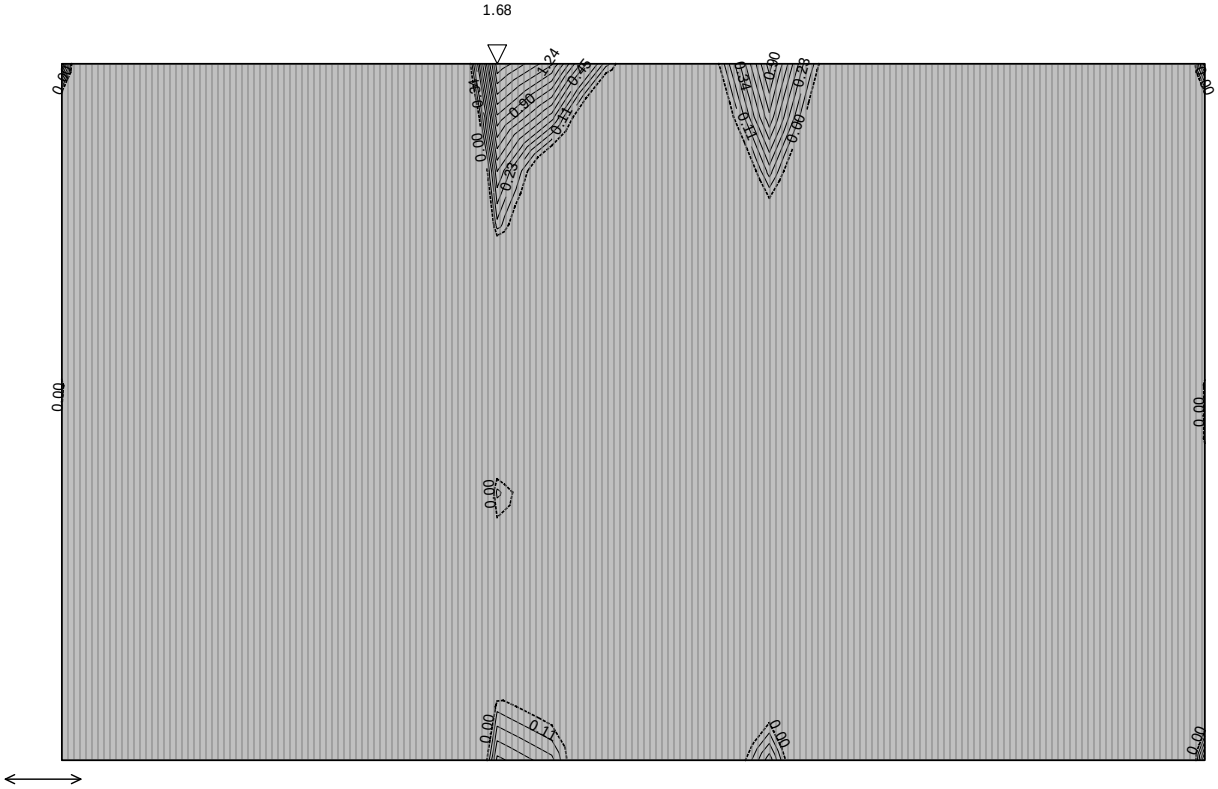
Vplivi v plošči: max Mxy= 9.13 / min Mxy= -7.58 kNm/m

Obt. 4: I+II



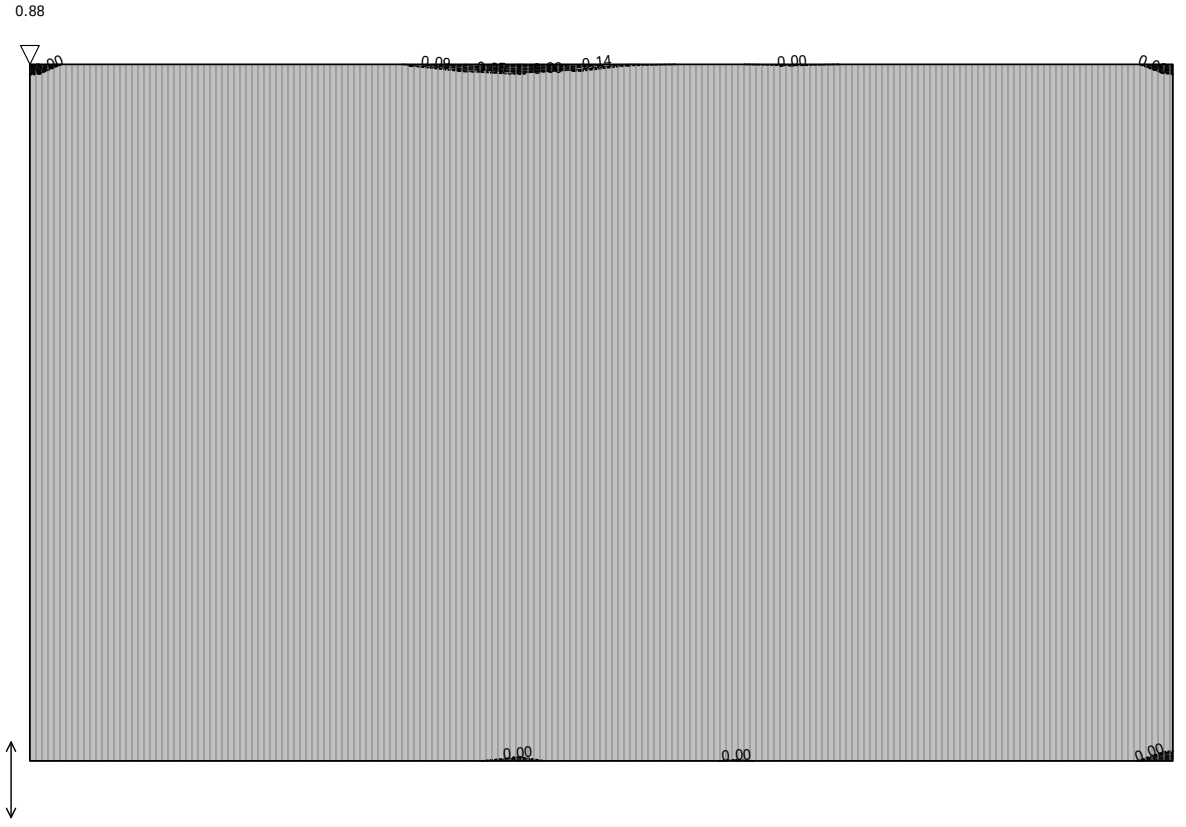
Vplivi v pov.podpori: max σ,tal= 109.42 / min σ,tal= 26.25 kN/m²

Merodajna obtežba: 1.35xI+1.50xII
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm



Aa - sp.cona - Smer 1 - max Aa1,s= 1.68 cm²/m

Merodajna obtežba: 1.35xI+1.50xII
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

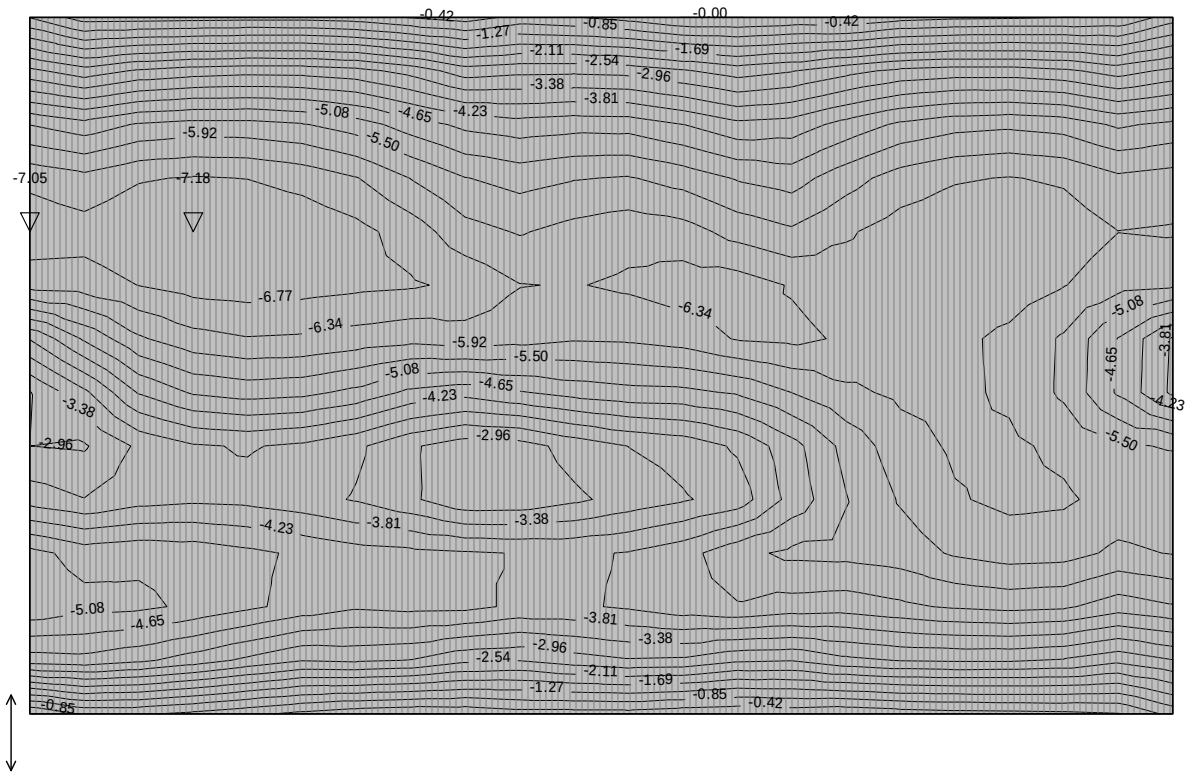


Aa - sp.cona - Smer 2 - max Aa2,s= 0.88 cm²/m

Merodajna obtežba: 1.35xI+1.50xII
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm

Aa - zg.cona - Smer 1 - max Aa1,z= -7.09 cm²/m

Merodajna obtežba: 1.35xI+1.50xII
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm



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

POTRESNA ANALIZA OBJEKTA

Objekt:	Bratuševa domačija - senik
Lokacija:	Bistrica ob Sotli
Konstrukcija:	opečna (pritlična etaža)
Projektni pospešek tal:	0,20g
Tip tal:	C
Kategorija pomembnosti:	II

Upoštevani standardi:

- SIST EN 1990: Osnove projektiranja
- SIST EN 1991-1-1: Prostorninska teža, lastna teža, koristne obtežbe stavb
- SIST EN 1991-1-3: Obtežba snega
- SIST EN 1991-1-4: Obtežba vetra
- SIST EN 1998-1: Projektiranje potresno odpornih konstrukcij - 1. del: Splošna pravila, potresni vplivi in pravila za stavbe
- SIST EN 1998-3: Projektiranje potresno odpornih konstrukcij - 3. del: Ocena in prenova stavb

Pritlična etaža, ki je v masivni opečni izvedbi, je analizirana z nelinearno statično analizo, kjer je vpliv lesene nadstropne etaže in ostrešja upoštevan kot dodatna obtežba.

Opis računske metode in programa

Računska metoda, ki je bila uporabljena v analizi potresne odpornosti zidane zgradbe temelji na nelinearni statični analizi z več prostostnimi stopnjami, kjer horizontalno obtežbo enakomerno povečujemo in ob tem upoštevamo pojav plastičnih členkov na računskem modelu konstrukcije (nelinearna statična analiza, angl. »push-over«). Ko se pojavi zadostno število plastičnih členkov, nastane plastični mehanizem, obnašanje konstrukcije pa opišemo s krivuljo, ki se imenuje histereza in prikazuje silo v odvisnosti od pomika. Pri tej metodi se potresna obremenitev določi iz projektnega spektra. Postopek se imenuje N2 metoda in je vključena v evropski standard Evrokod 8 ter je primerna za projektiranje novih objektov in oceno obnašanja obstoječih.

Seizmična analiza je izdelana z računalniškim programom 3Muri, ki je namenjen nelinearni statični analizi obstoječih in novih zidanih konstrukcij. Program poleg linearne statične in modalne analize omogoča določitev odpornosti konstrukcije pri potresni obtežbi v skladu z N2 metodo.

Matematični model konstrukcije v programu temelji na metodi FME (angl. »Frame by Macro Elements«). Stene zidanih stavb so modelirane z ekvivalentnim okvirjem. Ekvivalentni okvir določajo nelinearni makroelementi; slopi, prekladni in parapetni vodoravni ter togi odseki, ki ostale elemente med seboj povezujejo. Obnašanje slopov, prekladnih in parapetnih elementov se modelira z linijskimi elementi z dvema vozliščema. Povezave le-teh s togimi odseki, ki

omogočajo prenos statičnih in kinematičnih količin med vozlišči elementov, formirajo ekvivalentni okvir. Takšno modeliranje zidane stene z okvirjem dovolj natančno opiše njeno obnašanje ter omogoča redukcijo prostostnih stopenj.

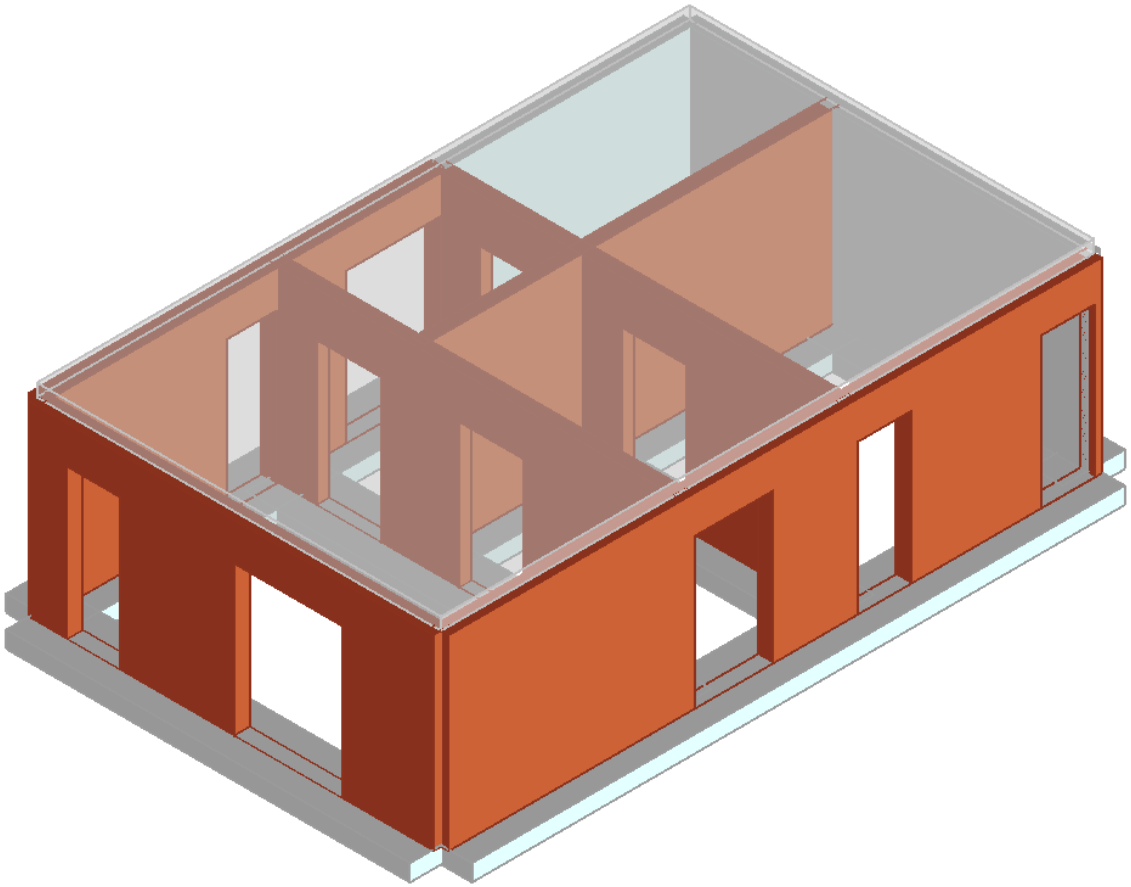
Nelinearna statična analiza

Predpogoj za začetek nelinearne statične analize je generiranje ekvivalentnega okvirja, ki ga program sam ustvari na osnovi geometrije vstavljenih elementov. Po tem koraku se ustvari mreža makroelementov, kjer je mogoča tudi naknadna modifikacija le-teh. Naslednja faza računske analize je nelinearna statična analiza, pri kateri so vodeni pomiki, monotono naraščajoča obtežba pa se na konstrukcijo razporedi ob upoštevanju masne ali modalne razporeditve.

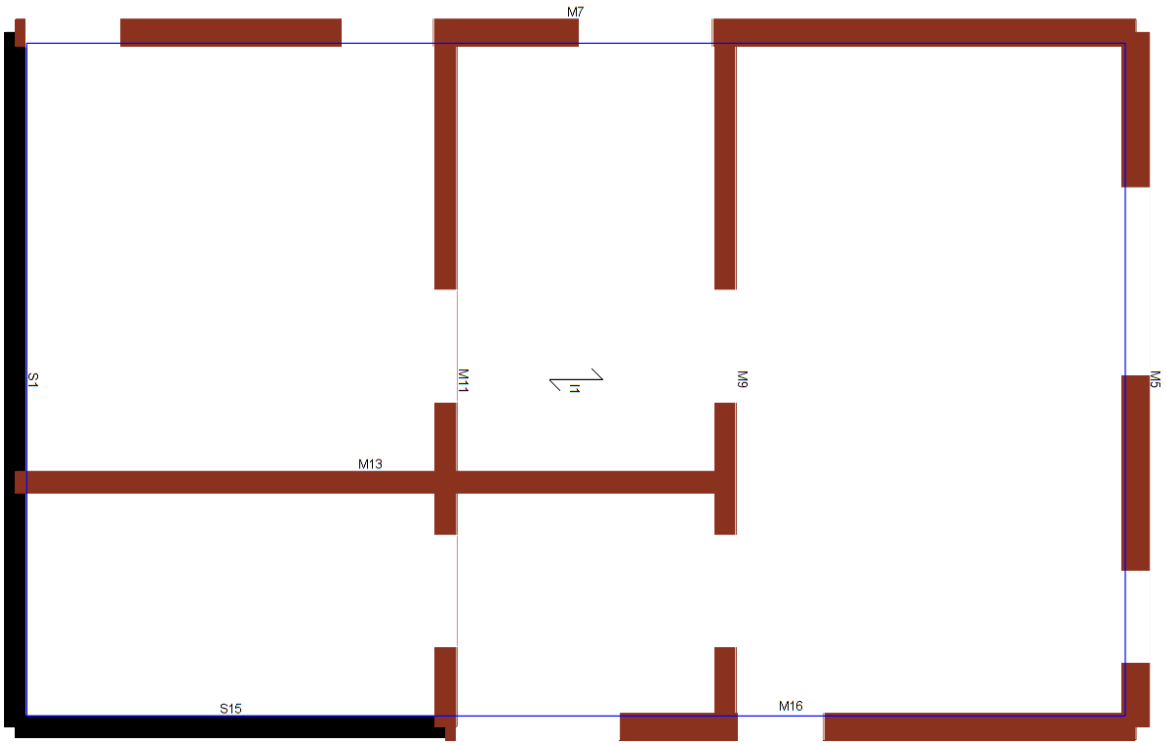
Obtežba je podana v skladu s SIST EN 1998-1 in zahteva podatek o vrednosti pospeška temeljnih tal, tipu tal ter vrednosti faktorja pomembnosti. Program maso in potresne sile razporedi po vseh vozliščih etaž.

Rezultat nelinearne statične analize je pushover krivulja, kjer je prikazana odvisnost prečne sile ob vpetju od pomika kontrolne točke. Na podlagi pushover krivulje je z določili N2 metode dobljena kapaciteta, s katero je izražena potresna odpornost konstrukcije. Na podlagi krivulje kapacitete program poda še bilinearni diagram ob upoštevanju N2 metode. Program omogoča opazovanje mehanizma porušitve in stopnjo poškodovanosti za vsak element v vsakem koraku analize.

3D model pritlične etaže objekta



Tloris pritličja



Materialne karakteristike

Zidovi

Name	E [N/mm2]	G [N/mm2]	Specific weight [kN/m3]	fm [N/mm2]	Shear resistance [N/mm2]
Modularni opečni blok MO15	5.000,00	500,00	14	5,50	0,20

Beton

Name	E [N/mm2]	G [N/mm2]	Specific weight [kN/m3]	fcm [N/mm2]	fck [N/mm2]
C25/30	31.000,00	12.917,00	25	33,00	0,25

Armaturno jeklo

Name	E [N/mm2]	G [N/mm2]	Specific weight [kN/m3]	fym [N/mm2]	fyk [N/mm2]
B500	200.000,00	76.923,00	79	538,00	5,00

Vertikalni nosilni elementi – **pritličje:**

Opečni zidovi

No.	Wall	Material	Reinforcement	Elevation [m]	Height [cm]	Thickness [cm]
16	2	Opecni zid (MO10 MM5)	-	3,000	3,000	25
5	3	Opecni zid (MO10 MM5)	-	3,000	3,000	25
7	4	Opecni zid (MO10 MM5)	-	3,000	3,000	25
9	5	Opecni zid (MO10 MM5)	-	3,000	3,000	20
11	6	Opecni zid (MO10 MM5)	-	3,000	3,000	20
13	7	Opecni zid (MO10 MM5)	-	3,000	3,000	20

Armiranobetonske stene

No.	Wall	Concrete material	Steel material	Elevation [m]	Height [cm]	Thickness [cm]
1	1	C25/30	B500	3,000	300	20
15	2	C25/30	B500	3,000	300	20

No.	Wall	Horiz. rebars diameter [mm]	Horiz. rebar average spacing [cm]	Horiz. rebar end spacing [cm]	Side b rebars diameter [mm]	Side b rebars spacing [cm]	Side b rebar concrete cover [cm]
1	1	8	15	15	8	15	3
15	2	8	15	15	8	15	3

Mehanske karakteristike zidovja, ki so upoštevane v izračunu potresne odpornosti:

Zidovje iz polne opeke

kar. tlačna trdnost: ***f_{ck} = 4,5 MPa***
natezna trdnost: ***τ = 0,20 MPa***
modul elastičnosti: ***E = 5000 MPa***
strižni modul: ***G = 500 MPa***

V programu je upoštevan materialni varnostni faktor γ_m = 1,5.

Vplivi

Za določitev potresnega vpliva upoštevamo težnostne sile (mase) z naslednjo kombinacijo:

$$\sum G_{kj} \text{ "+" } \sum \Psi_{Ei} \cdot Q_{ki}$$

kjer je:

G_{kj} karakteristična vrednost stalnega vpliva j,

Q_{ki} karakteristična vrednost spremenljivega vpliva i,

Ψ_{Ei} koeficient za kombinacijo za spremenljiv vpliv i.

Koeficienti Ψ_{Ei} upoštevajo verjetnost, da obtežba Q_{ki} med potresom ni prisotna po celi konstrukciji in jih izračunamo z izrazom:

$$\Psi_{Ei} = \varphi \cdot \Psi_{2i} .$$

Upoštevani varnostni faktorji:

- lastna teža $\gamma_G = 1.00$
- kombinacijski faktor za potres $\Psi_2 = 0.30$
- koristna obtežba $\gamma_Q = \varphi \cdot \Psi_2$

Pri določanju projektnega potresnega vpliva smo upoštevali v celotnem iznosu vse mase, ki so povezane s težnostnimi silami. Mase, ki izhajajo iz spremenljivega vpliva, smo zmanjšali s faktorjem ψ_{Ei} . Faktor ψ_{Ei} je določen s produktom ψ_{2i} in koeficientom φ .

No. Floor	Gk1 [kN/m2]	Gk2 [kN/m2]	Qk [kN/m2]	leading variable action	ϕ	ψ0	ψ2
1	9,00	0,00	2,00	No	1,00	0,70	0,30

Potresni vpliv

Skladno s SIST EN 1998 je spekter odziva definiran z maksimalnim pospešekom tal in tipom tal, glede na lokacijo objekta.

agR (SD)	Soil type	S	Tb	Tc	Td	I
1,96	C	1,15	0,20	0,60	2,00	1,00

agR (DL)	Soil type	S	Tb	Tc	Td	I
0,98	C	1,15	0,20	0,60	2,00	1,00

Za ugotavljanje zadostne potresne odpornosti konstrukcije, program primerja mejni pomik kapacitete konstrukcije in maksimalni pomik, ki ga narekuje potresni vpliv. V skladu s standardom SIST EN 1998-3 je opravljena kontrola za mejno stanje velikih poškodb (SD), ki približno ustreza mejnemu stanju nosilnosti v skladu s SIST EN 1998-1 ter dodatno za mejno stanje omejitve poškodb (DL).

Mejno stanje velikih poškodb SD (10% verjetnost prekoračitve v 50 letih):

- *Konstrukcija je pomembno poškodovana, ima še nekaj preostale nosilnosti in togosti, vertikalni elementi so še sposobni prenašati vertikalno obtežbo. Nekonstrukcijski elementi so poškodovani, vendar predelne stene in polnila še niso padli iz svoje ravnine. Pojavile so se zmerne trajne deformacije. Konstrukcija lahko prenese popotresne sunke*

zmerne jakosti, verjetno pa je, da konstrukcije ekonomsko ni smiselno popravljati.

$$d_t^{SD} \leq d_m^{SD}$$

d_t^{SD}: ciljni pomik (zahteva standarda)

d_m^{SD}: kapaciteta konstrukcije izražena s pomikom pri mejnem stanju SD

Mejno stanje omejitve poškodba DL (10% verjetnost prekoračitve v 10 letih):

- *Konstrukcija je le lažje poškodovana. Ne pride do pomembne plastifikacije nosilnih elementov, ki obdržijo svojo nosilnost in togost. Pri nekonstrukcijskih elementih, kot so predelne stene in polnila, se lahko pojavijo enakomerne razpoke, vendar je poškodbe mogoče ekonomično popraviti. Trajne deformacije so zanemarljivo majhne, popravila na konstrukciji niso potrebna.*

$$S_d(T^*) \leq d_y^*$$

$S_d(T^*)=^L$: ciljni pomik v času T=T* (zahteva standarda)

d_y^*: pomik na meji tečenja ekvivalentnega sistema SDOF

<u>Potresna ranljivost</u>

Za vsako obravnavano mejno stanje se izračuna indeks tveganja α (α_{SD}, α_{DL}):

$$\alpha_{SD} = \frac{PGA_{CSD}}{PGA_{DSD}}$$

$$\alpha_{DL} = \frac{PGA_{CDL}}{PGA_{DDL}} \quad ;$$

PGA_{CSD} : kapaciteta konstrukcije za mejno stanje SD

PGA_{CDL} : kapaciteta konstrukcije za mejno stanje DL

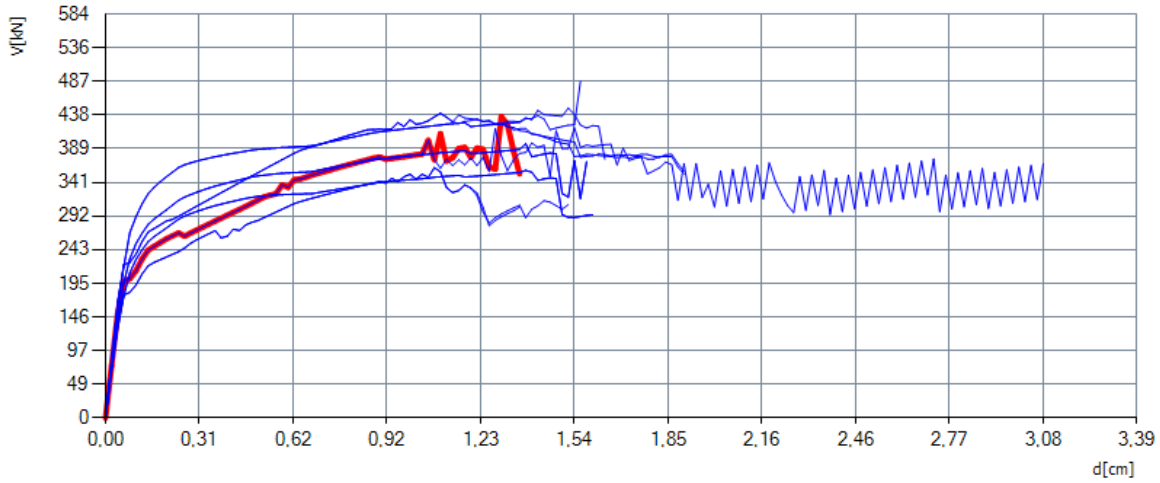
Kapaciteta konstrukcije je izražena z maksimalnim pospeškom, ki ga je konstrukcija sposobna prenesti.

PGA_{DSD} : projektni pospešek tal za mejno stanje SD (zahteva standarda)

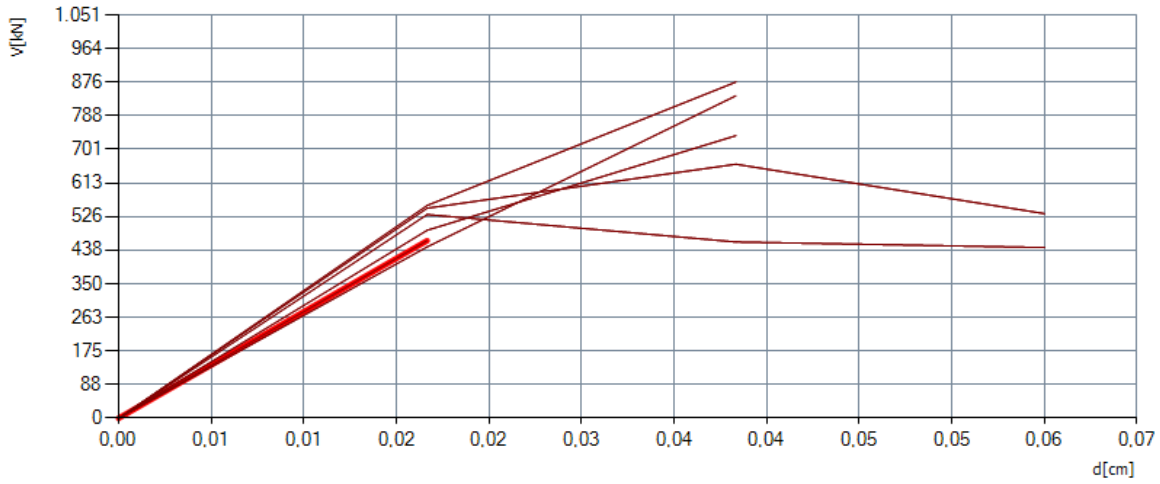
PGA_{DDL} : projektni pospešek tal za mejno stanje DL (zahteva standarda)

Rezultati

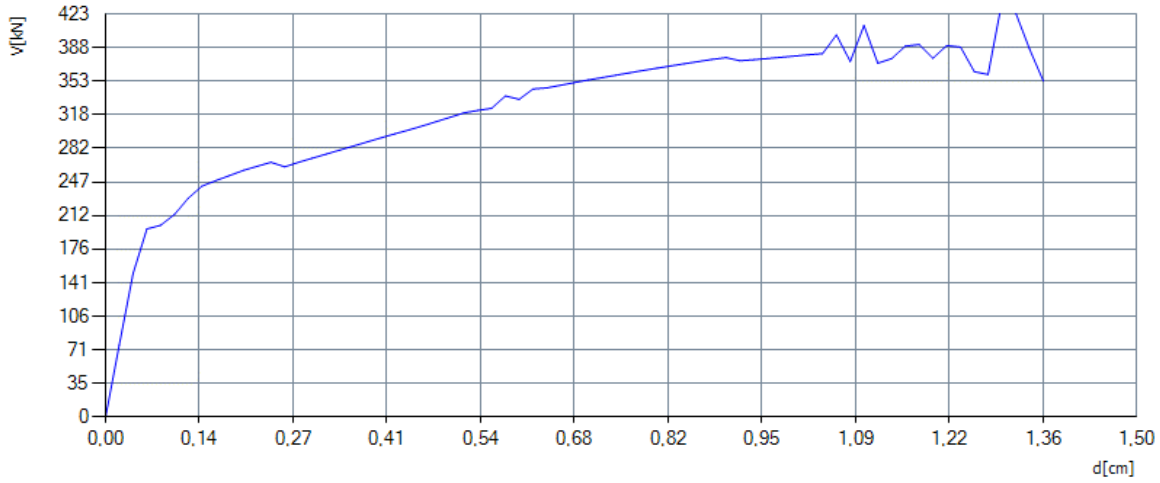
Prikaz histereznih ovojnic vseh analiz za smer X



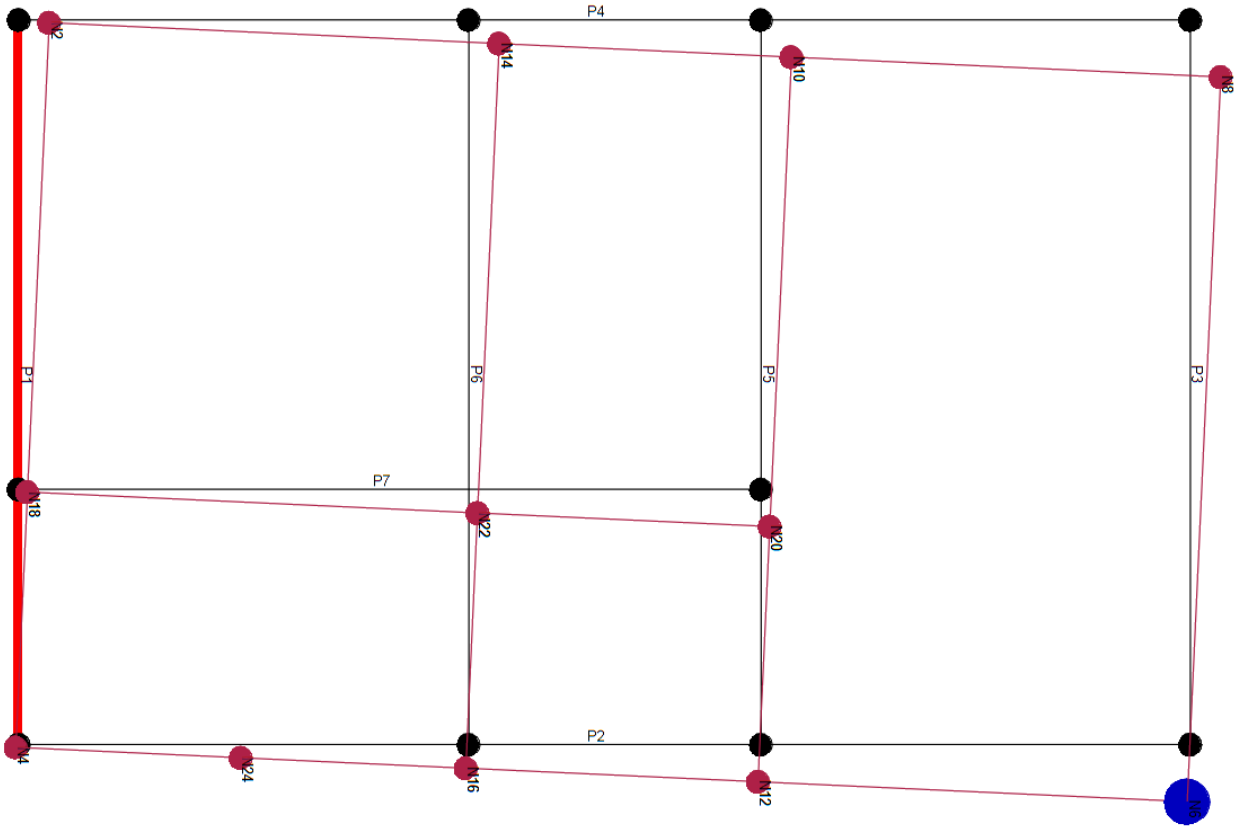
Prikaz histereznih ovojnic vseh analiz za smer Y



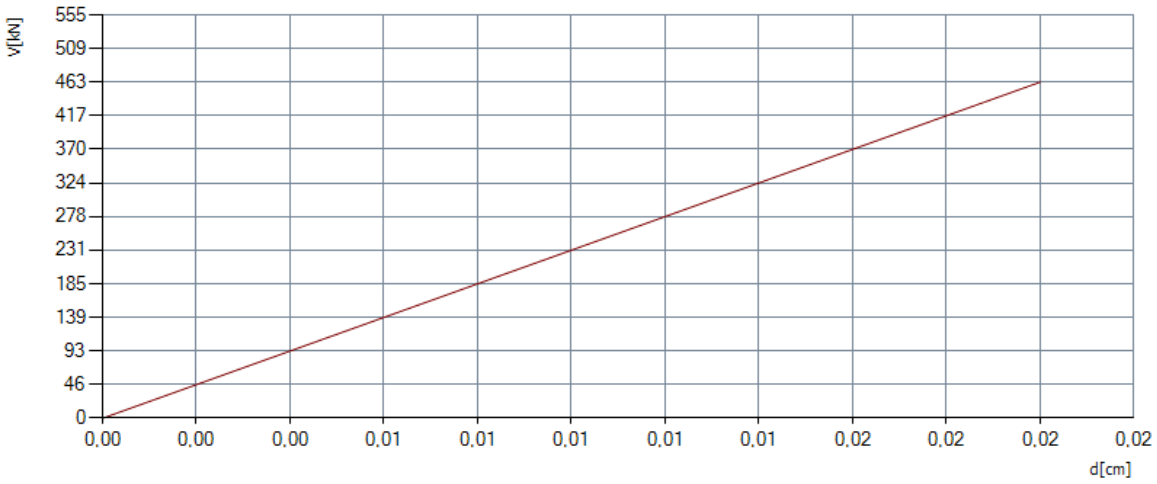
Histerezna ovojnica za kritično analizo – smer X:



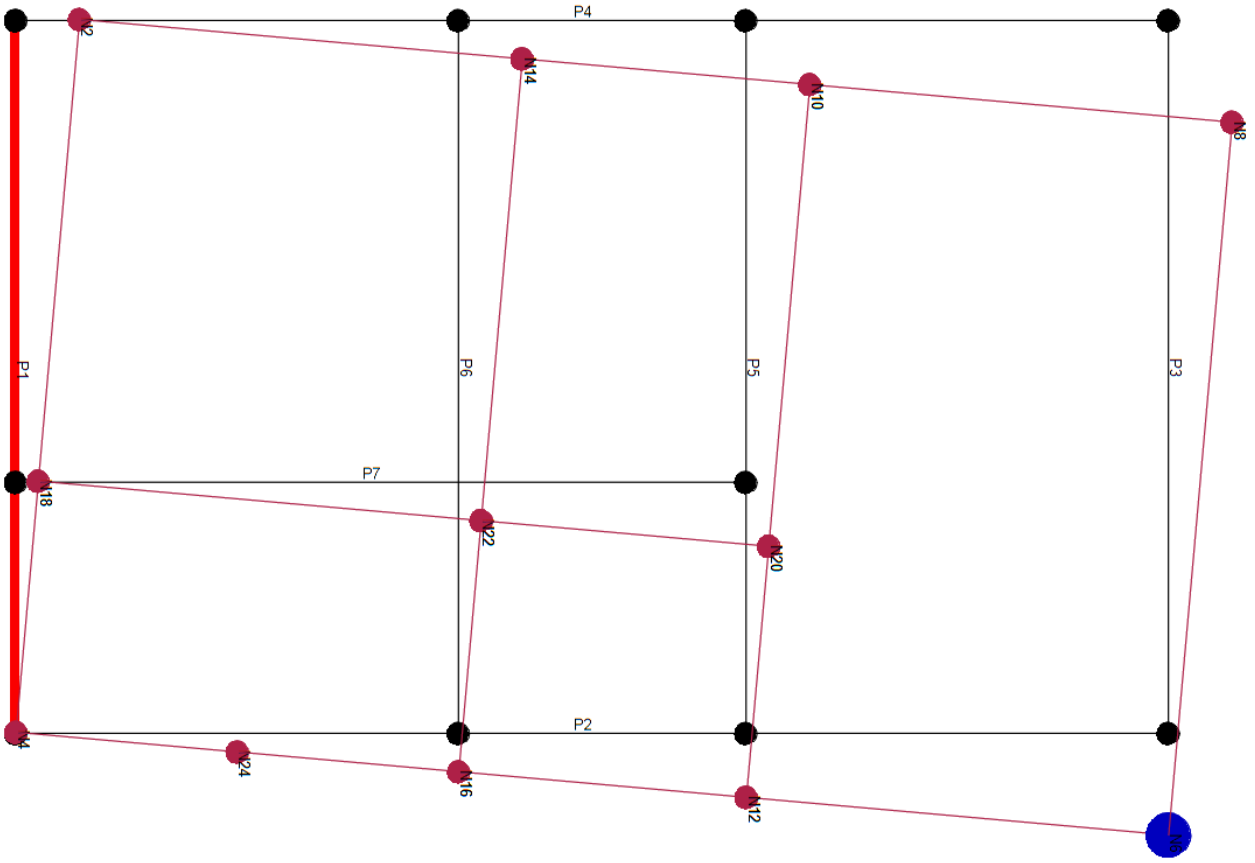
Deformacija nadstropne etaže pri kritični analizi – smer X



Histerezna ovojnica za kritično analizo – smer Y:

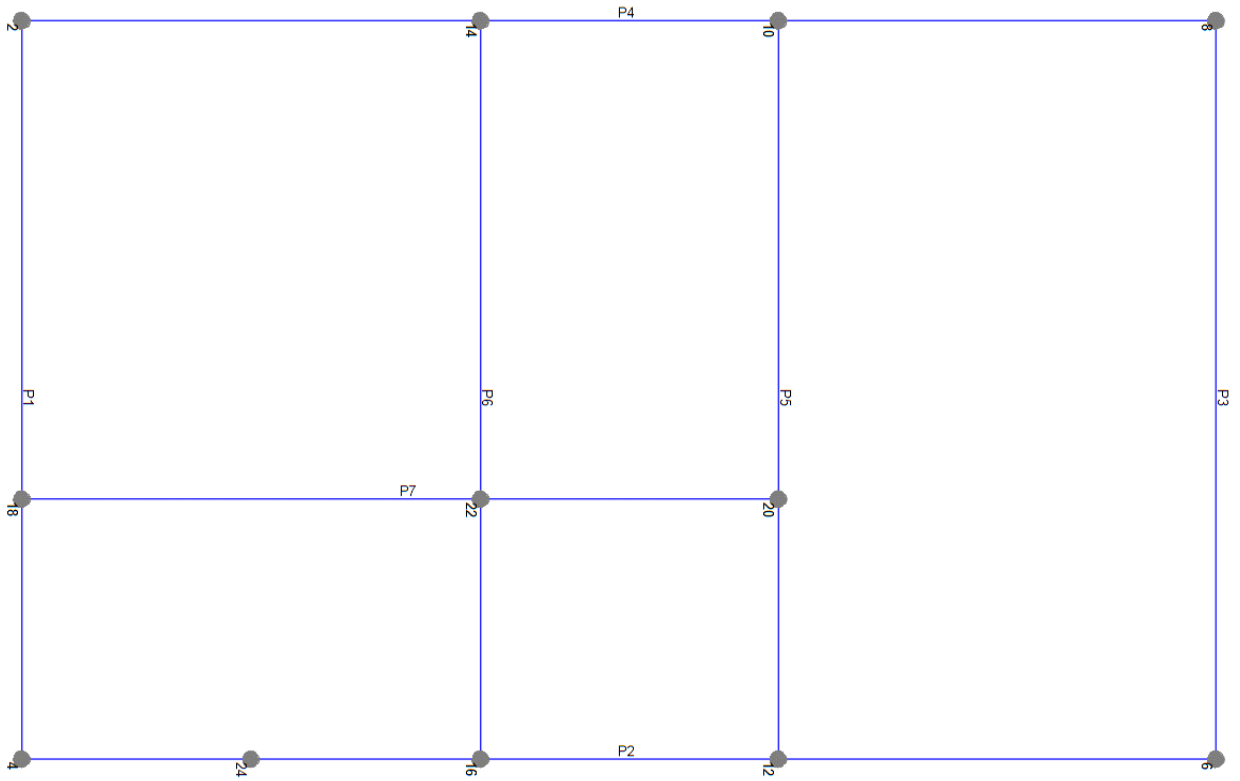


Deformacija nadstropne etaže pri kritični analizi – smer Y



Prikaz poškodb pri kritični analizi

Dispozicija sten – (tloris pritličja):



Legenda

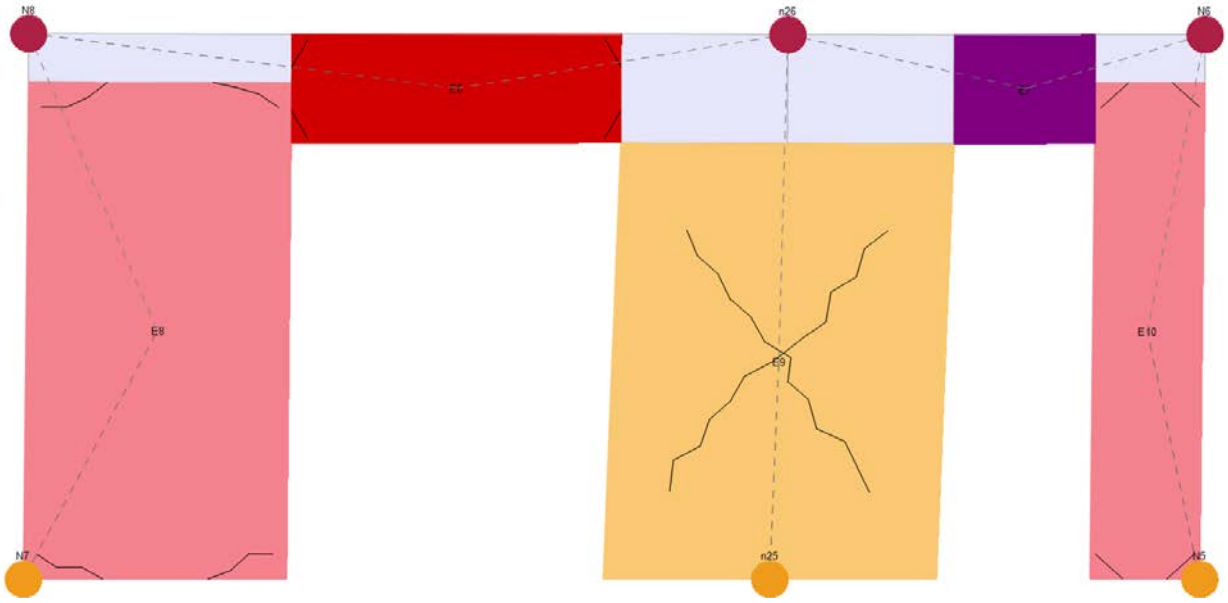
R.C.

	Undamaged
	Shear failure
	Bending damage
	Bending failure
	Compression failure
	Tension failure
	Shear failure

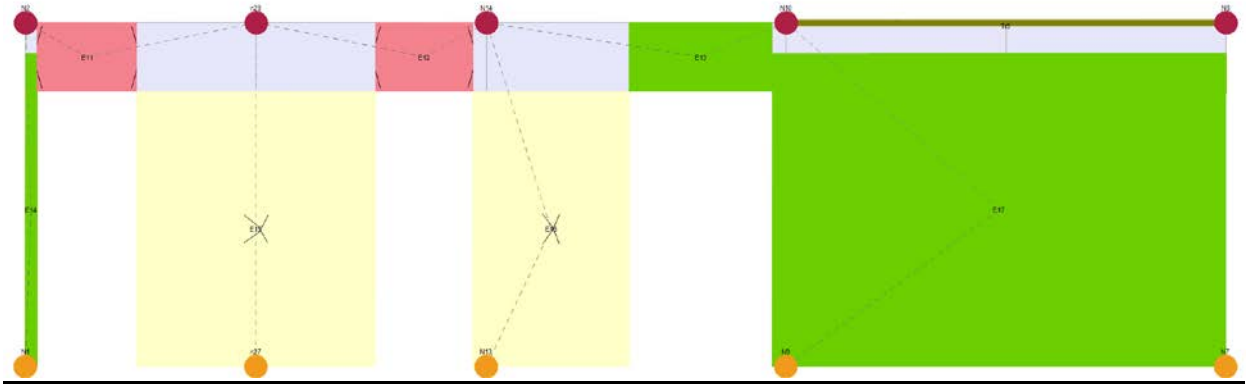
Masonry

	Undamaged
	Shear damage
	Bending damage
	Shear failure
	Bending failure
	Compression failure
	Tension failure
	Failure during elastic phase

Zid P3 (analiza 1, smer X):



Zid P4 (analiza 5, smer Y):



Rezultati vseh analiz za mejni stanji SD in DL

No.	Seism dir.	Seismic load	Ecc. [cm]	dt SD [cm]	dm SD [cm]	α SD
1	+X	Uniform	0	0,52	1,02	1,429
2	+X	Static forces	0	0,46	2,31	2,133
3	-X	Uniform	0	0,13	1,18	3,046
4	-X	Static forces	0	0,13	1,18	3,046
5	+Y	Uniform	0	0,01	0,01	1,420
6	+Y	Static forces	0	0,01	0,01	1,420
7	-Y	Uniform	0	0,01	0,05	2,739
8	-Y	Static forces	0	0,01	0,05	2,739
9	+X	Uniform	52	0,36	1,02	1,484
10	+X	Uniform	-52	0,31	1,43	2,077
11	+X	Static forces	52	0,36	1,14	1,556
12	+X	Static forces	-52	0,31	1,43	2,076
13	-X	Uniform	52	0,14	1,20	2,814
14	-X	Uniform	-52	0,10	1,23	4,041
15	-X	Static forces	52	0,14	1,20	2,814
16	-X	Static forces	-52	0,14	1,17	2,797
17	+Y	Uniform	32	0,01	0,03	2,635
18	+Y	Uniform	-32	0,01	0,03	3,235
19	+Y	Static forces	32	0,01	0,03	2,635
20	+Y	Static forces	-32	0,01	0,03	3,235
21	-Y	Uniform	32	0,01	0,03	2,748
22	-Y	Uniform	-32	0,01	0,05	2,231
23	-Y	Static forces	32	0,01	0,03	2,748
24	-Y	Static forces	-32	0,01	0,05	2,231

Povzetek **rezultatov kritičnih analiz** za mejno stanje SD:

	ag	dt^{SD} [cm]	dm^{SD} [cm]	PGA_{CSD}	α_{SD}
smer X	0,20g	0,52	1,02	0,29g	**1,43**
smer Y	0,20g	0,01	0,01	0,28g	**1,42**

Rezultati vseh analiz za mejno stanje DL

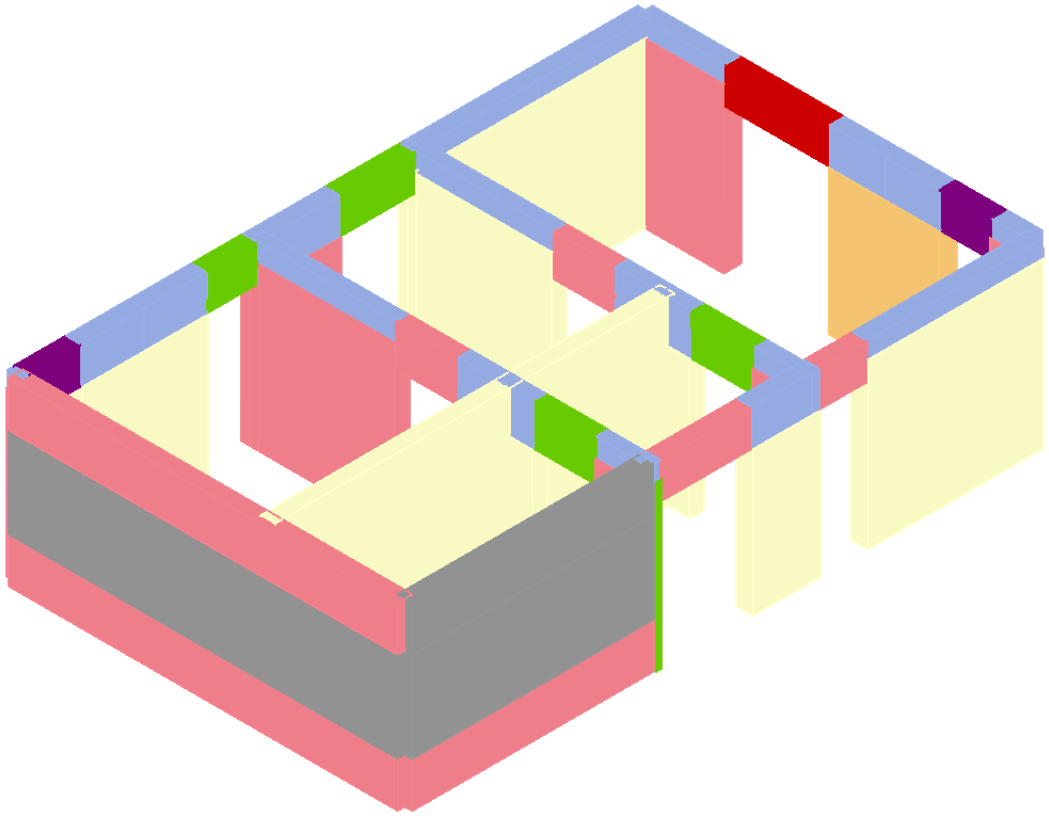
No.	Seism dir.	Seismic load	Ecc. [cm]	Sd DL [cm]	d*y DL [cm]	α DL
1	+X	Uniform	0	0,18	0,45	2,440
2	+X	Static forces	0	0,17	0,36	2,165
3	-X	Uniform	0	0,05	0,13	2,763
4	-X	Static forces	0	0,05	0,13	2,763
5	+Y	Uniform	0	0,01	0,04	3,792
6	+Y	Static forces	0	0,01	0,04	3,792
7	-Y	Uniform	0	0,01	0,05	5,052
8	-Y	Static forces	0	0,01	0,05	5,052
9	+X	Uniform	52	0,13	0,27	2,085
10	+X	Uniform	-52	0,11	0,30	2,663
11	+X	Static forces	52	0,13	0,26	2,062
12	+X	Static forces	-52	0,11	0,30	2,658
13	-X	Uniform	52	0,05	0,12	2,464
14	-X	Uniform	-52	0,04	0,12	3,229
15	-X	Static forces	52	0,05	0,12	2,464
16	-X	Static forces	-52	0,05	0,15	3,102
17	+Y	Uniform	32	0,01	0,09	7,033
18	+Y	Uniform	-32	0,01	0,07	6,841
19	+Y	Static forces	32	0,01	0,09	7,033
20	+Y	Static forces	-32	0,01	0,07	6,841
21	-Y	Uniform	32	0,01	0,06	5,478
22	-Y	Uniform	-32	0,01	0,04	3,967
23	-Y	Static forces	32	0,01	0,06	5,478
24	-Y	Static forces	-32	0,01	0,04	3,967

Povzetek **rezultatov k**ritičnih analiz za mejno stanje DL:

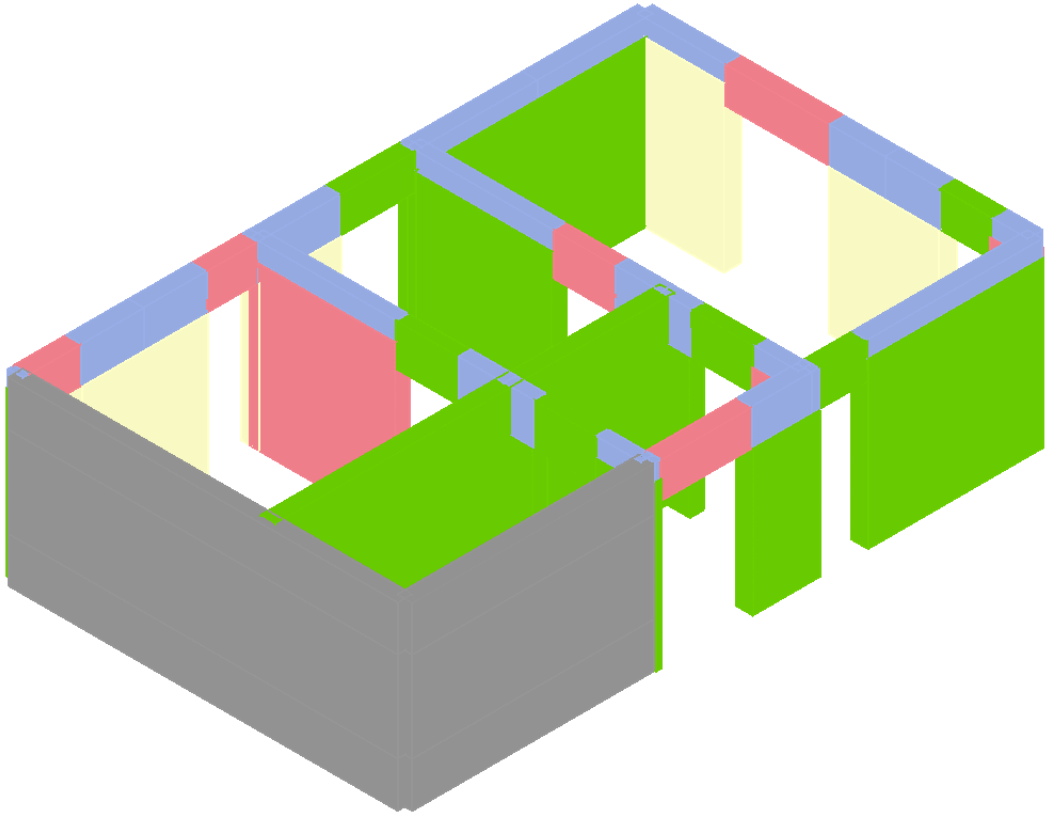
	ag	dt^{DL} [cm]	dm^{DL} [cm]	PGA_{CDL}	α_{DL}
smer X	0,10g	0,18	0,45	0,24g	**2,44**
smer Y	0,10g	0,01	0,04	0,38g	**3,79**

Potresna odpornost objekta ustreza zahtevam EC8.

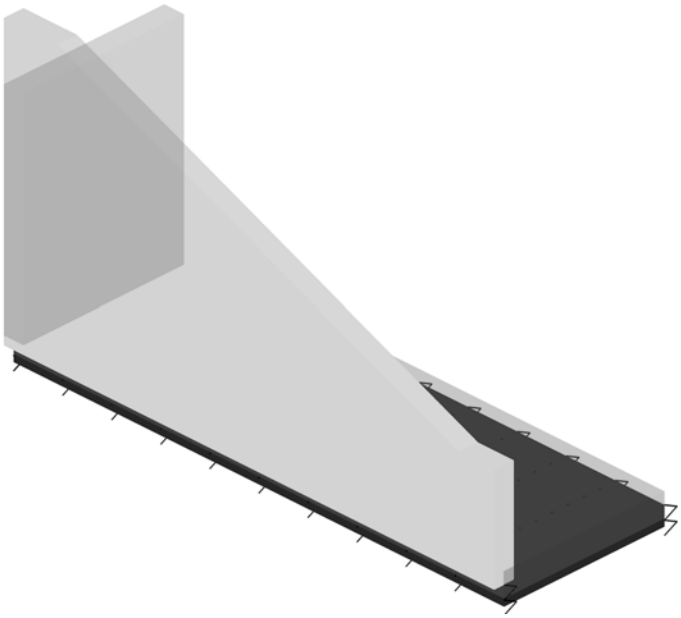
Poškodbe pri maksimalni kapaciteti kontrucije (d_m^{SD}) – smer X, mejno stanje SD



Poškodbe pri maksimalni kapaciteti kontrucije (d_m^{SD}) – smer Y, mejno stanje SD



OPORNI ZID



Izometrija

Tabele materialov

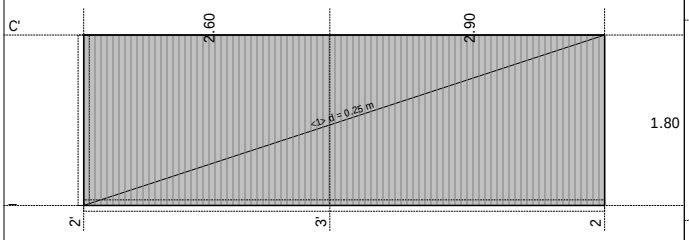
No	Naziv materiala	E[kN/m2]	μ	γ[kN/m3]	αt[1/C]	Em[kN/m2]	μm
1	Beton C 25/30	3.100e+7	0.20	25.00	1.000e-5	3.100e+7	0.20

Seti plošč

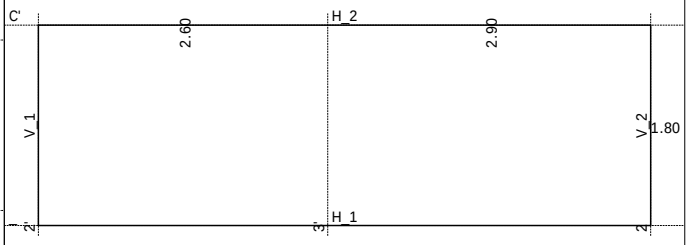
No	d[m]	e[m]	Material	Tip preračuna	Ortotropija	E2[kN/m2]	G[kN/m2]	α
<1>	0.250	0.125	1	Tanka plošča	Izotropna			
<2>	0.220	0.110	1	Tanka plošča	Izotropna			

Seti površinskih podpor

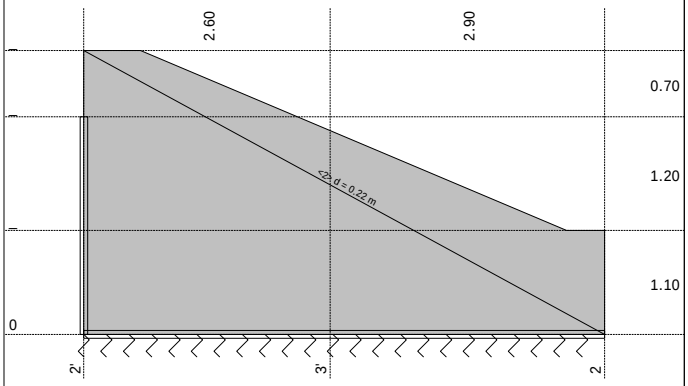
Set	K,R1	K,R2	K,R3
1	7.500e+3	7.500e+3	1.000e+4



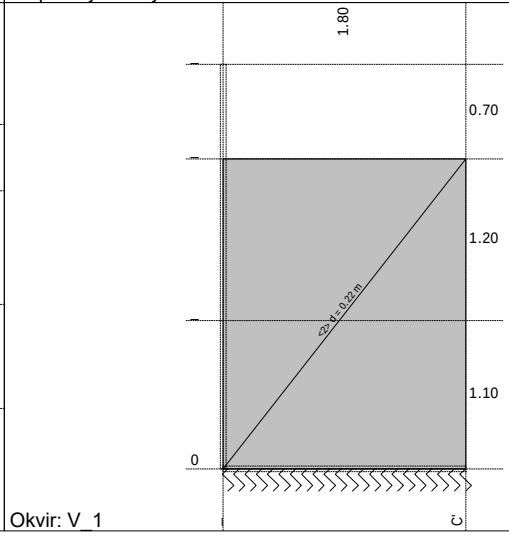
Nivo: [0.00 m]



Dispozicija okvirjev



Okvir: H_1



Okvir: V_1

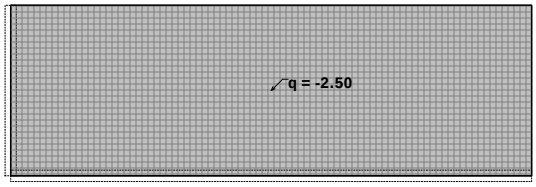
Vhodni podatki - Obtežba

Lista obtežnih primerov

LC	Naziv
1	Stalna (g)
2	Koristna
3	Zemljina

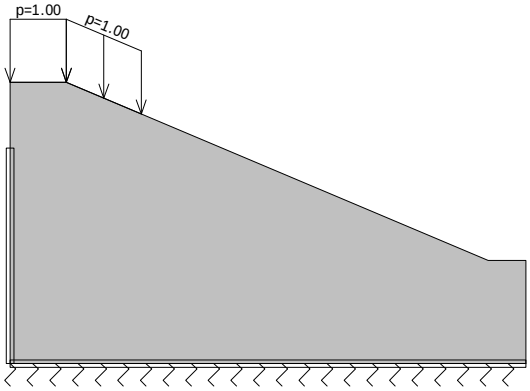
LC	Naziv
4	Komb.: 1.35xI+1.5xII+1.35xIII
5	Komb.: I+II+III
6	Komb.: I+1.5xIII

Obt. 1: Stalna (g)



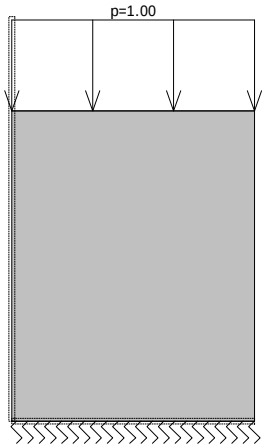
Nivo: [0.00 m]

Obt. 1: Stalna (g)



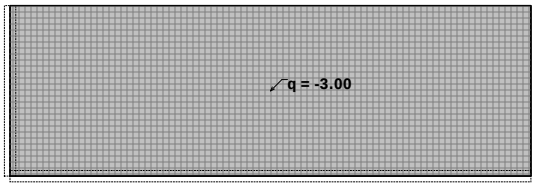
Okvir: H_1

Obt. 1: Stalna (g)



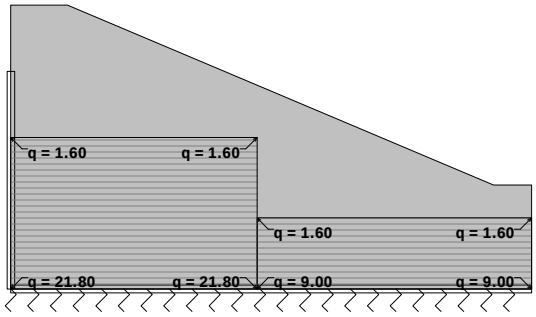
Okvir: V_1

Obt. 2: Koristna



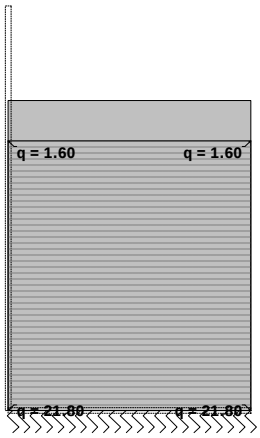
Nivo: [0.00 m]

Obt. 3: Zemljina



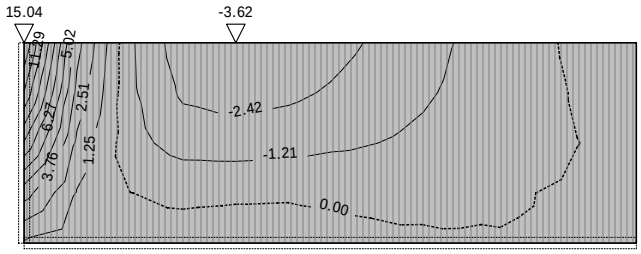
Okvir: H_1

Obt. 3: Zemljina



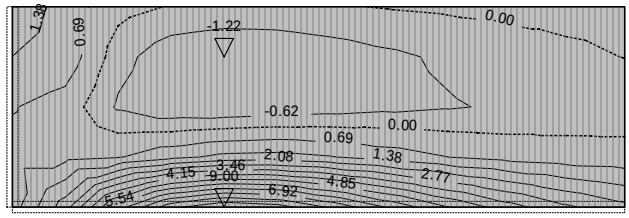
Okvir: V_1

Obt. 4: 1.35xI+1.5xII+1.35xIII



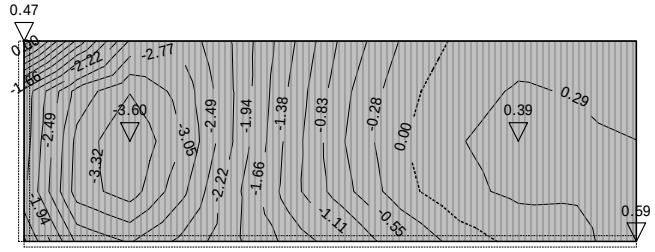
Nivo: [0.00 m]
Vplivi v plošči: max Mx= 15.04 / min Mx= -3.62 kNm/m

Obt. 4: 1.35xI+1.5xII+1.35xIII



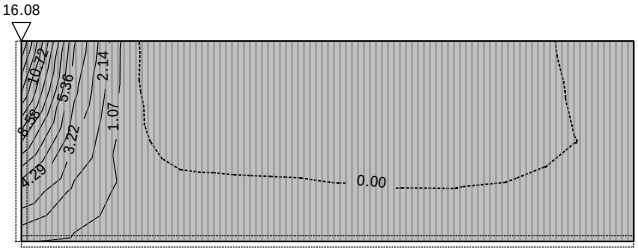
Nivo: [0.00 m]
Vplivi v plošči: max My= 9.00 / min My= -1.22 kNm/m

Obt. 4: 1.35xI+1.5xII+1.35xIII



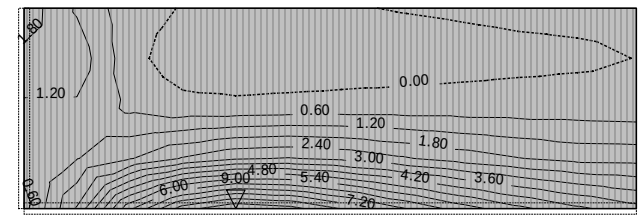
Nivo: [0.00 m]
Vplivi v plošči: max Mxy= 0.59 / min Mxy= -3.60 kNm/m

Obt. 7: [MSN] 4,6



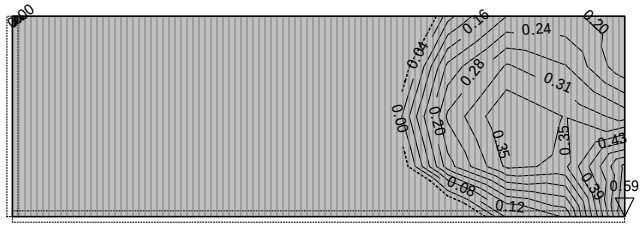
Nivo: [0.00 m]
Vplivi v plošči: max Mx= 16.08 / min Mx= 0.00 kNm/m

Obt. 7: [MSN] 4,6



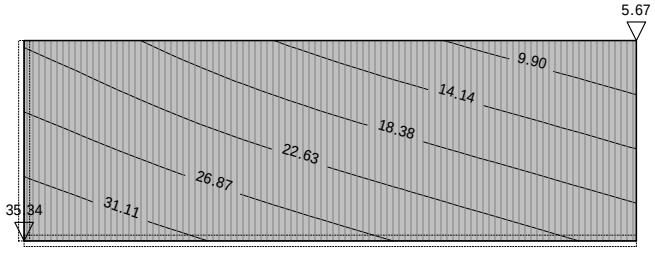
Nivo: [0.00 m]
Vplivi v plošči: max My= 9.00 / min My= 0.00 kNm/m

Obt. 7: [MSN] 4,6



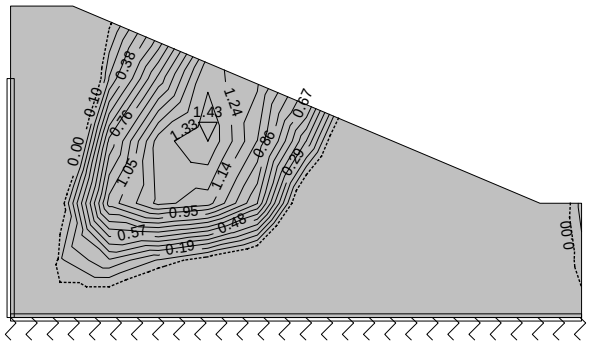
Nivo: [0.00 m]
Vplivi v plošči: max Mxy= 0.59 / min Mxy= 0.00 kNm/m

Obt. 5: I+II+III



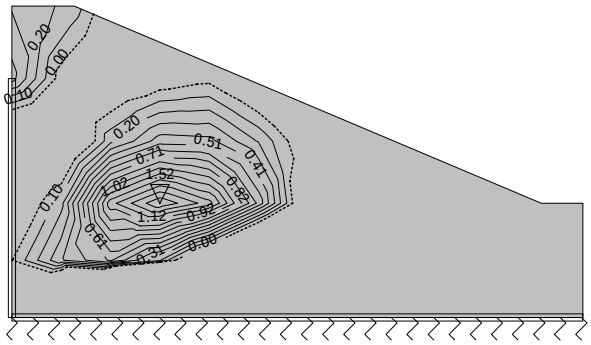
Nivo: [0.00 m]
Vplivi v pov.podpori: max σ,tal= 35.34 / min σ,tal= 5.67 kN/m²

Obt. 7: [MSN] 4,6



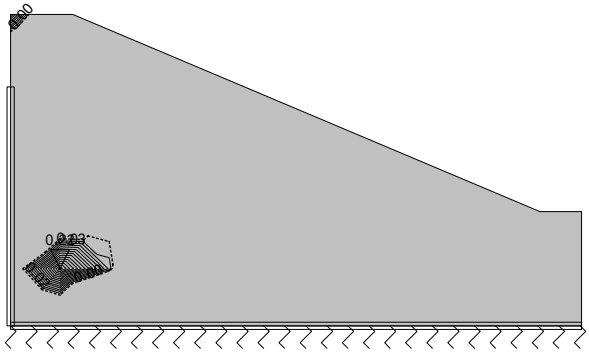
Okvir: H_1
Vplivi v plošči: max Mx= 1.43 / min Mx= 0.00 kNm/m

Obt. 7: [MSN] 4,6



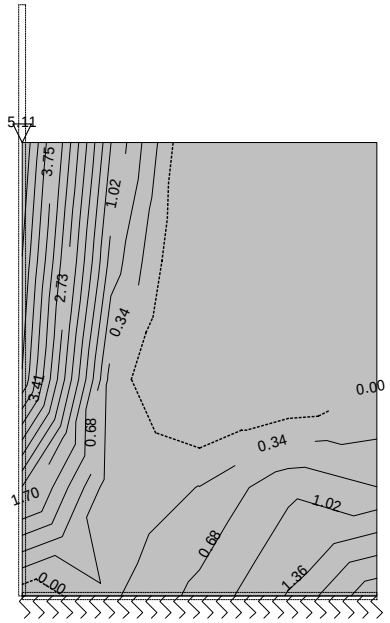
Okvir: H_1
Vplivi v plošči: max My= 1.52 / min My= 0.00 kNm/m

Obt. 7: [MSN] 4,6



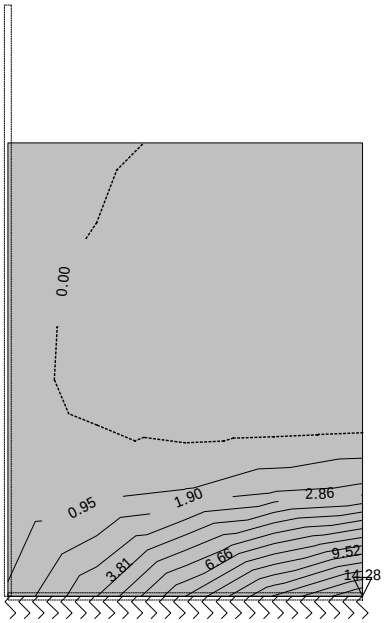
Okvir: H_1
Vplivi v plošči: max Mxy= 0.22 / min Mxy= 0.00 kNm/m

Obt. 7: [MSN] 4,6



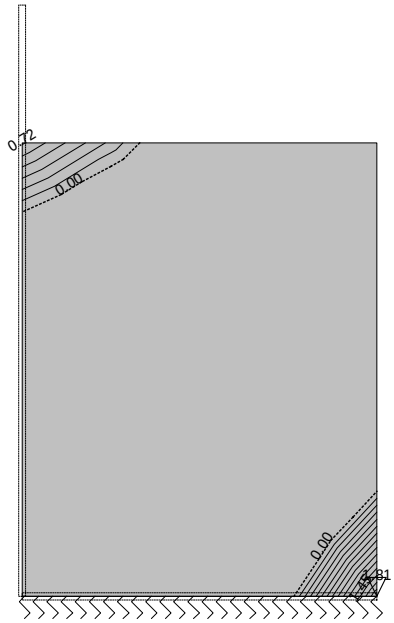
Okvir: V_1
Vplivi v plošči: max Mx= 5.11 / min Mx= 0.00 kNm/m

Obt. 7: [MSN] 4,6



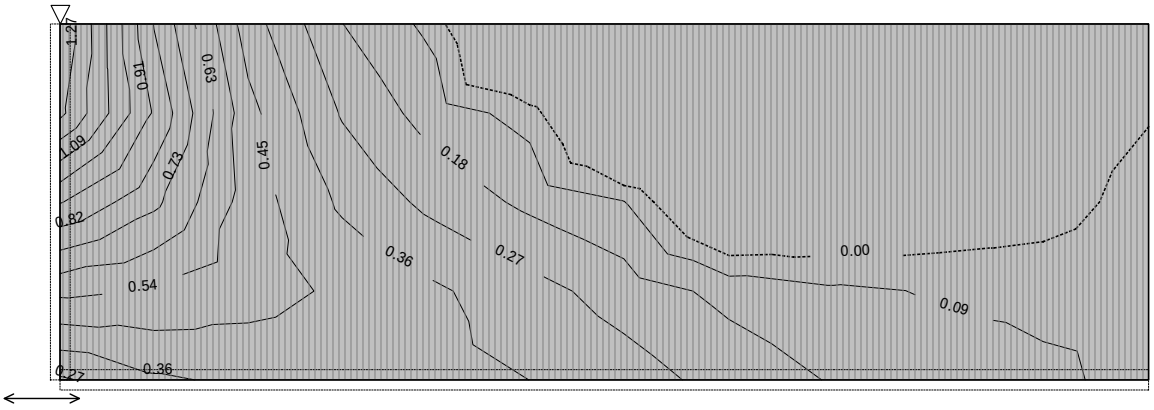
Okvir: V_1
Vplivi v plošči: max My= 14.28 / min My= 0.00 kNm/m

Obt. 7: [MSN] 4,6



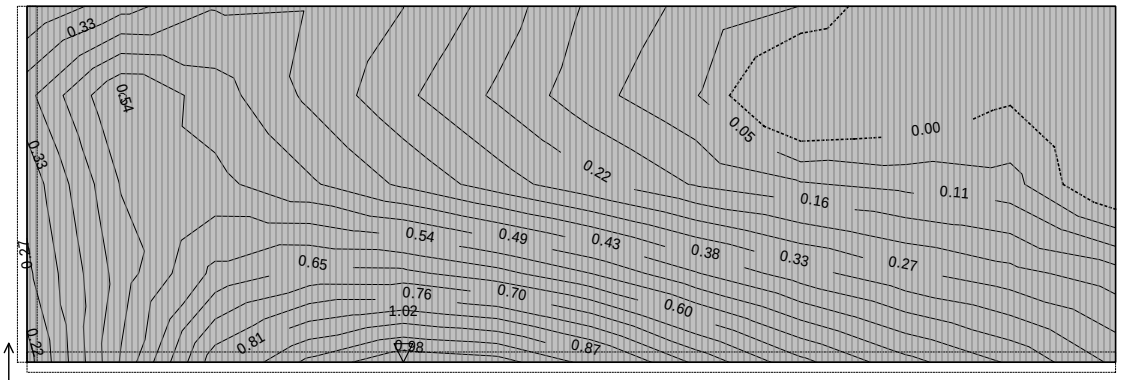
Okvir: V_1
Vplivi v plošči: max Mxy= 1.81 / min Mxy= 0.00 kNm/m

Merodajna obtežba: 4,6
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm



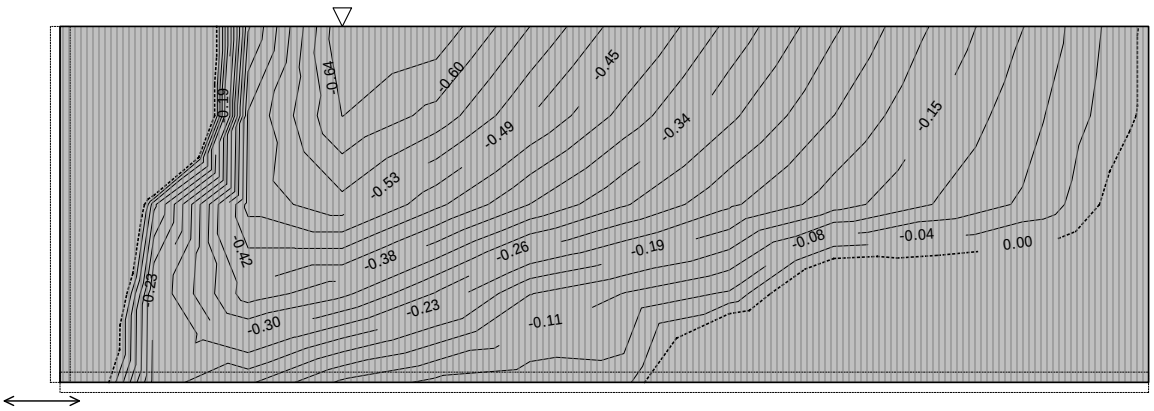
Nivo: [0.00 m]
Aa - sp.cona - Smer 1 - max Aa1,s= 1.36 cm²/m

Merodajna obtežba: 4,6
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm



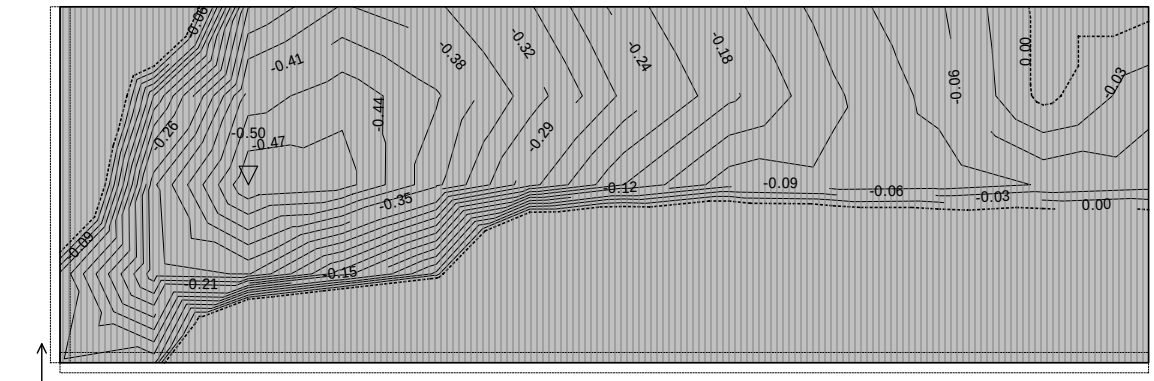
Nivo: [0.00 m]
Aa - sp.cona - Smer 2 - max Aa2,s= 1.02 cm²/m

Merodajna obtežba: 4,6
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm



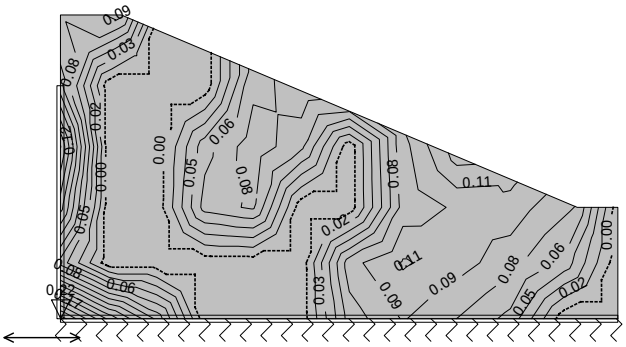
Nivo: [0.00 m]
Aa - zg.cona - Smer 1 - max Aa1,z= -0.68 cm²/m

Merodajna obtežba: 4,6
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm



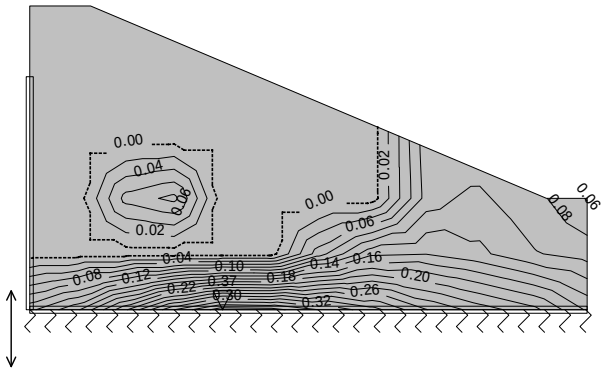
Nivo: [0.00 m]
Aa - zg.cona - Smer 2 - max Aa2,z= -0.50 cm²/m

Merodajna obtežba: 4,6
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm



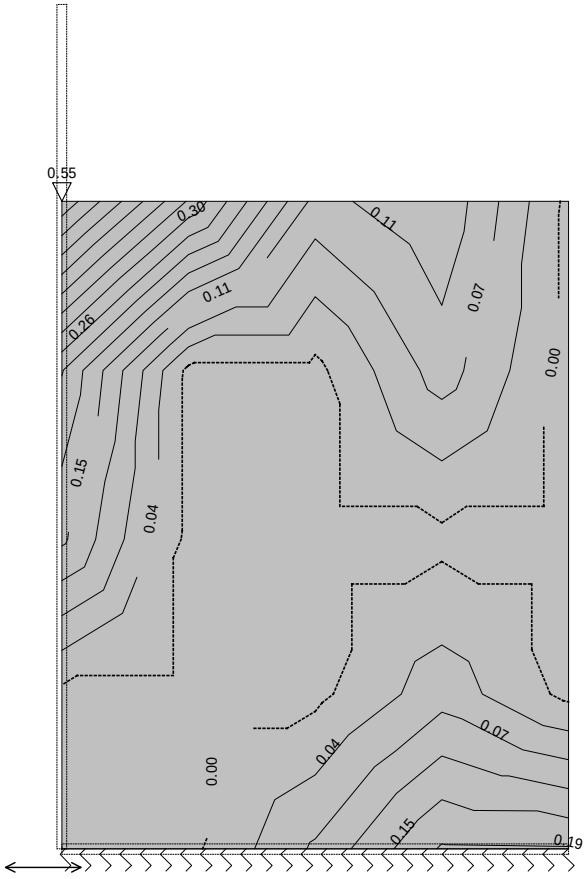
Okvir: H_1
Aa - sp.cona - Smer 1 - max Aa1,s= 0.22 cm²/m

Merodajna obtežba: 4,6
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm



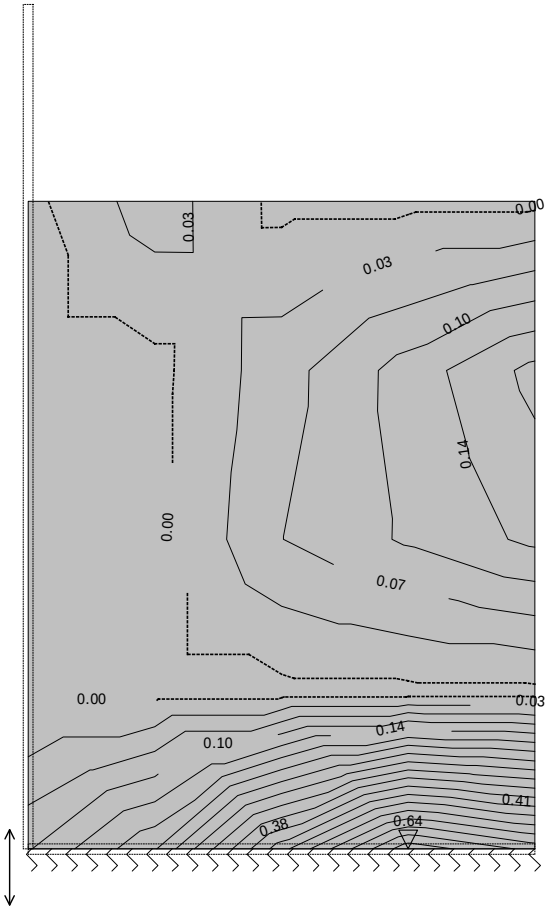
Okvir: H_1
Aa - sp.cona - Smer 2 - max Aa2,s= 0.37 cm²/m

Merodajna obtežba: 4,6
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm



Okvir: V_1
Aa - sp.cona - Smer 1 - max Aa1,s= 0.55 cm²/m

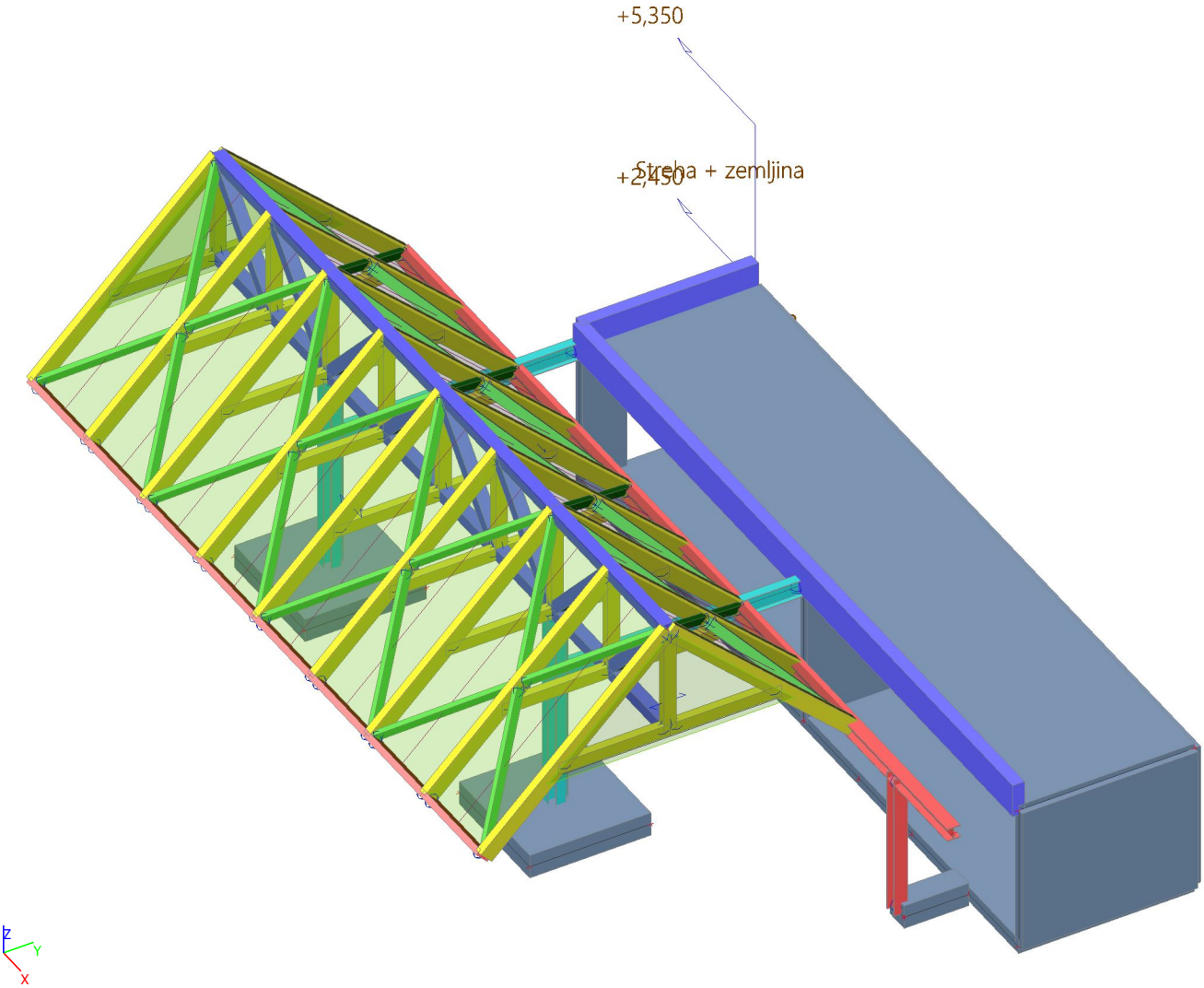
Merodajna obtežba: 4,6
EC 2 (EN 1992-1-1:2004), C 25, S500N, a=5.00 cm



Okvir: V_1
Aa - sp.cona - Smer 2 - max Aa2,s= 0.64 cm²/m

1. Kozolec

1.1. Računski model



1.2. Materiali

Steel EC3

Name	ρ [kg/m³]	E_{mod} [MPa]	μ	Lower limit [mm]	Upper limit [mm]	F_y [MPa]	F_u [MPa]	Colour
		G_{mod} [MPa]	α [m/mK]					
S 235	7850,00	2,1000e+05	0.3	0	40	235,0	360,0	
		8,0769e+04	0,01e-003	40	80	215,0	360,0	

Name	Type	ρ [kg/m³]	Density in fresh state [kg/m³]	E_{mod} [MPa]	μ	α [m/mK]	$f_{c.k.28}$ [MPa]	Colour
C25/30	Concrete	2500,00	2600,00	3,1500e+04	0.2	0,01e-003	25,00	

Explanations of symbols	
Density in fresh state	The value in the density in fresh state property is used only in case a composite deck is input and its self-weight load is taken into account.

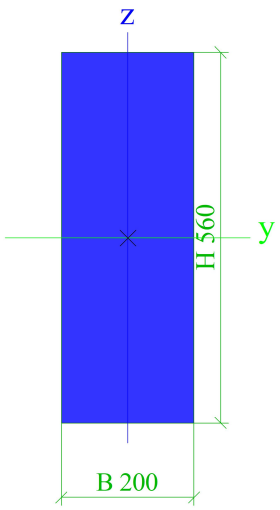
Reinforcement EC2

Name	Type	ρ [kg/m³]	E_{mod} [MPa]	G_{mod} [MPa]	α [m/mK]	$f_{y.k}$ [MPa]
B 400A	Reinforcement steel	7850,00	2,0000e+05	8,3333e+04	0,01e-003	400,0

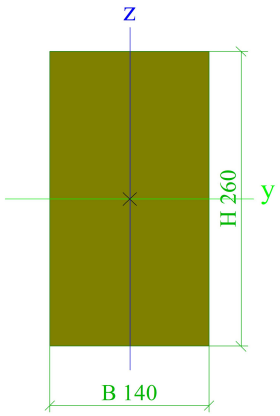
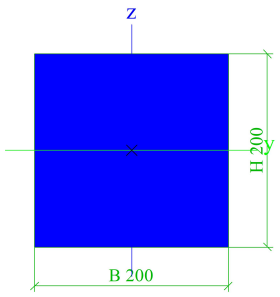
Timber EC5

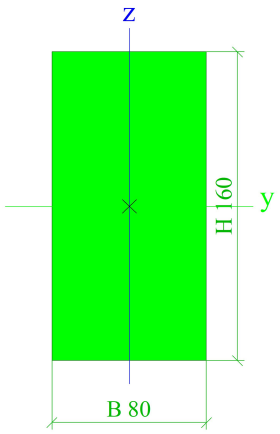
Name	Type of timber	μ	E_{mod} [MPa]	$f_{m.k}$ [MPa]	$f_{t.0.k}$ [MPa]	$f_{t.90.k}$ [MPa]	$f_{c.0.k}$ [MPa]	$f_{c.90.k}$ [MPa]	$f_{v.k}$ [MPa]	Colour
	ρ [kg/m³]	α [m/mK]	G_{mod} [MPa]							
C14 (EN 338)	Solid	0	7,0000e+03	14,0	7,2	0,4	16,0	2,0	3,0	
	350,00	5,00e-06	4,4000e+02							
C24 (EN 338)	Solid	0	1,1000e+04	24,0	14,5	0,4	21,0	2,5	4,0	
	420,00	5,00e-06	6,9000e+02							
GL 24h (EN 14080)	Glued, laminated	0	1,1500e+04	24,0	19,2	0,5	24,0	2,5	3,5	
	420,00	5,00e-06	6,5000e+02							

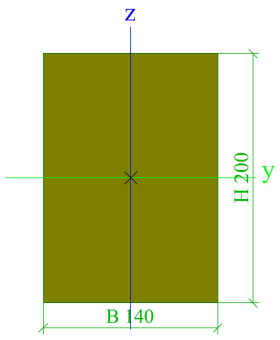
1.3. Seti gred

CS0		
Type	Rectangle	
Detailed	560; 200	
Shape type	Thick-walled	
Item material	C25/30	
Fabrication	general	
Colour		
A [m²]	1,1200e-01	
A_y [m²], A_z [m²]	9,3333e-02	9,3333e-02
A_L [m²/m], A_D [m²/m]	1,5200e+00	1,5200e+00
$c_{Y.UCS}$ [mm], $c_{Z.UCS}$ [mm]	100	280
α [deg]	0,00	
I_y [m⁴], I_z [m⁴]	2,9269e-03	3,7333e-04
i_y [mm], i_z [mm]	162	58
$W_{el.y}$ [m³], $W_{el.z}$ [m³]	1,0453e-02	3,7333e-03
$W_{pl.y}$ [m³], $W_{pl.z}$ [m³]	0,0000e+00	0,0000e+00
$M_{pl.y.+}$ [Nm], $M_{pl.y.-}$ [Nm]	0,00	0,00
$M_{pl.z.+}$ [Nm], $M_{pl.z.-}$ [Nm]	0,00	0,00
d_y [mm], d_z [mm]	0	0
I_t [m⁴], I_w [m⁶]	1,1574e-03	0,0000e+00
β_y [mm], β_z [mm]	0	0
Picture		

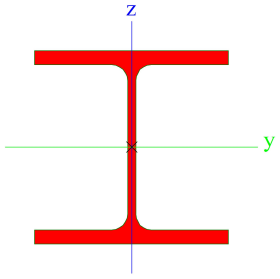
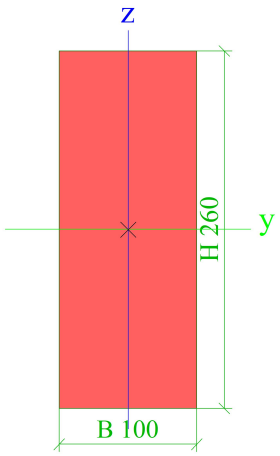
CS2		
Type	Rectangle	
Detailed	260; 140	
Shape type	Thick-walled	
Item material	C24 (EN 338)	
Fabrication	general	
Colour		
A [m²]	3,6400e-02	
A_y [m²], A_z [m²]	3,0348e-02	3,0337e-02
A_L [m²/m], A_D [m²/m]	8,0000e-01	8,0000e-01
$c_{Y.UCS}$ [mm], $c_{Z.UCS}$ [mm]	70	130
α [deg]	0,00	
I_y [m⁴], I_z [m⁴]	2,0505e-04	5,9453e-05
i_y [mm], i_z [mm]	75	40

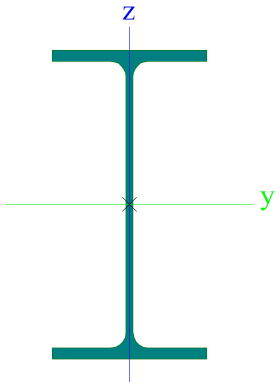
$W_{el.y}$ [m³], $W_{el.z}$ [m³]	1,5773e-03	8,4933e-04
$W_{pl.y}$ [m³], $W_{pl.z}$ [m³]	1,9328e-03	1,0407e-03
$M_{pl.y.+}$ [Nm], $M_{pl.y.-}$ [Nm]	40588,56	40588,56
$M_{pl.z.+}$ [Nm], $M_{pl.z.-}$ [Nm]	21855,38	21855,38
d_y [mm], d_z [mm]	0	0
I_t [m⁴], I_w [m⁶]	1,5761e-04	1,0419e-07
β_y [mm], β_z [mm]	0	0
Picture		
CS3		
Type	Rectangle	
Detailed	200; 200	
Shape type	Thick-walled	
Item material	C24 (EN 338)	
Fabrication	general	
Colour		
A [m²]	4,0000e-02	
A_y [m²], A_z [m²]	3,3351e-02	3,3351e-02
A_L [m²/m], A_D [m²/m]	8,0000e-01	8,0000e-01
$c_{Y.UCS}$ [mm], $c_{Z.UCS}$ [mm]	100	100
α [deg]	0,00	
I_y [m⁴], I_z [m⁴]	1,3333e-04	1,3333e-04
i_y [mm], i_z [mm]	58	58
$W_{el.y}$ [m³], $W_{el.z}$ [m³]	1,3333e-03	1,3333e-03
$W_{pl.y}$ [m³], $W_{pl.z}$ [m³]	1,6338e-03	1,6338e-03
$M_{pl.y.+}$ [Nm], $M_{pl.y.-}$ [Nm]	34309,86	34309,86
$M_{pl.z.+}$ [Nm], $M_{pl.z.-}$ [Nm]	34309,86	34309,86
d_y [mm], d_z [mm]	0	0
I_t [m⁴], I_w [m⁶]	2,2505e-04	8,6179e-09
β_y [mm], β_z [mm]	0	0
Picture		
CS6		
Type	Rectangle	
Detailed	160; 80	
Shape type	Thick-walled	
Item material	C24 (EN 338)	
Fabrication	general	
Colour		
A [m²]	1,2800e-02	
A_y [m²], A_z [m²]	1,0667e-02	1,0667e-02
A_L [m²/m], A_D [m²/m]	4,8000e-01	4,8000e-01
$c_{Y.UCS}$ [mm], $c_{Z.UCS}$ [mm]	40	80
α [deg]	0,00	
I_y [m⁴], I_z [m⁴]	2,7307e-05	6,8267e-06

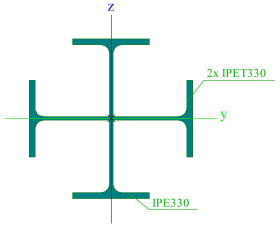
i_y [mm], i_z [mm]	46	23
$W_{el.y}$ [m^3], $W_{el.z}$ [m^3]	3,4133e-04	1,7067e-04
$W_{pl.y}$ [m^3], $W_{pl.z}$ [m^3]	4,1825e-04	2,0913e-04
$M_{pl.y.+}$ [Nm], $M_{pl.y.-}$ [Nm]	8783,32	8783,32
$M_{pl.z.+}$ [Nm], $M_{pl.z.-}$ [Nm]	4391,66	4391,66
d_y [mm], d_z [mm]	0	0
I_t [m^4], I_w [m^6]	1,8737e-05	0,0000e+00
β_y [mm], β_z [mm]	0	0
Picture		

CS9		
Type	RECT	
Detailed	140; 200	
Shape type	Thick-walled	
Item material	C14 (EN 338)	
Fabrication	timber	
Colour		
A [m^2]	2,8000e-02	
A_y [m^2], A_z [m^2]	2,3344e-02	2,3339e-02
A_L [m^2/m], A_D [m^2/m]	6,8000e-01	6,8000e-01
$c_{Y.UCS}$ [mm], $c_{Z.UCS}$ [mm]	70	100
α [deg]	0,00	
I_y [m^4], I_z [m^4]	9,3333e-05	4,5733e-05
i_y [mm], i_z [mm]	58	40
$W_{el.y}$ [m^3], $W_{el.z}$ [m^3]	9,3333e-04	6,5333e-04
$W_{pl.y}$ [m^3], $W_{pl.z}$ [m^3]	8,6897e-04	6,0828e-04
$M_{pl.y.+}$ [Nm], $M_{pl.y.-}$ [Nm]	13903,45	13903,45
$M_{pl.z.+}$ [Nm], $M_{pl.z.-}$ [Nm]	9732,41	9732,41
d_y [mm], d_z [mm]	0	0
I_t [m^4], I_w [m^6]	1,0405e-04	2,0153e-08
β_y [mm], β_z [mm]	0	0
Picture		

CS10		
Type	HE220B	
Formcode	1 - I section	
Shape type	Thin-walled	
Item material	S 235	
Fabrication	rolled	
Colour		
Flexural buckling y-y, Flexural buckling z-z	b	c
A [m^2]	9,1000e-03	

A_y [m²], A_z [m²]	6,7051e-03	2,2063e-03
A_L [m²/m], A_D [m²/m]	1,2700e+00	1,2700e+00
$c_{Y.UCS}$ [mm], $c_{Z.UCS}$ [mm]	110	110
α [deg]	0,00	
I_y [m⁴], I_z [m⁴]	8,0910e-05	2,8430e-05
i_y [mm], i_z [mm]	94	56
$W_{el.y}$ [m³], $W_{el.z}$ [m³]	7,3550e-04	2,5850e-04
$W_{pl.y}$ [m³], $W_{pl.z}$ [m³]	8,2700e-04	3,9390e-04
$M_{pl.y.+}$ [Nm], $M_{pl.y.-}$ [Nm]	194462,18	194462,18
$M_{pl.z.+}$ [Nm], $M_{pl.z.-}$ [Nm]	92575,76	92575,76
d_y [mm], d_z [mm]	0	0
I_t [m⁴], I_w [m⁶]	7,6570e-07	2,9540e-07
β_y [mm], β_z [mm]	0	0
Picture		
CS12		
Type	RECT	
Detailed	100; 260	
Shape type	Thick-walled	
Item material	C14 (EN 338)	
Fabrication	timber	
Colour		
A [m²]	2,6000e-02	
A_y [m²], A_z [m²]	2,1687e-02	2,1670e-02
A_L [m²/m], A_D [m²/m]	7,2000e-01	7,2000e-01
$c_{Y.UCS}$ [mm], $c_{Z.UCS}$ [mm]	50	130
α [deg]	0,00	
I_y [m⁴], I_z [m⁴]	1,4647e-04	2,1667e-05
i_y [mm], i_z [mm]	75	29
$W_{el.y}$ [m³], $W_{el.z}$ [m³]	1,1267e-03	4,3333e-04
$W_{pl.y}$ [m³], $W_{pl.z}$ [m³]	1,0490e-03	4,0345e-04
$M_{pl.y.+}$ [Nm], $M_{pl.y.-}$ [Nm]	16783,45	16783,45
$M_{pl.z.+}$ [Nm], $M_{pl.z.-}$ [Nm]	6455,17	6455,17
d_y [mm], d_z [mm]	0	0
I_t [m⁴], I_w [m⁶]	6,5690e-05	6,7154e-08
β_y [mm], β_z [mm]	0	0
Picture		
CS13		
Type	IPE300	
Formcode	1 - I section	
Shape type	Thin-walled	
Item material	S 235	
Fabrication	rolled	

Colour		
Flexural buckling y-y, Flexural buckling z-z	a	b
A [m²]	5,3800e-03	
A_y [m²], A_z [m²]	3,1835e-03	2,1775e-03
A_L [m²/m], A_D [m²/m]	1,1599e+00	1,1599e+00
$c_{Y.UCS}$ [mm], $c_{Z.UCS}$ [mm]	75	150
α [deg]	0,00	
I_y [m⁴], I_z [m⁴]	8,3560e-05	6,0400e-06
i_y [mm], i_z [mm]	125	34
$W_{el.y}$ [m³], $W_{el.z}$ [m³]	5,5700e-04	8,0500e-05
$W_{pl.y}$ [m³], $W_{pl.z}$ [m³]	6,2800e-04	1,2500e-04
$M_{pl.y.+}$ [Nm], $M_{pl.y.-}$ [Nm]	147776,33	147776,33
$M_{pl.z.+}$ [Nm], $M_{pl.z.-}$ [Nm]	29434,01	29434,01
d_y [mm], d_z [mm]	0	0
I_t [m⁴], I_w [m⁶]	2,0100e-07	1,2600e-07
β_y [mm], β_z [mm]	0	0
Picture		

CS14		
Type	IX	
Detailed	IPE330, IPET330	
Shape type	Thin-walled	
Item material	S 235	
Fabrication	welded	
Colour		
Flexural buckling y-y, Flexural buckling z-z	c	c
A [m²]	1,2532e-02	
A_y [m²], A_z [m²]	5,2624e-03	5,2170e-03
A_L [m²/m], A_D [m²/m]	2,4929e+00	2,4929e+00
$c_{Y.UCS}$ [mm], $c_{Z.UCS}$ [mm]	169	165
α [deg]	0,00	
I_y [m⁴], I_z [m⁴]	1,2566e-04	1,3179e-04
i_y [mm], i_z [mm]	100	103
$W_{el.y}$ [m³], $W_{el.z}$ [m³]	7,6159e-04	7,8097e-04
$W_{pl.y}$ [m³], $W_{pl.z}$ [m³]	9,5882e-04	9,8232e-04
$M_{pl.y.+}$ [Nm], $M_{pl.y.-}$ [Nm]	225322,80	225322,80
$M_{pl.z.+}$ [Nm], $M_{pl.z.-}$ [Nm]	230844,53	230844,53
d_y [mm], d_z [mm]	0	0
I_t [m⁴], I_w [m⁶]	4,1509e-07	4,0768e-07
β_y [mm], β_z [mm]	0	0
Picture		

Explanations of symbols	
A	Area
A_y	Shear Area in principal y-direction
A_z	Shear Area in principal z-direction
A_L	Circumference per unit length

Explanations of symbols	
A_D	Drying surface per unit length
$c_{Y.UCS}$	Centroid coordinate in Y-direction of Input axis system
$c_{Z.UCS}$	Centroid coordinate in Z-direction of

Explanations of symbols	
	Input axis system
$I_{Y.LCS}$	Second moment of area about the YLCS axis
$I_{Z.LCS}$	Second moment of area about the ZLCS axis
$I_{YZ.LCS}$	Product moment of area in the LCS system
α	Rotation angle of the principal axis system
I_y	Second moment of area about the principal y-axis
I_z	Second moment of area about the principal z-axis
i_y	Radius of gyration about the principal y-axis
i_z	Radius of gyration about the principal z-axis
$W_{el.y}$	Elastic section modulus about the principal y-axis
$W_{el.z}$	Elastic section modulus about the principal z-axis

Explanations of symbols	
$W_{pl.y}$	Plastic section modulus about the principal y-axis
$W_{pl.z}$	Plastic section modulus about the principal z-axis
$M_{pl.y.+}$	Plastic moment about the principal y-axis for a positive My moment
$M_{pl.y.-}$	Plastic moment about the principal y-axis for a negative My moment
$M_{pl.z.+}$	Plastic moment about the principal z-axis for a positive Mz moment
$M_{pl.z.-}$	Plastic moment about the principal z-axis for a negative Mz moment
d_y	Shear center coordinate in principal y-direction measured from the centroid - Not calculated or simplified
d_z	Shear center coordinate in principal z-direction measured from the centroid - Not calculated or simplified
I_t	Torsional constant - Not calculated or simplified
I_w	Warping constant - Not calculated or simplified
β_y	Mono-symmetry constant about the principal y-axis
β_z	Mono-symmetry constant about the principal z-axis

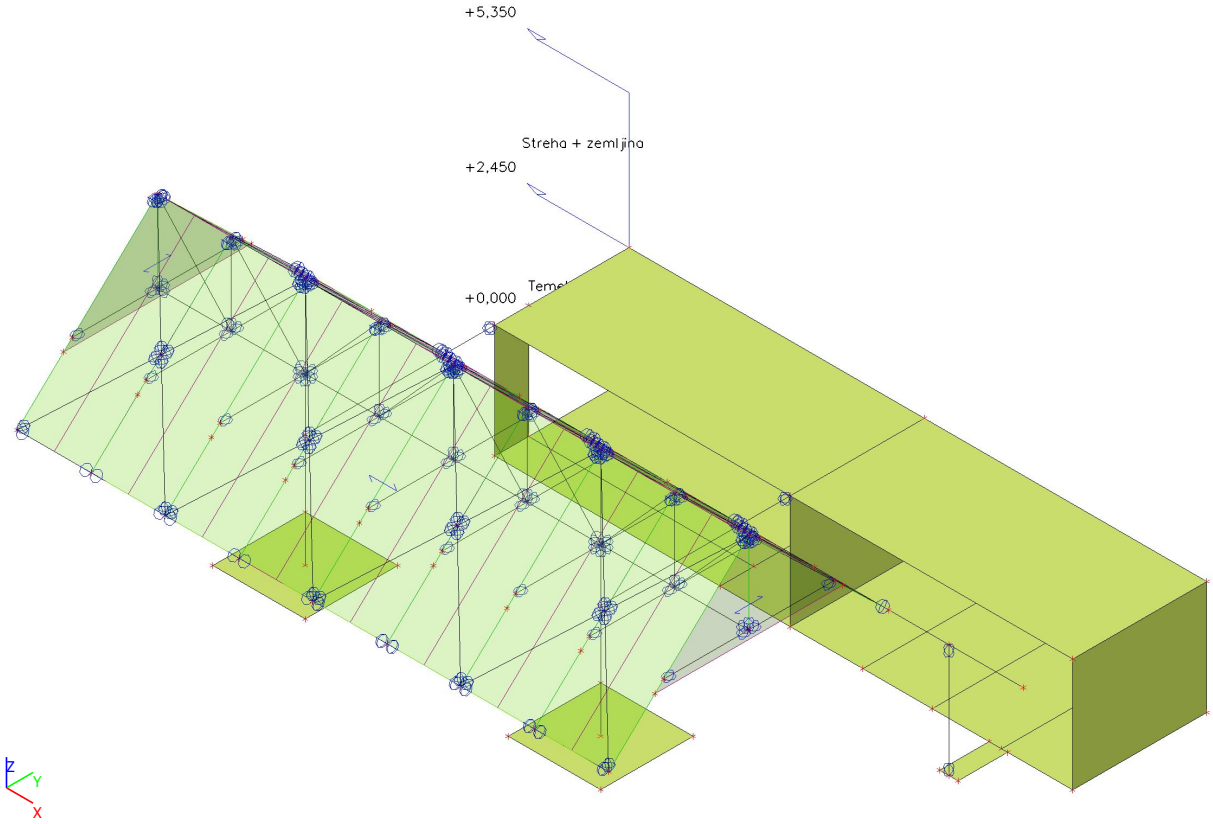
1.4. Seti plošč in sten

Name	Layer	Type	Element type	Material	Thickness type	Th. [mm]
S0	StructuralSurfaceMember	plate (111)	Standard	C25/30	constant	160
S1	StructuralSurfaceMember	wall (112)	Standard	C25/30	constant	200
S2	StructuralSurfaceMember	wall (112)	Standard	C25/30	constant	200
S3	StructuralSurfaceMember	wall (112)	Standard	C25/30	constant	200
S4	StructuralSurfaceMember	wall (112)	Standard	C25/30	constant	200
S5	StructuralSurfaceMember	plate (111)	Standard	C25/30	constant	250
S6	StructuralSurfaceMember	plate (111)	Standard	C25/30	constant	400
S7	StructuralSurfaceMember	plate (111)	Standard	C25/30	constant	400
S9	StructuralSurfaceMember	plate (111)	Standard	C25/30	constant	400

1.5. Obtežba

Name	Description	Action type	Load group	Direction	Duration	Master load case
	Spec	Load type				
LC0	Lastna	Permanent Self weight	LG0	-Z		
LC1	Stalna	Permanent Standard	LG1			
LC2	Koristna Standard	Variable Static	LG2		Long	None
LC3	Sneg (i) Standard	Variable Static	LG3		Medium	None
LC4	Sneg (ii) Standard	Variable Static	LG3		Medium	None
LC5	Sneg (iii) Standard	Variable Static	LG3		Medium	None
LC6	Veter X Standard	Variable Static	LG4		Long	None
LC7	Veter Y (+) Standard	Variable Static	LG4		Long	None
LC8	Veter Y (-) Standard	Variable Static	LG4		Long	None
LC9	Zemljina	Permanent Standard	LG1			

1.6. LC1 / Tot. value



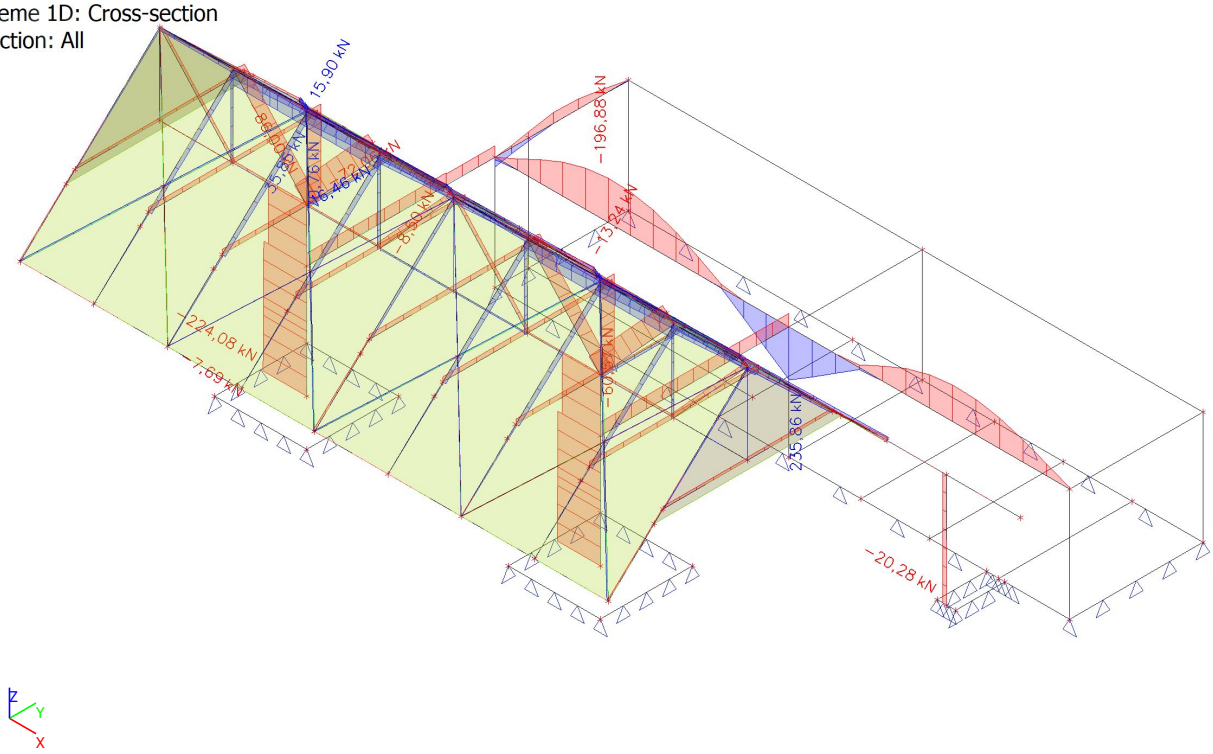
Name	Load	Relation	Type
LG0	Permanent		
LG1	Permanent		
LG2	Variable	Standard	Cat F : Vehicle <30kN
LG3	Variable	Exclusive	Snow
LG4	Variable	Exclusive	Wind

Name	Description	Type	Load cases	Coeff. [-]
ULS-Set B (auto).1		Envelope - ultimate	LC0 - Lastna	1,350
			LC1 - Stalna	1,350
			LC9 - Zemljina	1,350
ULS-Set B (auto).2		Envelope - ultimate	LC0 - Lastna	1,000
			LC1 - Stalna	1,000
			LC9 - Zemljina	1,000
ULS-Set B (auto).3		Envelope - ultimate	LC0 - Lastna	1,350
			LC1 - Stalna	1,350
			LC2 - Koristna	1,500
			LC3 - Sneg (i)	0,750
			LC4 - Sneg (ii)	0,750
			LC5 - Sneg (iii)	0,750
			LC6 - Veter X	0,900
			LC7 - Veter Y (+)	0,900
			LC9 - Zemljina	1,350
			LC8 - Veter Y (-)	0,900
ULS-Set B (auto).4		Envelope - ultimate	LC0 - Lastna	1,000
			LC1 - Stalna	1,000
			LC2 - Koristna	1,500
			LC3 - Sneg (i)	0,750
			LC4 - Sneg (ii)	0,750
			LC5 - Sneg (iii)	0,750
			LC6 - Veter X	0,900
			LC7 - Veter Y (+)	0,900
			LC9 - Zemljina	1,000
			LC8 - Veter Y (-)	0,900
ULS-Set B (auto).5		Envelope - ultimate	LC0 - Lastna	1,350
			LC1 - Stalna	1,350
			LC2 - Koristna	1,050
			LC3 - Sneg (i)	1,500
			LC4 - Sneg (ii)	1,500
			LC5 - Sneg (iii)	1,500
			LC6 - Veter X	0,900
			LC7 - Veter Y (+)	0,900
			LC9 - Zemljina	1,350
			LC8 - Veter Y (-)	0,900
ULS-Set B (auto).6		Envelope - ultimate	LC0 - Lastna	1,000
			LC1 - Stalna	1,000
			LC2 - Koristna	1,050
			LC3 - Sneg (i)	1,500
			LC4 - Sneg (ii)	1,500
			LC5 - Sneg (iii)	1,500
			LC6 - Veter X	0,900
			LC7 - Veter Y (+)	0,900
			LC9 - Zemljina	1,000
			LC8 - Veter Y (-)	0,900
ULS-Set B (auto).7		Envelope - ultimate	LC0 - Lastna	1,350
			LC1 - Stalna	1,350
			LC2 - Koristna	1,050
			LC3 - Sneg (i)	0,750
			LC4 - Sneg (ii)	0,750
			LC5 - Sneg (iii)	0,750
			LC6 - Veter X	1,500
			LC7 - Veter Y (+)	1,500
			LC9 - Zemljina	1,350
			LC8 - Veter Y (-)	1,500
ULS-Set B (auto).8		Envelope - ultimate	LC0 - Lastna	1,000
			LC1 - Stalna	1,000
			LC2 - Koristna	1,050
			LC3 - Sneg (i)	0,750
			LC4 - Sneg (ii)	0,750
			LC5 - Sneg (iii)	0,750
			LC6 - Veter X	1,500
			LC7 - Veter Y (+)	1,500
			LC9 - Zemljina	1,000
			LC8 - Veter Y (-)	1,500
SLS-Char (auto).1		Envelope - serviceability	LC0 - Lastna	1,000
			LC1 - Stalna	1,000
			LC9 - Zemljina	1,000

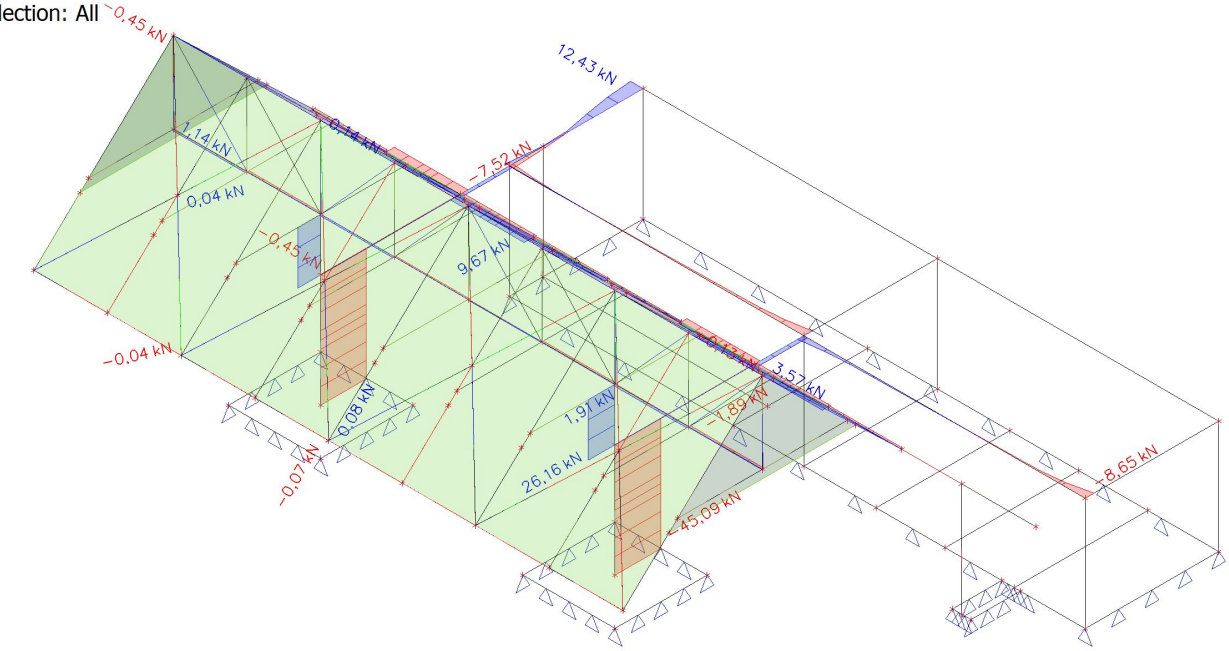
Name	Description	Type	Load cases	Coeff. [-]
SLS-Char (auto).2		Envelope - serviceability	LC0 - Lastna	1,000
			LC1 - Stalna	1,000
			LC2 - Koristna	1,000
			LC3 - Sneg (i)	0,500
			LC4 - Sneg (ii)	0,500
			LC5 - Sneg (iii)	0,500
			LC6 - Veter X	0,600
			LC7 - Veter Y (+)	0,600
			LC9 - Zemljina	1,000
			LC8 - Veter Y (-)	0,600
SLS-Char (auto).3		Envelope - serviceability	LC0 - Lastna	1,000
			LC1 - Stalna	1,000
			LC2 - Koristna	0,700
			LC3 - Sneg (i)	1,000
			LC4 - Sneg (ii)	1,000
			LC5 - Sneg (iii)	1,000
			LC6 - Veter X	0,600
			LC7 - Veter Y (+)	0,600
			LC9 - Zemljina	1,000
			LC8 - Veter Y (-)	0,600
SLS-Char (auto).4		Envelope - serviceability	LC0 - Lastna	1,000
			LC1 - Stalna	1,000
			LC2 - Koristna	0,700
			LC3 - Sneg (i)	0,500
			LC4 - Sneg (ii)	0,500
			LC5 - Sneg (iii)	0,500
			LC6 - Veter X	1,000
			LC7 - Veter Y (+)	1,000
			LC9 - Zemljina	1,000
			LC8 - Veter Y (-)	1,000
SLS-Quasi (auto).1		Envelope - serviceability	LC0 - Lastna	1,000
			LC1 - Stalna	1,000
			LC9 - Zemljina	1,000
SLS-Quasi (auto).2		Envelope - serviceability	LC0 - Lastna	1,000
			LC1 - Stalna	1,000
			LC2 - Koristna	0,600
			LC3 - Sneg (i)	0,000
			LC4 - Sneg (ii)	0,000
			LC5 - Sneg (iii)	0,000
			LC6 - Veter X	0,000
			LC7 - Veter Y (+)	0,000
			LC9 - Zemljina	1,000
			LC8 - Veter Y (-)	0,000

1.7. Rezultati - MSN

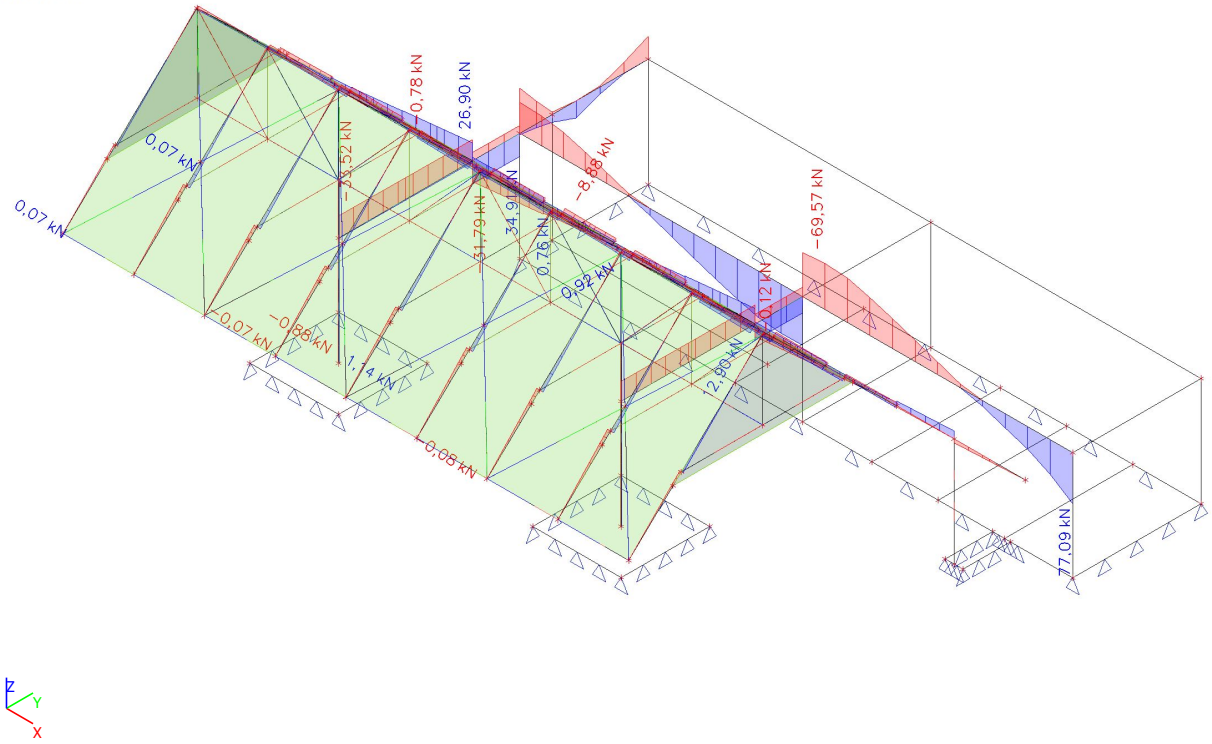
Values: **N**
Linear calculation
Class: All ULS
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: All



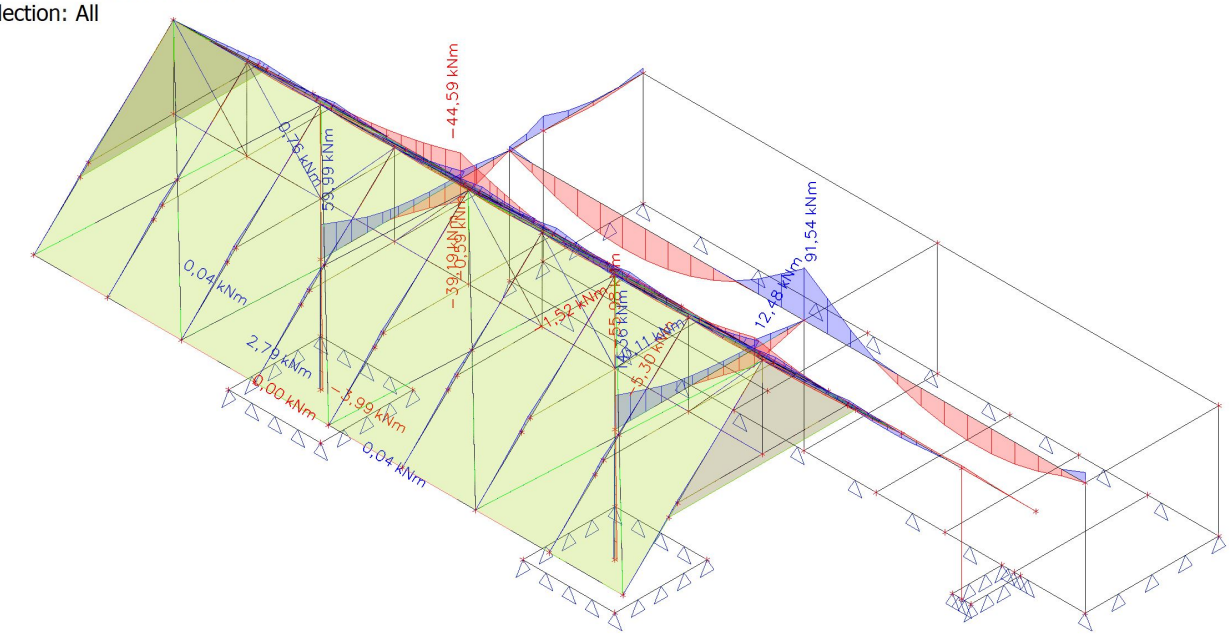
Values: V_y
Linear calculation
Class: All ULS
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: All



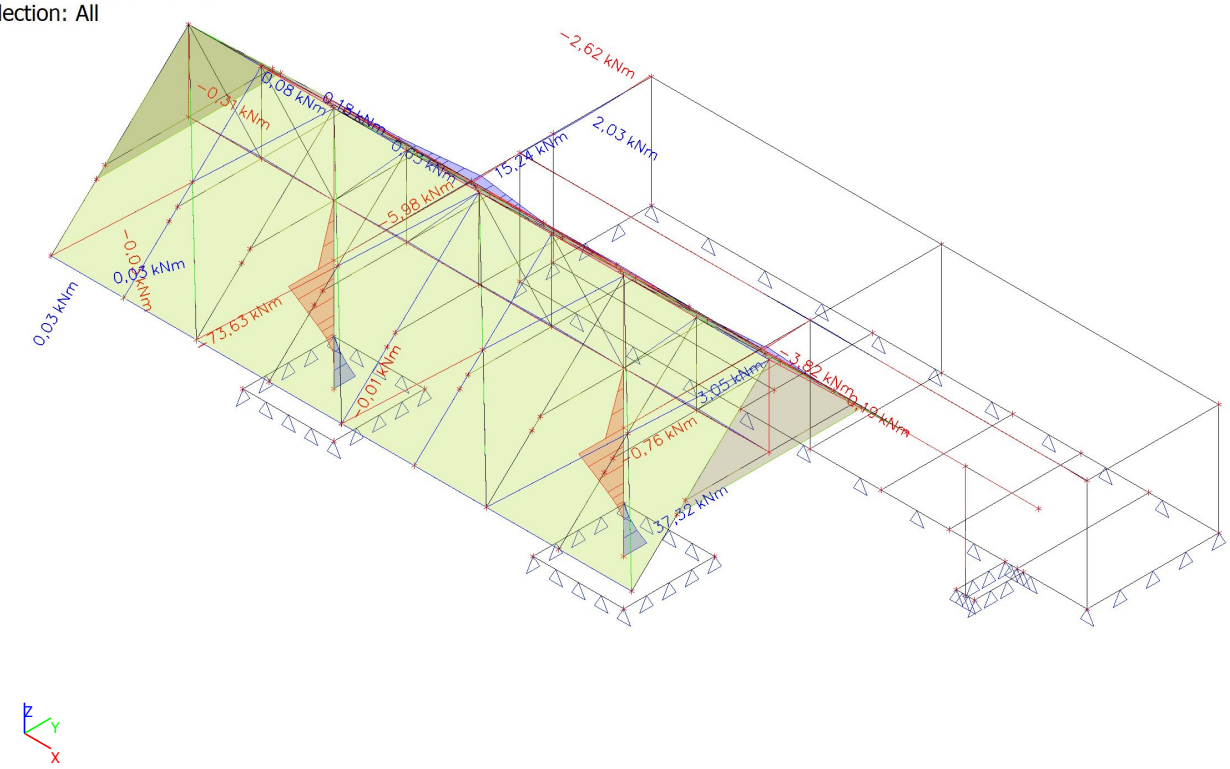
Values: V_z
Linear calculation
Class: All ULS
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: All



Values: M_y
Linear calculation
Class: All ULS
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: All



Values: M_z
Linear calculation
Class: All ULS
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: All



Linear calculation
Class: All ULS
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: All

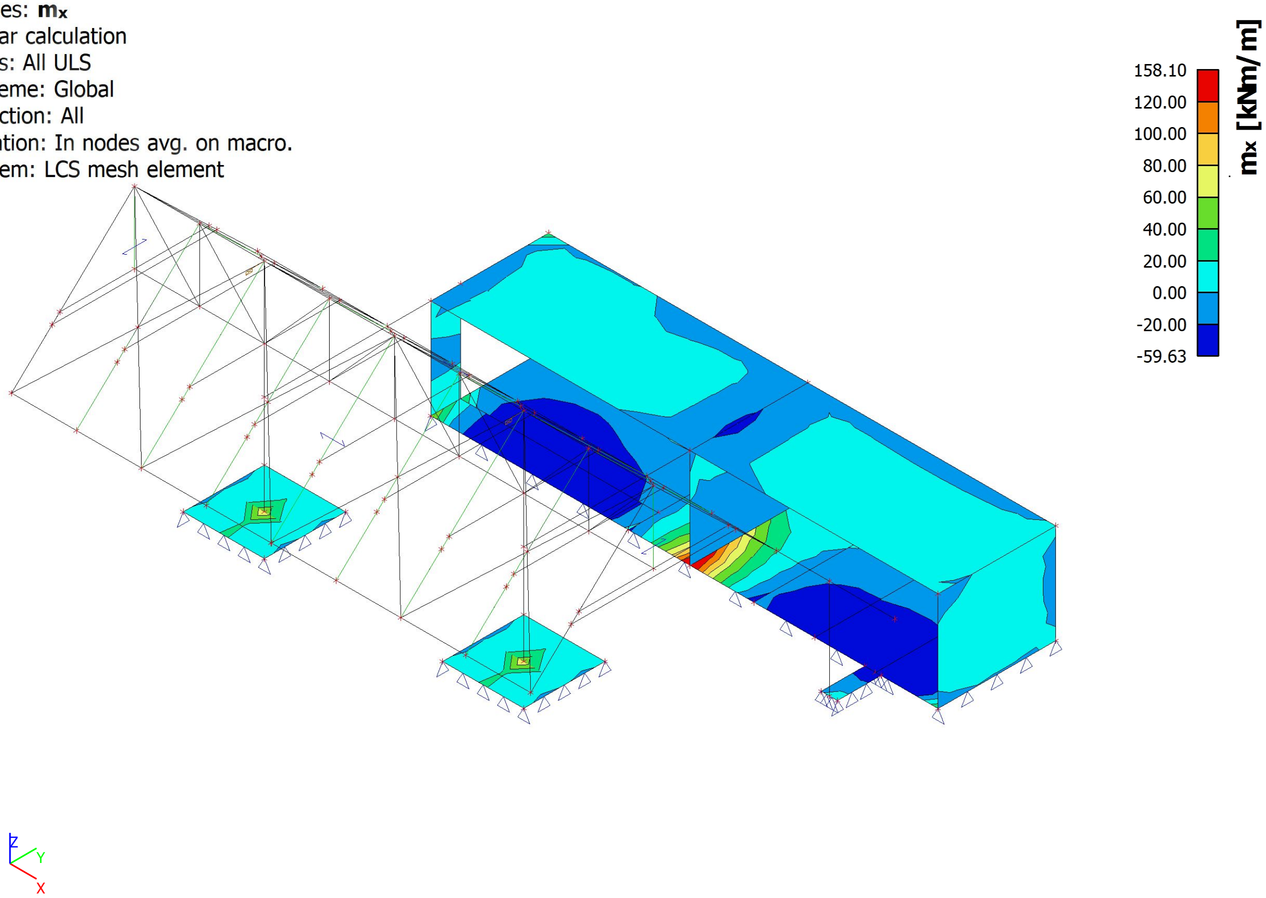
Name	dx [m]	Case	Cross-section	N [kN]	M_y [kNm]	M_z [kNm]
B1	2,458-	ULS-Set B (auto)/1	CS0 - Rectangle (560; 200)	**-196,88**	**-55,98**	-0,30
B1	6,390+	ULS-Set B (auto)/2	CS0 - Rectangle (560; 200)	**235,86**	**91,54**	0,92
B0	0,000	ULS-Set B (auto)/3	CS0 - Rectangle (560; 200)	2,51	5,67	**-2,62**
B0	1,627-	ULS-Set B (auto)/4	CS0 - Rectangle (560; 200)	-23,78	6,43	**2,03**
B2	0,000	ULS-Set B (auto)/2	CS13 - IPE300	**-60,57**	48,14	0,00
B58	0,000	ULS-Set B (auto)/5	CS13 - IPE300	**-1,06**	8,17	-2,77
B3	3,030	ULS-Set B (auto)/6	CS13 - IPE300	-53,70	**-39,19**	-1,33
B3	0,000	ULS-Set B (auto)/1	CS13 - IPE300	-56,40	**59,99**	0,02
B57	0,000	ULS-Set B (auto)/7	CS13 - IPE300	-23,03	-6,65	**-3,82**
B3	3,030	ULS-Set B (auto)/8	CS13 - IPE300	-45,44	3,78	**0,63**
B13	4,194	ULS-Set B (auto)/9	CS2 - Rectangle (260; 140)	**-13,24**	-0,05	0,01
B4	0,000	ULS-Set B (auto)/9	CS2 - Rectangle (260; 140)	**35,85**	1,11	0,00
B17	1,911	ULS-Set B (auto)/10	CS2 - Rectangle (260; 140)	16,69	**-5,30**	0,00
B17	4,194	ULS-Set B	CS2 - Rectangle	19,01	**12,48**	0,00

Name	dx [m]	Case	Cross-section	N [kN]	M_y [kNm]	M_z [kNm]
		(auto)/11	(260; 140)			
B19	4,194	ULS-Set B (auto)/12	CS2 - Rectangle (260; 140)	4,89	-0,08	**-0,19**
B7	4,194	ULS-Set B (auto)/13	CS2 - Rectangle (260; 140)	1,97	-0,10	**0,18**
B48	1,762	ULS-Set B (auto)/12	CS9 - RECT (140; 200)	**-72,06**	0,07	-0,01
B24	0,000	ULS-Set B (auto)/12	CS9 - RECT (140; 200)	**16,46**	0,00	0,00
B49	0,000	ULS-Set B (auto)/1	CS9 - RECT (140; 200)	-57,08	**-1,52**	0,05
B49	1,762	ULS-Set B (auto)/1	CS9 - RECT (140; 200)	-57,31	**0,11**	0,05
B26	1,057	ULS-Set B (auto)/14	CS9 - RECT (140; 200)	0,57	0,00	**-0,31**
B48	0,000	ULS-Set B (auto)/15	CS9 - RECT (140; 200)	-53,42	-1,18	**0,08**
B33	0,000	ULS-Set B (auto)/12	CS3 - Rectangle (200; 200)	**-86,00**	**0,76**	0,00
B50	0,000	ULS-Set B (auto)/12	CS3 - Rectangle (200; 200)	**70,76**	0,15	0,00
B50	3,200-	ULS-Set B (auto)/12	CS3 - Rectangle (200; 200)	13,42	**-0,59**	0,02
B53	1,600+	ULS-Set B (auto)/16	CS3 - Rectangle (200; 200)	0,72	-0,10	**-0,76**
B53	1,600-	ULS-Set B (auto)/8	CS3 - Rectangle (200; 200)	-9,14	-0,32	**3,05**
B121	0,000	ULS-Set B (auto)/1	CS10 - HE220B	**-20,28**	0,00	0,00
B56	0,000	ULS-Set B (auto)/17	CS10 - HE220B	**0,00**	0,00	0,00
B56	12,500+	ULS-Set B (auto)/1	CS10 - HE220B	-5,62	**-44,59**	14,72
B56	8,980	ULS-Set B (auto)/1	CS10 - HE220B	-6,64	**14,36**	-4,57
B56	12,500+	ULS-Set B (auto)/18	CS10 - HE220B	-5,45	9,70	**-5,98**
B56	12,500-	ULS-Set B (auto)/1	CS10 - HE220B	-5,68	-44,58	**15,24**
B69	2,638	ULS-Set B (auto)/19	CS6 - Rectangle (160; 80)	**-8,50**	0,00	0,00
B70	2,638	ULS-Set B (auto)/20	CS6 - Rectangle (160; 80)	**15,90**	**0,00**	0,00
B64	1,319	ULS-Set B (auto)/21	CS6 - Rectangle (160; 80)	9,61	0,04	**-0,03**
B63	1,319	ULS-Set B (auto)/21	CS6 - Rectangle (160; 80)	-3,23	**0,04**	**0,03**
B73	0,000	ULS-Set B (auto)/12	CS12 - RECT (100; 260)	**-7,69**	0,00	0,00
B78	0,000	ULS-Set B (auto)/22	CS12 - RECT (100; 260)	**-1,49**	0,00	0,00
B75	0,005-	ULS-Set B (auto)/12	CS12 - RECT (100; 260)	-7,67	**0,00**	0,00
B75	0,645	ULS-Set B (auto)/12	CS12 - RECT (100; 260)	-7,54	**0,04**	0,02
B75	0,005+	ULS-Set B (auto)/23	CS12 - RECT (100; 260)	-2,93	0,01	**-0,01**
B71	0,640	ULS-Set B (auto)/21	CS12 - RECT (100; 260)	-5,83	0,03	**0,03**
B88	0,000	ULS-Set B (auto)/24	CS14 - IX (IPE330, IPET330)	**-224,08**	0,01	32,83
B87	3,588	ULS-Set B (auto)/25	CS14 - IX (IPE330, IPET330)	**-49,74**	0,00	0,00
B88	0,000	ULS-Set B (auto)/26	CS14 - IX (IPE330, IPET330)	-156,44	**-3,99**	21,58
B88	0,000	ULS-Set B (auto)/5	CS14 - IX (IPE330, IPET330)	-127,39	**2,79**	24,92
B88	2,450-	ULS-Set B (auto)/1	CS14 - IX (IPE330, IPET330)	-192,71	-0,39	**-73,63**

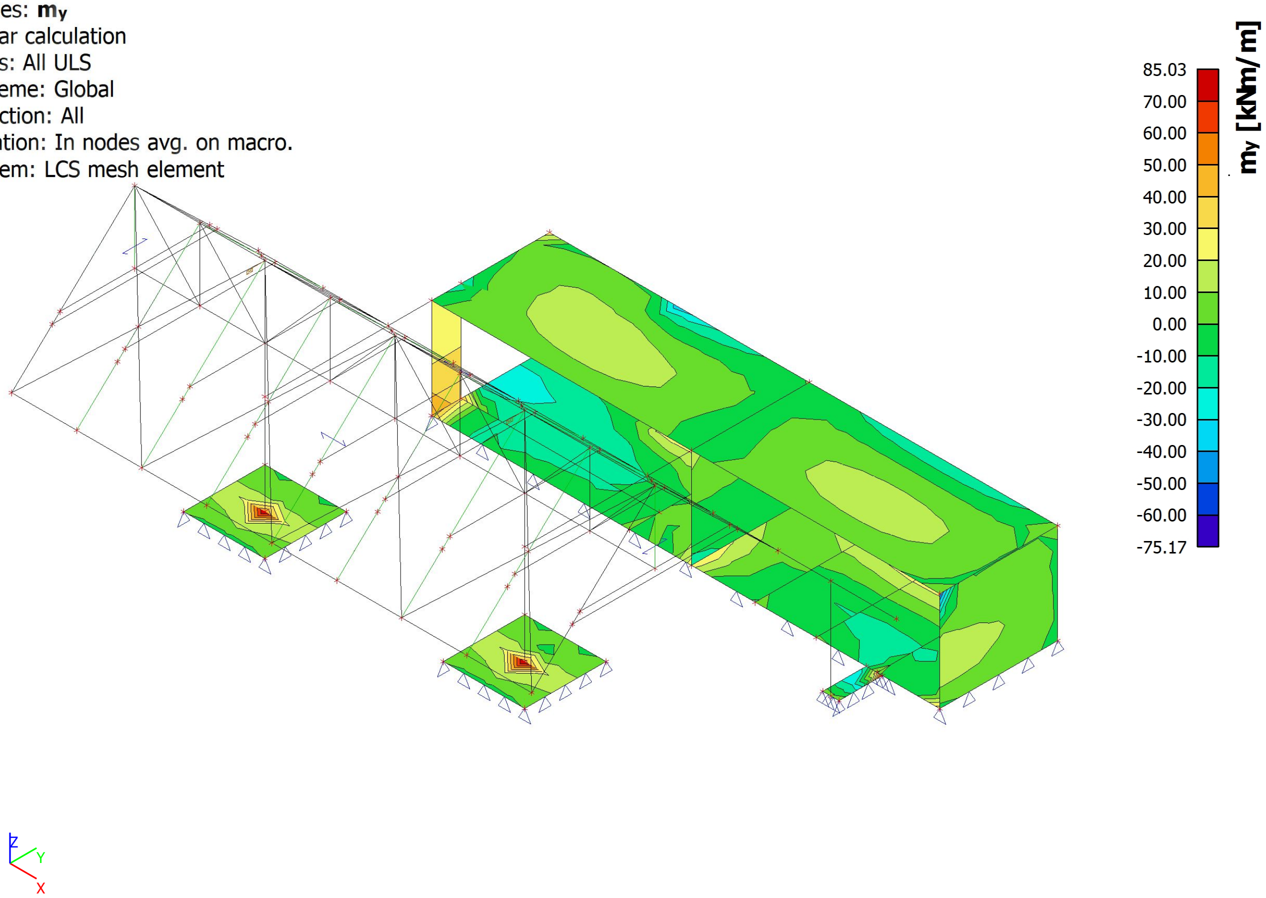
Name	dx [m]	Case	Cross-section	N [kN]	M_y [kNm]	M_z [kNm]
B87	0,000	ULS-Set B (auto)/1	CS14 - IX (IPE330, IPET330)	-191,83	-0,17	**37,32**

Name	Combination key
ULS-Set B (auto)/1	1.35*LC0 + 1.35*LC1 + 1.05*LC2 + 1.50*LC4 + 0.90*LC6 + 1.35*LC9
ULS-Set B (auto)/2	1.35*LC0 + 1.35*LC1 + 1.05*LC2 + 1.50*LC4 + 0.90*LC7 + 1.35*LC9
ULS-Set B (auto)/3	1.35*LC0 + 1.35*LC1 + 1.50*LC2 + 0.75*LC4 + 0.90*LC6 + 1.35*LC9
ULS-Set B (auto)/4	1.35*LC0 + 1.35*LC1 + 1.50*LC2 + 0.75*LC5 + 0.90*LC6 + 1.35*LC9
ULS-Set B (auto)/5	LC0 + LC1 + 0.75*LC5 + 1.50*LC6 + LC9
ULS-Set B (auto)/6	1.35*LC0 + 1.35*LC1 + 1.50*LC4 + 0.90*LC6 + 1.35*LC9
ULS-Set B (auto)/7	1.35*LC0 + 1.35*LC1 + 0.75*LC4 + 1.50*LC6 + 1.35*LC9
ULS-Set B (auto)/8	1.35*LC0 + 1.35*LC1 + 1.05*LC2 + 0.75*LC5 + 1.50*LC7 + 1.35*LC9
ULS-Set B (auto)/9	1.35*LC0 + 1.35*LC1 + 1.05*LC2 + 1.50*LC5 + 0.90*LC6 + 1.35*LC9
ULS-Set B (auto)/10	1.35*LC0 + 1.35*LC1 + 1.05*LC2 + 0.75*LC4 + 1.50*LC6 + 1.35*LC9
ULS-Set B (auto)/11	1.35*LC0 + 1.35*LC1 + 1.05*LC2 + 1.50*LC6 + 1.35*LC9
ULS-Set B (auto)/12	1.35*LC0 + 1.35*LC1 + 1.05*LC2 + 1.50*LC3 + 0.90*LC7 + 1.35*LC9
ULS-Set B (auto)/13	1.35*LC0 + 1.35*LC1 + 1.05*LC2 + 0.75*LC3 + 1.50*LC7 + 1.35*LC9
ULS-Set B (auto)/14	1.35*LC0 + 1.35*LC1 + 1.50*LC6 + 1.35*LC9
ULS-Set B (auto)/15	1.35*LC0 + 1.35*LC1 + 1.05*LC2 + 0.75*LC5 + 1.50*LC6 + 1.35*LC9
ULS-Set B (auto)/16	LC0 + LC1 + 0.75*LC4 + 1.50*LC6 + LC9
ULS-Set B (auto)/17	1.35*LC0 + 1.35*LC1 + 1.35*LC9
ULS-Set B (auto)/18	LC0 + LC1 + 1.05*LC2 + 0.75*LC5 + 1.50*LC7 + LC9
ULS-Set B (auto)/19	1.35*LC0 + 1.35*LC1 + 1.50*LC4 + 0.90*LC7 + 1.35*LC9
ULS-Set B (auto)/20	1.35*LC0 + 1.35*LC1 + 1.50*LC3 + 0.90*LC7 + 1.35*LC9
ULS-Set B (auto)/21	1.35*LC0 + 1.35*LC1 + 1.50*LC3 + 0.90*LC6 + 1.35*LC9
ULS-Set B (auto)/22	LC0 + LC1 + 1.05*LC2 + LC9 + 1.50*LC8
ULS-Set B (auto)/23	1.35*LC0 + 1.35*LC1 + 1.05*LC2 + 1.35*LC9 + 1.50*LC8
ULS-Set B (auto)/24	1.35*LC0 + 1.35*LC1 + 1.05*LC2 + 1.50*LC3 + 0.90*LC6 + 1.35*LC9
ULS-Set B (auto)/25	LC0 + LC1 + LC9 + 1.50*LC8
ULS-Set B (auto)/26	1.35*LC0 + 1.35*LC1 + 1.05*LC2 + 0.75*LC4 + 1.50*LC7 + 1.35*LC9

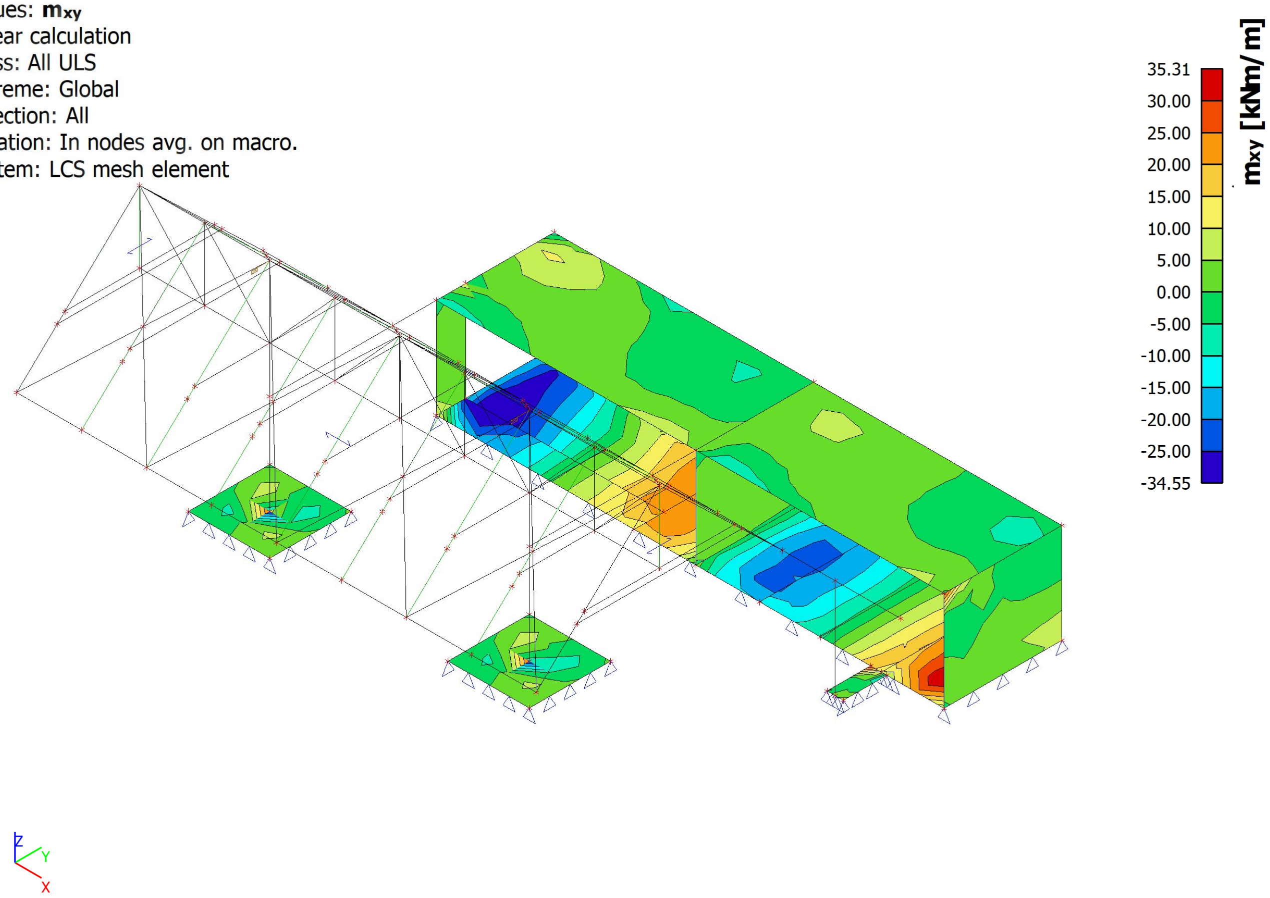
Values: **m_x**
Linear calculation
Class: All ULS
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



Values: **m_y**
Linear calculation
Class: All ULS
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element

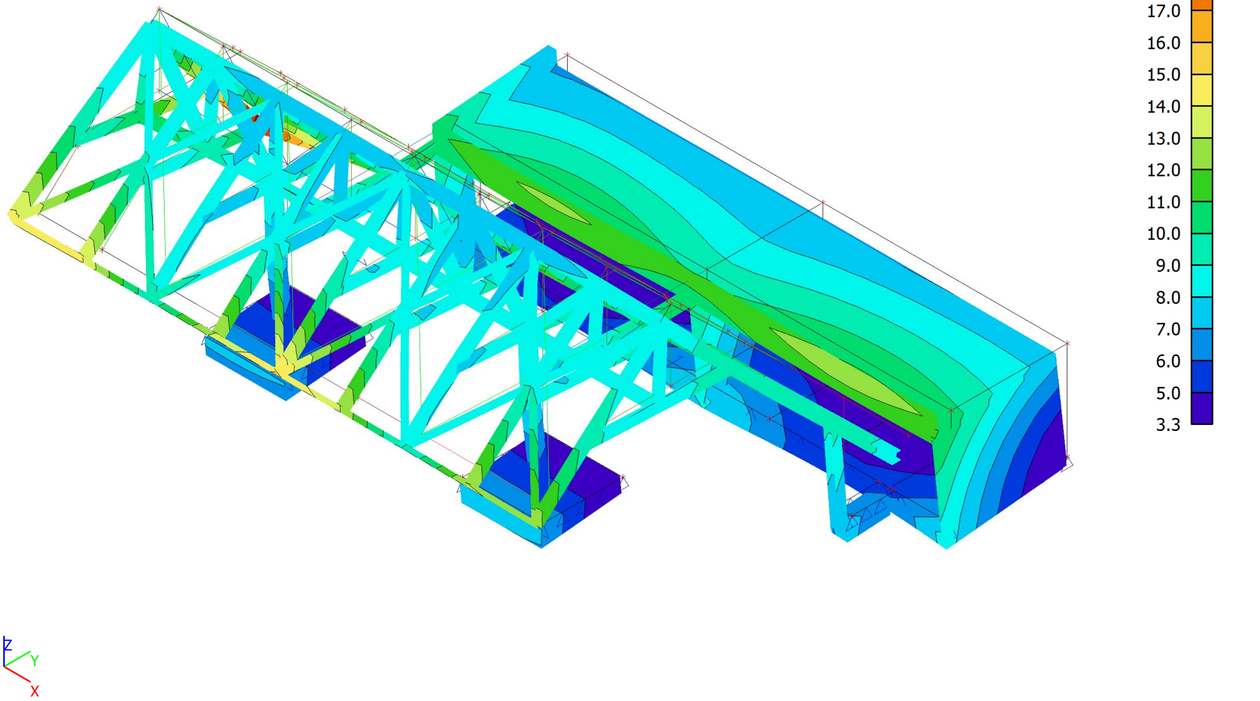


Values: m_{xy}
Linear calculation
Class: All ULS
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



1.8. Rezultati - MSU

Values: U_{total}
Linear calculation
Class: All SLS
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



Linear calculation
Class: All SLS
Selection: All
Location: In nodes avg. on macro. System: LCS mesh element
Results on 1D member:
Extreme 1D: Global

Name	dx [m]	Fibre	Case	u_x [mm]	u_y [mm]	u_z [mm]	$φ_x$ [mrad]	$φ_y$ [mrad]	$φ_z$ [mrad]	U_{total} [mm]
B93	0,000	3	SLS-Char (auto)/1	0,5	1,0	1,4	0,0	-1,8	0,1	**1,9**
B56	15,700	1	SLS-Char (auto)/2	-0,2	12,6	-15,7	2,6	2,8	2,4	**20,1**

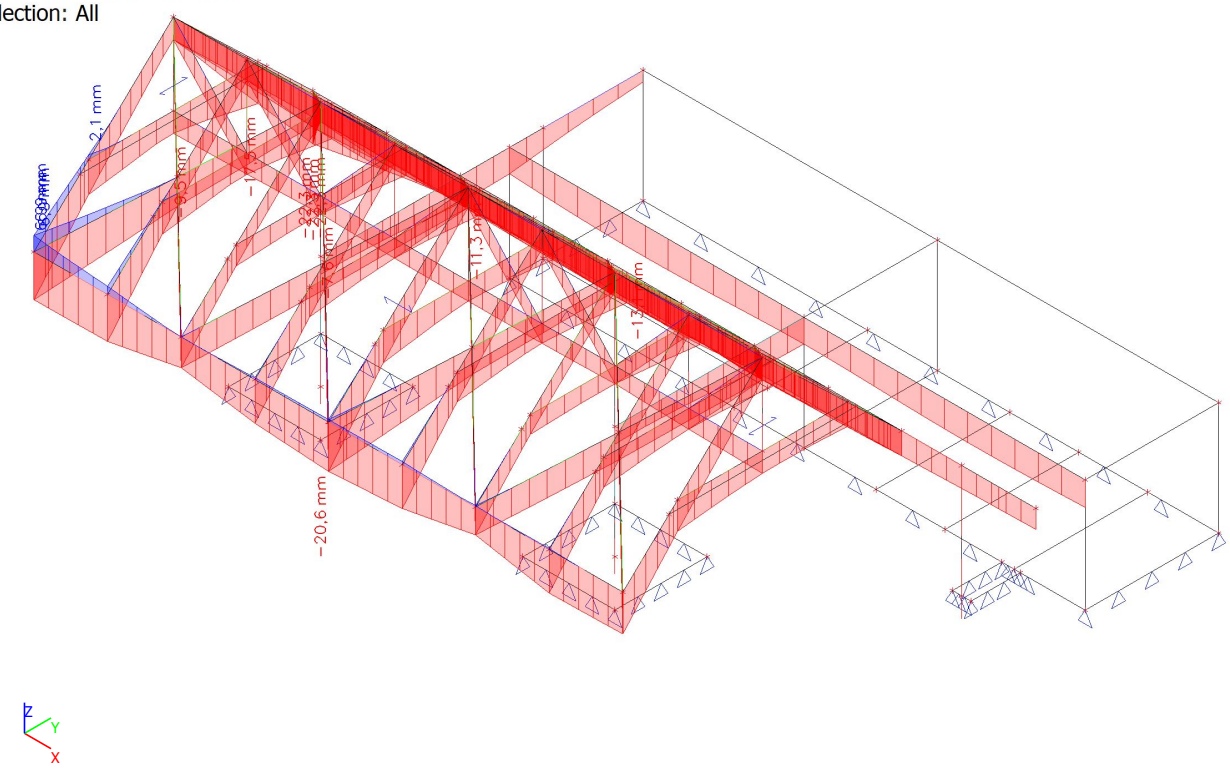
Results on 2D member:
Extreme 2D: Global

Name	Mesh	Position [m]	Case	ux+ [mm] ux- [mm]	uy+ [mm] uy- [mm]	uz+ [mm] uz- [mm]	$φ_x$ [mrad]	$φ_y$ [mrad]	$φ_z$ [mrad]	U total+ [mm] U total- [mm]
S7	Element: 507 Node: 558	-0,500 -7,000 0,000	SLS-Char (auto)/3	**0,0** 0,0	-1,3 -0,5	-4,2 -4,2	1,8	0,1	-0,1	4,4 4,3
S2	Element: 305 Node: 4	12,500 0,000 2,450	SLS-Char (auto)/2	**-7,1** **-7,1**	-1,8 -2,2	-0,5 -0,5	-0,1	-0,1	2,2	7,4 7,5
S6	Element: 485 Node: 534	6,890 -7,000 0,000	SLS-Char (auto)/4	-0,1 **0,0**	-1,2 -0,6	-3,9 -3,9	1,5	-0,2	0,0	4,1 4,0
S2	Element: 280 Node: 5	12,500 -2,900 2,450	SLS-Char (auto)/2	-7,1 -7,1	**-8,1** **-8,6**	-0,7 -0,8	-0,5	-0,1	**2,3**	10,9 11,2
S1	Element: 151 Node: 7	0,000 0,000 0,000	SLS-Char (auto)/5	-0,3 -0,4	**3,6** **3,6**	-1,2 -1,5	1,6	0,1	-0,1	3,8 3,9

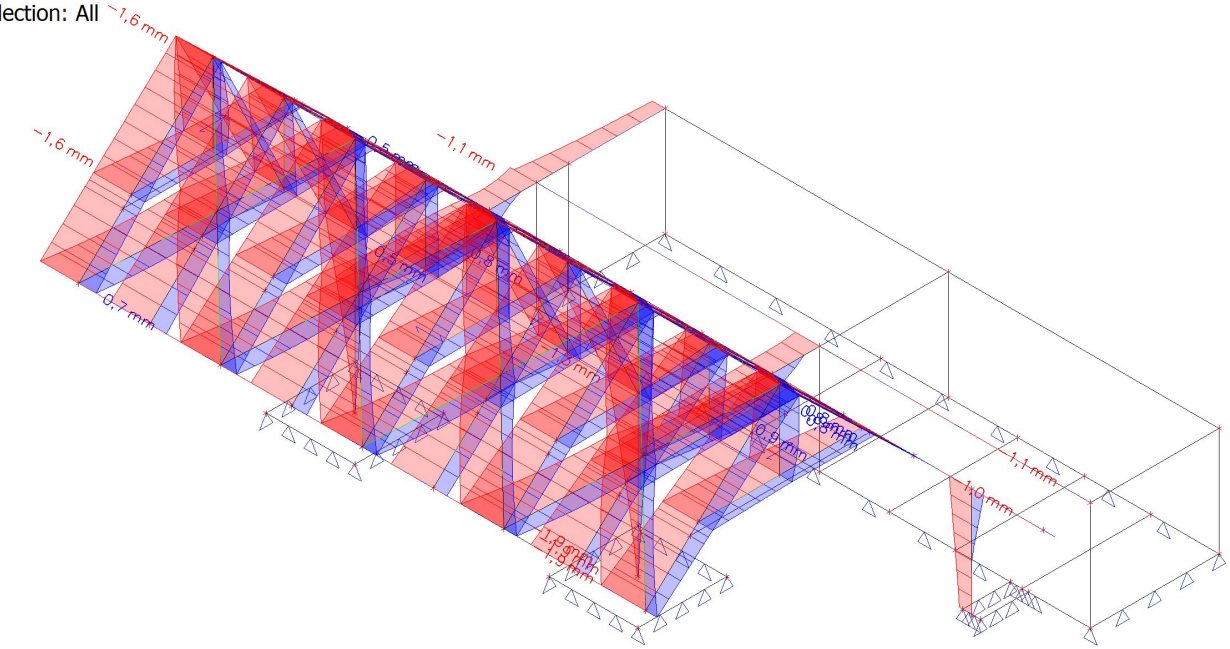
Name	Mesh	Position [m]	Case	ux+ [mm] ux- [mm]	uy+ [mm] uy- [mm]	uz+ [mm] uz- [mm]	φ_x [mrad]	φ_y [mrad]	φ_z [mrad]	U total+ [mm] U total- [mm]
S0	Element: 26 Node: 866	2,949 -2,900 2,450	SLS-Char (auto)/2	-0,8 -0,8	-6,5 -6,2	**-9,4** **-9,4**	1,6	0,0	-0,1	11,5 11,3
S3	Element: 331 Node: 12	6,390 0,000 0,000	SLS-Char (auto)/4	-1,6 -1,6	-2,7 -3,0	**-0,3** **-0,4**	-0,1	-0,1	1,3	3,2 3,4
S4	Element: 336 Node: 13	0,000 -2,900 0,000	SLS-Char (auto)/2	-1,5 -1,5	-7,7 -8,0	-0,5 -0,5	**-1,6**	0,0	1,7	7,8 8,2
S0	Element: 16 Node: 577	3,077 -0,485 2,450	SLS-Char (auto)/2	-0,6 -0,6	-6,6 -6,1	-3,9 -3,9	**3,0**	-0,2	-0,1	7,7 7,3
S5	Element: 341 Node: 382	0,487 -2,900 0,000	SLS-Char (auto)/2	-0,7 -0,2	-1,7 -1,3	-7,0 -7,0	1,7	**-1,8**	0,0	7,2 7,1
S5	Element: 480 Node: 878	12,500 -2,900 0,000	SLS-Char (auto)/6	-0,2 -0,7	-2,1 -1,6	-8,2 -8,2	1,9	**2,1**	0,0	8,4 8,4
S0	Element: 6 Node: 872	0,000 -2,900 2,450	SLS-Char (auto)/4	-1,1 -1,2	-3,9 -3,8	-6,5 -6,5	1,1	0,8	**-0,2**	7,6 7,6
S6	Element: 484 Node: 27	7,390 -6,000 0,000	SLS-Char (auto)/7	-0,1 0,0	-1,2 -0,5	-1,2 -1,2	1,6	-0,2	0,0	**1,7** **1,3**
S0	Element: 146 Node: 851	10,463 -2,900 2,450	SLS-Char (auto)/2	-0,8 -0,8	-7,1 -6,8	-9,2 -9,2	1,8	-0,1	-0,1	**11,6** **11,5**

Name	Combination key
SLS-Char (auto)/1	LC0 + LC1 + 0.50*LC5 + LC7 + LC9
SLS-Char (auto)/2	LC0 + LC1 + 0.70*LC2 + LC4 + 0.60*LC6 + LC9
SLS-Char (auto)/3	LC0 + LC1 + 0.50*LC3 + LC6 + LC9
SLS-Char (auto)/4	LC0 + LC1 + 0.70*LC2 + 0.50*LC4 + LC7 + LC9
SLS-Char (auto)/5	LC0 + LC1 + LC2 + 0.50*LC3 + 0.60*LC7 + LC9
SLS-Char (auto)/6	LC0 + LC1 + LC2 + 0.50*LC4 + 0.60*LC6 + LC9
SLS-Char (auto)/7	LC0 + LC1 + 0.70*LC2 + LC9 + LC8

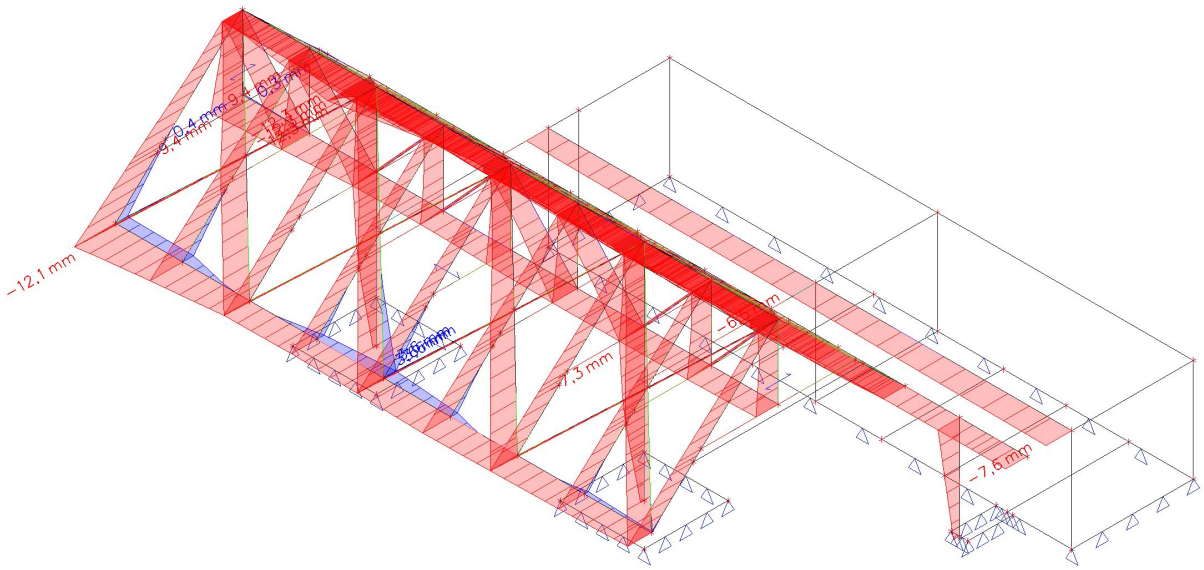
Values: u_z
Linear calculation
Class: All ULS
Coordinate system: Global
Extreme 1D: Cross-section
Selection: All



Values: u_x
Linear calculation
Class: All SLS
Coordinate system: Global
Extreme 1D: Cross-section
Selection: All



Values: u_y
Linear calculation
Class: All SLS
Coordinate system: Global
Extreme 1D: Cross-section
Selection: All



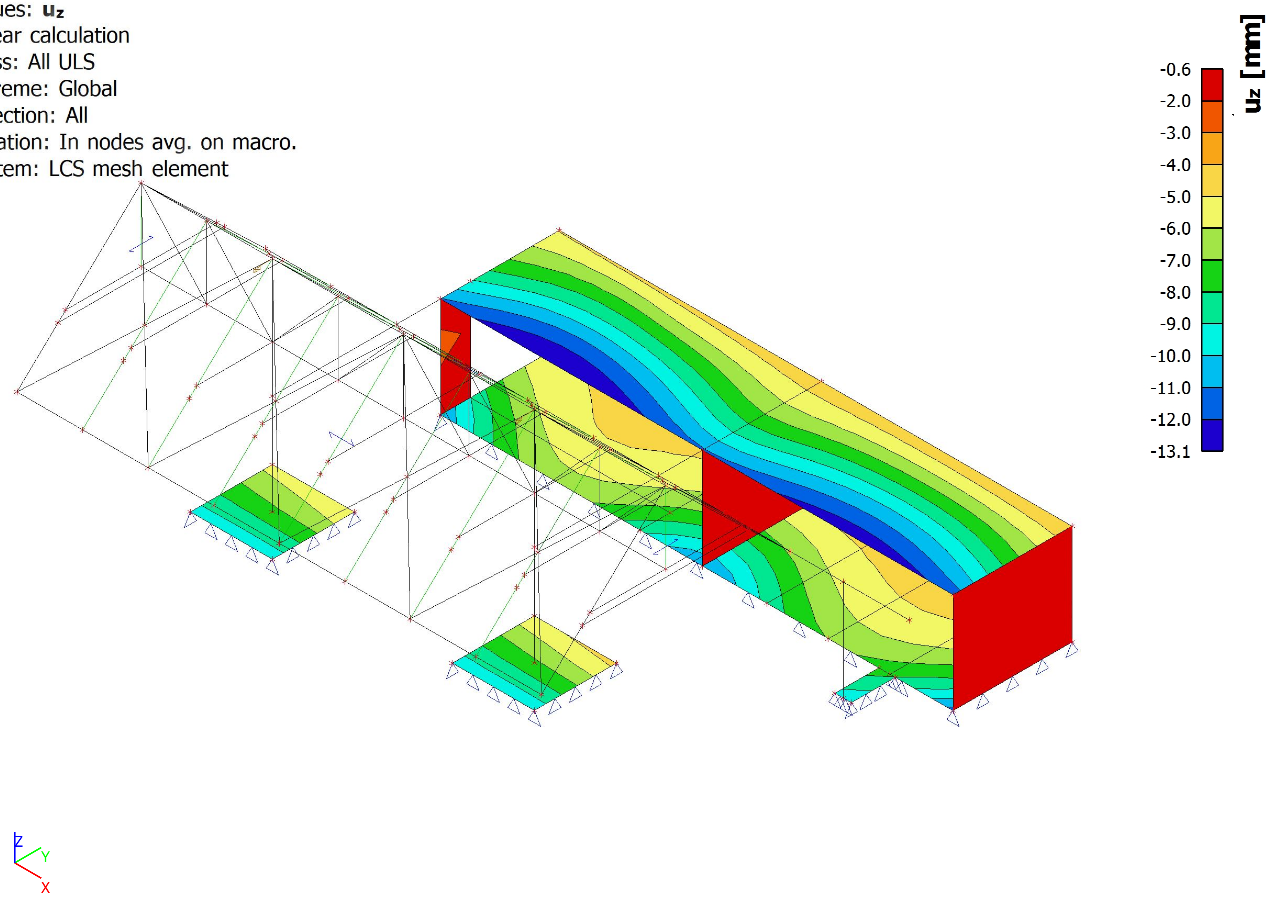
Linear calculation
Class: All SLS
Coordinate system: Global
Extreme 1D: Global
Selection: All

Deformations

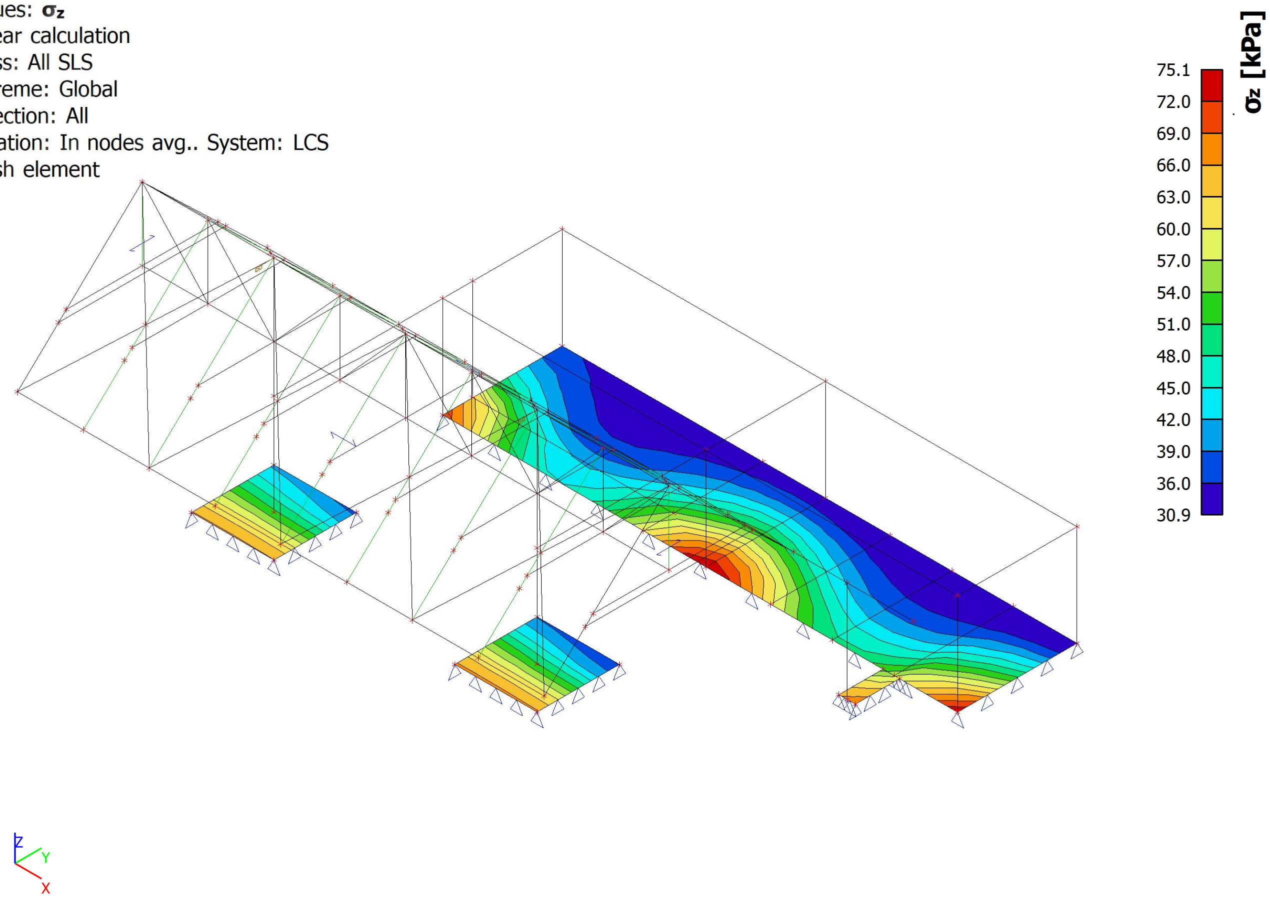
Name	dx [m]	Case	u_x [mm]	u_y [mm]	u_z [mm]
B80	0,330	SLS-Char (auto)/1	**-1,9**	-3,0	-7,2
B81	1,649	SLS-Char (auto)/2	**0,9**	-5,7	-4,9
B74	1,595	SLS-Char (auto)/3	-1,5	**3,6**	-12,6
B9	4,194	SLS-Char (auto)/4	0,2	**-12,3**	**-15,4**
B64	2,638	SLS-Char (auto)/4	-0,4	-12,1	**3,2**

Name	Combination key
SLS-Char (auto)/1	LC0 + LC1 + 0.70*LC2 + LC4 + 0.60*LC7 + LC9
SLS-Char (auto)/2	LC0 + LC1 + 0.50*LC5 + LC6 + LC9
SLS-Char (auto)/3	LC0 + LC1 + 0.50*LC5 + LC7 + LC9
SLS-Char (auto)/4	LC0 + LC1 + 0.70*LC2 + LC4 + 0.60*LC6 + LC9

Values: $\mathbf{u_z}$
Linear calculation
Class: All ULS
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element

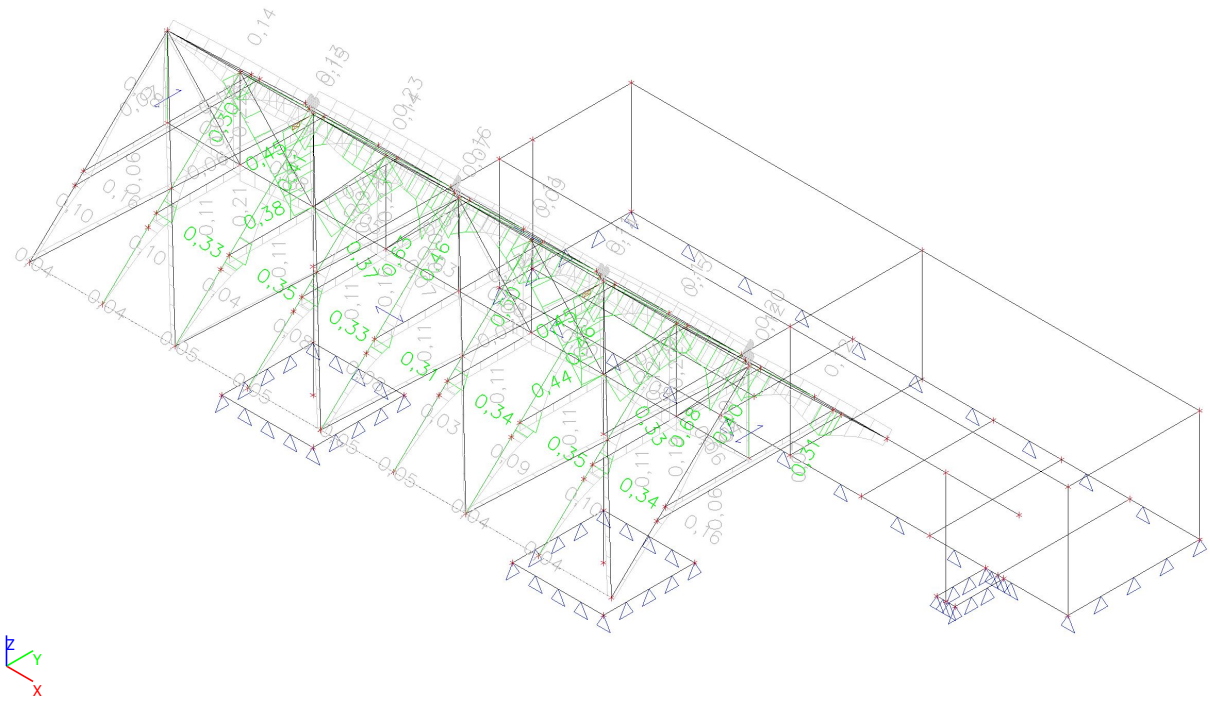


Values: $\mathbf{\sigma_z}$
Linear calculation
Class: All SLS
Extreme: Global
Selection: All
Location: In nodes avg.. System: LCS mesh element



1.9. Dimenzioniranje

1.10. Les



Linear calculation, Extreme : Cross-section
Selection : All
Class : All ULS

EN 1995-1-1 Code Check

Beam B17	**4,194 m**	**CS2 - Rectangle (260; 140)**	**C24 (EN 338)**	**All ULS**	**0,68 -**

Combination key
All ULS / 1.35*LC0 + 1.35*LC1 + 1.05*LC2 + 1.50*LC6 + 1.35*LC9

Basic data	
Partial safety factor γM for Solid timber	1,30

Material data		
Bending (fm,k)	24,0	MPa
Tension (ft,0,k)	14,5	MPa
Tension (ft,90,k)	0,4	MPa
Compression (fc,0,k)	21,0	MPa
Compression (fc,90,k)	2,5	MPa
Shear (fv,k)	4,0	MPa
Type of timber	Solid	

The critical check is on position **4,194** m.

Internal forces		
NEd	19,01	kN
Vy,Ed	0,00	kN
Vz,Ed	12,64	kN
TEd	0,00	kNm
My,Ed	12,48	kNm
Mz,Ed	0,00	kNm

Modification factor	
Service Class	1
Load duration	Long term
Modification factor kmod	0,70

..:: SECTION CHECK ::..

Tension parallel to the grain
According to EN 1995-1-1 article 6.1.2 and formula (6.1)

σt,0,d	0,5	MPa
kh	1,00	
ft,0,d	7,8	MPa
Unity check	0,07	-

Compression perpendicular to the grain
Note: The check for Compression perpendicular to the grain has been ignored due to user input.
Bending
According to EN 1995-1-1 article 6.1.6 and formula (6.11),(6.12)

σm,y,d	7,9	MPa
kh,y	1,00	
fm,y,d	12,9	MPa
km	0,70	

Unity check (6.11) = 0,61 + 0,00 = 0,61 -
Unity check (6.12) = 0,43 + 0,00 = 0,43 -

Shear
According to EN 1995-1-1 article 6.1.7 and formula (6.13)

kcr	0,67	
τz,d	0,8	MPa
fv,d	2,2	MPa
Unity check τz	0,36	-

Combined Bending and Axial Tension
According to EN 1995-1-1 article 6.2.3 and formula (6.17),(6.18)

ft,0,d	7,8	MPa
fm,y,d	12,9	MPa
km	0,70	

Unity check (6.17) = 0,07 + 0,61 + 0,00 = 0,68 -
Unity check (6.18) = 0,07 + 0,43 + 0,00 = 0,50 -

The member satisfies the section check.

..:: STABILITY CHECK ::..

Beams subjected to bending or combined bending and compression
According to EN 1995-1-1 article 6.3.3 and formula (6.33),(6.35)

LTB Parameters		
Elastic critical moment My,crit	149,05	kNm
Critical bending stress σm,crit	94,5	MPa
Relative slenderness λrel,m	0,504	-
Reduction factor kcrit	1,000	-

Unity check (6.33) = 0,61 -

My,crit Parameters		
G0,05	462,5	MPa
LTB length L	4,194	m
Lef/L	0,90	
Effective length Lef	3,775	m
Influence of load position	no influence	

The member satisfies the stability check.

EN 1995-1-1 Code Check

Beam B49	**1,762 m**	**CS9 - RECT (140; 200)**	**C14 (EN 338)**	**All ULS**	**0,45 -**

Combination key
All ULS / 1.35*LC0 + 1.35*LC1 + 1.05*LC2 + 1.50*LC3 + 0.90*LC6 + 1.35*LC9

Basic data	
Partial safety factor γM for Solid timber	1,30

Material data		
Bending (fm,k)	14,0	MPa
Tension (ft,0,k)	7,2	MPa
Tension (ft,90,k)	0,4	MPa
Compression (fc,0,k)	16,0	MPa
Compression (fc,90,k)	2,0	MPa
Shear (fv,k)	3,0	MPa
Type of timber	Solid	

The critical check is on position **0,000** m.

Internal forces		
NEd	-70,62	kN
Vy,Ed	-0,17	kN
Vz,Ed	0,84	kN
TEd	0,00	kNm
My,Ed	-1,37	kNm
Mz,Ed	0,05	kNm

Modification factor	
Service Class	1
Load duration	Medium term
Modification factor kmod	0,80

..:: SECTION CHECK ::..

Compression parallel to the grain
According to EN 1995-1-1 article 6.1.4 and formula (6.2)

σc,0,d	2,5	MPa
fc,0,d	9,8	MPa
Unity check	0,26	-

Compression perpendicular to the grain
Note: The check for Compression perpendicular to the grain has been ignored due to user input.
Bending
According to EN 1995-1-1 article 6.1.6 and formula (6.11),(6.12)

σm,y,d	1,5	MPa
kh,y	1,00	
fm,y,d	8,6	MPa
σm,z,d	0,1	MPa
kh,z	1,01	
fm,z,d	8,7	MPa
km	0,70	

Unity check (6.11) = 0,17 + 0,01 = 0,18 -
Unity check (6.12) = 0,12 + 0,01 = 0,13 -

Shear
According to EN 1995-1-1 article 6.1.7 and formula (6.13)

kcr	0,67	
τy,d	0,0	MPa
τz,d	0,1	MPa
fv,d	1,8	MPa
Unity check τy	0,01	-
Unity check τz	0,04	-
Unity check Interaction	0,00	-

Note: The interaction equation has been added as a NCCI.

Combined Bending and Axial Compression
According to EN 1995-1-1 article 6.2.4 and formula (6.19),(6.20)

fc,0,d	9,8	MPa
fm,y,d	8,6	MPa
fm,z,d	8,7	MPa
km	0,70	

Unity check (6.19) = 0,07 + 0,17 + 0,01 = 0,24 -
Unity check (6.20) = 0,07 + 0,12 + 0,01 = 0,19 -

The member satisfies the section check.

..:: STABILITY CHECK ::..

Columns subjected to compression or combined compression and bending
According to EN 1995-1-1 article 6.3.2 and formula (6.23),(6.24)

Buckling parameters	yy	zz	
Sway type	sway	non-sway	
System length L	1,762	1,762	m
Buckling factor k	1,00	1,00	
Buckling length Lcr	1,762	1,762	m
Slenderness λ	30,512	43,589	-
Relative slenderness λ	0,567	0,810	-
Limit slenderness	0,300	0,300	-
Imperfection βc	0,200	0,200	-
Reduction factor kc	0,929	0,820	-

Unity check (6.23) = 0,28 + 0,17 + 0,01 = 0,45 -
Unity check (6.24) = 0,31 + 0,12 + 0,01 = 0,44 -

Beams subjected to bending or combined bending and compression
According to EN 1995-1-1 article 6.3.3 and formula (6.33),(6.35)

LTB Parameters		
Elastic critical moment My,crit	144,55	kNm
Critical bending stress σm,crit	154,9	MPa
Relative slenderness λrel,m	0,301	-
Reduction factor kcrit	1,000	-

Unity check (6.33) = 0,17 -
Unity check (6.35) = 0,03 + 0,31 = 0,34 -

My,crit Parameters		
G0,05	293,8	MPa
LTB length L	1,762	m
Lef/L	1,00	
Effective length Lef	1,762	m
Influence of load position	no influence	

The member satisfies the stability check.

EN 1995-1-1 Code Check

Beam B35	**2,373 m**	**CS3 - Rectangle (200; 200)**	**C24 (EN 338)**	**All ULS**	**0,44 -**

Combination key
All ULS / 1.35*LC0 + 1.35*LC1 + 1.05*LC2 + 1.50*LC3 + 0.90*LC7 + 1.35*LC9

Basic data	
Partial safety factor γM for Solid timber	1,30

Material data		
Bending (fm,k)	24,0	MPa
Tension (ft,0,k)	14,5	MPa
Tension (ft,90,k)	0,4	MPa
Compression (fc,0,k)	21,0	MPa
Compression (fc,90,k)	2,5	MPa
Shear (fv,k)	4,0	MPa
Type of timber	Solid	

The critical check is on position **2,373** m.

Internal forces		
NEd	-84,99	kN
Vy,Ed	0,00	kN
Vz,Ed	0,58	kN
TEd	-0,03	kNm
My,Ed	0,76	kNm
Mz,Ed	0,00	kNm

Modification factor	
Service Class	1
Load duration	Medium term
Modification factor kmod	0,80

..:: SECTION CHECK ::..

Compression parallel to the grain
According to EN 1995-1-1 article 6.1.4 and formula (6.2)

σc,0,d	2,1	MPa
fc,0,d	12,9	MPa
Unity check	0,16	-

Compression perpendicular to the grain
Note: The check for Compression perpendicular to the grain has been ignored due to user input.
Bending
According to EN 1995-1-1 article 6.1.6 and formula (6.11),(6.12)

σm,y,d	0,6	MPa
kh,y	1,00	
fm,y,d	14,8	MPa
km	0,70	

Unity check (6.11) = 0,04 + 0,00 = 0,04 -
Unity check (6.12) = 0,03 + 0,00 = 0,03 -

Shear
According to EN 1995-1-1 article 6.1.7 and formula (6.13)

kcr	0,67	
τz,d	0,0	MPa
fv,d	2,5	MPa
Unity check τz	0,01	-

Torsion
According to EN 1995-1-1 article 6.1.8 and formula (6.14)

τtor,d	0,0	MPa
kshape	1,05	
fv,d	2,5	MPa
Unity check	0,01	-
Unity check Interaction Shear	0,01	-

Note: The interaction equation has been added as a NCCI.

Combined Bending and Axial Compression
According to EN 1995-1-1 article 6.2.4 and formula (6.19),(6.20)

fc,0,d	12,9	MPa
fm,y,d	14,8	MPa
km	0,70	

Unity check (6.19) = 0,03 + 0,04 + 0,00 = 0,07 -
Unity check (6.20) = 0,03 + 0,03 + 0,00 = 0,05 -

The member satisfies the section check.

..:: STABILITY CHECK ::..

Columns subjected to compression or combined compression and bending
According to EN 1995-1-1 article 6.3.2 and formula (6.23),(6.24)

Buckling parameters	yy	zz	
Sway type	sway	non-sway	
System length L	2,373	2,373	m
Buckling factor k	2,05	1,00	
Buckling length Lcr	4,867	2,373	m
Slenderness λ	84,298	41,101	-
Relative slenderness λ	1,429	0,697	-
Limit slenderness	0,300	0,300	-
Imperfection βc	0,200	0,200	-
Reduction factor kc	0,412	0,878	-

Unity check (6.23) = 0,40 + 0,04 + 0,00 = 0,44 -
Unity check (6.24) = 0,19 + 0,03 + 0,00 = 0,21 -

Beams subjected to bending or combined bending and compression
According to EN 1995-1-1 article 6.3.3 and formula (6.33),(6.35)

LTB Parameters		
Elastic critical moment My,crit	471,39	kNm
Critical bending stress σm,crit	353,5	MPa
Relative slenderness λrel,m	0,261	-
Reduction factor kcrit	1,000	-

Unity check (6.33) = 0,04 -
Unity check (6.35) = 0,00 + 0,19 = 0,19 -

My,crit Parameters		
G0,05	462,5	MPa
LTB length L	2,373	m
Lef/L	0,90	
Effective length Lef	2,136	m
Influence of load position	no influence	

The member satisfies the stability check.

EN 1995-1-1 Code Check

Beam B69	**2,638 m**	**CS6 - Rectangle (160; 80)**	**C24 (EN 338)**	**All ULS**	**0,23 -**

Combination key
All ULS / 1.35*LC0 + 1.35*LC1 + 1.50*LC4 + 0.90*LC7 + 1.35*LC9

Basic data	
Partial safety factor γM for Solid timber	1,30

Material data		
Bending (fm,k)	24,0	MPa
Tension (ft,0,k)	14,5	MPa
Tension (ft,90,k)	0,4	MPa
Compression (fc,0,k)	21,0	MPa
Compression (fc,90,k)	2,5	MPa
Shear (fv,k)	4,0	MPa
Type of timber	Solid	

The critical check is on position **1,319** m.

Internal forces		
NEd	-8,45	kN
Vy,Ed	0,00	kN
Vz,Ed	0,00	kN
TEd	0,00	kNm
My,Ed	0,04	kNm
Mz,Ed	-0,03	kNm

Modification factor	
Service Class	1
Load duration	Medium term
Modification factor kmod	0,80

..:: SECTION CHECK ::..

Compression parallel to the grain
According to EN 1995-1-1 article 6.1.4 and formula (6.2)

σc,0,d	0,7	MPa
fc,0,d	12,9	MPa
Unity check	0,05	-

Compression perpendicular to the grain
Note: The check for Compression perpendicular to the grain has been ignored due to user input.
Bending
According to EN 1995-1-1 article 6.1.6 and formula (6.11),(6.12)

σm,y,d	0,1	MPa
kh,y	1,00	
fm,y,d	14,8	MPa
σm,z,d	0,2	MPa
kh,z	1,13	
fm,z,d	16,7	MPa
km	0,70	

Unity check (6.11) = 0,01 + 0,01 = 0,02 -
Unity check (6.12) = 0,01 + 0,01 = 0,02 -

Combined Bending and Axial Compression
According to EN 1995-1-1 article 6.2.4 and formula (6.19),(6.20)

fc,0,d	12,9	MPa
fm,y,d	14,8	MPa
fm,z,d	16,7	MPa
km	0,70	

Unity check (6.19) = 0,00 + 0,01 + 0,01 = 0,02 -
Unity check (6.20) = 0,00 + 0,01 + 0,01 = 0,02 -

The member satisfies the section check.

..:: STABILITY CHECK ::..

Columns subjected to compression or combined compression and bending
According to EN 1995-1-1 article 6.3.2 and formula (6.23),(6.24)

Buckling parameters	yy	zz	
Sway type	sway	non-sway	
System length L	2,638	2,638	m
Buckling factor k	1,00	1,00	
Buckling length Lcr	2,638	2,638	m
Slenderness λ	57,109	114,215	-
Relative slenderness λ	0,968	1,937	-
Limit slenderness	0,300	0,300	-
Imperfection βc	0,200	0,200	-
Reduction factor kc	0,713	0,239	-

Unity check (6.23) = 0,07 + 0,01 + 0,01 = 0,09 -
Unity check (6.24) = 0,21 + 0,01 + 0,01 = 0,23 -

Beams subjected to bending or combined bending and compression
According to EN 1995-1-1 article 6.3.3 and formula (6.33),(6.35)

LTB Parameters		
Elastic critical moment My,crit	27,69	kNm
Critical bending stress σm,crit	81,1	MPa
Relative slenderness λrel,m	0,544	-
Reduction factor kcrit	1,000	-

Unity check (6.33) = 0,01 -
Unity check (6.35) = 0,00 + 0,21 = 0,21 -

My,crit Parameters		
G0,05	462,5	MPa
LTB length L	2,638	m
Lef/L	0,90	
Effective length Lef	2,374	m
Influence of load position	no influence	

The member satisfies the stability check.

EN 1995-1-1 Code Check

Beam B73	**1,600 m**	**CS12 - RECT (100; 260)**	**C14 (EN 338)**	**All ULS**	**0,05 -**

Combination key
All ULS / 1.35*LC0 + 1.35*LC1 + 1.05*LC2 + 1.50*LC3 + 0.90*LC7 + 1.35*LC9

Basic data	
Partial safety factor γM for Solid timber	1,30

Material data		
Bending (fm,k)	14,0	MPa
Tension (ft,0,k)	7,2	MPa
Tension (ft,90,k)	0,4	MPa
Compression (fc,0,k)	16,0	MPa
Compression (fc,90,k)	2,0	MPa
Shear (fv,k)	3,0	MPa
Type of timber	Solid	

The critical check is on position **0,640** m.

Internal forces		
NEd	-7,69	kN
Vy,Ed	0,01	kN
Vz,Ed	0,01	kN
TEd	-0,03	kNm
My,Ed	0,03	kNm
Mz,Ed	0,03	kNm

Modification factor	
Service Class	1
Load duration	Medium term
Modification factor kmod	0,80

..:: SECTION CHECK ::..

Compression parallel to the grain
According to EN 1995-1-1 article 6.1.4 and formula (6.2)

σc,0,d	0,3	MPa
fc,0,d	9,8	MPa
Unity check	0,03	-

Compression perpendicular to the grain
Note: The check for Compression perpendicular to the grain has been ignored due to user input.
Bending
According to EN 1995-1-1 article 6.1.6 and formula (6.11),(6.12)

σm,y,d	0,0	MPa
kh,y	1,00	
fm,y,d	8,6	MPa
σm,z,d	0,1	MPa
kh,z	1,08	
fm,z,d	9,3	MPa
km	0,70	

Unity check (6.11) = 0,00 + 0,00 = 0,01 -
Unity check (6.12) = 0,00 + 0,01 = 0,01 -

Shear
According to EN 1995-1-1 article 6.1.7 and formula (6.13)

kcr	0,67	
τy,d	0,0	MPa
τz,d	0,0	MPa
fv,d	1,8	MPa
Unity check τy	0,00	-
Unity check τz	0,00	-
Unity check Interaction	0,00	-

Note: The interaction equation has been added as a NCCI.

Torsion
According to EN 1995-1-1 article 6.1.8 and formula (6.14)

τtor,d	0,0	MPa
kshape	1,13	
fv,d	1,8	MPa
Unity check	0,02	-
Unity check Interaction Shear	0,02	-

Note: The interaction equation has been added as a NCCI.

Combined Bending and Axial Compression
According to EN 1995-1-1 article 6.2.4 and formula (6.19),(6.20)

fc,0,d	9,8	MPa
fm,y,d	8,6	MPa
fm,z,d	9,3	MPa
km	0,70	

Unity check (6.19) = 0,00 + 0,00 + 0,00 = 0,01 -
Unity check (6.20) = 0,00 + 0,00 + 0,01 = 0,01 -

The member satisfies the section check.

..:: STABILITY CHECK ::..

Columns subjected to compression or combined compression and bending
According to EN 1995-1-1 article 6.3.2 and formula (6.23),(6.24)

Buckling parameters	yy	zz	
Sway type	sway	non-sway	
System length L	1,600	1,600	m
Buckling factor k	1,00	1,00	
Buckling length Lcr	1,600	1,600	m
Slenderness λ	21,318	55,424	-
Relative slenderness λ	0,396	1,029	-
Limit slenderness	0,300	0,300	-
Imperfection βc	0,200	0,200	-
Reduction factor kc	0,978	0,667	-

Unity check (6.23) = 0,03 + 0,00 + 0,00 = 0,04 -
Unity check (6.24) = 0,05 + 0,00 + 0,01 = 0,05 -

Beams subjected to bending or combined bending and compression
According to EN 1995-1-1 article 6.3.3 and formula (6.33),(6.35)

LTB Parameters		
Elastic critical moment My,crit	96,71	kNm
Critical bending stress σm,crit	85,8	MPa
Relative slenderness λrel,m	0,404	-
Reduction factor kcrit	1,000	-

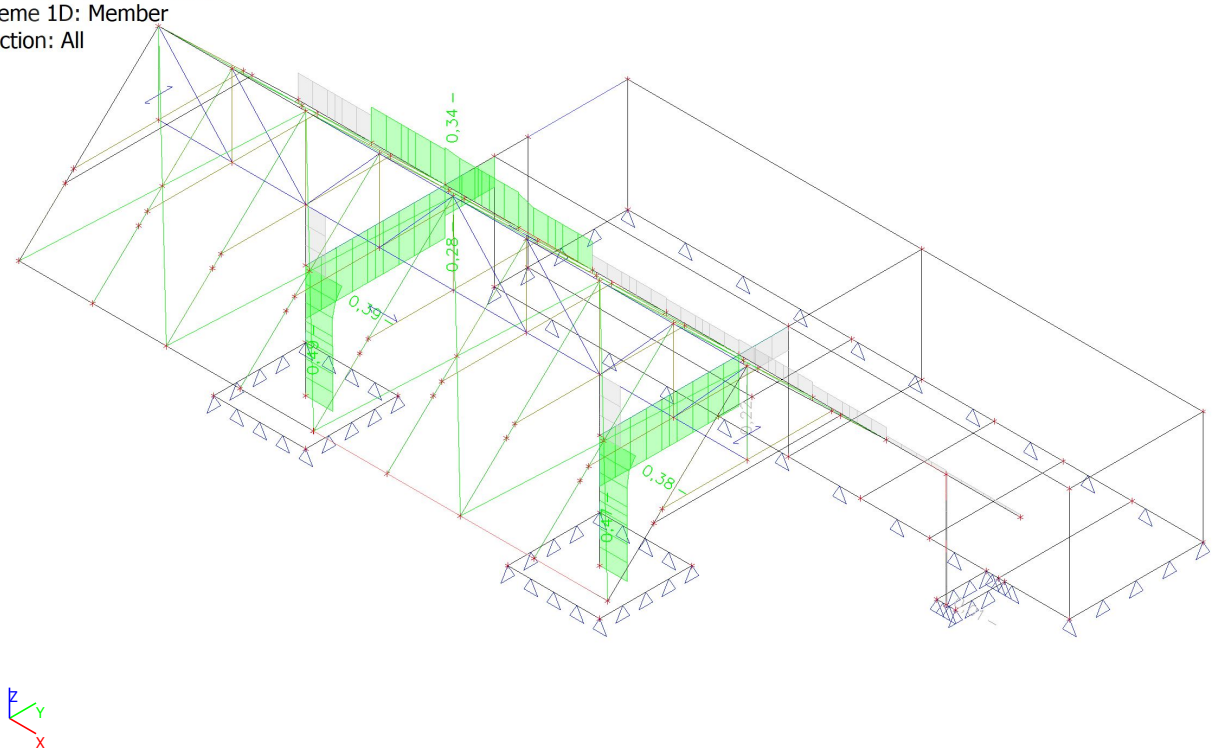
Unity check (6.33) = 0,00 -
Unity check (6.35) = 0,00 + 0,05 = 0,05 -

My,crit Parameters		
G0,05	293,8	MPa
LTB length L	1,600	m
Lef/L	0,90	
Effective length Lef	1,440	m
Influence of load position	no influence	

The member satisfies the stability check.

1.11. Jeklo

Values: **$UC_{Overall}$**
Linear calculation
Class: All ULS
Coordinate system: Principal
Extreme 1D: Member
Selection: All



Linear calculation
Class: All ULS
Coordinate system: Principal
Extreme 1D: Cross-section
Selection: All

EN 1993-1-1 Code Check
National annex: Slovenian SIST-EN NA

Member B3	**0,000 / 3,030 m**	**IPE300**	**S 235**	**All ULS**	**0,49 -**

Combination key
All ULS / 1.35*LC0 + 1.35*LC1 + 1.05*LC2 + 1.50*LC4 + 0.90*LC6 + 1.35*LC9

N_{Ed} [kN]	$V_{y,Ed}$ [kN]	$V_{z,Ed}$ [kN]	T_{Ed} [kNm]	$M_{y,Ed}$ [kNm]	$M_{z,Ed}$ [kNm]
-56,40	-0,44	-33,52	0,01	59,99	0,02

Section check	
Section classification	1
Compression check	0,04 -
Bending moment check for M_y	0,41 -
Bending moment check for M_z	0,00 -
Shear check for V_y	0,00 -
Shear check for V_z	0,10 -
Torsion check	0,00 -
Combined bending, axial force and shear force check	0,17 -
Conclusion - section check	0,41 -

Buckling axis	k	L [m]	N_{cr} [kN]	M_{cr} [kNm]	λ_{rel}	χ
y-y	1,19	3,598	13377,77		0,31	1,00
z-z	0,81	2,464	2062,50		0,78	1,00
LTB	1,00	3,030		621,56	0,49	1,00

Stability Check	
Stability classification	1
Bending and axial compression check	0,49 -
Conclusion - stability check	0,49 -

EN 1993-1-1 Code Check
National annex: Slovenian SIST-EN NA

Member B56	**12,500 / 15,700 m**	**HE220B**	**S 235**	**All ULS**	**0,34 -**

Combination key
All ULS / LC0 + LC1 + 1.50*LC3 + LC9

N_{Ed} [kN]	$V_{y,Ed}$ [kN]	$V_{z,Ed}$ [kN]	T_{Ed} [kNm]	$M_{y,Ed}$ [kNm]	$M_{z,Ed}$ [kNm]
-6,98	5,90	-23,33	2,23	-29,42	8,93

Section check	
Section classification	1
Compression check	0,00 -
Bending moment check for M_y	0,15 -
Bending moment check for M_z	0,10 -
Shear check for V_y	0,01 -
Shear check for V_z	0,06 -
Torsion check	0,34 -
Combined Shear and Torsion check for V_y and $T_{t,Ed}$	0,01 -
Combined Shear and Torsion check for V_z and $T_{t,Ed}$	0,07 -
Combined bending, axial force and shear force check	0,12 -
Conclusion - section check	0,34 -

Buckling axis	k	L [m]	N_{cr} [kN]	M_{cr} [kNm]	λ_{rel}	χ
y-y	2,47	7,892	2692,76		0,89	1,00
z-z	0,68	1,091	49496,21		0,21	1,00
LTB	1,00	1,600		5041,80	0,20	1,00

Stability Check	
Stability classification	1
Bending and axial compression check	0,21 -
Conclusion - stability check	0,21 -

EN 1993-1-1 Code Check
National annex: Slovenian SIST-EN NA

Member B88	**2,450 / 3,588 m**	**IX (IPE330, IPET330)**	**S 235**	**All ULS**	**0,39 -**

Combination key
All ULS / 1.35*LC0 + 1.35*LC1 + 1.05*LC2 + 1.50*LC4 + 0.90*LC6 + 1.35*LC9

N_{Ed} [kN]	$V_{y,Ed}$ [kN]	$V_{z,Ed}$ [kN]	T_{Ed} [kNm]	$M_{y,Ed}$ [kNm]	$M_{z,Ed}$ [kNm]
-192,71	-0,10	-44,42	0,01	-73,63	-0,39

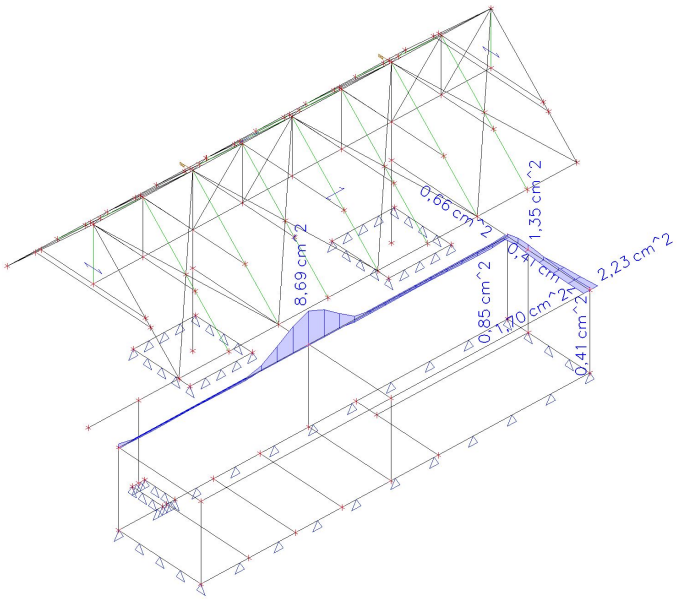
Section check	
Section classification	1
Compression check	0,07 -
Bending moment check for M_y	0,32 -
Bending moment check for M_z	0,00 -
Shear check for V_y	0,00 -
Shear check for V_z	0,06 -
Torsion check	0,00 -
Combined bending, axial force and shear force check	0,39 -
Conclusion - section check	0,39 -

Buckling axis	k	L [m]	N_{cr} [kN]	M_{cr} [kNm]	λ_{rel}	χ
y-y	0,85	2,074	63521,51		0,22	0,99
z-z	3,09	11,105	2111,79		1,18	0,44
y-z	1,00	2,450	2111,79		1,18	0,44
LTB	1,00	2,450		6404,42	0,19	1,00

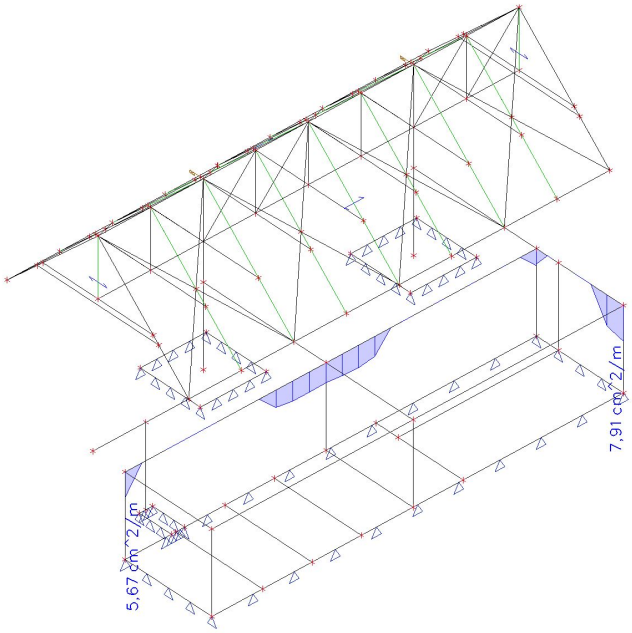
Stability Check	
Stability classification	1
Flexural Buckling check	0,15 -
Torsional(-Flexural) Buckling check	0,15 -
Bending and axial compression check	0,29 -
Conclusion - stability check	0,29 -

1.12. Beton

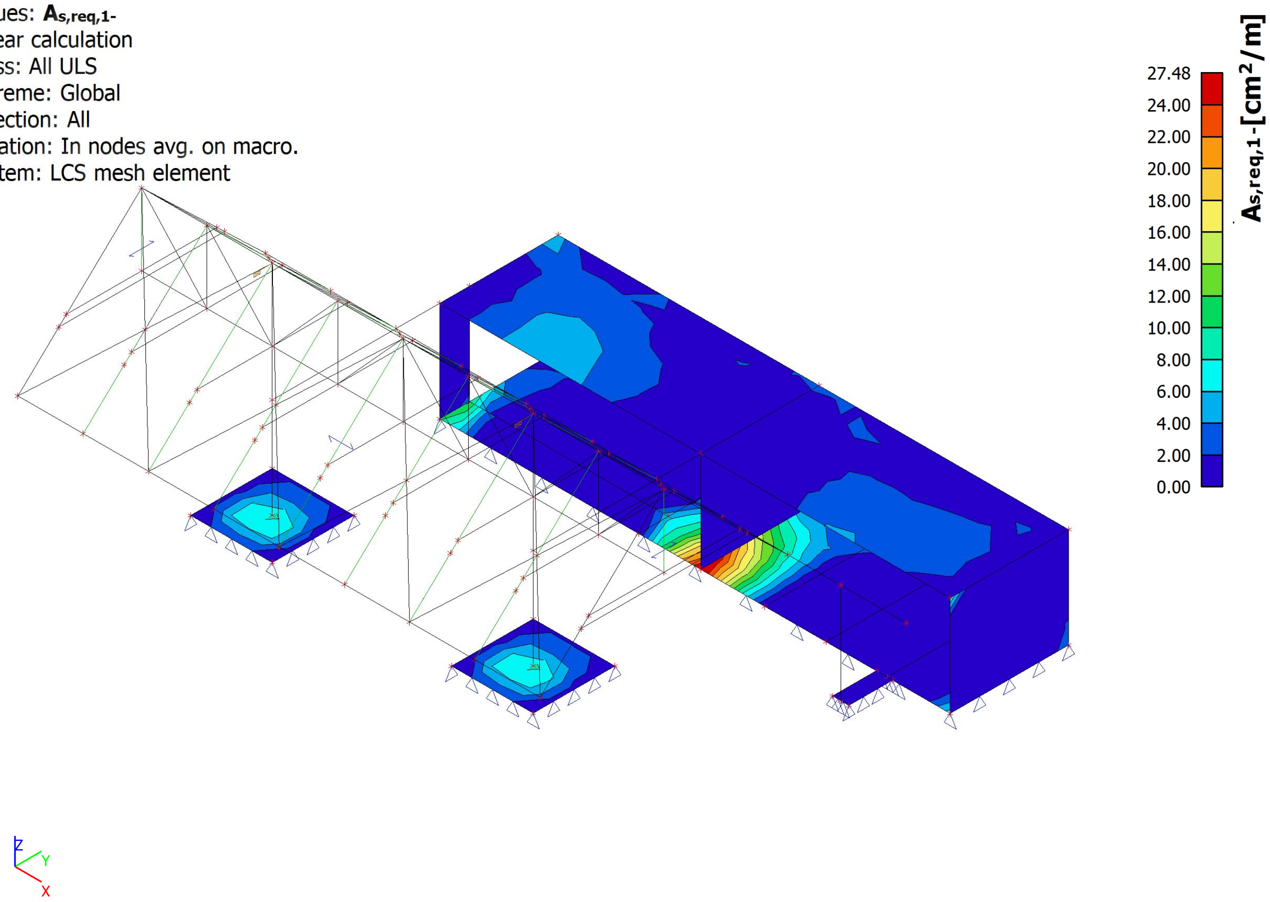
Values: **As,req**
Linear calculation
Class: All ULS
Coordinate system: Member
Extreme 1D: Member
Selection: All



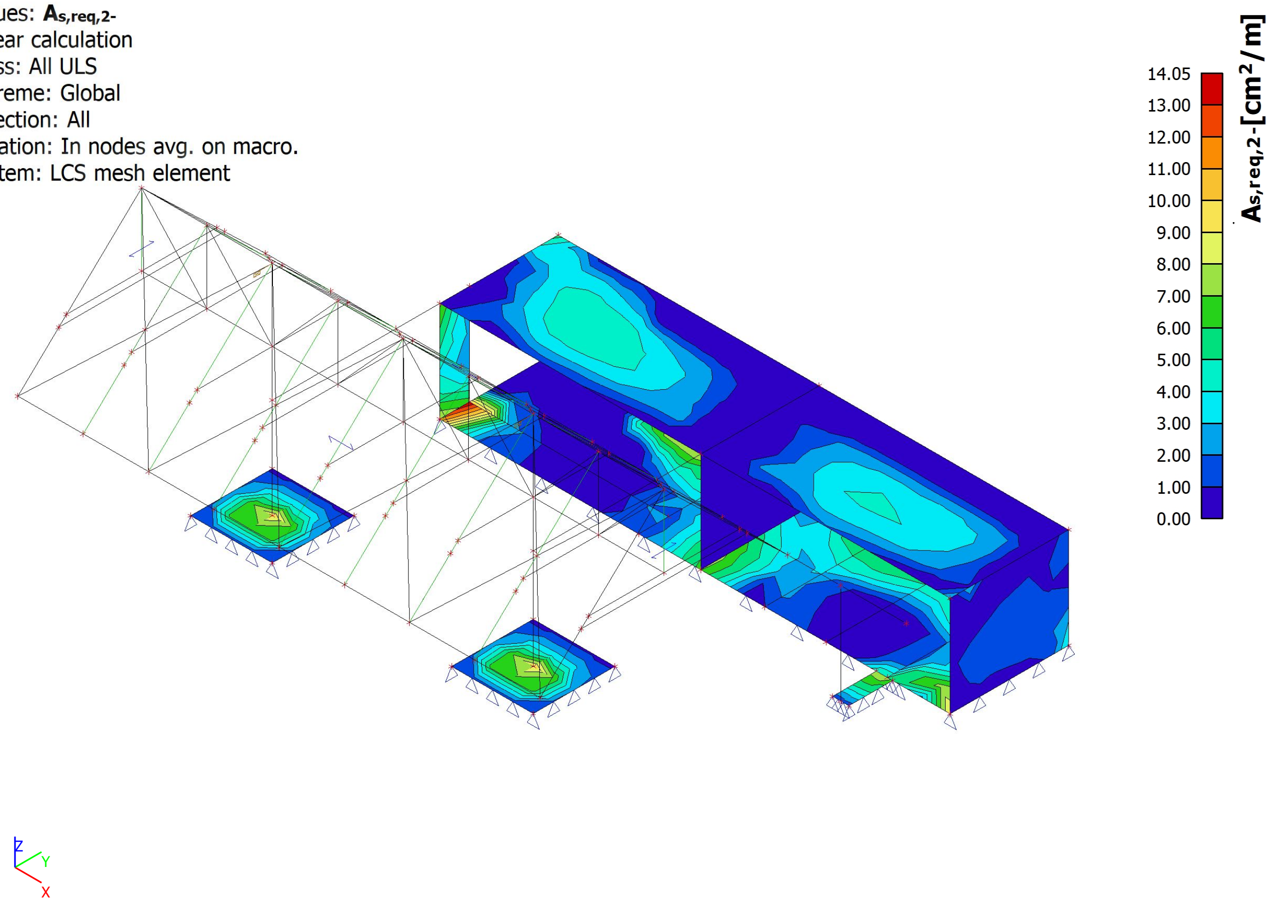
Values: **Aswm,req**
Linear calculation
Class: All ULS
Coordinate system: Member
Extreme 1D: Member
Selection: All



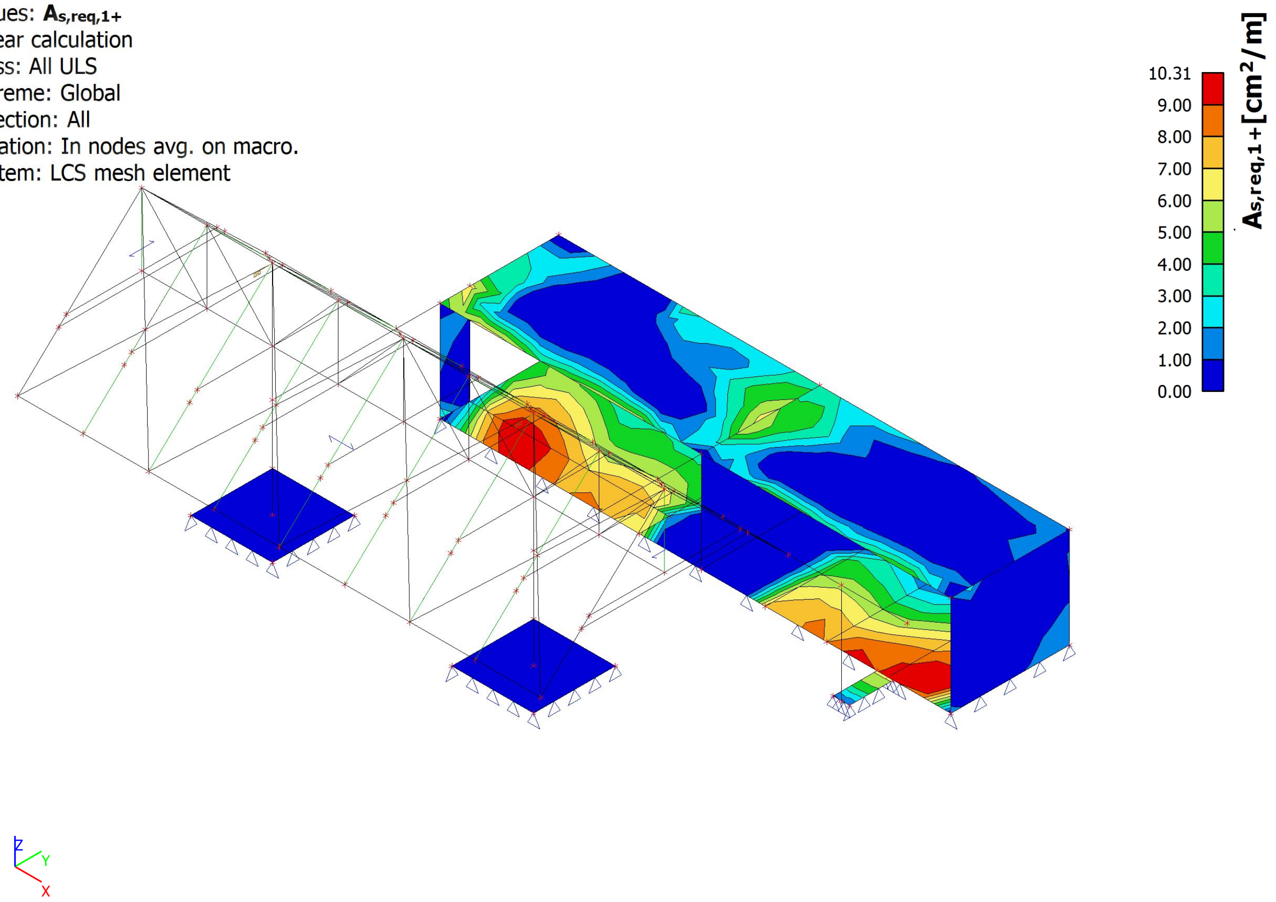
Values: $A_{s,req,1-}$
Linear calculation
Class: All ULS
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



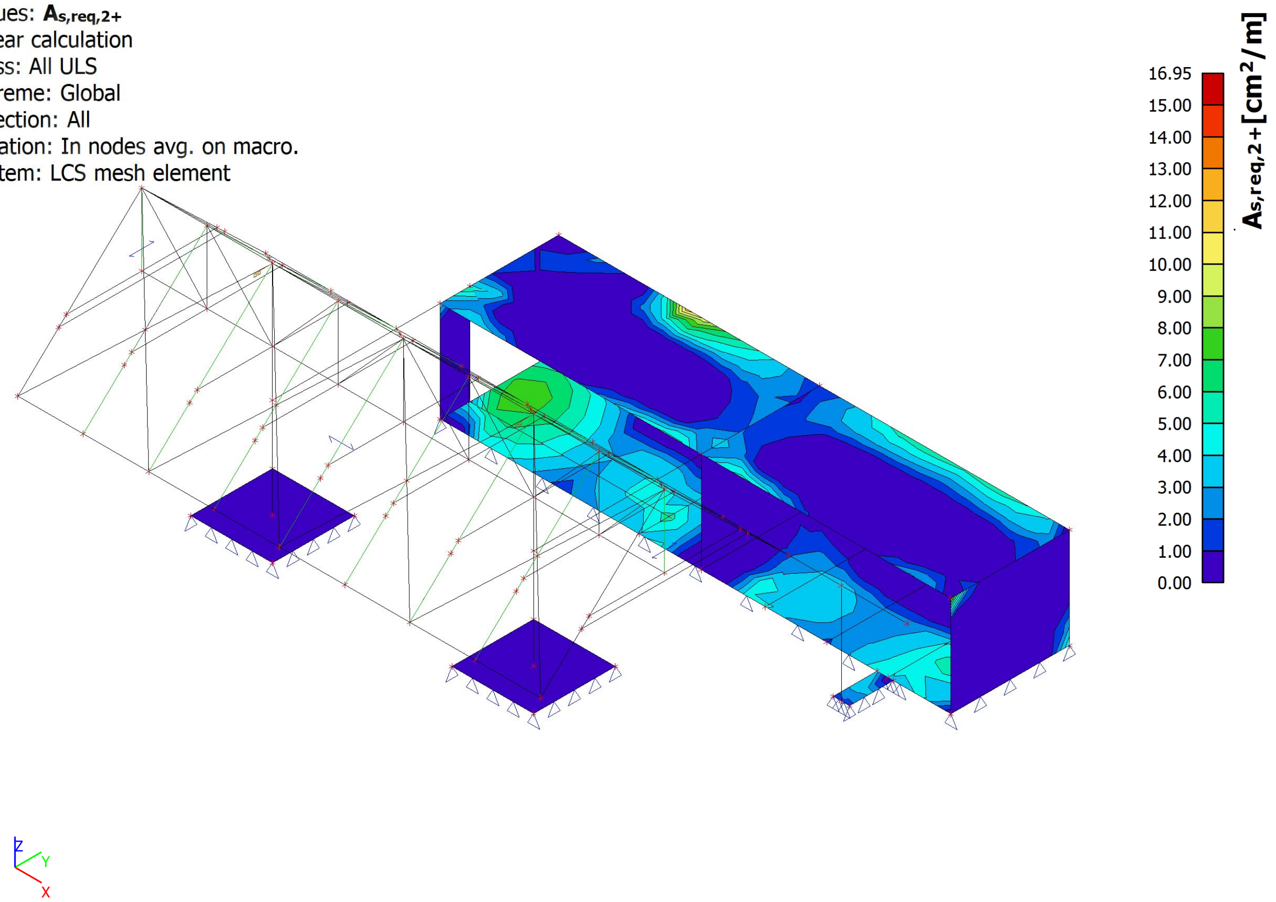
Values: $A_{s,req,2-}$
Linear calculation
Class: All ULS
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



Values: $A_{s,req,1+}$
Linear calculation
Class: All ULS
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



Values: $A_{s,req,2+}$
Linear calculation
Class: All ULS
Extreme: Global
Selection: All
Location: In nodes avg. on macro.
System: LCS mesh element



Item: 01_Palicje-prikljucek K nad stebri

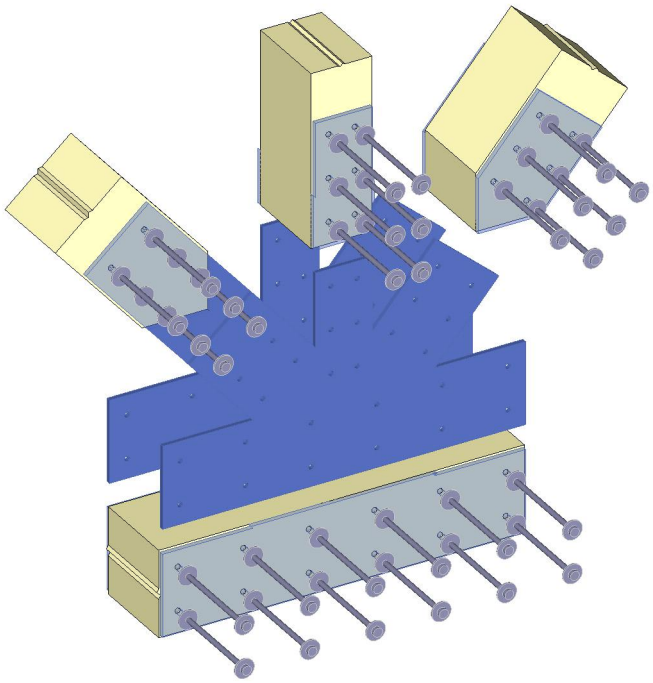
Timber Joint (x64) HO13+ 01/22 (FRILO R-2022-2/P07)

Basic parameters

Design code	:	DIN EN 1995-1-1/NA:2013-08
Basis	:	EN 1995-1-1/A2:2014
Extraction resistant metal fasteners	:	Check of Johansen with rope effect

Timber-Node connection with outer plates - continuous chord

System graphic Explosion



System with 4 Members

Member	Material	SCL	Cross-section			Location	
			n	Width cm	Height cm	Relation	Inclination °
Continuous chord	C24	1	1 x	20.0 /	20.0	global	0.0
Post	C24	1	1 x	20.0 /	14.0	rel. chord	90.0
Diagonal left	C24	1	1 x	20.0 /	20.0	rel. chord	-49.0
Diagonal right	C24	1	1 x	20.0 /	20.0	rel. chord	49.0

Fastener

Member	Fastener	Type	f_{uk} kN/cm²	$M_{y,Rk}$ Nmm	Diameter			Edge distance (uv) mm
					d_{sa}	d_{si}	d	
Continuous chord	Bolt	8.8	80.00	153491	44.0	13.5	12.0	0.0
Post	Bolt	8.8	80.00	153491	44.0	13.5	12.0	0.0
Diagonal left	Bolt	8.8	80.00	153491	44.0	13.5	12.0	0.0
Diagonal right	Bolt	8.8	80.00	153491	44.0	13.5	12.0	0.0
Washer d_{sa} - outer diameter d_{si} - inner diameter								

Metal sheet - contoured - in chord concave - in member orthogonal

Material	Quantity	Thickness cm	Clearance mm	Hole type	Edge distance mm
S235	2	1.0	0.6	drilled	5.0

Loading

Internal forces (design values)

Situation	Cutting face	N_d kN	V_{zd} kN	M_{yd} kNm	LDC	k_{mod}
P/T	Chord face at left	-4.3	0.0		middle	0.80
	Chord face at right	-8.9	0.0		middle	0.80
	Post	-68.2			middle	0.80
	Diagonal left	-80.6			middle	0.80
	Diagonal right	-71.3			middle	0.80
	Supporting force s)	-1.5	-182.8			
s) : Support reaction acts horizontally (N_d) or vertically (V_{zd}) in the COG of the node						

Design situations

Situation	Description	Timber	Steel		
		γ_M	γ_{M0}	γ_{M1}	γ_{M2}
P/T	persistent/transient	1.30	1.00	1.10	1.25

Results

Note : The stress check is only carried out in the joint region!
The support affects only the balance,
possibly thereby additional checks have to be performed!

Checks Continuous chord b/h = 20.0 /20.0 - (Softwood C24 EN 338:2016)

Fastener- spacing

VM longitudinal		VM transversal		Edge longitudinal		Edge longitudinal		Edge transversal		Edge transversal	
a_1 exist mm	a_1 min mm	a_2 exist mm	a_2 min mm	$a_{3,t}$ exist mm	$a_{3,t}$ min mm	$a_{3,c}$ exist mm	$a_{3,c}$ min mm	$a_{4,t}$ exist mm	$a_{4,t}$ min mm	$a_{4,c}$ exist mm	$a_{4,c}$ min mm
150	48	100	48	-	84	-	84	50	48	50	36

Capacity of the joint

VM	Quantity Gaps	α_1 °	α_2 °	M_{yk} Nmm	t_r mm	k_{ser} kN/m	$F_{v,Rd}$ kN
B	2	88.08	-	153490.8	0	17963.35	**17.6**
B (0°)	2	0.00	-	153490.8	0	17963.35	**21.8**
Fastener : B - Bolt							

Extraction resistance of MF

Decisive design pull-out parameters	$f_{c,90,k}$ N/mm²	A_{eff} mm2	A_{sp} mm2	$F_{t,Rd}$ kN	$F_{ax,Rd}$ kN
Bolt	360.00	1377	84.3	48.6	48.6

Required number of connection - check

VM transversal	selected longitudinal		n_{eff} tot.	n_{eff} req.	$F_{v,Ed}$ kN		$F_{v,Rd}$ kN	η
2	x	6	11.96	10.39	**182.9**	<	**210.5**	**0.87**
Member in Grain direction:			9.93	0.28	**6.1**	<	**216.3**	**0.03**

selected:	**12**	**Bolt**	d =	12.0 mm	l_{staple} = 220.0 mm

Tension check in timber at connection L -left R -right face

Face	A_{netto} cm²	k_{te}	f_{nd} kN/cm²	N_d kN	σ_{nd} kN/cm²	Equation	η
R	348.0	1.00	1.29	-8.9	**-0.03**	6.2	**0.02**

Checks in sheet according to EN 1993-1 - γM0 = 1.00 γM2 = 1.25 dl = 12.6 mm

l_{crack} cm	A_{netto} cm²	$\sigma_{x,Ed}$ kN/cm²	$\sigma_{x,Rd}$ kN/cm²	η
75.5	151.0	1.21	23.50	**0.05**

min,e mm	min,e_1 mm	min,e_2 mm	min,e_3 mm	k_1* α_b	$F_{v,Ed}$ kN	$F_{b,Rd}$ kN	η
150	38 *)	38 *)	100	2.50	15.3	172.8	**0.09**
*) limited to max_e = 3 * dll							

Block shear failure in the sheet

eccentric	A_{nt} cm²	A_{nv} cm²	$F_{v,Ed}$ kN	$V_{eff,Rd}$ kN	η
in direction N	17.5	288.3	6.1	4163.0	**0.00**

Utilization Continuous chord

Stress	Joint	Metal sheet
0.02 < 1.0	**0.87 < 1.0**	**0.09 < 1.0**

Checks Post b/h = 20.0 /14.0 - (Softwood C24 EN 338:2016)

Fastener- spacing

VM longitudinal		VM transversal		Edge longitudinal		Edge longitudinal		Edge transversal		Edge transversal	
a_1 exist mm	a_1 min mm	a_2 exist mm	a_2 min mm	$a_{3,t}$ exist mm	$a_{3,t}$ min mm	$a_{3,c}$ exist mm	$a_{3,c}$ min mm	$a_{4,t}$ exist mm	$a_{4,t}$ min mm	$a_{4,c}$ exist mm	$a_{4,c}$ min mm
100	60	60	48	-	84	50	48	40	36	40	36

Capacity of the joint

VM	Quantity Gaps	α_1 °	α_2 °	M_{yk} Nmm	t_r mm	k_{ser} kN/m	$F_{v,Rd}$ kN
B	2	0.00	-	153490.8	0	17963.35	**21.8**
Fastener : B - Bolt							

Extraction resistance of MF

Decisive design pull-out parameters	$f_{c,90,k}$ N/mm²	A_{eff} mm2	A_{sp} mm2	$F_{t,Rd}$ kN	$F_{ax,Rd}$ kN
Bolt	360.00	1377	84.3	48.6	48.6

Required number of connection - check

VM transversal	selected longitudinal		n_{eff} tot.	n_{eff} req.	$F_{v,Ed}$ kN		$F_{v,Rd}$ kN	η
2	x	3	4.81	3.13	**68.2**	<	**104.8**	**0.65**

selected:	**6**	**Bolt**	d =	12.0 mm	l_{staple} = 220.0 mm

Tension check in timber at connection

A_{netto} cm²	k_{te}	f_{nd} kN/cm²	N_d kN	σ_{nd} kN/cm²	Equation	η
228.0	1.00	1.29	-68.2	**-0.30**	6.2	**0.23**

Checks in sheet according to EN 1993-1 - γM0 = 1.00 γM2 = 1.25 dl = 12.6 mm

l_{crack} cm	A_{netto} cm²	$\sigma_{x,Ed}$ kN/cm²	$\sigma_{x,Rd}$ kN/cm²	η
10.5	21.0	3.25	23.50	**0.14**
The stability of the sheet in the pressing rod will not be further investigated.				

min,e mm	min,e_1 mm	min,e_2 mm	min,e_3 mm	k_1* α_b	$F_{v,Ed}$ kN	$F_{b,Rd}$ kN	η
100	38 *)	35	60	2.50	14.2	172.8	**0.08**
*) limited to max_e = 3 * dll							

Utilization Post

Stress	Joint	Metal sheet
0.23 < 1.0	**0.65 < 1.0**	**0.14 < 1.0**

Checks Diagonal left b/h = 20.0 /20.0 - (Softwood C24 EN 338:2016)

Fastener- spacing

VM longitudinal		VM transversal		Edge longitudinal		Edge longitudinal		Edge transversal		Edge transversal	
a_1 exist mm	a_1 min mm	a_2 exist mm	a_2 min mm	$a_{3,t}$ exist mm	$a_{3,t}$ min mm	$a_{3,c}$ exist mm	$a_{3,c}$ min mm	$a_{4,t}$ exist mm	$a_{4,t}$ min mm	$a_{4,c}$ exist mm	$a_{4,c}$ min mm
80	60	100	48	-	84	50	48	50	36	50	36

Capacity of the joint

VM	Quantity Gaps	α_1 °	α_2 °	M_{yk} Nmm	t_r mm	k_{ser} kN/m	$F_{v,Rd}$ kN
B	2	0.00	-	153490.8	0	17963.35	**21.8**
Fastener : B - Bolt							

Extraction resistance of MF

Decisive design pull-out parameters	$f_{c,90,k}$ N/mm²	A_{eff} mm2	A_{sp} mm2	$F_{t,Rd}$ kN	$F_{ax,Rd}$ kN
Bolt	360.00	1377	84.3	48.6	48.6

Required number of connection - check

VM transversal	selected longitudinal		n_{eff} tot.	n_{eff} req.	$F_{v,Ed}$ kN		$F_{v,Rd}$ kN	η
2	x	3	4.55	3.70	**80.6**	<	**99.1**	**0.81**

selected:	**6**	**Bolt**	d =	12.0 mm	l_{staple} = 220.0 mm

Tension check in timber at connection

A_{netto} cm²	k_{te}	f_{nd} kN/cm²	N_d kN	σ_{nd} kN/cm²	Equation	η
348.0	1.00	1.29	-80.6	**-0.23**	6.2	**0.18**

Checks in sheet according to EN 1993-1 - γM0 = 1.00 γM2 = 1.25 dl = 12.6 mm

l_{crack} cm	A_{netto} cm²	$\sigma_{x,Ed}$ kN/cm²	$\sigma_{x,Rd}$ kN/cm²	η
16.5	33.0	2.45	23.50	**0.10**
The stability of the sheet in the pressing rod will not be further investigated.				

min,e mm	min,e_1 mm	min,e_2 mm	min,e_3 mm	k_1* α_b	$F_{v,Ed}$ kN	$F_{b,Rd}$ kN	η
80	38 *)	38 *)	100	2.50	17.7	172.8	**0.10**
*) limited to max_e = 3 * dll							

Utilization Diagonal left

Stress	Joint	Metal sheet
0.18 < 1.0	**0.81 < 1.0**	**0.10 < 1.0**

Checks Diagonal right b/h = 20.0 /20.0 - (Softwood C24 EN 338:2016)

Fastener- spacing

VM longitudinal		VM transversal		Edge longitudinal		Edge longitudinal		Edge transversal		Edge transversal	
a_1 exist mm	a_1 min mm	a_2 exist mm	a_2 min mm	$a_{3,t}$ exist mm	$a_{3,t}$ min mm	$a_{3,c}$ exist mm	$a_{3,c}$ min mm	$a_{4,t}$ exist mm	$a_{4,t}$ min mm	$a_{4,c}$ exist mm	$a_{4,c}$ min mm
80	60	100	48	-	84	50	48	50	36	50	36

Capacity of the joint

VM	Quantity Gaps	α_1 °	α_2 °	M_{yk} Nmm	t_r mm	k_{ser} kN/m	$F_{v,Rd}$ kN
B	2	0.00	-	153490.8	0	17963.35	**21.8**
Fastener : B - Bolt							

Extraction resistance of MF

Decisive design pull-out parameters	$f_{c,90,k}$ N/mm²	A_{eff} mm2	A_{sp} mm2	$F_{t,Rd}$ kN	$F_{ax,Rd}$ kN
Bolt	360.00	1377	84.3	48.6	48.6

Required number of connection - check

VM transversal	selected longitudinal		n_{eff} tot.	n_{eff} req.	$F_{v,Ed}$ kN		$F_{v,Rd}$ kN	η
2	x	3	4.55	3.27	**71.3**	<	**99.1**	**0.72**

selected:	**6**	**Bolt**	d =	12.0 mm	l_{staple} = 220.0 mm

Tension check in timber at connection

A_{netto} cm²	k_{te}	f_{nd} kN/cm²	N_d kN	σ_{nd} kN/cm²	Equation	η
348.0	1.00	1.29	-71.3	**-0.20**	6.2	**0.16**

Checks in sheet according to EN 1993-1 - γM0 = 1.00 γM2 = 1.25 dl = 12.6 mm

l_{crack} cm	A_{netto} cm²	$\sigma_{x,Ed}$ kN/cm²	$\sigma_{x,Rd}$ kN/cm²	η
16.5	33.0	2.16	23.50	**0.09**
The stability of the sheet in the pressing rod will not be further investigated.				

min,e mm	min,e_1 mm	min,e_2 mm	min,e_3 mm	k_1* α_b	$F_{v,Ed}$ kN	$F_{b,Rd}$ kN	η
80	38 *)	38 *)	100	2.50	15.7	172.8	**0.09**
*) limited to max_e = 3 * dll							

Utilization Diagonal right

Stress	Joint	Metal sheet
0.16 < 1.0	**0.72 < 1.0**	**0.09 < 1.0**

Maximum utilization from all checks

Stress η = **0.23** Post
Joint η = **0.87** Continuous chord
Metal sheet η = **0.14** Post

Item: 02_Palicje-vmesni K

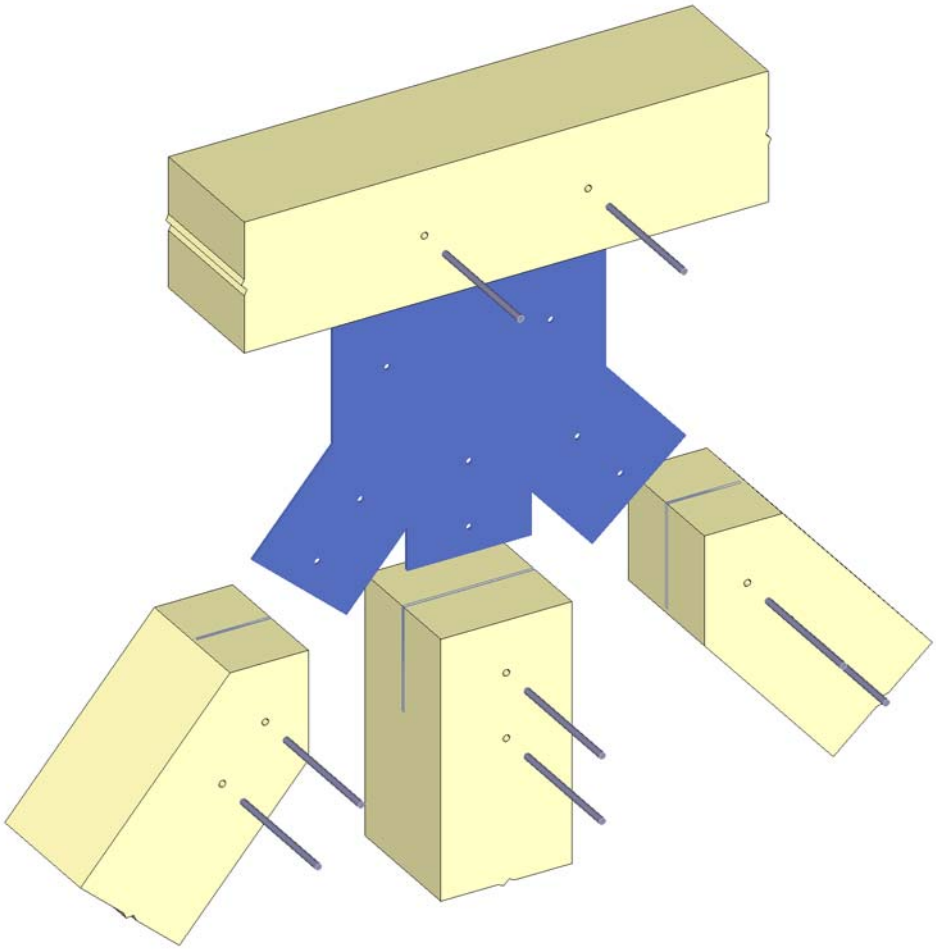
Timber Joint (x64) HO13+ 01/22 (FRILO R-2022-2/P07)

Basic parameters

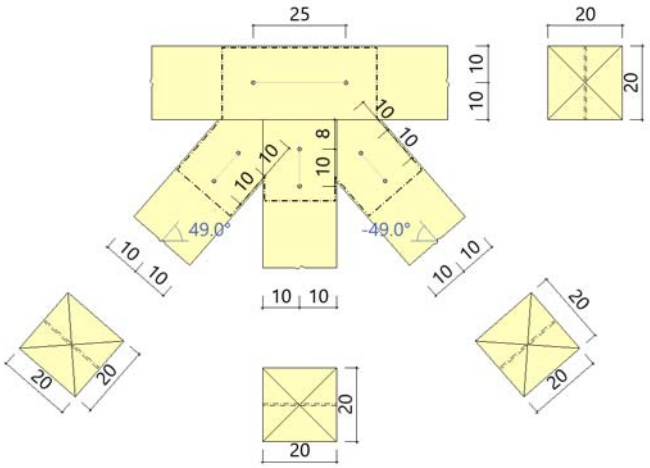
Design code	:	DIN EN 1995-1-1/NA:2013-08
Basis	:	EN 1995-1-1/A2:2014
Slotted plate connection	:	Check outer timber with reduced kte

Timber-Node connection with slotted plates - continuous chord

System graphic Explosion



System graphic 2D
Scale 1 : 20



System with 4 Members

Member	Material	SCL	Cross-section			Location	
			n	Width cm	Height cm	Relation	Inclination °
Continuous chord	C24	1	1 x	20.0 /	20.0	global	0.0
Post	C24	1	1 x	20.0 /	20.0	rel. chord	90.0
Diagonal left	C24	1	1 x	20.0 /	20.0	rel. chord	49.0
Diagonal right	C24	1	1 x	20.0 /	20.0	rel. chord	-49.0

Fastener

Member	Fastener	Type	f_{uk} N/mm²	$M_{y,Rk}$ Nmm	Dm mm	Edge distance (uv) mm
Continuous chord	Dowel pin	S 235	360.00	42996	10.0	0.0
Post	Dowel pin	S 235	360.00	42996	10.0	0.0
Diagonal left	Dowel pin	S 235	360.00	42996	10.0	0.0
Diagonal right	Dowel pin	S 235	360.00	42996	10.0	0.0

Metal sheet - contoured - in chord orthogonal - in member orthogonal

Material	Quantity	Thickness cm	Clearance mm	Hole type	Edge distance mm
S235	1	0.5	0.6	drilled	5.0

Loading

Internal forces (design values)

Situation	Cutting face	N_d kN	V_{zd} kN	M_{yd} kNm	LDC	k_{mod}
P/T	Chord face at left	12.7	0.0		middle	0.80
	Chord face at right	13.6	0.0		middle	0.80
	Post	2.0			middle	0.80
	Diagonal left	-5.0			middle	0.80
	Diagonal right	-5.0			middle	0.80
	Supporting force s)	-0.9	5.5			

s) : Support reaction acts horizontally (N_d) or vertically (V_{zd}) in the COG of the node

Design situations

Situation	Description	Timber	Steel		
		γ_M	γ_{M0}	γ_{M1}	γ_{M2}
P/T	persistent/transient	1.30	1.00	1.10	1.25

Results

Note : The stress check is only carried out in the joint region!
The support affects only the balance,
possibly thereby additional checks have to be performed!

Checks Continuous chord b/h = 20.0 /20.0 - (Softwood C24 EN 338:2016)

Fastener- spacing

VM longitudinal		VM transversal		Edge longitudinal		Edge longitudinal		Edge transversal		Edge transversal	
a_1 exist mm	a_1 min mm	a_2 exist mm	a_2 min mm	$a_{3,t}$ exist mm	$a_{3,t}$ min mm	$a_{3,c}$ exist mm	$a_{3,c}$ min mm	$a_{4,t}$ exist mm	$a_{4,t}$ min mm	$a_{4,c}$ exist mm	$a_{4,c}$ min mm
250	30	-	30	-	80	-	80	100	40	100	30

Capacity of the joint

VM	Quantity Gaps	α_1 °	α_2 °	M_{yk} Nmm	t_r mm	k_{ser} kN/m	$F_{v,Rd}$ kN
SDow	2	90.00	-	42995.6	0	14969.46	**7.7**
Fastener : SDow - Dowel pin							

Required number of connection - check

VM transversal	selected longitudinal		n_{eff} tot.	n_{eff} req.	$F_{v,Ed}$ kN		$F_{v,Rd}$ kN	η
1	x	2	2.00	0.72	**5.5**	<	**15.4**	**0.36**

selected:	**2**	**Dowel pin**	d =	10.0 mm	l_{min} = 200.0 mm

Check cross connection DIN EN 1995-1-1/NA:2013 a/h,top = 0.50

k_s	k_r	a cm	$f_{t,90,d}$ N/mm²	$F_{90,d}$ kN		$F_{v,90,Rd}$ kN	η
2.45	1.00	10.00	0.25	5.5	<	24.3	**0.23**

Tension check in timber at connection L -left R -right face

Face	A_{netto} cm²	k_{te}	f_{nd} N/mm²	N_d kN	σ_{nd} N/mm²	Equation	η
R	185.3	1.00	8.92	6.8	**0.37**	6.1	**0.04**

Checks in sheet according to EN 1993-1 - γM0 = 1.00 γM2 = 1.25 dl = 10.6 mm

l_{crack} cm	A_{netto} cm²	$\sigma_{x,Ed}$ N/mm²	$\sigma_{x,Rd}$ N/mm²	η
39.6	19.8	2.80	235.00	**0.01**

min,e mm	min,e_1 mm	min,e_2 mm	min,e_3 mm	k_1* α_b	$F_{v,Ed}$ kN	$F_{b,Rd}$ kN	η
-	32 *)	32 *)	250	2.50	2.8	36.0	**0.08**
*) limited to max_e = 3 * dll							

Block shear failure in the sheet

	A_{nt} cm²	A_{nv} cm²	$F_{v,Ed}$ kN	$V_{eff,Rd}$ kN	η
in direction V_z	12.0	9.5	5.5	473.6	**0.01**

Utilization Continuous chord

Stress	Trans connection	Joint	Metal sheet
0.04 < 1.0	**0.23 < 1.0**	**0.36 < 1.0**	**0.08 < 1.0**

Checks Post b/h = 20.0 /20.0 - (Softwood C24 EN 338:2016)

Fastener- spacing

VM longitudinal		VM transversal		Edge longitudinal		Edge longitudinal		Edge transversal		Edge transversal	
a_1 exist mm	a_1 min mm	a_2 exist mm	a_2 min mm	$a_{3,t}$ exist mm	$a_{3,t}$ min mm	$a_{3,c}$ exist mm	$a_{3,c}$ min mm	$a_{4,t}$ exist mm	$a_{4,t}$ min mm	$a_{4,c}$ exist mm	$a_{4,c}$ min mm
100	50	-	30	80	80	-	40	100	30	100	30

Capacity of the joint

VM	Quantity Gaps	α_1 °	α_2 °	M_{yk} Nmm	t_r mm	k_{ser} kN/m	$F_{v,Rd}$ kN
SDow	2	0.00	-	42995.6	0	14969.46	**9.4**
Fastener : SDow - Dowel pin							

Required number of connection - check

VM transversal	selected longitudinal		n_{eff} tot.	n_{eff} req.	$F_{v,Ed}$ kN		$F_{v,Rd}$ kN	η
1	x	2	1.75	0.21	**2.0**	<	**16.5**	**0.12**

selected:	**2**	**Dowel pin**	d =	10.0 mm	l_{min} = 200.0 mm

Tension check in timber at connection

A_{netto} cm²	k_{te}	f_{nd} N/mm²	N_d kN	σ_{nd} N/mm²	Equation	η
185.3	0.40	3.57	1.0	**0.05**	6.1	**0.02**

Checks in sheet according to EN 1993-1 - γM0 = 1.00 γM2 = 1.25 dl = 10.6 mm

l_{crack} cm	A_{netto} cm²	$\sigma_{x,Ed}$ N/mm²	$\sigma_{x,Rd}$ N/mm²	η
17.9	9.0	2.23	235.00	**0.01**

min,e mm	min,e_1 mm	min,e_2 mm	min,e_3 mm	k_1* α_b	$F_{v,Ed}$ kN	$F_{b,Rd}$ kN	η
100	32 *)	32 *)	-	2.50	1.1	36.0	**0.03**
*) limited to max_e = 3 * dll							

Utilization Post

Stress	Joint	Metal sheet
0.02 < 1.0	**0.12 < 1.0**	**0.03 < 1.0**

Checks Diagonal left b/h = 20.0 /20.0 - (Softwood C24 EN 338:2016)

Fastener- spacing

VM longitudinal		VM transversal		Edge longitudinal		Edge longitudinal		Edge transversal		Edge transversal	
a_1 exist mm	a_1 min mm	a_2 exist mm	a_2 min mm	$a_{3,t}$ exist mm	$a_{3,t}$ min mm	$a_{3,c}$ exist mm	$a_{3,c}$ min mm	$a_{4,t}$ exist mm	$a_{4,t}$ min mm	$a_{4,c}$ exist mm	$a_{4,c}$ min mm
100	50	-	30	-	80	100	40	100	30	100	30

Capacity of the joint

VM	Quantity Gaps	α_1 °	α_2 °	M_{yk} Nmm	t_r mm	k_{ser} kN/m	$F_{v,Rd}$ kN
SDow	2	0.00	-	42995.6	0	14969.46	**9.4**
Fastener : SDow - Dowel pin							

Required number of connection - check

VM transversal	selected longitudinal		n_{eff} tot.	n_{eff} req.	$F_{v,Ed}$ kN		$F_{v,Rd}$ kN	η
1	x	2	1.75	0.53	**5.0**	<	**16.5**	**0.30**

selected:	**2**	**Dowel pin**	d =	10.0 mm	l_{min} = 200.0 mm

Tension check in timber at connection

A_{netto} cm²	k_{te}	f_{nd} N/mm²	N_d kN	σ_{nd} N/mm²	Equation	η
195.0	1.00	12.92	-2.5	**-0.13**	6.2	**0.01**

Checks in sheet according to EN 1993-1 - γM0 = 1.00 γM2 = 1.25 dl = 10.6 mm

l_{crack} cm	A_{netto} cm²	$\sigma_{x,Ed}$ N/mm²	$\sigma_{x,Rd}$ N/mm²	η
17.9	9.0	5.57	235.00	**0.02**
The stability of the sheet in the pressing rod will not be further investigated.				

min,e mm	min,e_1 mm	min,e_2 mm	min,e_3 mm	k_1* α_b	$F_{v,Ed}$ kN	$F_{b,Rd}$ kN	η
100	32 *)	32 *)	-	2.50	2.9	36.0	**0.08**
*) limited to max_e = 3 * dll							

Utilization Diagonal left

Stress	Joint	Metal sheet
0.01 < 1.0	**0.30 < 1.0**	**0.08 < 1.0**

Checks Diagonal right b/h = 20.0 /20.0 - (Softwood C24 EN 338:2016)

Fastener- spacing

VM longitudinal		VM transversal		Edge longitudinal		Edge longitudinal		Edge transversal		Edge transversal	
a_1 exist mm	a_1 min mm	a_2 exist mm	a_2 min mm	$a_{3,t}$ exist mm	$a_{3,t}$ min mm	$a_{3,c}$ exist mm	$a_{3,c}$ min mm	$a_{4,t}$ exist mm	$a_{4,t}$ min mm	$a_{4,c}$ exist mm	$a_{4,c}$ min mm
100	50	-	30	-	80	100	40	100	30	100	30

Capacity of the joint

VM	Quantity Gaps	α_1 °	α_2 °	M_{yk} Nmm	t_r mm	k_{ser} kN/m	$F_{v,Rd}$ kN
SDow	2	0.00	-	42995.6	0	14969.46	**9.4**
Fastener : SDow - Dowel pin							

Required number of connection - check

VM transversal	selected longitudinal		n_{eff} tot.	n_{eff} req.	$F_{v,Ed}$ kN		$F_{v,Rd}$ kN	η
1	x	2	1.75	0.53	**5.0**	<	**16.5**	**0.30**

selected:	**2**	**Dowel pin**	d =	10.0 mm	l_{min} = 200.0 mm

Tension check in timber at connection

A_{netto} cm²	k_{te}	f_{nd} N/mm²	N_d kN	σ_{nd} N/mm²	Equation	η
195.0	1.00	12.92	-2.5	**-0.13**	6.2	**0.01**

Checks in sheet according to EN 1993-1 - γM0 = 1.00 γM2 = 1.25 dl = 10.6 mm

l_{crack} cm	A_{netto} cm^2	$\sigma_{x,Ed}$ N/mm^2	$\sigma_{x,Rd}$ N/mm^2	η
17.9	9.0	5.57	235.00	**0.02**
The stability of the sheet in the pressing rod will not be further investigated.				

min,e mm	min,e_1 mm	min,e_2 mm	min,e_3 mm	$k_1 * \alpha_b$	$F_{v,Ed}$ kN	$F_{b,Rd}$ kN	η
100	32 *)	32 *)	-	2.50	2.9	36.0	**0.08**
*) limited to max_e = 3 * dll							

Utilization Diagonal right

Stress	Joint	Metal sheet
0.01 < 1.0	**0.30 < 1.0**	**0.08 < 1.0**

Maximum utilization from all checks

Stress η = **0.04** Continuous chord
Joint η = **0.36** Continuous chord
Metal sheet η = **0.08** Diagonal left

Item: 03_Palicje-vertikala T

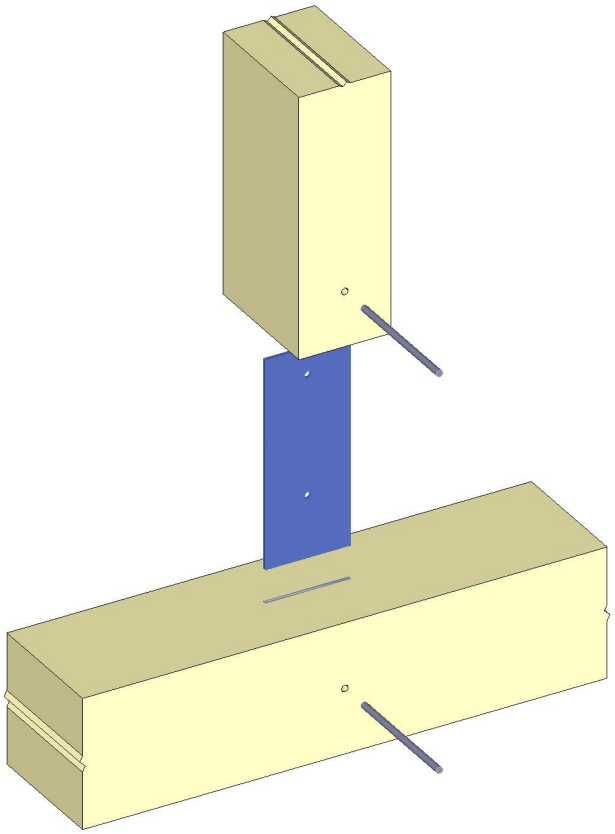
Timber Joint (x64) HO13+ 01/22 (FRILO R-2022-2/P07)

Basic parameters

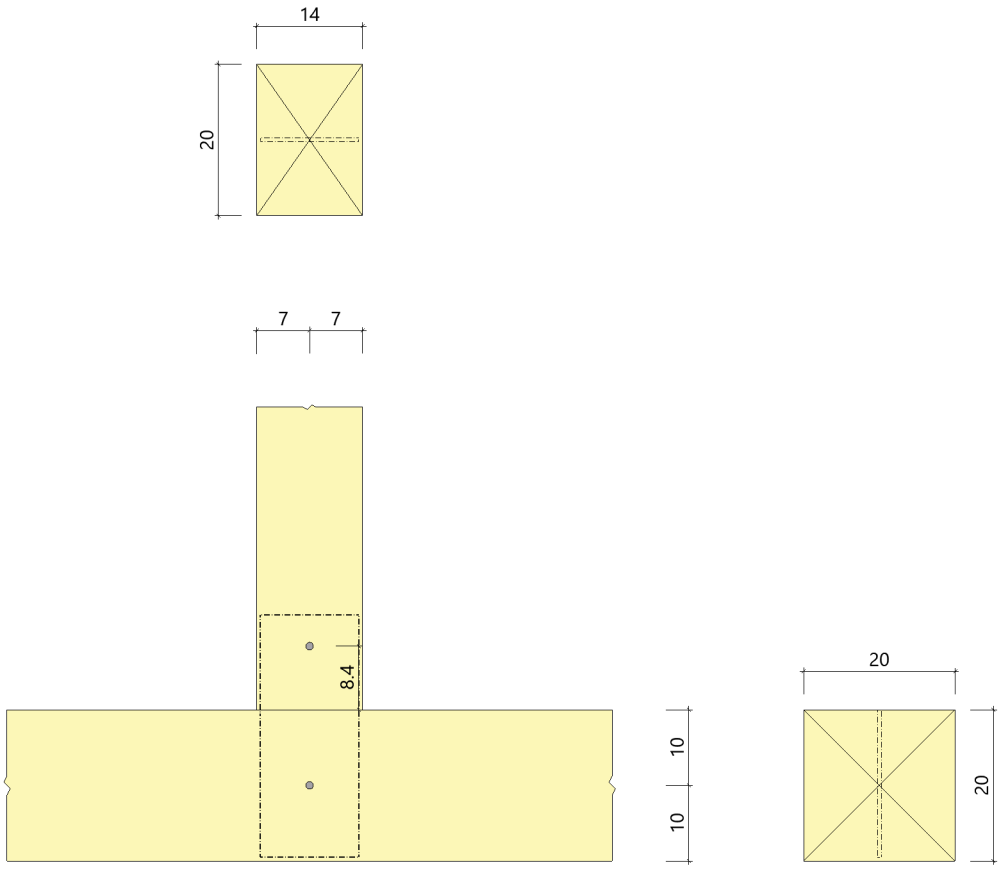
Design code	:	DIN EN 1995-1-1/NA:2013-08
Basis	:	EN 1995-1-1/A2:2014
Slotted plate connection	:	Check outer timber with reduced kte

Timber-Node connection with slotted plates - continuous chord

System graphic Explosion



System graphic 2D
Scale 1 : 10



System with 2 Members

Member	Material	SCL	Cross-section			Location	
			n	Width cm	Height cm	Relation	Inclination °
Continuous chord	C24	1	1 x	20.0 /	20.0	global	0.0
Post	C24	1	1 x	20.0 /	14.0	rel. chord	90.0

Fastener

Member	Fastener	Type	f_{uk} kN/cm²	$M_{y,Rk}$ Nmm	Dm mm	Edge distance (uv) mm
Continuous chord	Dowel pin	S 235	36.00	42996	10.0	0.0
Post	Dowel pin	S 235	36.00	42996	10.0	0.0

Metal sheet - contoured - in chord orthogonal - in member orthogonal

Material	Quantity	Thickness cm	Clearance mm	Hole type	Edge distance mm
S235	1	0.5	0.6	drilled	5.0

Loading

Internal forces (design values)

Situation	Cutting face	N_d kN	V_{zd} kN	M_{yd} kNm	LDC	k_{mod}
P/T	Chord face at left	-4.3	0.0		middle	0.80
	Chord face at right	-4.3	0.0		middle	0.80
	Post	1.0			middle	0.80
	Supporting force [s)]	0.0	1.0			

[s)] : Support reaction acts horizontally (N_d) or vertically (V_{zd}) in the COG of the node

Design situations

Situation	Description	Timber	Steel		
		γ_M	γ_{M0}	γ_{M1}	γ_{M2}
P/T	persistent/transient	1.30	1.00	1.10	1.25

Results

Note : The stress check is only carried out in the joint region!
The support affects only the balance,
possibly thereby additional checks have to be performed!

Checks Continuous chord b/h = 20.0 /20.0 - (Softwood C24 EN 338:2016)

Fastener- spacing

VM longitudinal		VM transversal		Edge longitudinal		Edge longitudinal		Edge transversal		Edge transversal	
a_1 exist mm	a_1 min mm	a_2 exist mm	a_2 min mm	$a_{3,t}$ exist mm	$a_{3,t}$ min mm	$a_{3,c}$ exist mm	$a_{3,c}$ min mm	$a_{4,t}$ exist mm	$a_{4,t}$ min mm	$a_{4,c}$ exist mm	$a_{4,c}$ min mm
-	30	-	30	-	80	-	80	100	40	100	30

Capacity of the joint

VM	Quantity Gaps	α_1 °	α_2 °	M_{yk} Nmm	t_r mm	k_{ser} kN/m	$F_{v,Rd}$ kN
SDow	2	90.00	-	42995.6	0	14969.46	**7.7**
Fastener : SDow - Dowel pin							

Required number of connection - check

VM transversal	selected longitudinal		n_{eff} tot.	n_{eff} req.	$F_{v,Ed}$ kN		$F_{v,Rd}$ kN	η
1	x	1	0.50	0.13	**1.0**	<	**3.9**	**0.26**

selected:	**1**	**Dowel pin**	d =	10.0 mm	l_{min} = 200.0 mm

Caution: **CHECK THE ARRANGEMENT - TOTALLY LESS THAN 4 SHEAR FACES!**
Note: **supporting joints should have at least two fasteners!**

Check cross connection DIN EN 1995-1-1/NA:2013 a/h,top = 0.50

k_s	k_r	a cm	$f_{t,90,d}$ kN/cm²	$F_{90,d}$ kN		$F_{v,90,Rd}$ kN	η
1.00	1.00	10.00	0.02	1.0	<	9.9	**0.10**

Tension check in timber at connection L -left R -right face

Face	A_{netto} cm²	k_{te}	f_{nd} kN/cm²	N_d kN	σ_{nd} kN/cm²	Equation	η
R	195.0	1.00	1.29	-2.2	**-0.01**	6.2	**0.01**

Checks in sheet according to EN 1993-1 - γM0 = 1.00 γM2 = 1.25 dl = 10.6 mm

l_{crack} cm	A_{netto} cm²	$\sigma_{x,Ed}$ kN/cm²	$\sigma_{x,Rd}$ kN/cm²	η
11.9	6.0	0.17	23.50	**0.01**

min,e mm	min,e_1 mm	min,e_2 mm	min,e_3 mm	k_1* α_b	$F_{v,Ed}$ kN	$F_{b,Rd}$ kN	η
-	32 *)	32 *)	-	2.50	2.0	36.0	**0.06**
*) limited to max_e = 3 * dll							

Utilization Continuous chord

Stress	Trans connection	Joint	Metal sheet
0.01 < 1.0	**0.10 < 1.0**	**0.26 < 1.0**	**0.06 < 1.0**

Checks Post b/h = 20.0 /14.0 - (Softwood C24 EN 338:2016)

Fastener- spacing

VM longitudinal		VM transversal		Edge longitudinal		Edge longitudinal		Edge transversal		Edge transversal	
a_1 exist mm	a_1 min mm	a_2 exist mm	a_2 min mm	$a_{3,t}$ exist mm	$a_{3,t}$ min mm	$a_{3,c}$ exist mm	$a_{3,c}$ min mm	$a_{4,t}$ exist mm	$a_{4,t}$ min mm	$a_{4,c}$ exist mm	$a_{4,c}$ min mm
-	50	-	30	84	80	-	40	70	30	70	30

Capacity of the joint

VM	Quantity Gaps	α_1 °	α_2 °	M_{yk} Nmm	t_r mm	k_{ser} kN/m	$F_{v,Rd}$ kN
SDow	2	0.00	-	42995.6	0	14969.46	**9.4**
Fastener : SDow - Dowel pin							

Required number of connection - check

VM transversal	selected longitudinal		n_{eff} tot.	n_{eff} req.	$F_{v,Ed}$ kN		$F_{v,Rd}$ kN	η
1	x	1	0.50	0.11	**1.0**	<	**4.7**	**0.21**

selected:	**1**	**Dowel pin**	d =	10.0 mm	l_{min} = 200.0 mm

Caution: **CHECK THE ARRANGEMENT - TOTALLY LESS THAN 4 SHEAR FACES!**
Note: **supporting joints should have at least two fasteners!**

Tension check in timber at connection

A_{netto} cm^2	k_{te}	f_{nd} kN/cm^2	N_d kN	σ_{nd} kN/cm^2	Equation	η
126.8	0.40	0.36	0.5	**0.004**	6.1	**0.01**

Checks in sheet according to EN 1993-1 - γM0 = 1.00 γM2 = 1.25 dl = 10.6 mm

l_{crack} cm	A_{netto} cm^2	$\sigma_{x,Ed}$ kN/cm^2	$\sigma_{x,Rd}$ kN/cm^2	η
11.9	6.0	0.17	23.50	**0.01**

min,e mm	min,e_1 mm	min,e_2 mm	min,e_3 mm	k_1* α_b	$F_{v,Ed}$ kN	$F_{b,Rd}$ kN	η
-	32 *)	32 *)	-	2.50	2.0	36.0	**0.06**
*) limited to max_e = 3 * dll							

Utilization Post

Stress	Joint	Metal sheet
0.01 < 1.0	**0.21 < 1.0**	**0.06 < 1.0**

Maximum utilization from all checks

Stress η = **0.01** Post
Joint η = **0.26** Continuous chord
Metal sheet η = **0.06** Continuous chord

Item: 05_Palicje-vertikala-diagonala-sredina

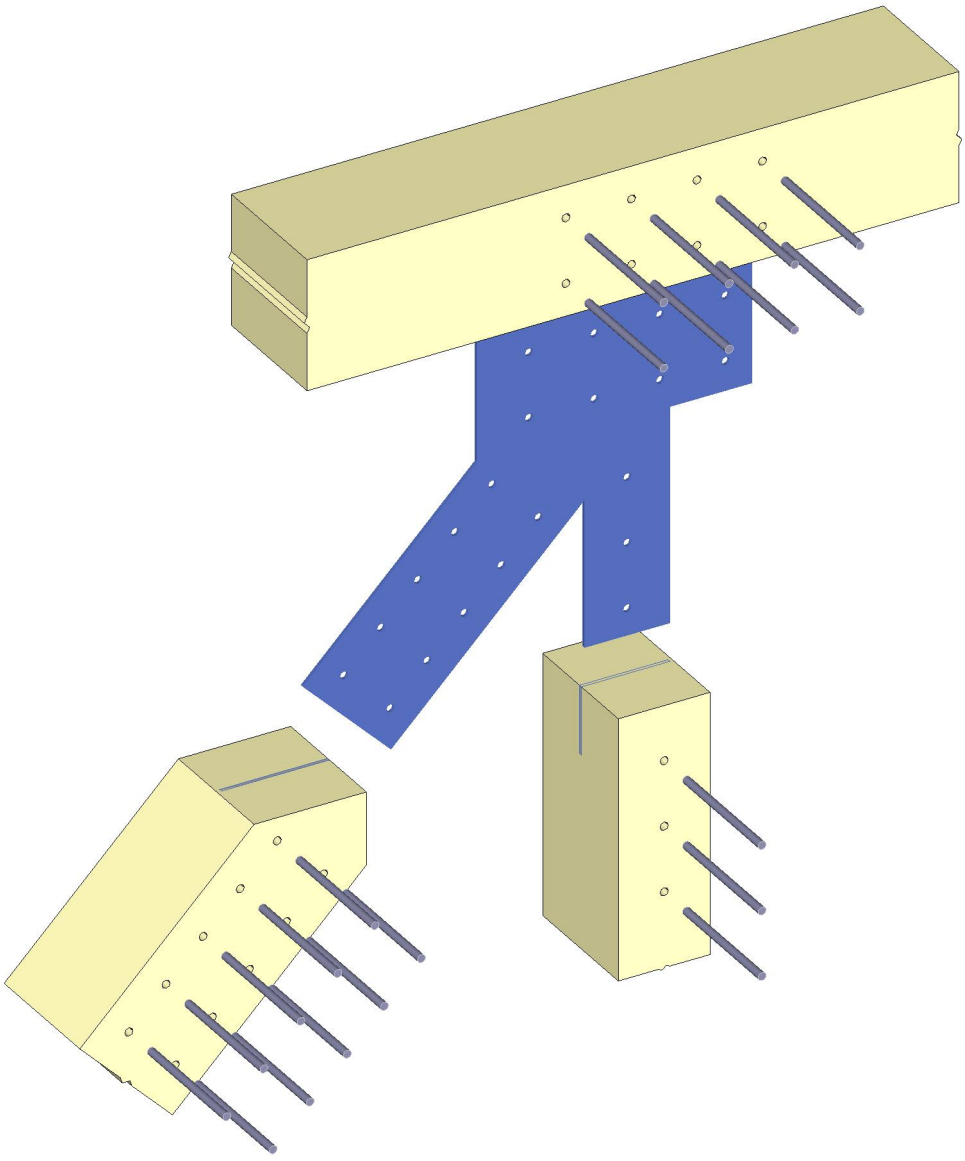
Timber Joint (x64) HO13+ 01/22 (FRILO R-2022-2/P07)

Basic parameters

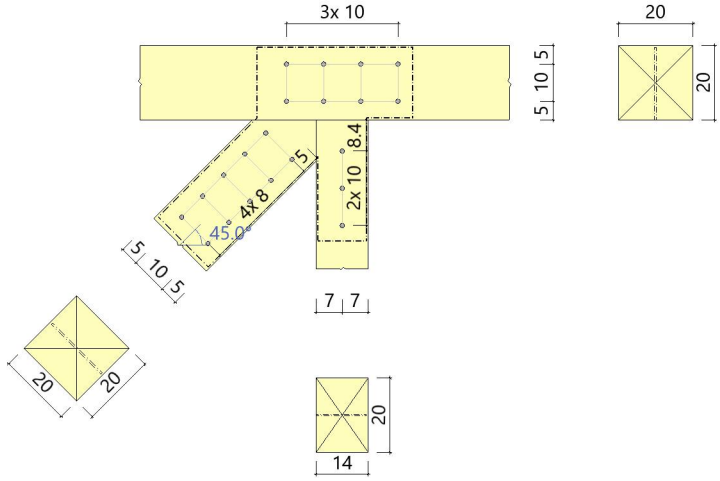
Design code	:	DIN EN 1995-1-1/NA:2013-08
Basis	:	EN 1995-1-1/A2:2014
Slotted plate connection	:	Check outer timber with reduced kte

Timber-Node connection with slotted plates - continuous chord

System graphic Explosion



System graphic 2D
Scale 1 : 20



System with 3 Members

Member	Material	SCL	Cross-section			Location	
			n	Width cm	Height cm	Relation	Inclination °
Continuous chord	C24	1	1 x	20.0 /	20.0	global	0.0
Post	C24	1	1 x	20.0 /	14.0	rel. chord	90.0
Diagonal left	C24	1	1 x	20.0 /	20.0	rel. chord	45.0

Fastener

Member	Fastener	Type	f_{uk} kN/cm²	$M_{y,Rk}$ Nmm	Dm mm	Edge distance (uv) mm
Continuous chord	Dowel pin	S 235	36.00	69071	12.0	0.0
Post	Dowel pin	S 235	36.00	69071	12.0	0.0
Diagonal left	Dowel pin	S 235	36.00	69071	12.0	0.0

Metal sheet - contoured - in chord orthogonal - in member orthogonal

Material	Quantity	Thickness cm	Clearance mm	Hole type	Edge distance mm
S235	1	0.5	0.6	drilled	5.0

Loading

Internal forces (design values)

Situation	Cutting face	N_d kN	V_{zd} kN	M_{yd} kNm	LDC	k_{mod}
P/T	Chord face at left	13.6	0.0		middle	0.80
	Chord face at right	64.5	0.0		middle	0.80
	Post	10.1			middle	0.80
	Diagonal left	-80.2			middle	0.80
	Supporting force s)	-107.6	46.6			

s) : Support reaction acts horizontally (N_d) or vertically (V_{zd}) in the COG of the node

Design situations

Situation	Description	Timber	Steel		
		γ_M	γ_{M0}	γ_{M1}	γ_{M2}
P/T	persistent/transient	1.30	1.00	1.10	1.25

Results

Note : The stress check is only carried out in the joint region!
The support affects only the balance,
possibly thereby additional checks have to be performed!

Checks Continuous chord b/h = 20.0 /20.0 - (Softwood C24 EN 338:2016)

Fastener- spacing

VM longitudinal		VM transversal		Edge longitudinal		Edge longitudinal		Edge transversal		Edge transversal	
a_1 exist mm	a_1 min mm	a_2 exist mm	a_2 min mm	$a_{3,t}$ exist mm	$a_{3,t}$ min mm	$a_{3,c}$ exist mm	$a_{3,c}$ min mm	$a_{4,t}$ exist mm	$a_{4,t}$ min mm	$a_{4,c}$ exist mm	$a_{4,c}$ min mm
100	55	100	36	-	84	-	53	50	39	50	36

Capacity of the joint

VM	Quantity Gaps	α_1 °	α_2 °	M_{yk} Nmm	t_r mm	k_{ser} kN/m	$F_{v,Rd}$ kN
SDow	2	39.42	-	69070.9	0	17963.35	**11.8**
SDow (0°)	2	0.00	-	69070.9	0	17963.35	**13.0**
Fastener : SDow - Dowel pin							

Required number of connection - check

VM transversal	selected longitudinal		n_{eff} tot.	n_{eff} req.	$F_{v,Ed}$ kN		$F_{v,Rd}$ kN	η
2	x	4	7.01	6.24	**73.4**	<	**82.4**	**0.89**
Member in Grain direction:			6.23	4.38	**56.7**	<	**80.7**	**0.70**

selected:	**8**	**Dowel pin**	d =	12.0 mm	l_{min} = 200.0 mm

Tension check in timber at connection L -left R -right face

Face	A_{netto} cm²	k_{te}	f_{nd} kN/cm²	N_d kN	σ_{nd} kN/cm²	Equation	η
R	171.6	1.00	0.89	32.3	**0.19**	6.1	**0.21**

Checks in sheet according to EN 1993-1 - γM0 = 1.00 γM2 = 1.25 dl = 12.6 mm

l_{crack} cm	A_{netto} cm²	$\sigma_{x,Ed}$ kN/cm²	$\sigma_{x,Rd}$ kN/cm²	η
22.7	11.4	6.46	23.50	**0.27**

min,e mm	min,e_1 mm	min,e_2 mm	min,e_3 mm	k_1* α_b	$F_{v,Ed}$ kN	$F_{b,Rd}$ kN	η
100	38 *)	38 *)	100	2.50	10.5	43.2	**0.24**
*) limited to $\max e = 3 * dll$							

Block shear failure in the sheet

eccentric	A_{nt} cm²	A_{nv} cm²	$F_{v,Ed}$ kN	$V_{eff,Rd}$ kN	η
in direction N	4.4	33.5	56.7	517.8	**0.11**

Utilization Continuous chord

Stress	Joint	Metal sheet
0.21 < 1.0	**0.89 < 1.0**	**0.27 < 1.0**

Checks Post b/h = 20.0 /14.0 - (Softwood C24 EN 338:2016)

Fastener- spacing

VM longitudinal		VM transversal		Edge longitudinal		Edge longitudinal		Edge transversal		Edge transversal	
a_1 exist mm	a_1 min mm	a_2 exist mm	a_2 min mm	$a_{3,t}$ exist mm	$a_{3,t}$ min mm	$a_{3,c}$ exist mm	$a_{3,c}$ min mm	$a_{4,t}$ exist mm	$a_{4,t}$ min mm	$a_{4,c}$ exist mm	$a_{4,c}$ min mm
100	60	-	36	84	84	-	42	70	36	70	36

Capacity of the joint

VM	Quantity Gaps	α_1 °	α_2 °	M_{yk} Nmm	t_r mm	k_{ser} kN/m	$F_{v,Rd}$ kN
SDow	2	0.00	-	69070.9	0	17963.35	**13.0**
Fastener : SDow - Dowel pin							

Required number of connection - check

VM transversal	selected longitudinal		n_{eff} tot.	n_{eff} req.	$F_{v,Ed}$ kN		$F_{v,Rd}$ kN	η
1	x	3	2.41	0.78	**10.1**	<	**31.1**	**0.32**

selected:	**3**	**Dowel pin**	d =	12.0 mm	l_{min} = 200.0 mm

Tension check in timber at connection

A_{netto} cm²	k_{te}	f_{nd} kN/cm²	N_d kN	σ_{nd} kN/cm²	Equation	η
124.8	0.40	0.36	5.1	**0.04**	6.1	**0.11**

Checks in sheet according to EN 1993-1 - γM0 = 1.00 γM2 = 1.25 dl = 12.6 mm

l_{crack} cm	A_{netto} cm²	$\sigma_{x,Ed}$ kN/cm²	$\sigma_{x,Rd}$ kN/cm²	η
11.7	5.9	1.72	23.50	**0.07**

min,e mm	min,e_1 mm	min,e_2 mm	min,e_3 mm	$k_1 * \alpha_b$	$F_{v,Ed}$ kN	$F_{b,Rd}$ kN	η
100	38 *)	38 *)	-	2.50	4.2	43.2	**0.10**
*) limited to max_e = 3 * dll							

Utilization Post

Stress	Joint	Metal sheet
0.11 < 1.0	**0.32 < 1.0**	**0.10 < 1.0**

Checks Diagonal left b/h = 20.0 /20.0 - (Softwood C24 EN 338:2016)

Fastener- spacing

VM longitudinal		VM transversal		Edge longitudinal		Edge longitudinal		Edge transversal		Edge transversal	
a_1 exist mm	a_1 min mm	a_2 exist mm	a_2 min mm	$a_{3,t}$ exist mm	$a_{3,t}$ min mm	$a_{3,c}$ exist mm	$a_{3,c}$ min mm	$a_{4,t}$ exist mm	$a_{4,t}$ min mm	$a_{4,c}$ exist mm	$a_{4,c}$ min mm
80	60	100	36	-	84	50	42	50	36	50	36

Capacity of the joint

VM	Quantity Gaps	α_1 °	α_2 °	M_{yk} Nmm	t_r mm	k_{ser} kN/m	$F_{v,Rd}$ kN
SDow	2	0.00	-	69070.9	0	17963.35	**13.0**
Fastener : SDow - Dowel pin							

Required number of connection - check

VM transversal	selected longitudinal		n_{eff} tot.	n_{eff} req.	$F_{v,Ed}$ kN		$F_{v,Rd}$ kN	η
2	x	5	7.20	6.19	**80.2**	<	**93.3**	**0.86**

selected:	**10**	**Dowel pin**	d =	12.0 mm	l_{min} = 200.0 mm

Tension check in timber at connection

A_{netto} cm²	k_{te}	f_{nd} kN/cm²	N_d kN	σ_{nd} kN/cm²	Equation	η
195.0	1.00	1.29	-40.1	**-0.21**	6.2	**0.16**

Checks in sheet according to EN 1993-1 - γM0 = 1.00 γM2 = 1.25 dl = 12.6 mm

l_{crack} cm	A_{netto} cm²	$\sigma_{x,Ed}$ kN/cm²	$\sigma_{x,Rd}$ kN/cm²	η
16.5	8.2	9.73	23.50	**0.41**
The stability of the sheet in the pressing rod will not be further investigated.				

min,e mm	min,e_1 mm	min,e_2 mm	min,e_3 mm	k_1* α_b	$F_{v,Ed}$ kN	$F_{b,Rd}$ kN	η
80	38 *)	38 *)	100	2.50	11.1	43.2	**0.26**
*) limited to max_e = 3 * dll							

Utilization Diagonal left

Stress	Joint	Metal sheet
0.16 < 1.0	**0.86 < 1.0**	**0.41 < 1.0**

Maximum utilization from all checks

Stress	η =	**0.21**	Continuous chord
Joint	η =	**0.89**	Continuous chord
Metal sheet	η =	**0.41**	Diagonal left

Item: 06_Palicje-vertikala-diagonala-vogal

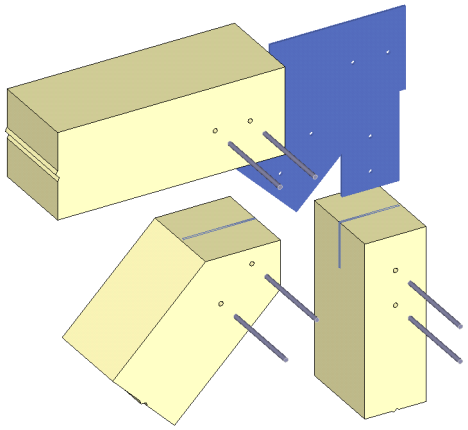
Timber Joint (x64) HO13+ 01/22 (FRILO R-2022-2/P07)

Basic parameters

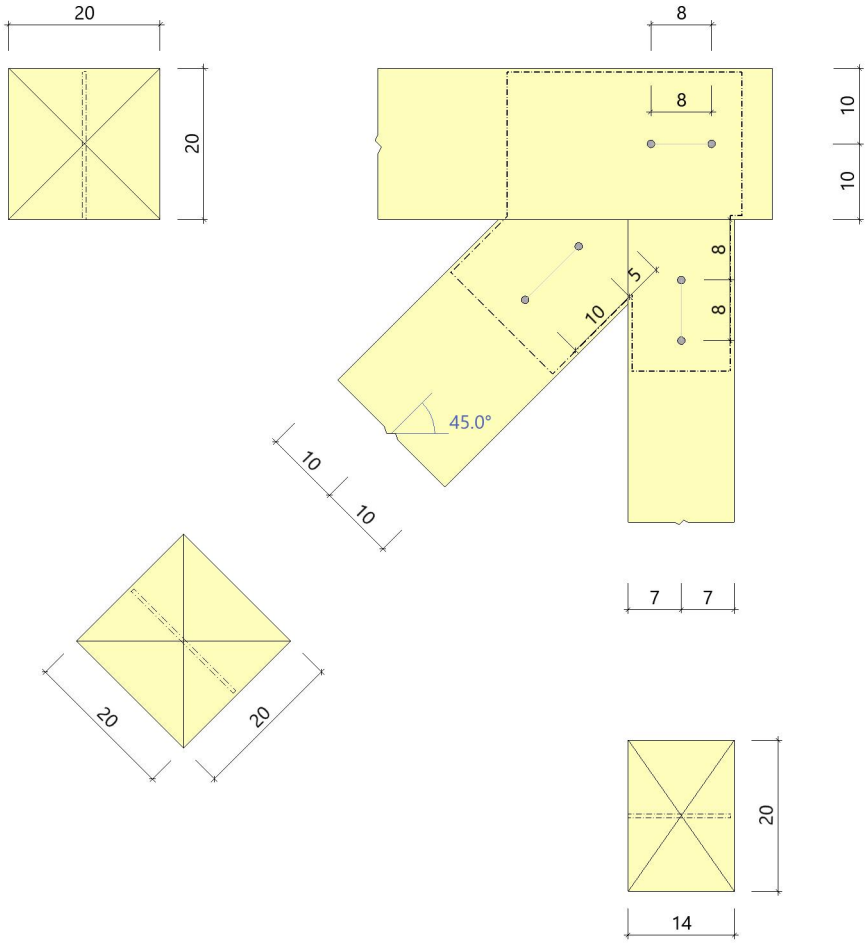
Design code	:	DIN EN 1995-1-1/NA:2013-08
Basis	:	EN 1995-1-1/A2:2014
Slotted plate connection	:	Check outer timber with reduced kte

Timber-Node connection with slotted plates - Chord end

System graphic Explosion



System graphic 2D
Scale 1 : 10



System with 3 Members

Member	Material	SCL	Cross-section			Location	
			n	Width cm	Height cm	Relation	Inclination °
Chord	C24	1	1 x	20.0 /	20.0	global	0.0
Post	C24	1	1 x	20.0 /	14.0	rel. chord	90.0
Diagonal left	C24	1	1 x	20.0 /	20.0	rel. chord	45.0
Overhang strap at the node end 5.0 cm							

Fastener

Member	Fastener	Type	f_{uk} kN/cm²	$M_{y,Rk}$ Nmm	Dm mm	Edge distance (uv) mm
Chord	Dowel pin	S 235	36.00	42996	10.0	0.0
Post	Dowel pin	S 235	36.00	42996	10.0	0.0
Diagonal left	Dowel pin	S 235	36.00	42996	10.0	0.0

Metal sheet - contoured - in chord orthogonal - in member orthogonal

Material	Quantity	Thickness cm	Clearance mm	Hole type	Edge distance mm
S235	1	0.5	0.6	drilled	5.0

Loading

Internal forces (design values)

Situation	Cutting face	N_d kN	V_{zd} kN	LDC	k_{mod}
P/T	Chord	13.0	0.0	middle	0.80
	Post	1.0		middle	0.80
	Diagonal left	-13.0		middle	0.80
	Supporting force s)	3.8	8.2		
s) : Support reaction acts horizontally (N_d) or vertically (V_{zd}) in the COG of the node					

Design situations

Situation	Description	Timber	Steel		
		γ_M	γ_{M0}	γ_{M1}	γ_{M2}
P/T	persistent/transient	1.30	1.00	1.10	1.25

Results

Note : The stress check is only carried out in the joint region!
The support affects only the balance,
possibly thereby additional checks have to be performed!

Checks Chord b/h = 20.0 /20.0 - (Softwood C24 EN 338:2016)

Fastener- spacing

VM longitudinal		VM transversal		Edge longitudinal		Edge longitudinal		Edge transversal		Edge transversal	
a_1 exist mm	a_1 min mm	a_2 exist mm	a_2 min mm	$a_{3,t}$ exist mm	$a_{3,t}$ min mm	$a_{3,c}$ exist mm	$a_{3,c}$ min mm	$a_{4,t}$ exist mm	$a_{4,t}$ min mm	$a_{4,c}$ exist mm	$a_{4,c}$ min mm
80	45	-	30	-	80	80	53	100	33	100	30

Capacity of the joint

VM	Quantity Gaps	α_1 °	α_2 °	M_{yk} Nmm	t_r mm	k_{ser} kN/m	$F_{v,Rd}$ kN
SDow	2	41.71	-	42995.6	0	14969.46	**8.5**
SDow (0°)	2	0.00	-	42995.6	0	14969.46	**9.4**
Fastener : SDow - Dowel pin							

Required number of connection - check

VM transversal	selected longitudinal		n_{eff} tot.	n_{eff} req.	$F_{v,Ed}$ kN		$F_{v,Rd}$ kN	η
1	x	2	1.81	1.44	**12.3**	<	**15.5**	**0.80**
Member in Grain direction:			1.65	0.97	**9.2**	<	**15.6**	**0.59**

selected:	**2**	**Dowel pin**	d =	10.0 mm	l_{min} = 200.0 mm

Check cross connection DIN EN 1995-1-1/NA:2013 a/h,top = 0.50

k_s	k_r	a cm	$f_{t,90,d}$ kN/cm²	$F_{90,d}$ kN		$F_{v,90,Rd}$ kN	η
1.26	1.00	10.00	0.02	8.2	<	12.5	**0.65**

Tension check in timber at connection

A_{netto} cm²	k_{te}	f_{nd} kN/cm²	N_d kN	σ_{nd} kN/cm²	Equation	η
185.3	0.40	0.36	6.5	**0.04**	6.1	**0.10**

Checks in sheet according to EN 1993-1 - γM0 = 1.00 γM2 = 1.25 dl = 10.6 mm

l_{crack} cm	A_{netto} cm²	$\sigma_{x,Ed}$ kN/cm²	$\sigma_{x,Rd}$ kN/cm²	η
24.4	12.2	1.01	23.50	**0.04**
The stability of the sheet in the pressing rod will not be further investigated.				

min,e mm	min,e_1 mm	min,e_2 mm	min,e_3 mm	k_1* α_b	$F_{v,Ed}$ kN	$F_{b,Rd}$ kN	η
80	32 *)	32 *)	-	2.50	6.8	36.0	**0.19**
*) limited to max_e = 3 * dll							

Block shear failure in the sheet

eccentric	A_{nt} cm²	A_{nv} cm²	$F_{v,Ed}$ kN	$V_{eff,Rd}$ kN	η
in direction V_z	3.5	9.5	12.3	243.7	**0.05**

Utilization Chord

Stress	Trans connection	Joint	Metal sheet
0.10 < 1.0	**0.65 < 1.0**	**0.80 < 1.0**	**0.19 < 1.0**

Checks Post b/h = 20.0 /14.0 - (Softwood C24 EN 338:2016)

Fastener- spacing

VM longitudinal		VM transversal		Edge longitudinal		Edge longitudinal		Edge transversal		Edge transversal	
a_1 exist mm	a_1 min mm	a_2 exist mm	a_2 min mm	$a_{3,t}$ exist mm	$a_{3,t}$ min mm	$a_{3,c}$ exist mm	$a_{3,c}$ min mm	$a_{4,t}$ exist mm	$a_{4,t}$ min mm	$a_{4,c}$ exist mm	$a_{4,c}$ min mm
80	50	-	30	80	80	-	40	70	30	70	30

Capacity of the joint

VM	Quantity Gaps	α_1 °	α_2 °	M_{yk} Nmm	t_r mm	k_{ser} kN/m	$F_{v,Rd}$ kN
SDow	2	0.00	-	42995.6	0	14969.46	**9.4**
Fastener : SDow - Dowel pin							

Required number of connection - check

VM transversal	selected longitudinal		n_{eff} tot.	n_{eff} req.	$F_{v,Ed}$ kN		$F_{v,Rd}$ kN	η
1	x	2	1.65	0.11	**1.0**	<	**15.6**	**0.06**

selected:	2	Dowel pin	d =	10.0 mm	l_{min} = 200.0 mm

Tension check in timber at connection

A_{netto} cm²	k_{te}	f_{nd} kN/cm²	N_d kN	σ_{nd} kN/cm²	Equation	η
126.8	0.40	0.36	0.5	**0.004**	6.1	**0.01**

Checks in sheet according to EN 1993-1 - γM0 = 1.00 γM2 = 1.25 dl = 10.6 mm

l_{crack} cm	A_{netto} cm²	$\sigma_{x,Ed}$ kN/cm²	$\sigma_{x,Rd}$ kN/cm²	η
11.9	6.0	0.17	23.50	**0.01**

min,e mm	min,e_1 mm	min,e_2 mm	min,e_3 mm	k_1* α_b	$F_{v,Ed}$ kN	$F_{b,Rd}$ kN	η
80	32 *)	32 *)	-	2.50	0.6	36.0	**0.02**
*) limited to max_e = 3 * dll							

Utilization Post

Stress	Joint	Metal sheet
0.01 < 1.0	**0.06 < 1.0**	**0.02 < 1.0**

Checks Diagonal left b/h = 20.0 /20.0 - (Softwood C24 EN 338:2016)

Fastener- spacing

VM longitudinal		VM transversal		Edge longitudinal		Edge longitudinal		Edge transversal		Edge transversal	
a_1 exist mm	a_1 min mm	a_2 exist mm	a_2 min mm	$a_{3,t}$ exist mm	$a_{3,t}$ min mm	$a_{3,c}$ exist mm	$a_{3,c}$ min mm	$a_{4,t}$ exist mm	$a_{4,t}$ min mm	$a_{4,c}$ exist mm	$a_{4,c}$ min mm
100	50	-	30	-	80	50	40	100	30	100	30

Capacity of the joint

VM	Quantity Gaps	α_1 °	α_2 °	M_{yk} Nmm	t_r mm	k_{ser} kN/m	$F_{v,Rd}$ kN
SDow	2	0.00	-	42995.6	0	14969.46	**9.4**
Fastener : SDow - Dowel pin							

Required number of connection - check

VM transversal	selected longitudinal		n_{eff} tot.	n_{eff} req.	$F_{v,Ed}$ kN		$F_{v,Rd}$ kN	η
1	x	2	1.75	1.38	**13.0**	<	**16.5**	**0.79**

selected:	2	Dowel pin	d =	10.0 mm	l_{min} = 200.0 mm

Tension check in timber at connection

A_{netto} cm²	k_{te}	f_{nd} kN/cm²	N_d kN	σ_{nd} kN/cm²	Equation	η
195.0	1.00	1.29	-6.5	**-0.03**	6.2	**0.03**

Checks in sheet according to EN 1993-1 - γM0 = 1.00 γM2 = 1.25 dl = 10.6 mm

l_{crack} cm	A_{netto} cm²	$\sigma_{x,Ed}$ kN/cm²	$\sigma_{x,Rd}$ kN/cm²	η
17.9	9.0	1.45	23.50	**0.06**
The stability of the sheet in the pressing rod will not be further investigated.				

min,e mm	min,e_1 mm	min,e_2 mm	min,e_3 mm	k_1* α_b	$F_{v,Ed}$ kN	$F_{b,Rd}$ kN	η
100	32 *)	32 *)	-	2.50	7.4	36.0	**0.21**
*) limited to max_e = 3 * dll							

Utilization Diagonal left

Stress	Joint	Metal sheet
0.03 < 1.0	**0.79 < 1.0**	**0.21 < 1.0**

Maximum utilization from all checks

Stress	η =	**0.10**	Chord
Joint	η =	**0.80**	Chord
Metal sheet	η =	**0.21**	Diagonal left

Material

Steel	S 235
Concrete	C25/30

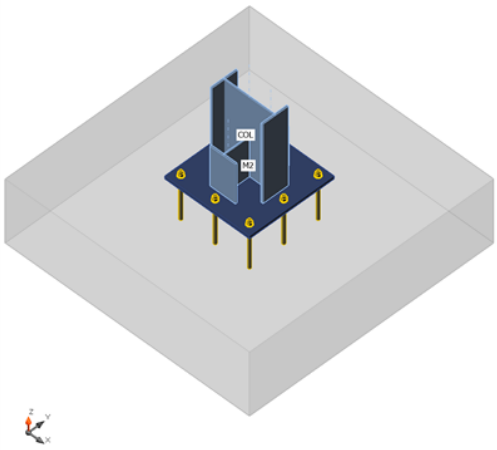
CON1

Sidranje stebra v temelj

Analysis: Joint design resistance

Beams and columns

Name	Cross-section	β – Direction [°]	γ - Pitch [°]	α - Rotation [°]	Offset ex [mm]	Offset ey [mm]	Offset ez [mm]	Forces in
COL	1 - CON1(IPE330)	0,0	-90,0	0,0	0	0	0	Node
M2	2 - T(IPE330)	90,0	-90,0	0,0	0	0	132	Node
M3	2 - T(IPE330)	0,0	-90,0	-90,0	0	0	132	Node



Material

Steel	S 235 (EN)
Concrete	C25/30 (EN)
Bolts	M20 8.8

Foundation block

CB 1

Dimensions	1530 x 1530	mm
Depth	400	mm
Anchor	M20 8.8	
Anchoring length	250	mm
Shear force transfer	Friction	

Load effects

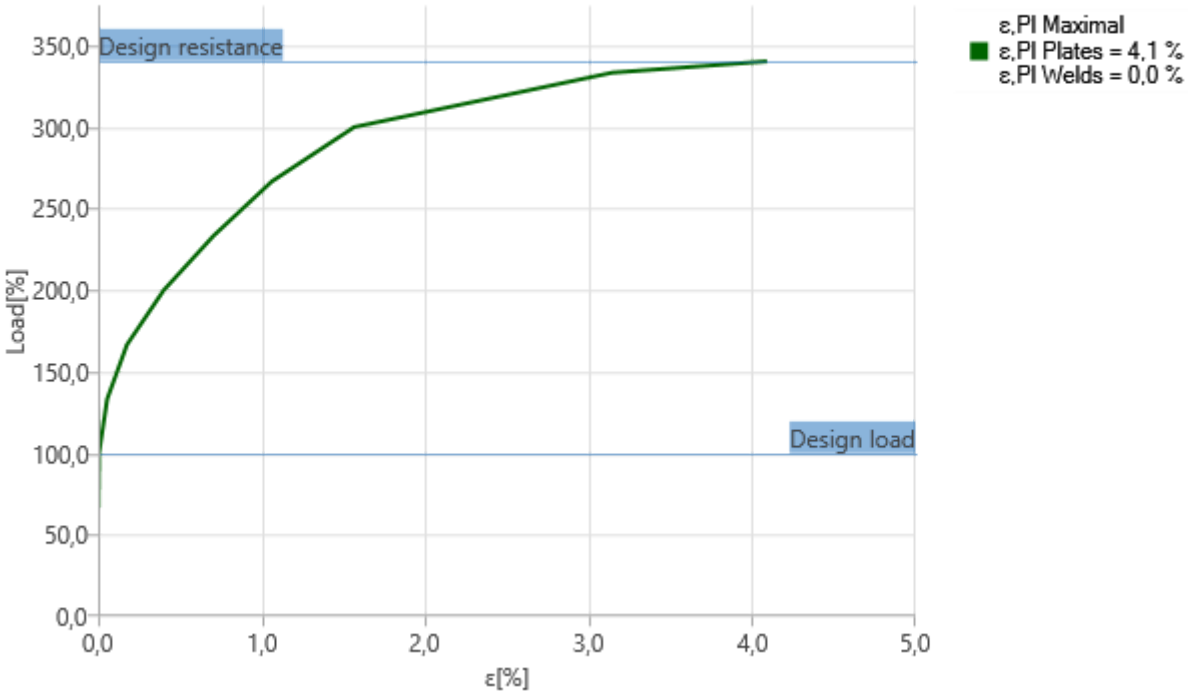
Name	Member	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
LE1	COL	-200,0	0,0	-48,2	0,0	37,6	5,0
	M2	0,0	0,0	0,0	0,0	0,0	0,0
	M3	0,0	0,0	0,0	0,0	0,0	0,0

Summary

Name	Value	Status
Plates	0,0 < 5%	OK
Anchors	52,7 < 100%	OK
Concrete block	27,2 < 100%	OK
Shear	79,1 < 100%	OK

Joint design resistance

Loads	Resistance [%]
LE1	340,4



Joint design resistance, LE1

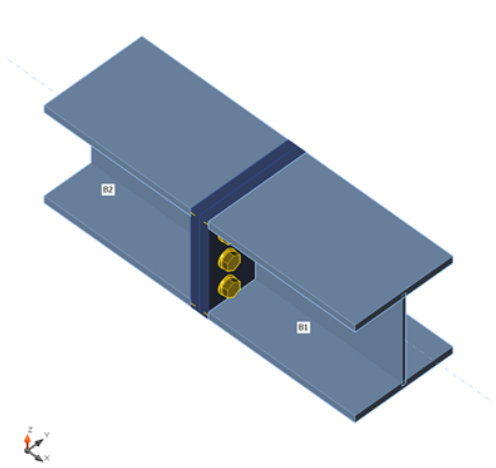
CON2

Montazni spoj HEB220

Analysis: Joint design resistance

Beams and columns

Name	Cross-section	β – Direction [°]	γ - Pitch [°]	α - Rotation [°]	Offset ex [mm]	Offset ey [mm]	Offset ez [mm]	Forces in
B1	4 - CON1(HEB220)	0,0	0,0	0,0	0	0	0	Node
B2	4 - CON1(HEB220)	180,0	0,0	0,0	0	0	0	Node



Material

Steel	S 235 (EN)
Bolts	M20 8.8

Load effects

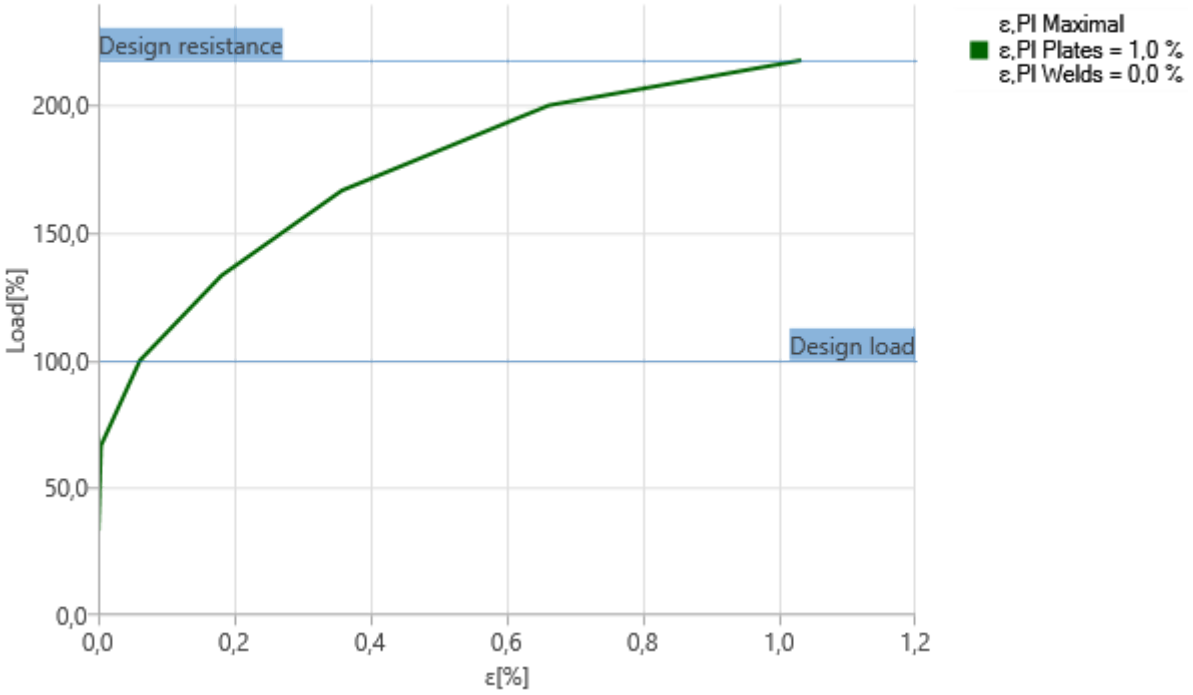
Name	Member	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
LE1	B1	0,0	0,0	-40,0	0,0	30,0	0,0

Summary

Name	Value	Status
Plates	0,1 < 5%	OK
Bolts	69,8 < 100%	OK

Joint design resistance

Loads	Resistance [%]
LE1	217,7



Joint design resistance, LE1

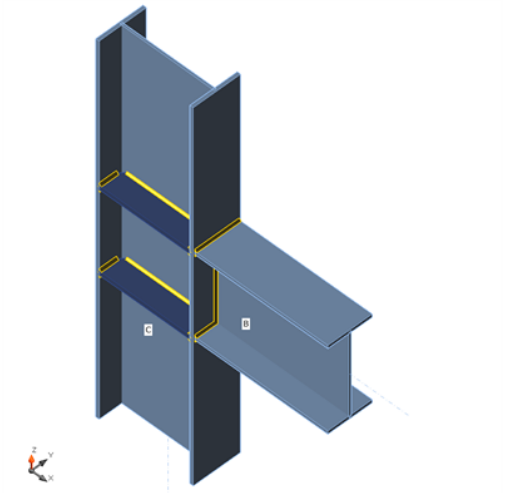
CON3

Varjen spoj IPE300 na steber

Analysis: Joint design resistance

Beams and columns

Name	Cross-section	β – Direction [°]	γ - Pitch [°]	α - Rotation [°]	Offset ex [mm]	Offset ey [mm]	Offset ez [mm]	Forces in
C	1 - CON1(IPE330)	0,0	-90,0	0,0	0	0	0	Node
B	5 - IPE300	0,0	0,0	0,0	0	0	0	Node



Material

Steel	S 235 (EN)

Load effects

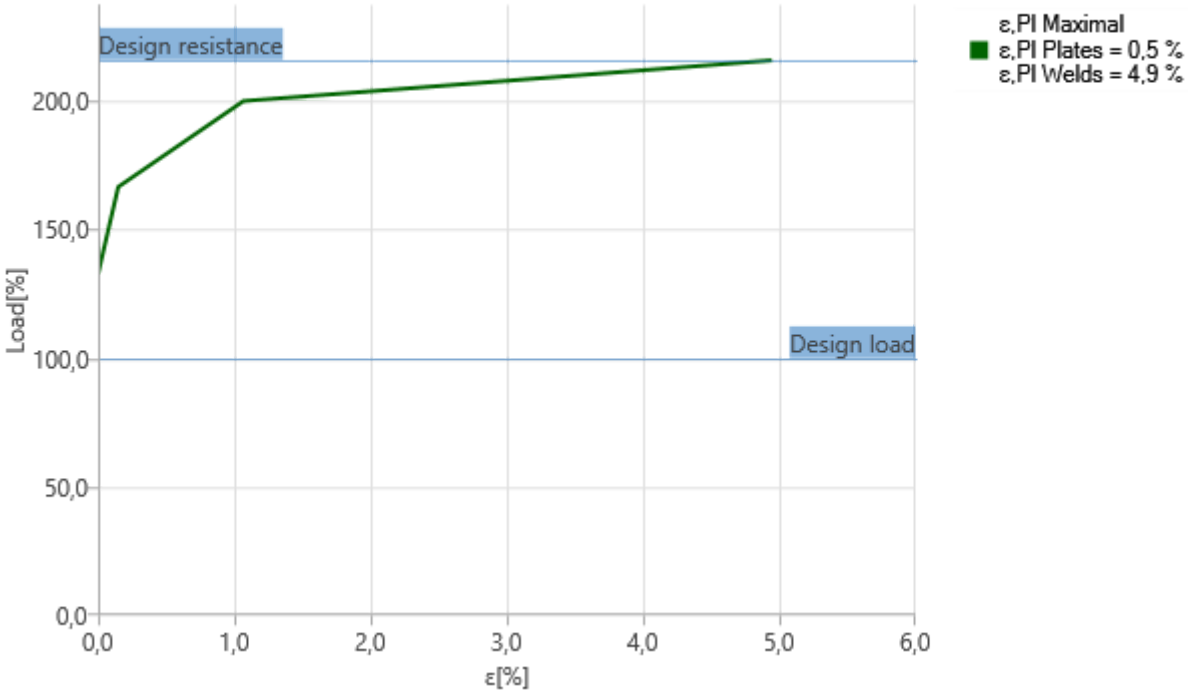
Name	Member	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
LE1	B	0,0	0,0	-41,2	0,0	70,4	0,0

Summary

Name	Value	Status
Plates	0,0 < 5%	OK
Welds	64,3 < 100%	OK

Joint design resistance

Loads	Resistance [%]
LE1	215,9



Joint design resistance, LE1

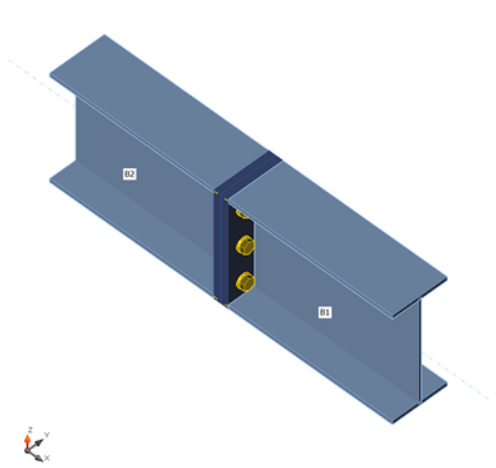
CON4

Montazni spoj IPE300

Analysis: Joint design resistance

Beams and columns

Name	Cross-section	β – Direction [°]	γ - Pitch [°]	α - Rotation [°]	Offset ex [mm]	Offset ey [mm]	Offset ez [mm]	Forces in
B1	5 - IPE300	0,0	0,0	0,0	0	0	0	Node
B2	5 - IPE300	180,0	0,0	0,0	0	0	0	Node



Material

Steel	S 235 (EN)
Bolts	M20 8.8

Load effects

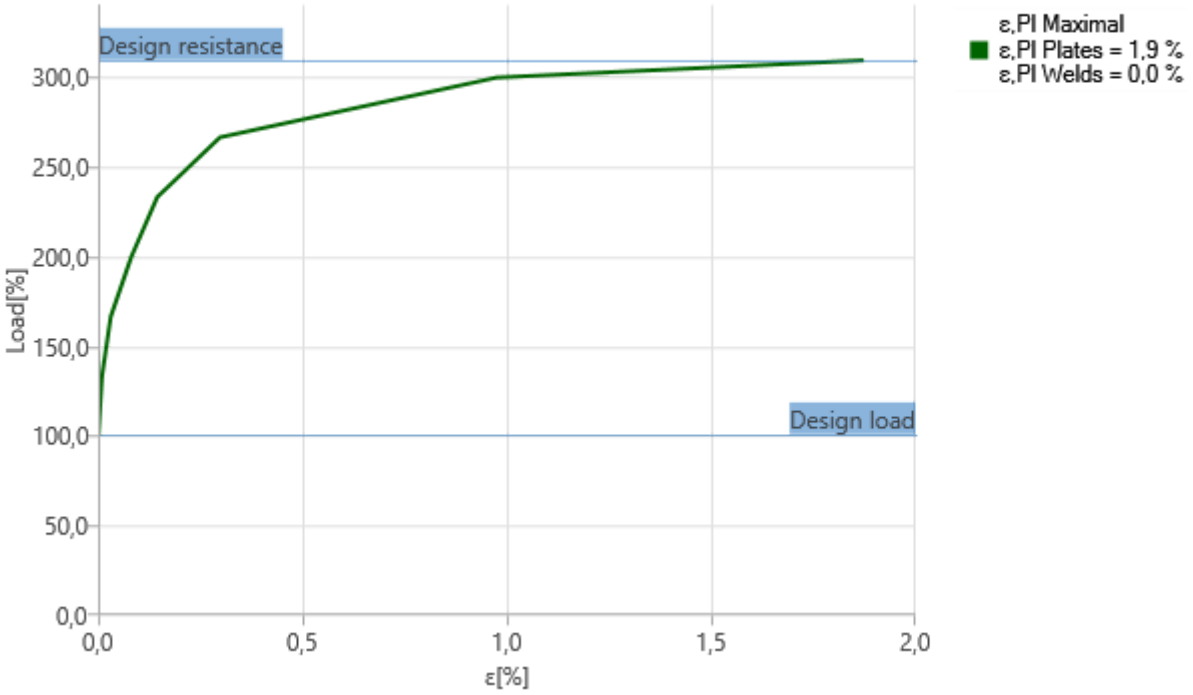
Name	Member	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
LE1	B1	0,0	0,0	-30,0	0,0	30,0	0,0

Summary

Name	Value	Status
Plates	0,0 < 5%	OK
Bolts	42,8 < 100%	OK

Joint design resistance

Loads	Resistance [%]
LE1	309,6



Joint design resistance, LE1

Project item CON1

Design

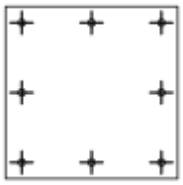
Name	CON1
Description	Sidranje stebra v temelj
Analysis	Joint design resistance

Foundation block

Item	Value	Unit
CB 1		
Dimensions	1530 x 1530	mm
Depth	400	mm
Anchor	M20 8.8	
Anchoring length	250	mm
Shear force transfer	Friction	

Bill of material

Manufacturing operations

Name	Plates [mm]	Shape	Nr.	Welds [mm]	Length [mm]	Bolts	Nr.
BP1	P20,0x530,0-530,0 (S 235)		1	Bevel: a = 11,5 Bevel: a = 7,5	320,0 318,5	M20 8.8	8

Welds

Type	Material	Throat thickness [mm]	Leg size [mm]	Length [mm]
Bevel	S 235	11,5	16,3	640,0
Bevel	S 235	7,5	10,6	637,0

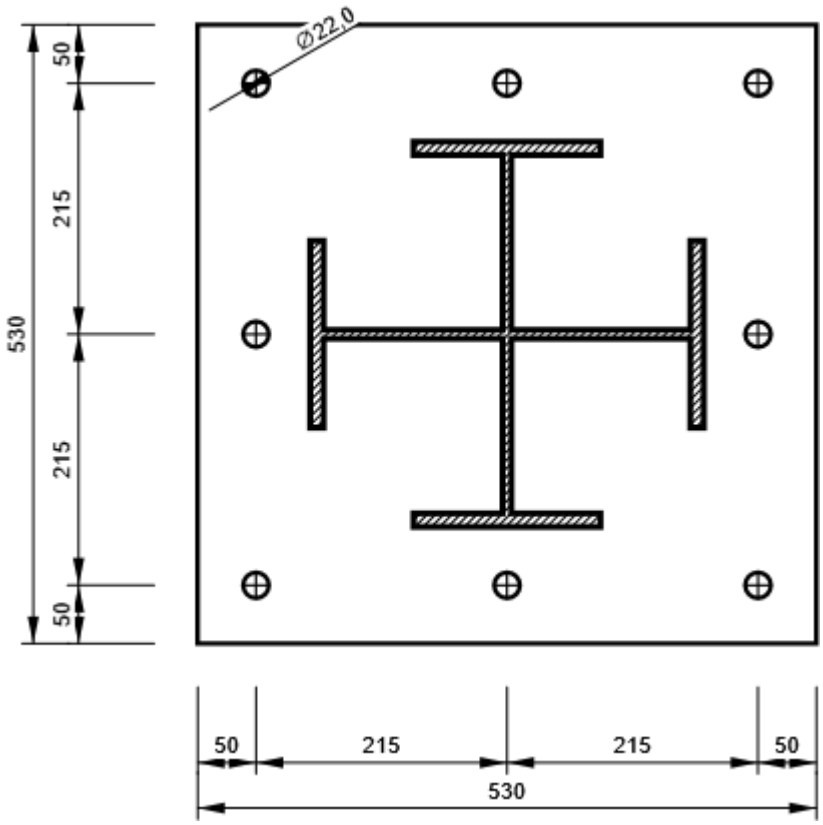
Anchors

Name	Length [mm]	Drill length [mm]	Count
M20 8.8	270	250	8

Drawing

BP1

P20,0x530-530 (S 235)



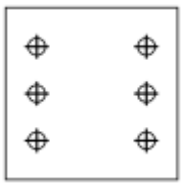
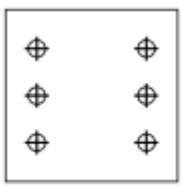
Project item CON2

Design

Name	CON2
Description	Montazni spoj HEB220
Analysis	Joint design resistance

Bill of material

Manufacturing operations

Name	Plates [mm]	Shape	Nr.	Welds [mm]	Length [mm]	Bolts	Nr.
PP1	P20,0x220,0-220,0 (S 235)		1	Bevel: a = 16,0 Bevel: a = 9,5	880,0 408,0	M20 8.8	6
	P20,0x220,0-220,0 (S 235)		1				

Welds

Type	Material	Throat thickness [mm]	Leg size [mm]	Length [mm]
Bevel	S 235	16,0	22,6	880,0
Bevel	S 235	9,5	13,4	408,0

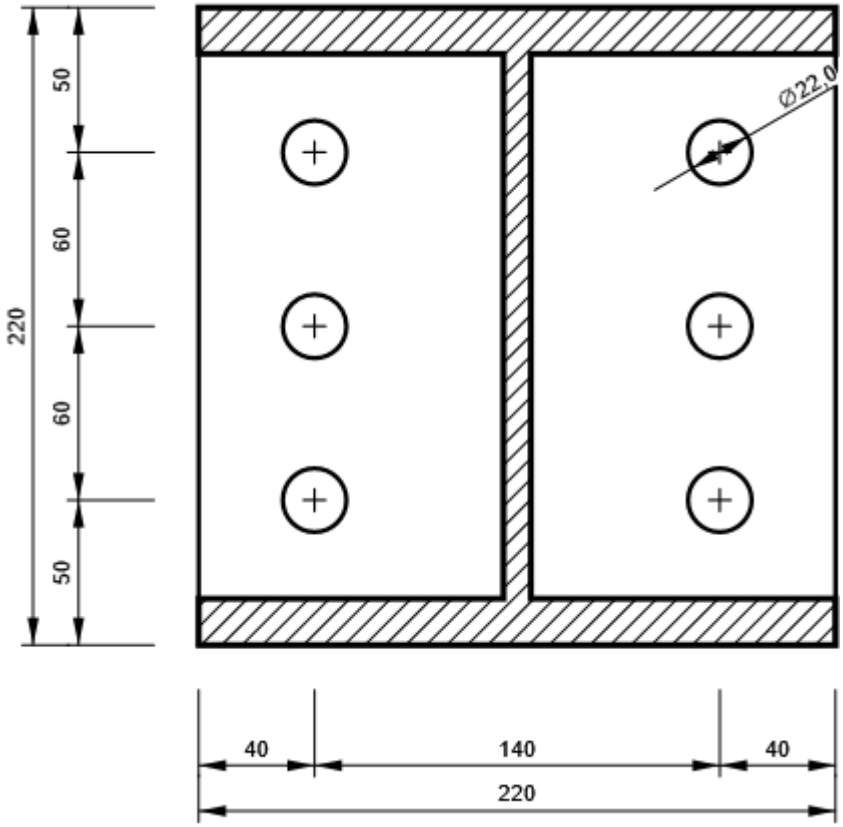
Bolts

Name	Grip length [mm]	Count
M20 8.8	40	6

Drawing

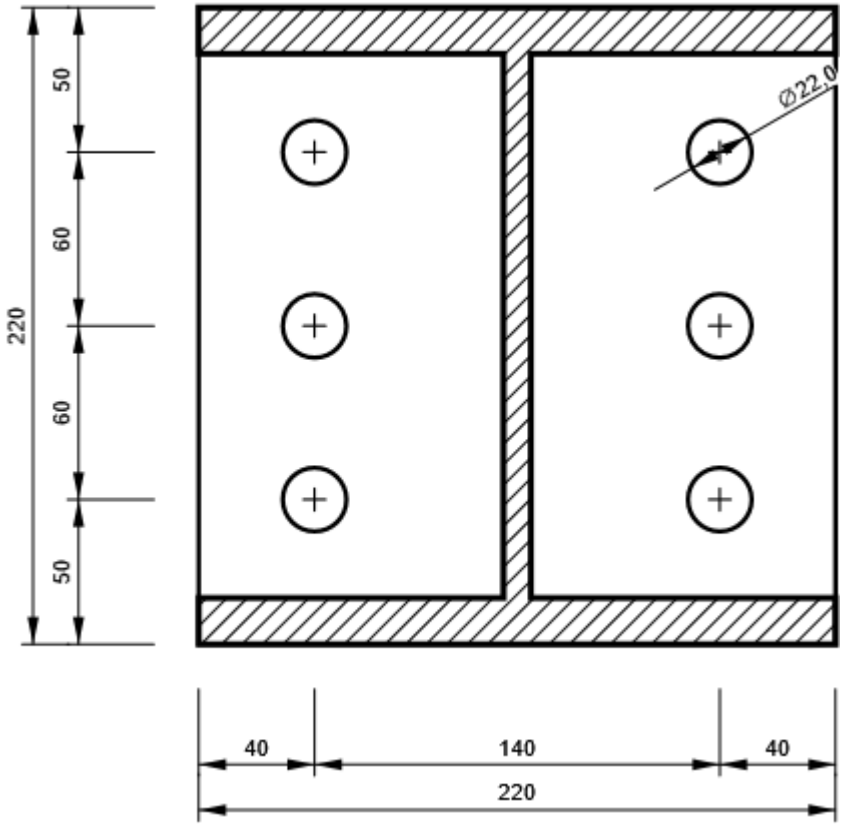
PP1 - 1

P20,0x220-220 (S 235)



PP1 - 2

P20,0x220-220 (S 235)



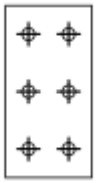
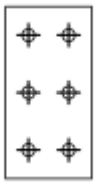
Project item CON4

Design

Name	CON4
Description	Montazni spoj IPE300
Analysis	Joint design resistance

Bill of material

Manufacturing operations

Name	Plates [mm]	Shape	Nr.	Welds [mm]	Length [mm]	Bolts	Nr.
PP1	P20,0x150,0-300,0 (S 235)		1	Bevel: a = 10,7 Bevel: a = 7,1	600,0 578,6	M20 8.8	6
	P20,0x150,0-300,0 (S 235)		1				

Welds

Type	Material	Throat thickness [mm]	Leg size [mm]	Length [mm]
Bevel	S 235	10,7	15,1	600,0
Bevel	S 235	7,1	10,0	578,6

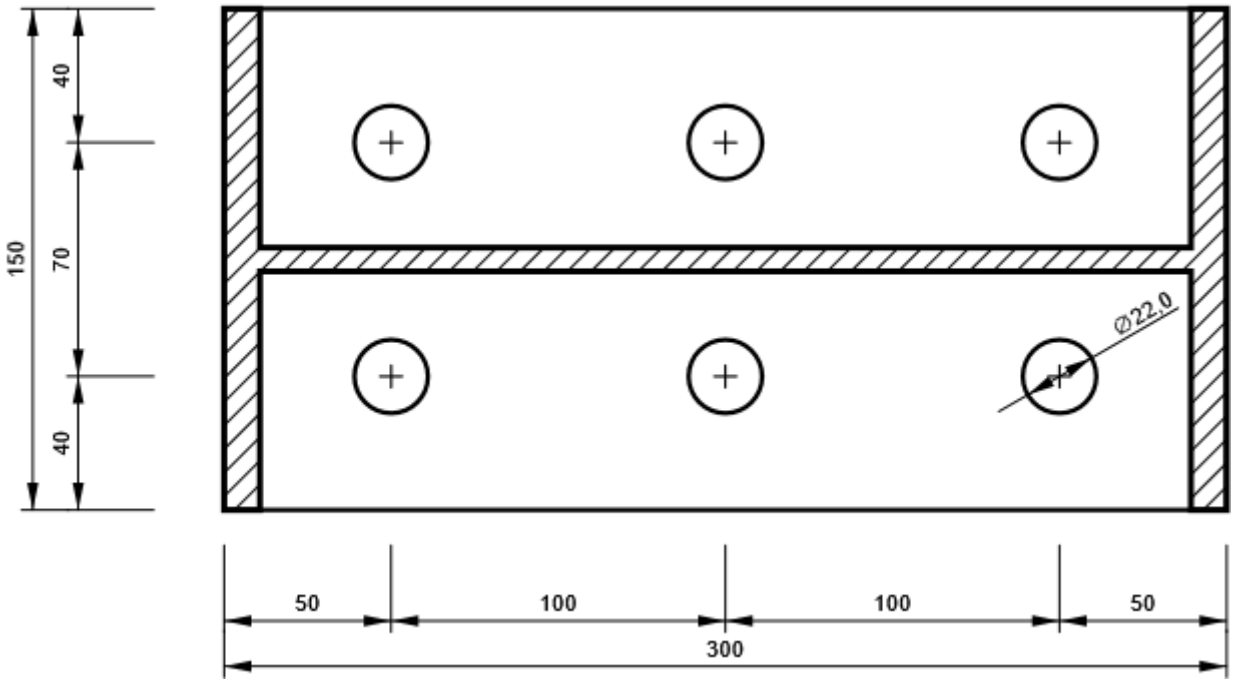
Bolts

Name	Grip length [mm]	Count
M20 8.8	40	6

Drawing

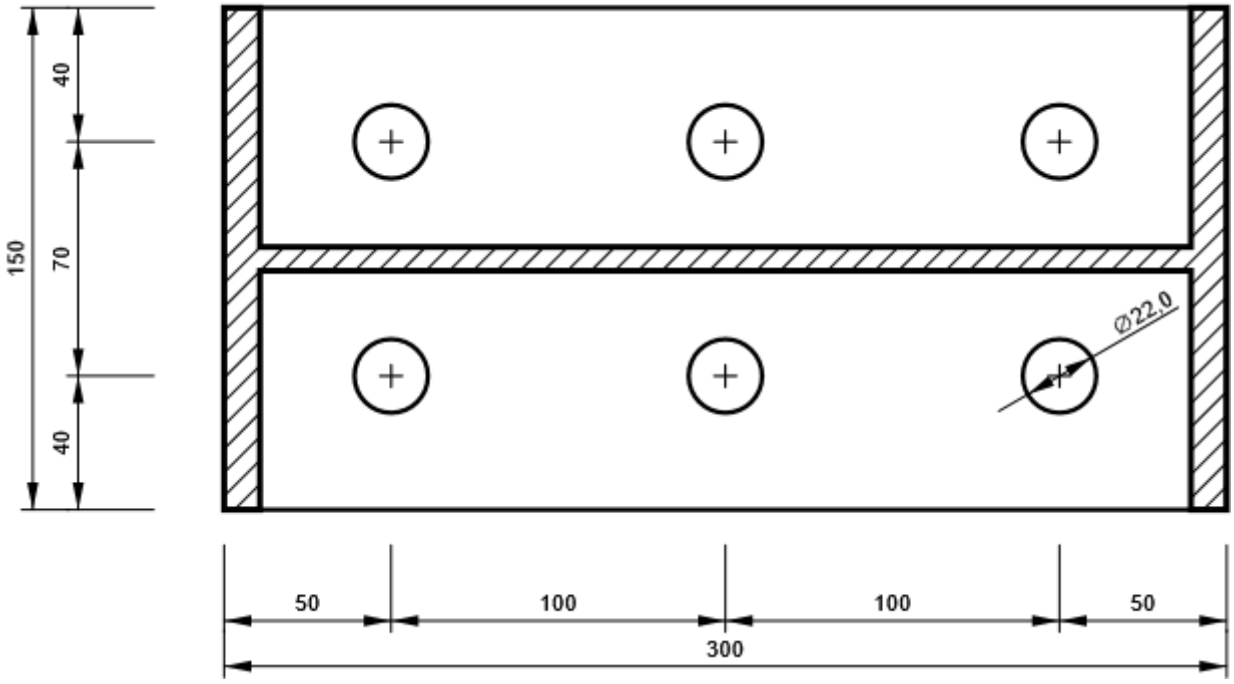
PP1 - 1

P20,0x300-150 (S 235)



PP1 - 2

P20,0x300-150 (S 235)



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2.4	ARMATURNE RISBE IN DETAJLI

Specifikacija armature

List 1: Senik – temeljna plošča objekta in opornih zidov

List 2: Senik – sidra, AB stena in vezi, stene opornih zidov

List 3: Senik – plošča nad pritličjem

List 4: Kozolec – točkovni temelji

List 5: Kozolec – temeljna plošča in sidra

List 6: Kozolec – plošča nad pritličjem

List 7: Kozolec – stene, nosilec in oporna zidova

List 8: Senik – dispozicija vertikalnih povezij in sidranja lesenih sten (nadstropje)

List 9: Detajli 1 (kozolec)

List 10: Detajli 2 (kozolec in senik)

REKAPITULACIJA ARMATURE

Objekt: BRATUŠEVA DOMAČIJA

Št. načrta gradbenih konstrukcij: JP-14/22

Št. projekta: A198

Datum: december 2022

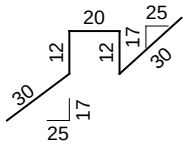
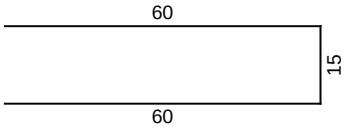
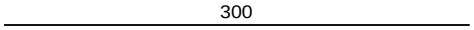
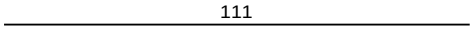
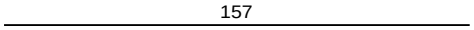
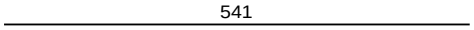
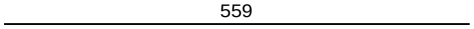
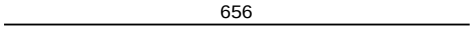
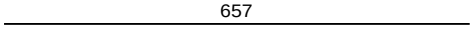
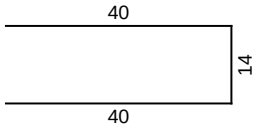
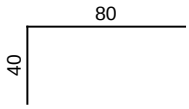
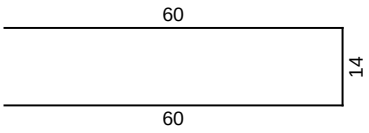
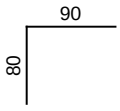
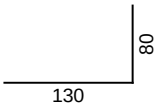
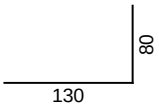
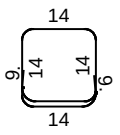
Palice - izvleček

ø [mm]	lgn [m]	Teža enote [kg/m']	Teža [kg]
S500			
8	4871.13	0.41	1987.42
10	535.90	0.64	341.90
12	1175.54	0.92	1081.50
14	185.28	1.24	230.12
16	439.45	1.62	712.35
20	40.92	2.47	101.07
Skupaj			**4454.36**

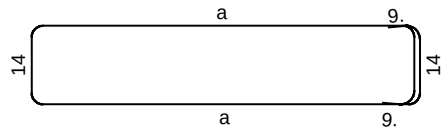
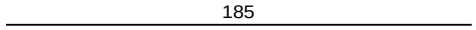
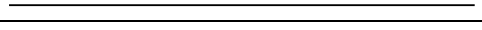
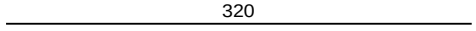
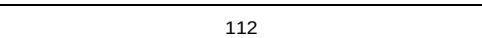
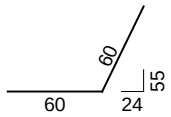
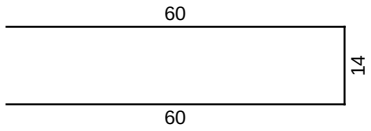
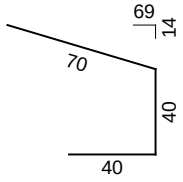
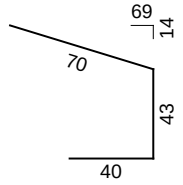
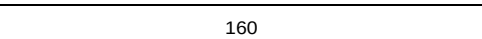
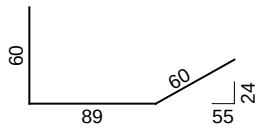
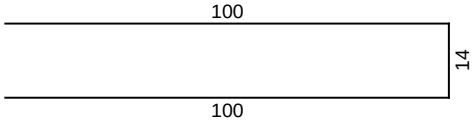
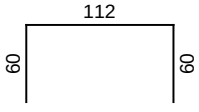
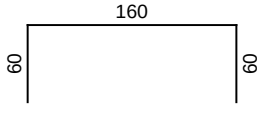
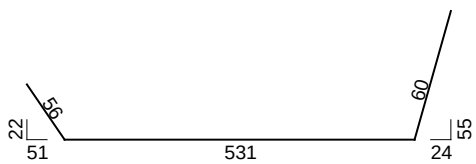
Mreže - izvleček

Oznaka mreže	B [cm]	L [cm]	n	Teža enote [kg/m2]	Skupna teža celih mrež [kg]	Neto vgrajena teža [kg]
Q-283	215	600	16	4.44	916.42	743.19
Q-335	215	600	28	5.33	1925.20	1605.59
Q-424	215	600	12	6.66	1030.97	766.35
Q-636	215	600	17	10.47	2296.07	1998.24
Skupaj					**6168.65**	**5113.36**

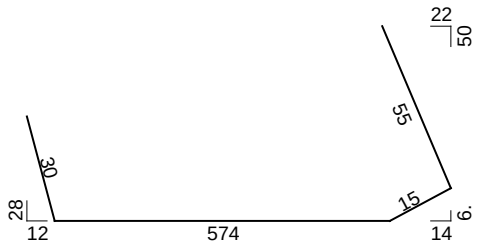
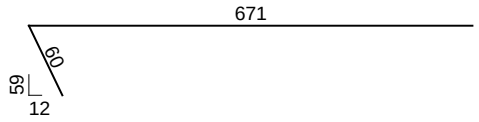
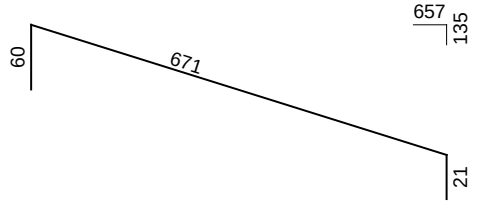
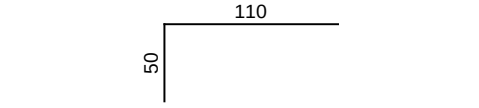
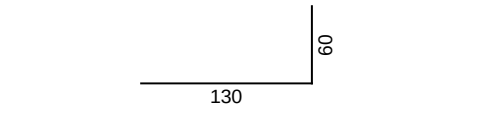
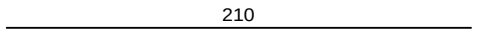
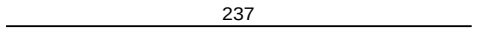
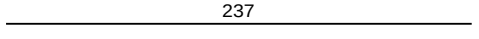
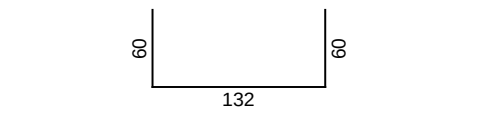
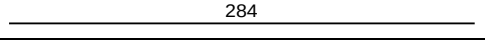
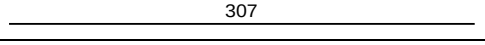
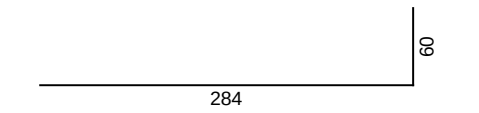
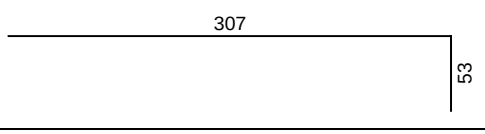
Palice - specifikacija

ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]	Opomba
Temeljna plošča (Senik) (1 kos)						
1		8	1.04	169	175.76	
2		8	1.35	552	745.20	
3		8	3.00	35	105.00	
4		12	1.11	8	8.88	
5		12	1.57	8	12.56	
6		12	5.41	8	43.28	
7		12	5.59	16	89.44	
8		12	6.56	8	52.48	
9		12	6.57	8	52.56	
Sidra, AB stena in vezi, stene opornih zidov (Senik) (1 kos)						
1		8	0.94	134	125.96	
2		8	1.20	136	163.20	
3		8	1.34	191	255.94	
4		8	1.70	52	88.40	
5		8	2.10	10	21.00	
6		8	2.10	86	180.60	
7		8	0.88	152	133.76	

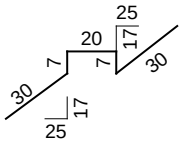
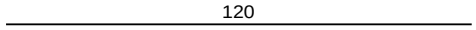
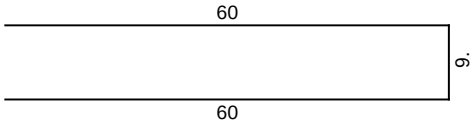
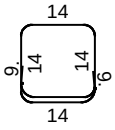
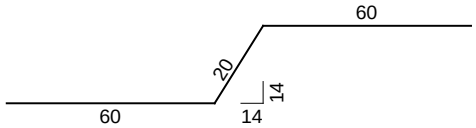
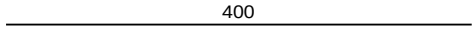
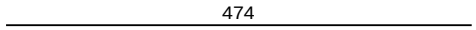
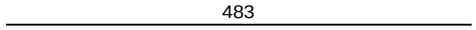
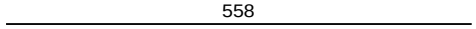
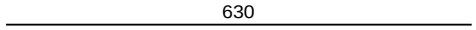
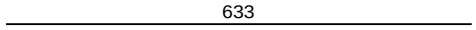
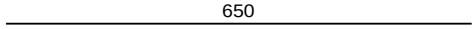
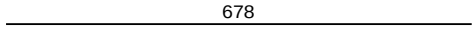
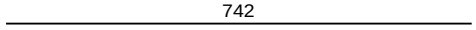
Palice - specifikacija

ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]	Opomba
8	 a = 41, 43, 45, 47, 50, 52, 54, 56, 58, 60, 62, 65, 67, 69, 71, 73, 75, 77, 80, 82, 84, 86, 88, 90, 93, 95	8	*1.96	1 x 26	50.86	
9		10	1.85	2	3.70	
10		10	2.55	2	5.10	
11		10	3.20	4	12.80	
12		12	1.12	2	2.24	
13		12	1.20	2	2.40	
14		12	1.34	27	36.18	
15		12	1.50	2	3.00	
16		12	1.53	2	3.06	
17		12	1.60	2	3.20	
18		12	2.09	2	4.18	
19		12	2.14	2	4.28	
20		12	2.32	2	4.64	
21		12	2.80	2	5.60	
22		12	6.47	2	12.94	

Palice - specifikacija

ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]	Opomba
23		12	6.74	2	13.48	
24		12	7.31	2	14.62	
25		12	7.52	2	15.04	
26		14	1.60	32	51.20	
27		14	3.44	32	110.08	
28		16	1.90	24	45.60	
29		16	1.92	2	3.84	
30		16	2.10	8	16.80	
31		16	2.37	2	4.74	
32		16	2.37	2	4.74	
33		16	2.52	2	5.04	
34		16	2.84	6	17.04	
35		16	3.07	2	6.14	
36		16	3.44	6	20.64	
37		16	3.60	2	7.20	

Palice - specifikacija

ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]	Opomba
Plošča nad pritličjem (Senik) (1 kos)						
1		8	0.94	110	103.40	
2		8	1.20	125	150.00	
3		8	1.29	230	296.70	
4		8	0.88	283	249.04	
5		12	1.40	2	2.80	
6		12	4.00	1	4.00	
7		12	4.74	2	9.48	
8		12	4.83	4	19.32	
9		12	5.58	8	44.64	
10		12	6.30	2	12.60	
11		12	6.33	4	25.32	
12		12	6.50	15	97.50	
13		12	6.78	4	27.12	
14		12	7.42	1	7.42	

Palice - izvleček

Ø [mm]	lgn [m]	Teža enote [kg/m']	Teža [kg]
S500			
8	2844.82	0.41	1160.69
10	21.60	0.64	13.78
12	634.26	0.92	583.52
14	161.28	1.24	200.31
16	131.78	1.62	213.62
Skupaj (S500)			2171.91
Skupaj			2171.91

Mreže - specifikacija

Pozicija	Oznaka mreže	B [cm]	L [cm]	n	Teža enote [kg/m2]	Skupna teža [kg]	Opomba
Temeljna plošča (Senik) (1 kos)							
II	Q-335	215	600	4	5.33	275.03	
II-1	Q-335	210	600	1	5.33	67.16	
II-2	Q-335	210	102	1	5.33	11.38	
II-3	Q-335	215	102	4	5.33	46.60	
II-4	Q-335	213	102	1	5.33	11.52	
II-5	Q-335	213	600	1	5.33	68.01	
II-6	Q-335	210	158	2	5.33	35.27	
II-7	Q-335	215	158	2	5.33	36.11	
II-8	Q-335	207	158	2	5.33	34.69	
II-9	Q-335	210	111	1	5.33	12.42	
II-10	Q-335	215	111	2	5.33	25.44	
II-11	Q-335	152	111	1	5.33	9.02	
II-12	Q-335	210	102	1	5.33	11.36	
II-13	Q-335	215	102	2	5.33	23.26	
II-14	Q-335	152	102	1	5.33	8.25	
III	Q-636	215	600	4	10.47	540.25	
III-1	Q-636	210	600	1	10.47	131.92	
III-2	Q-636	210	102	1	10.47	22.35	
III-3	Q-636	215	102	4	10.47	91.53	
III-4	Q-636	213	102	1	10.47	22.64	
III-5	Q-636	213	600	1	10.47	133.60	
Skupaj						1617.81	
Sidra, AB stena in vezi, stene opornih zidov (Senik) (1 kos)							
I-15	Q-335	211	270	2	5.33	60.82	
I-16	Q-335	215	270	8	5.33	247.89	
I-17	Q-335	143	270	2	5.33	41.12	
I-18	Q-335	58	270	2	5.33	16.79	
I-19	Q-335	211	304	2	5.33	68.22	
I-20	Q-335	215	257	2	5.33	58.89	
I-21	Q-335	207	184	2	5.33	40.60	
I-22	Q-335	141	236	2	5.33	35.36	
I-23	Q-335	215	152	2	5.33	34.76	
I-24	Q-335	214	117	2	5.33	26.60	
I-25	Q-335	114	209	2	5.33	25.23	
Skupaj						656.27	
Plošča nad pritličjem (Senik) (1 kos)							
I	Q-283	215	600	1	4.44	57.28	
I-1	Q-283	215	373	3	4.44	106.77	
I-2	Q-283	122	373	1	4.44	20.15	
I-3	Q-283	215	257	2	4.44	49.15	

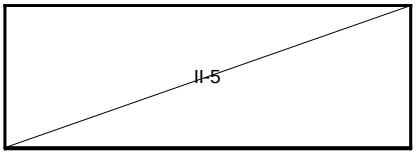
Mreže - specifikacija							
Pozicija	Oznaka mreže	B [cm]	L [cm]	n	Teža enote [kg/m2]	Skupna teža [kg]	Opomba
I-4	Q-283	69	257	1	4.44	7.87	
I-5	Q-283	215	407	2	4.44	77.69	
I-6	Q-283	69	407	1	4.44	12.44	
I-7	Q-283	215	217	1	4.44	20.75	
I-8	Q-283	86	217	1	4.44	8.31	
I-9	Q-283	215	227	2	4.44	43.30	
I-10	Q-283	66	227	1	4.44	6.69	
I-11	Q-283	215	100	6	4.44	57.28	
I-12	Q-283	80	100	2	4.44	7.13	
I-13	Q-283	164	100	1	4.44	7.30	
I-14	Q-283	116	100	1	4.44	5.17	
I-15	Q-283	212	100	1	4.44	9.41	
I-16	Q-283	144	100	1	4.44	6.38	
I-17	Q-283	215	242	1	4.44	23.09	
I-18	Q-283	215	600	1	4.44	57.28	
I-19	Q-283	185	242	1	4.44	19.84	
I-20	Q-283	215	600	1	4.44	57.28	
I-21	Q-283	141	512	1	4.44	32.00	
Skupaj						692.54	

Mreže - izvleček						
Oznaka mreže	B [cm]	L [cm]	n	Teža enote [kg/m2]	Skupna teža celih mrež [kg]	Neto vgrajena teža [kg]
Q-283	215	600	14	4.44	801.86	683.58
Q-335	215	600	22	5.33	1512.65	1296.15
Q-636	215	600	8	10.47	1080.50	942.29
Skupaj					3395.02	2922.02

Mreže - načrt razreza

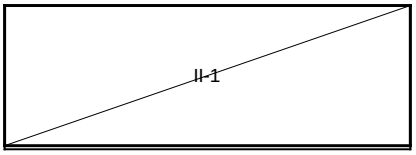
Q-335 (600 cm x 215 cm)

1x



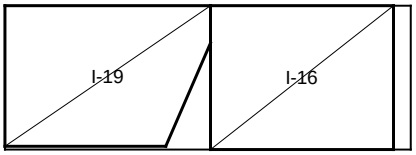
II-5 600 x 213

1x



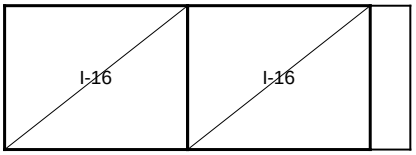
II-1 600 x 210

2x



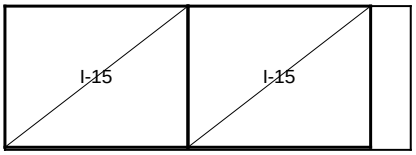
I-19 304 x 211
I-16 270 x 215

3x



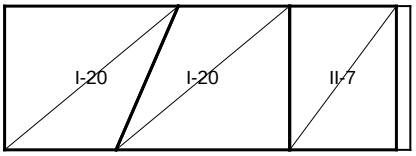
I-16 270 x 215
I-16 270 x 215

1x



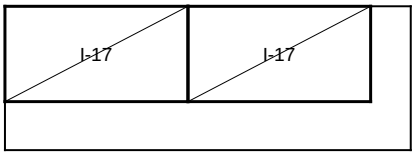
I-15 270 x 211
I-15 270 x 211

1x



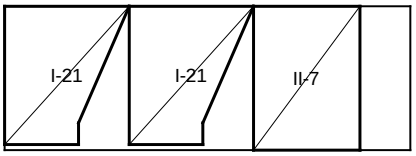
I-20 257 x 215
I-20 257 x 215
II-7 158 x 215

1x



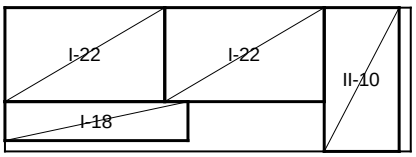
I-17 270 x 143
I-17 270 x 143

1x



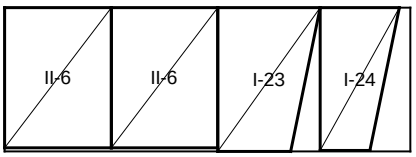
I-21 184 x 207
I-21 184 x 207
II-7 158 x 215

1x



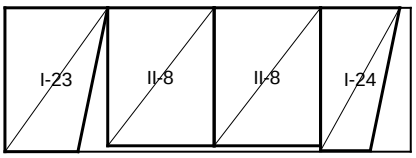
I-22 236 x 141
I-22 236 x 141
II-10 111 x 215
I-18 270 x 58

1x



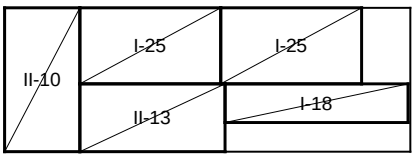
II-6 158 x 210
II-6 158 x 210
I-23 152 x 215
I-24 117 x 214

1x



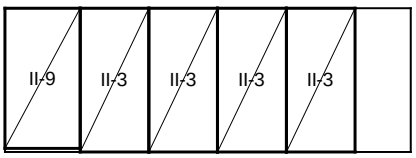
I-23 152 x 215
II-8 158 x 207
II-8 158 x 207
I-24 117 x 214

1x



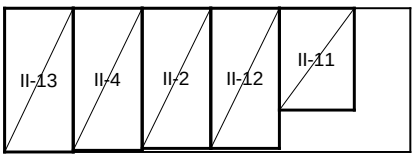
II-10 111 x 215
I-25 209 x 114
I-25 209 x 114
II-13 102 x 215
I-18 270 x 58

1x



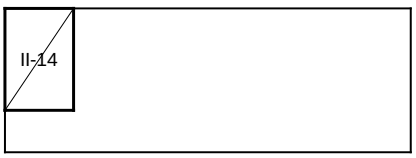
II-9 111 x 210
II-3 102 x 215
II-3 102 x 215
II-3 102 x 215
II-3 102 x 215

1x



II-13 102 x 215
II-4 102 x 213
II-2 102 x 210
II-12 102 x 210
II-11 111 x 152

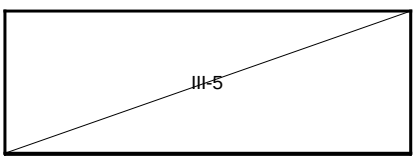
1x



II-14 102 x 152

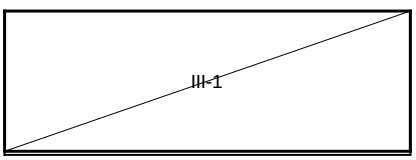
Q-636 (600 cm x 215 cm)

1x



III-5 600 x 213

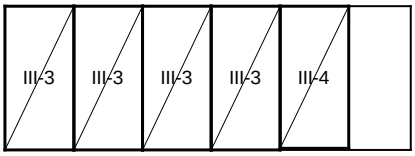
1x



III-1 600 x 210

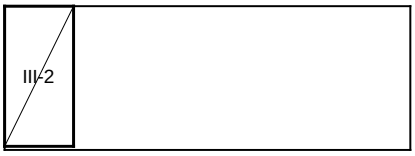
Mreže - načrt razreza

1x



III-3 102 x 215
III-3 102 x 215
III-3 102 x 215
III-3 102 x 215
III-4 102 x 213

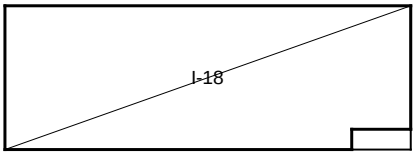
1x



III-2 102 x 210

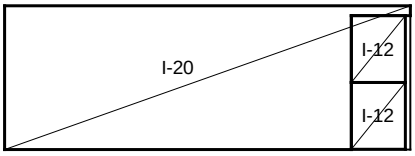
Q-283 (600 cm x 215 cm)

1x



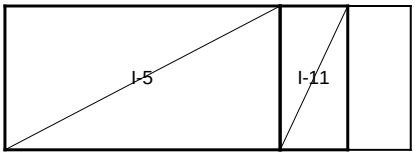
I-18 600 x 215

1x



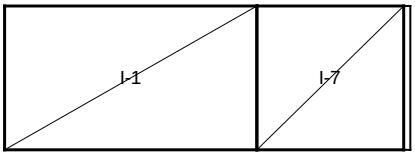
I-20 600 x 215
I-12 100 x 80
I-12 100 x 80

2x



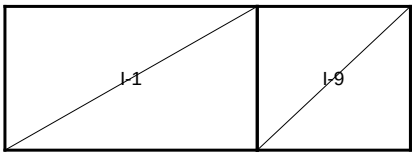
I-5 407 x 215
I-11 100 x 215

1x



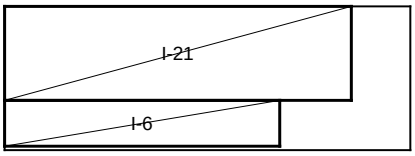
I-1 373 x 215
I-7 217 x 215

2x



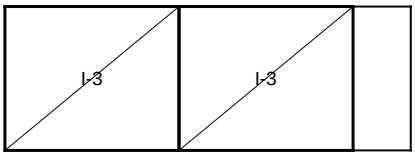
I-1 373 x 215
I-9 227 x 215

1x



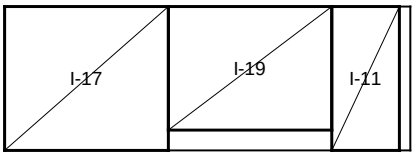
I-21 512 x 141
I-6 407 x 69

1x



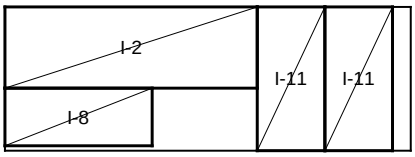
I-3 257 x 215
I-3 257 x 215

1x



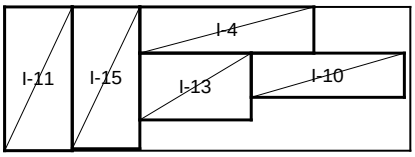
I-17 242 x 215
I-19 242 x 185
I-11 100 x 215

1x



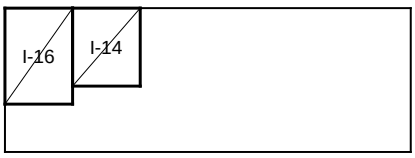
I-2 373 x 122
I-11 100 x 215
I-11 100 x 215
I-8 217 x 86

1x

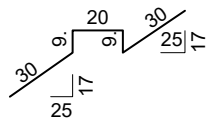
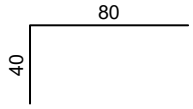
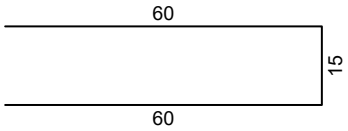
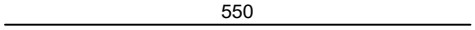
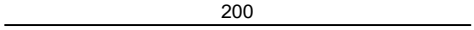
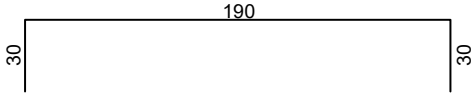
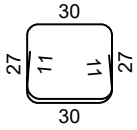
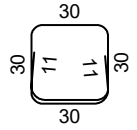
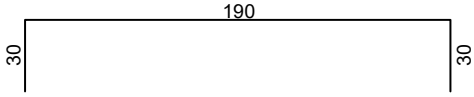
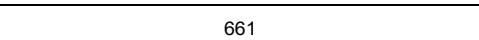
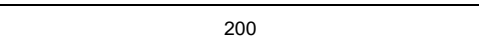
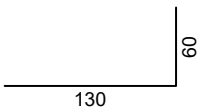
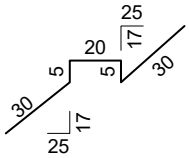


I-11 100 x 215
I-15 100 x 212
I-4 257 x 69
I-13 100 x 164
I-10 227 x 66

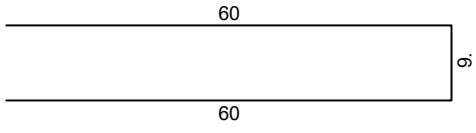
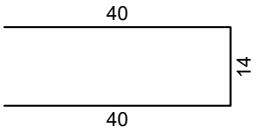
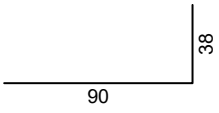
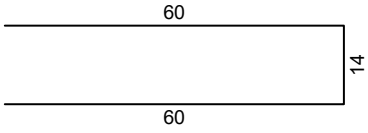
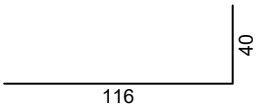
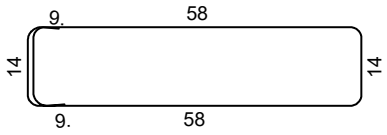
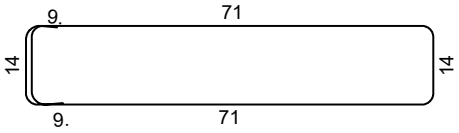
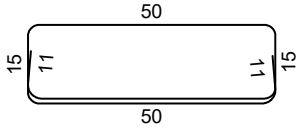
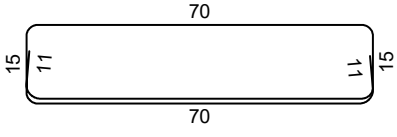
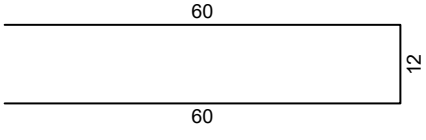
1x

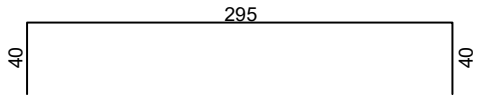
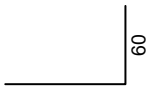
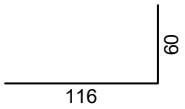


I-16 100 x 144
I-14 100 x 116

Palice - specifikacija						
ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]	Opomba
Temelji (Kozolec) (1 kos)						
1		8	0.98	74	72.52	
2		8	1.20	230	276.00	
3		8	1.35	210	283.50	
4		8	2.93	25	73.25	
5		8	5.50	46	253.00	
6		10	2.00	49	98.00	
7		10	2.50	80	200.00	
8		10	2.93	22	64.46	
9		10	1.66	3	4.98	
10		10	1.72	3	5.16	
11		12	1.50	10	15.00	
12		12	2.50	80	200.00	
13		12	2.93	8	23.44	
14		12	6.61	16	105.76	
15		14	2.00	12	24.00	
16		16	1.90	32	60.80	
17		16	3.00	25	75.00	
Plošča nad pritličjem (Kozolec) (1 kos)						
1		8	0.90	59	53.10	

Palice - specifikacija

ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]	Opomba
2		8	1.29	210	270.90	
3		12	2.93	12	35.16	
4		12	6.61	12	79.32	
Stene, nosilec in oporna zidova (Kozolec) (1 kos)						
1		8	0.94	101	94.94	
2		8	1.10	42	46.20	
3		8	1.28	20	25.60	
4		8	1.34	182	243.88	
5		8	1.44	12	17.28	
6		8	1.56	14	21.84	
7		8	1.89	8	15.12	
8		8	2.95	8	23.60	
9		8	1.76	128	225.28	
10		8	2.02	15	30.30	
11		10	0.80	13	10.40	
12		10	6.57	12	78.84	
13		10	2.02	13	26.26	
14		10	2.62	10	26.20	
15		12	1.32	8	10.56	

Palice - specifikacija						
ozn	oblika in mere [cm]	Ø	lg [m]	n [kos]	lgn [m]	Opomba
16	142	12	1.42	12	17.04	
17	144	12	1.44	4	5.76	
18	186	12	1.86	8	14.88	
19	189	12	1.89	4	7.56	
20	295	12	2.95	4	11.80	
21		12	3.75	4	15.00	
22		16	1.51	8	12.08	
23		16	1.76	8	14.08	
24	283	16	2.83	28	79.24	
25		16	2.93	4	11.72	
26	399	16	3.99	3	11.97	
27	426	16	4.26	3	12.78	
28	600	16	6.00	5	30.00	
29	682	20	6.82	6	40.92	

Palice - izvleček			
Ø [mm]	lgn [m]	Teža enote [kg/m']	Teža [kg]
S500			
8	2026.31	0.41	826.73
10	514.30	0.64	328.12
12	541.28	0.92	497.98
14	24.00	1.24	29.81
16	307.67	1.62	498.73
20	40.92	2.47	101.07
Skupaj (S500)			2282.45
Skupaj			2282.45

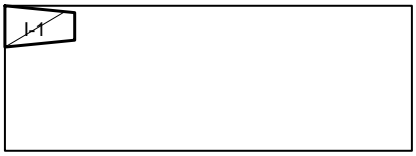
Mreže - specifikacija							
Pozicija	Oznaka mreže	B [cm]	L [cm]	n	Teža enote [kg/m2]	Skupna teža [kg]	Opomba
Temelji (Kozolec) (1 kos)							
I	Q-283	215	600	1	4.44	57.28	
I-1	Q-283	61	103	1	4.44	2.80	
II-1	Q-424	210	293	1	6.66	40.99	
II-2	Q-424	215	293	6	6.66	251.78	
II-3	Q-424	77	293	1	6.66	15.05	
III-1	Q-636	210	293	1	10.47	64.44	
III-2	Q-636	215	293	6	10.47	395.82	
III-3	Q-636	77	293	1	10.47	23.65	
Skupaj						851.80	
Plošča nad pritličjem (Kozolec) (1 kos)							
I-1	Q-335	215	100	10	5.33	114.60	
I-2	Q-335	121	100	2	5.33	12.95	
I-3	Q-335	128	100	2	5.33	13.67	
I-4	Q-335	206	100	1	5.33	10.97	
I-5	Q-335	156	100	1	5.33	8.31	
III-4	Q-636	215	284	7	10.47	447.45	
III-5	Q-636	64	284	1	10.47	18.91	
III-6	Q-636	215	300	1	10.47	67.53	
III-7	Q-636	121	300	1	10.47	38.15	
Skupaj						732.53	
Stene, nosilec in oporna zidova (Kozolec) (1 kos)							
I-6	Q-335	169	218	4	5.33	78.31	
I-7	Q-335	152	218	4	5.33	70.63	
II-4	Q-424	215	218	14	6.66	437.02	
II-5	Q-424	74	218	2	6.66	21.51	
Skupaj						607.47	

Mreže - izvleček						
Oznaka mreže	B [cm]	L [cm]	n	Teža enote [kg/m2]	Skupna teža celih mrež [kg]	Neto vgrajena teža [kg]
Q-283	215	600	2	4.44	114.55	59.61
Q-335	215	600	6	5.33	412.54	309.44
Q-424	215	600	12	6.66	1030.97	766.35
Q-636	215	600	9	10.47	1215.57	1055.95
Skupaj					2773.63	2191.33

Mreže - načrt razreza

Q-283 (600 cm x 215 cm)

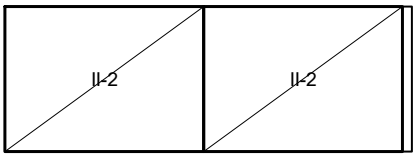
1x



I-1 103 x 61

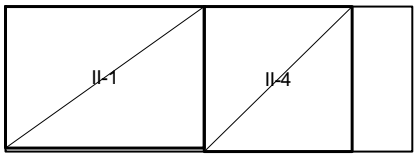
Q-424 (600 cm x 215 cm)

3x



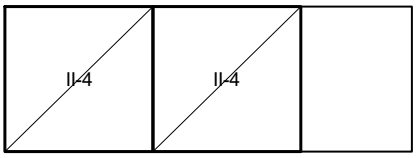
II-2 293 x 215
II-2 293 x 215

1x



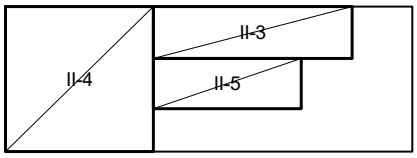
II-1 293 x 210
II-4 218 x 215

6x



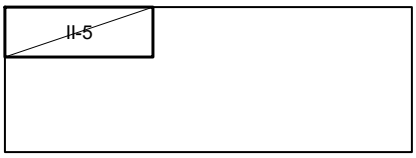
II-4 218 x 215
II-4 218 x 215

1x



II-4 218 x 215
II-3 293 x 77
II-5 218 x 74

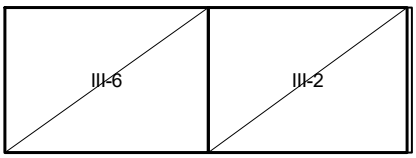
1x



II-5 218 x 74

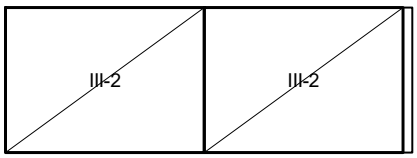
Q-636 (600 cm x 215 cm)

1x



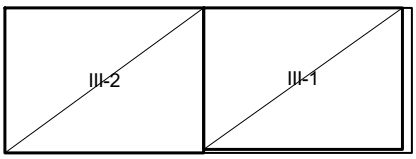
III-6 300 x 215
III-2 293 x 215

2x



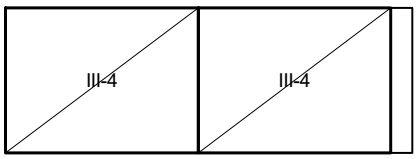
III-2 293 x 215
III-2 293 x 215

1x



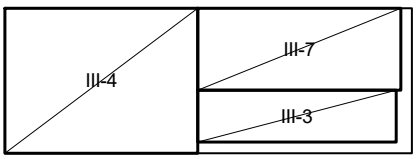
III-2 293 x 215
III-1 293 x 210

3x



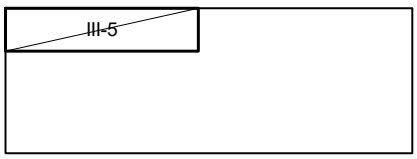
III-4 284 x 215
III-4 284 x 215

1x



III-4 284 x 215
III-7 300 x 121
III-3 293 x 77

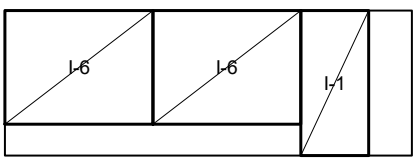
1x



III-5 284 x 64

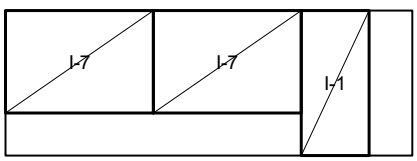
Q-335 (600 cm x 215 cm)

2x



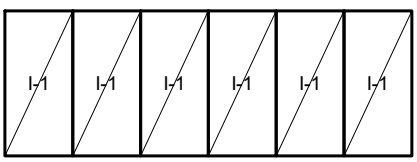
I-6 218 x 169
I-6 218 x 169
I-1 100 x 215

2x



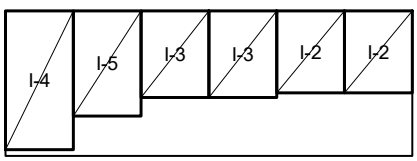
I-7 218 x 152
I-7 218 x 152
I-1 100 x 215

1x



I-1 100 x 215
I-1 100 x 215
I-1 100 x 215
I-1 100 x 215
I-1 100 x 215
I-1 100 x 215

1x

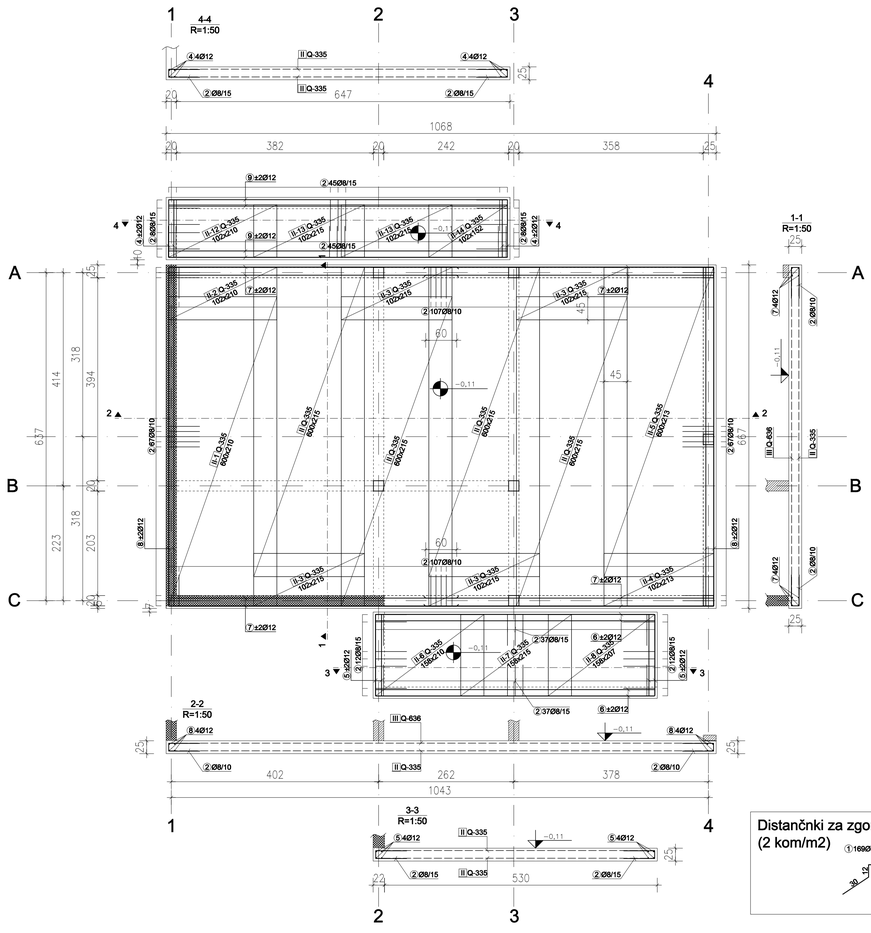


I-4 100 x 206
I-5 100 x 156
I-3 100 x 128
I-3 100 x 128
I-2 100 x 121
I-2 100 x 121

TEMELJNA PLOŠČA objekta (-0,11 m)
d=25 cm

TEMELJNI PLOŠČI opornih zidov (-0,11 m)
d=25 cm

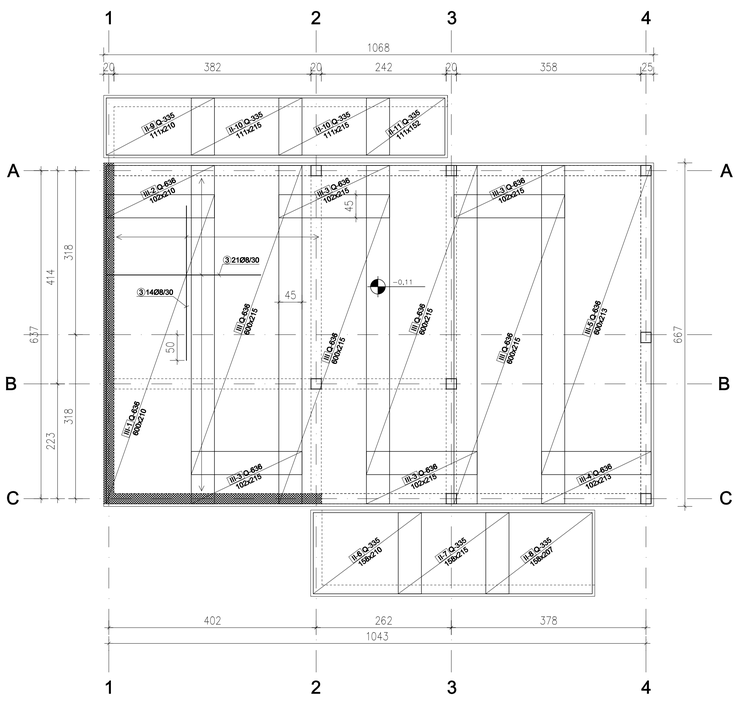
spodnja armatura



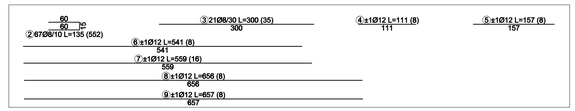
TEMELJNA PLOŠČA objekta (-0,11 m)
d=25 cm

TEMELJNI PLOŠČI opornih zidov (-0,11 m)
d=25 cm

zgornja armatura



Distančnik za zgornjo armaturo
(2 kom/m2)



Preklopi, ki niso kotirani:
Ø8 mm - 40 cm
Ø10 mm - 50 cm
Ø12 mm - 60 cm
Ø14 mm - 70 cm
Ø16 mm - 80 cm
Ø20 mm - 100 cm
Ø25 mm - 125 cm

VSE MERE PREVERITI NA LICU MESTA!
UPOŠTEVATI NAČRTE ARHITEKTURE, STROJNIH INŠTALACIJ IN ZUNANJE UREDITVE!

material	standard	konstrukcijski element	oznaka	zaščitni sloj
beton	SIST EN 206: 2013 SIST EN 1026: 2016	temeljna plošča (senik in kozolec)	C25/30 XC2 Cl 0,2 D_{max} 16	4 cm
		točkovni temelji (kozolec)	C25/37 XC2 Cl 0,2 D_{max} 16	5 cm
		stene (senik in kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16	3 cm
		oporni zidovi (senik) in obbetoniran del stebrov (kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16	4 cm
		plošča nad pritličjem (senik)	C25/30 XC1 Cl 0,2 D_{max} 16	2,5 cm
		plošča nad pritličjem (kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16	3,5 cm
jeklo za armiranje	SIST EN 10080: 2005	vsi AB elementi	S500 B	
konstrukcijsko jeklo	SIST EN 10025	pločevine, profili	S235 JR	

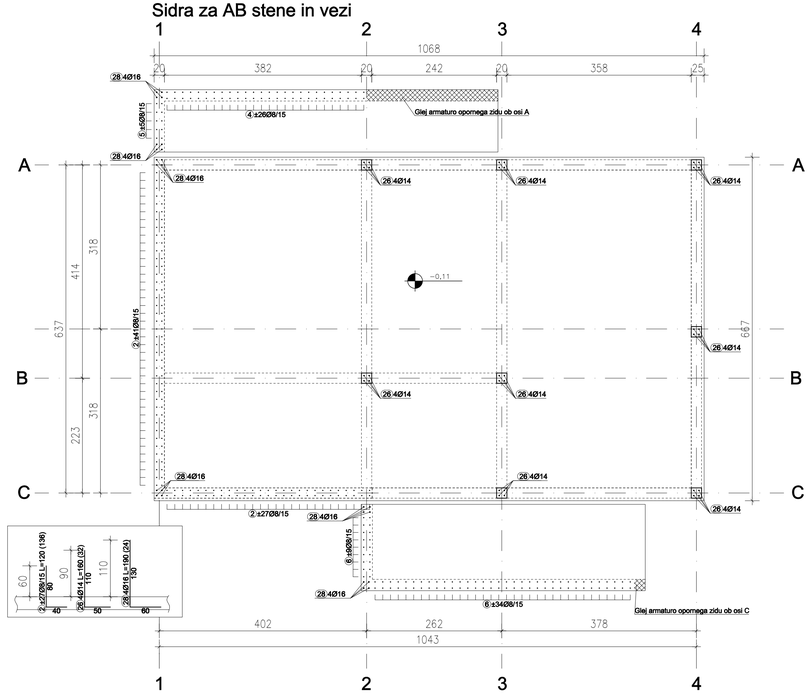
SENIK - TEMELJNA PLOŠČA OBJEKTA IN OPORNIH ZIDOV **Št. lista: 1**

Sprememba:	**Datum spremembe:**
	Podpis:

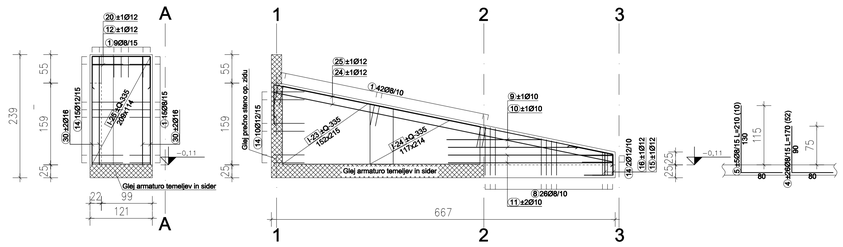
STATIKA, PROJEKTIRANJE, SVETOVANJE
SPS
Jan Pajer s.p.
Trnoveljska cesta 68, 3000 Celje
tel./fax.: +386(0)3 5051588
gsm: +386(0)31 225533
jan.pajer@siol.net
DDV ID: SI40988708

Investitor:	OBČINA BISTRICA OB SOTLI Bistrica ob Sotli 17, 3256 Bistrica ob Sotli			
Objekt:	BRATUŠEVA DOMAČIJA Medgeneracijski center z varovanimi stanovanji			
Vrsta projekta:	PZI			
Vrsta načrta:	NAČRT GRADBENIH KONSTRUKCIJ		**Št. načrta:**	JP-12/22
Vsebina risbe:	SENIK - TEMELJNA PLOŠČA OBJEKTA IN OPORNIH ZIDOV		**Merilo:**	1:50, 1:25
Odgovorni proj.:	Jan Pajer, udig	IZS G-2755	**Datum:**	december 2022
Izdelal:	mag. Jerica Rihar, udig	IZS G-3418	**Št. projekta:**	A198

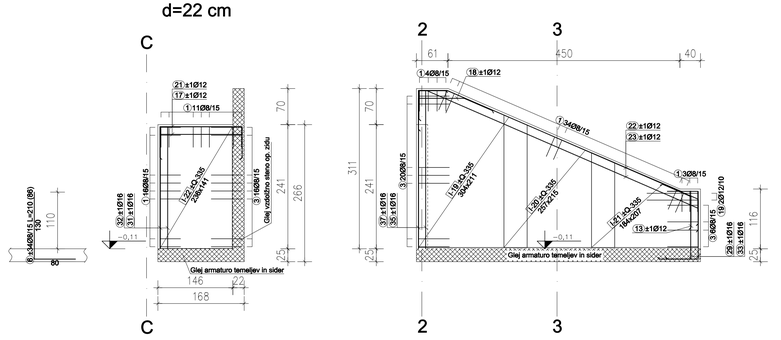
Sidra za AB stene in vezi



AB STENI OPORNEGA ZIDU OB OSI A
d=22 cm



AB STENI OPORNEGA ZIDU OB OSI C
d=22 cm

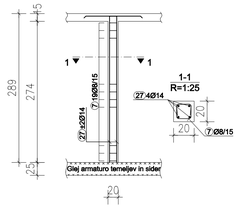


AB VERTIKALNA VEZ
20/20 cm, 8 kom

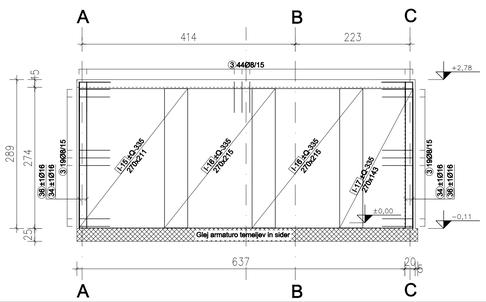
A/2, A/3, A/4

B/2, B/3, B'/4

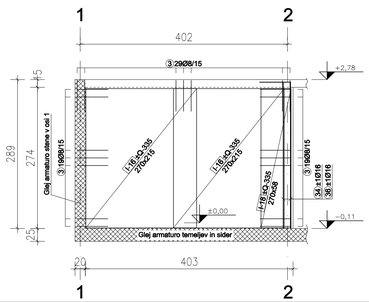
C/3, C/4

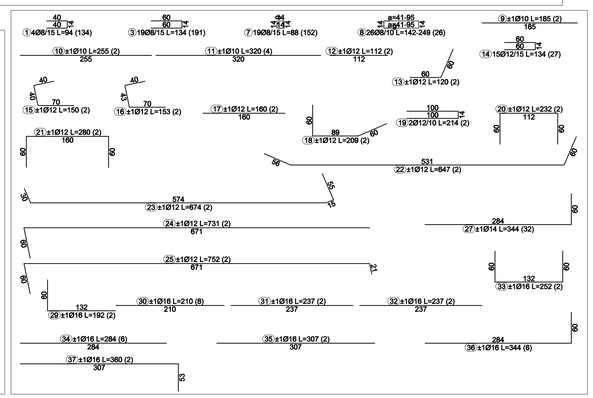


AB STENA v osi 1
d=20 cm



AB STENA v osi C
d=20 cm





Preklopi, ki niso kotirani:

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Ø12 mm - 60 cm
Ø14 mm - 70 cm
Ø16 mm - 80 cm
Ø20 mm - 100 cm
Ø25 mm - 125 cm

VSE MERE PREVERITI NA LICU MESTA!
UPOŠTEVATI NAČRTE ARHITEKTURE, STROJNIH INŠTALACIJ IN ZUNANJE UREDITVE!

material	standard	konstrukcijski element	oznaka	zaščitni sloj
beton	SIST EN 206: 2013 SIST EN 1026: 2016	temeljna plošča (senik in kozolec)	C25/30 XC2 Cl 0,2 D_{max} 16	4 cm
		točkovni temelji (kozolec)	C25/37 XC2 Cl 0,2 D_{max} 16	5 cm
		stene (senik in kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16	3 cm
		oporni zidovi (senik) in obbetoniran del stebrov (kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16	4 cm
		plošča nad pritličjem (senik)	C25/30 XC1 Cl 0,2 D_{max} 16	2,5 cm
		plošča nad pritličjem (kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16	3,5 cm
jeklo za armiranje	SIST EN 10080: 2005	vsi AB elementi	S500 B	
konstrukcijsko jeklo	SIST EN 10025	pločevine, profili	S235 JR	

SENIK - SIDRA, AB STENA IN VEZI, STENE OPORNIH ZIDOV Št. lista: 2

Sprememba:	**Datum spremembe:**
	Podpis:

STATIKA, PROJEKTIRANJE, SVETOVANJE
SPS
Jan Pajer s.p.
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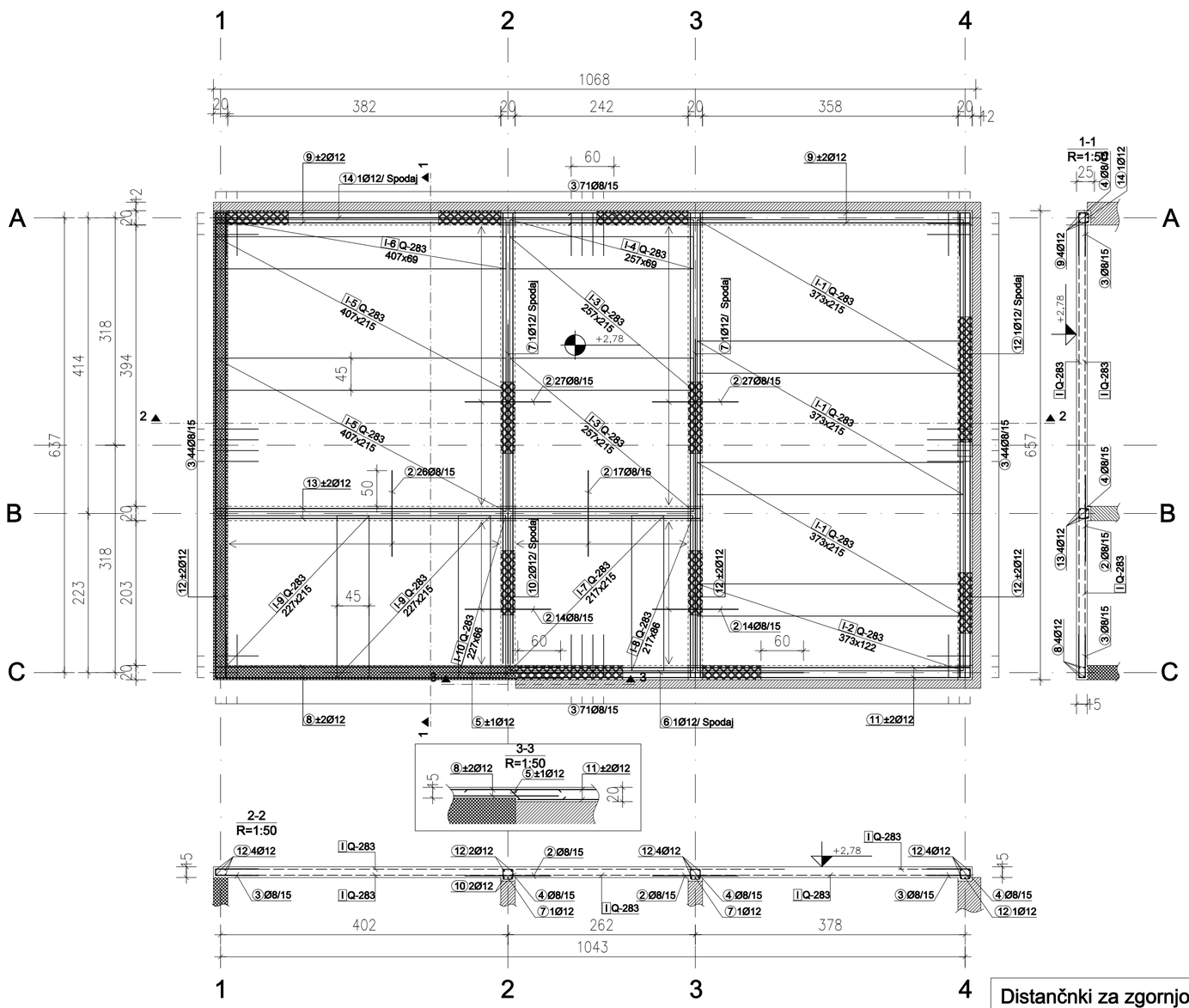
tel./fax.: +386(0)1 5051588
gsm: +386(0)31 225533
jan.pajer@siol.net
DDV ID: SI40988708

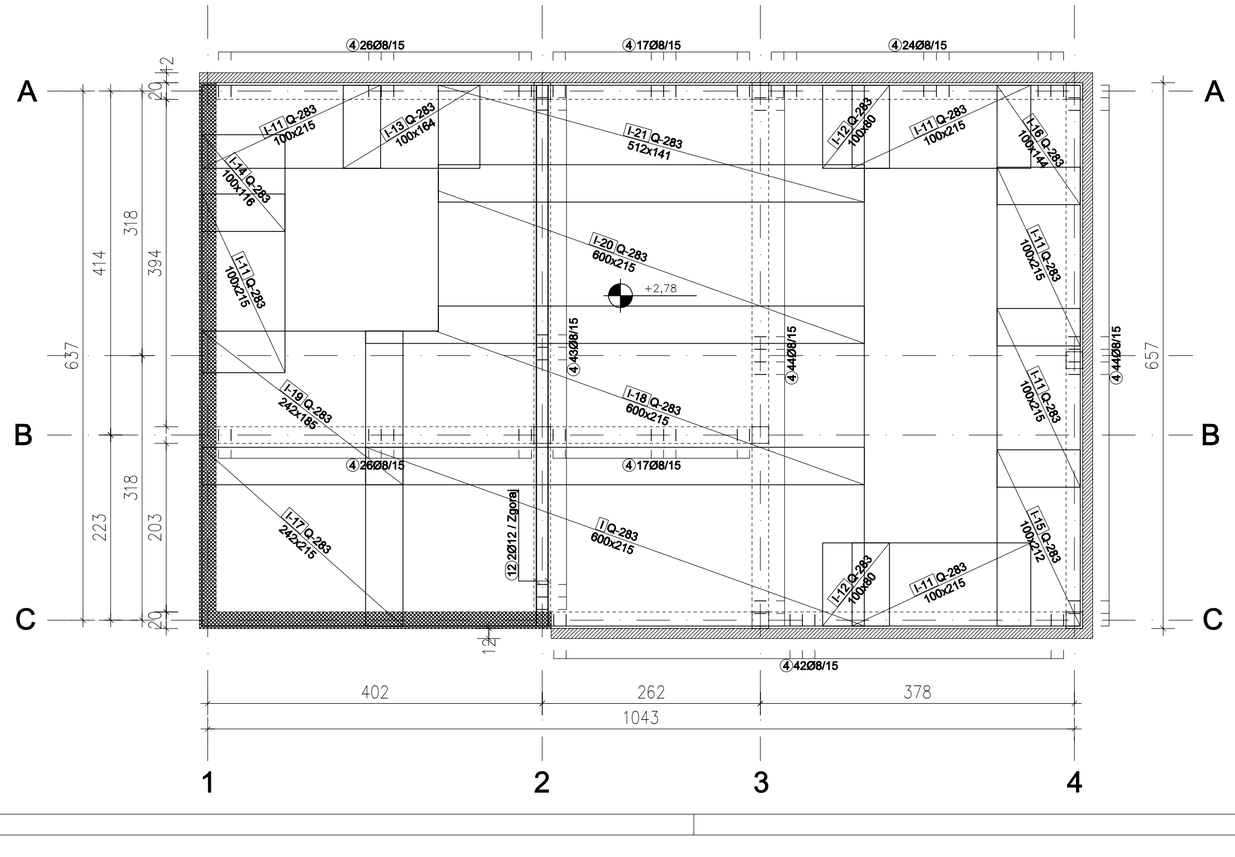
Investitor:	OBČINA BISTRICA OB SOTLI Bistrica ob Sotli 17, 3256 Bistrica ob Sotli		
Objekt:	BRATUŠEVA DOMAČIJA Medgeneracijski center z varovanimi stanovanji		
Vrsta projekta:	PZI		
Vrsta načrta:	NAČRT GRADBENIH KONSTRUKCIJ	**Št. načrta:**	JP-12/22
Vsebina risbe:	SENIK - SIDRA, AB STENA IN VEZI, STENE OPORNIH ZIDOV	**Merilo:**	1:50, 1:25
Odgovorni proj.:	Jan Pajer, udig IZS G-2755	**Datum:**	december 2022
Izdelal:	mag. Jerica Rihar, udig IZS G-3418	**Št. projekta:**	A198

PLOŠČA NAD PRITLIČJEM (+2,78 m)
d=15 cm

spodnja armatura

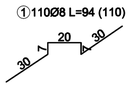


zgornja armatura



Distančnki za zgornjo armaturo (2 kom/m2)

①110Ø8 L=94 (110)



①110Ø8 L=94 (110)
②26Ø8/15 L=120 (125)
120
60
60
③44Ø8/15 L=129 (230)
④42Ø8/15 L=88 (283)
60
60
⑤±1Ø12 L=140 (2)
⑥1Ø12 L=400 (1)
400
⑦1Ø12 L=474 (2)
474
⑧±1Ø12 L=483 (4)
483
⑨±1Ø12 L=558 (8)
558
⑩1Ø12 L=630 (2)
630
⑪±1Ø12 L=633 (4)
633
⑫±1Ø12 L=650 (15)
650
⑬±1Ø12 L=678 (4)
678
⑭1Ø12 L=742 (1)
742

Preklopi, ki niso kotirani:

Ø8 mm - 40 cm
Ø10 mm - 50 cm
Ø12 mm - 60 cm
Ø14 mm - 70 cm
Ø16 mm - 80 cm
Ø20 mm - 100 cm
Ø25 mm - 125 cm

VSE MERE PREVERITI NA LICU MESTA!
UPOŠTEVATI NAČRTE ARHITEKTURE, STROJNIH INŠTALACIJ IN ZUNANJE UREDITVE!

material	standard	konstrukcijski element	oznaka	zaščitni sloj
beton	SIST EN 206: 2013 SIST EN 1026: 2016	temeljna plošča (senik in kozolec)	C25/30 XC2 Cl 0,2 D_{max} 16	4 cm
		točkovni temelji (kozolec)	C25/37 XC2 Cl 0,2 D_{max} 16	5 cm
		stene (senik in kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16	3 cm
		oporni zidovi (senik) in obbetoniran del stebrov (kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16	4 cm
		plošča nad pritličjem (senik)	C25/30 XC1 Cl 0,2 D_{max} 16	2,5 cm
		plošča nad pritličjem (kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16	3,5 cm
jeklo za armiranje	SIST EN 10080: 2005	vsi AB elementi	S500 B	
konstrukcijsko jeklo	SIST EN 10025	pločevine, profili	S235 JR	

SENIK - PLOŠČA NAD PRITLIČJEM **Št. lista: 3**

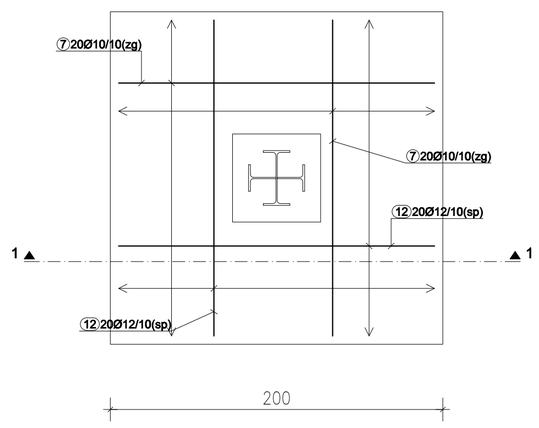
Sprememba: **Datum spremembe:**

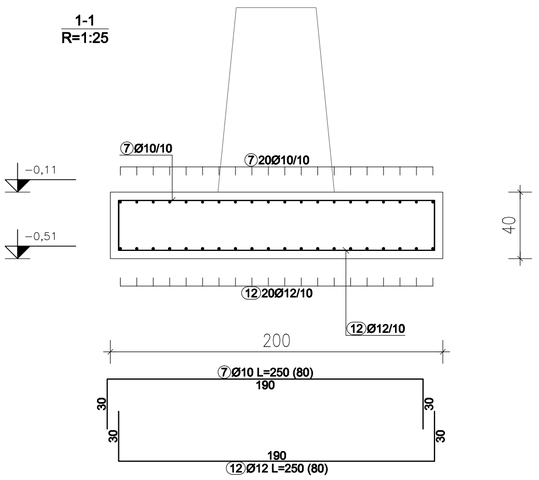
Podpis:

STATIKA, PROJEKTIRANJE, SVETOVANJE
SPS Jan Pajer s.p.
Trnoveljska cesta 68, 3000 Celje
tel./fax.: +386(0)1 5051588
gsm: +386(0)31 225533
jan.pajer@siol.net
DDV ID: SI40988708

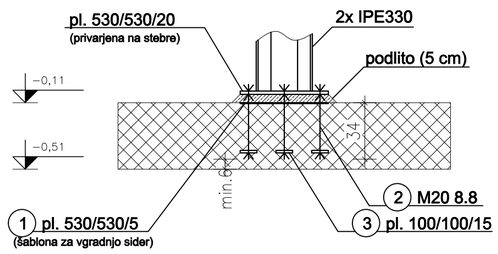
Investitor:	OBČINA BISTRICA OB SOTLI Bistrica ob Sotli 17, 3256 Bistrica ob Sotli			
Objekt:	BRATUŠEVA DOMAČIJA Medgeneracijski center z varovanimi stanovanji			
Vrsta projekta:	PZI			
Vrsta načrta:	NAČRT GRADBENIH KONSTRUKCIJ		**Št. načrta:**	JP-12/22
Vsebina risbe:	SENIK - PLOŠČA NAD PRITLIČJEM		**Merilo:**	1:50, 1:25
Odgovorni proj.:	Jan Pajer, udig	IZS G-2755	**Datum:**	december 2022
Izdelal:	mag. Jerica Rihar, udig	IZS G-3418	**Št. projekta:**	A198

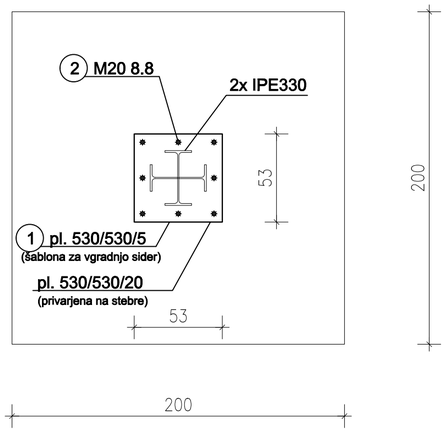
TOČKOVNI TEMELJI
200x200x40 cm, 2 kom





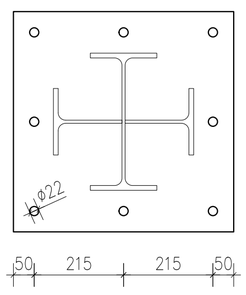
DETAJL SIDRANJA STEBROV V TEMELJE



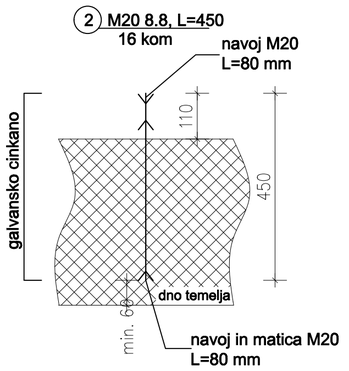


KOSOVNICA PLOČEVIN IN SIDER ZA VGRADNJO V TEMELJE
M 1:10

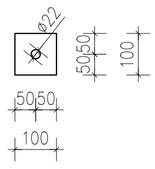
1 pl. 530x530x5
2 kom



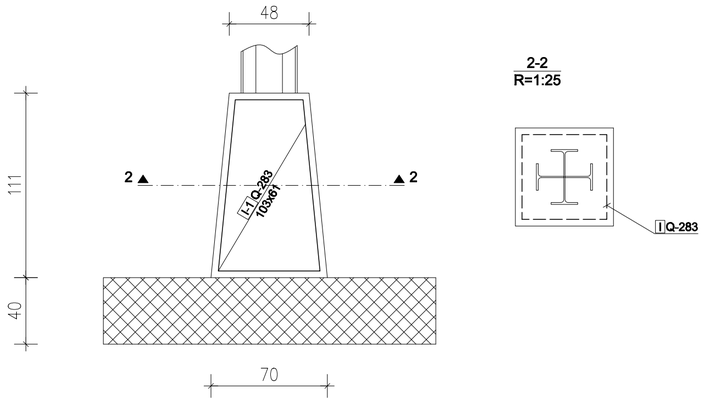
2 M20 8.8, L=450
16 kom



3 pl. 100/100/15
16 kom



ARMATURA OBBETONIRANEGA DELA STEBROV



Mrežo kriviti po opažu na licu mesta!

Preklopi, ki niso kotirani:

Ø8 mm - 40 cm
Ø10 mm - 50 cm
Ø12 mm - 60 cm
Ø14 mm - 70 cm
Ø16 mm - 80 cm
Ø20 mm - 100 cm
Ø25 mm - 125 cm

VSE MERE PREVERITI NA LICU MESTA!
UPOŠTEVATI NAČRTE ARHITEKTURE, STROJNIH INŠTALACIJ IN ZUNANJE UREDITVE!

material	standard	konstrukcijski element	oznaka	zaščitni sloj
beton	SIST EN 206: 2013 SIST EN 1026: 2016	temeljna plošča (senik in kozolec)	C25/30 XC2 Cl 0,2 D_{max} 16	4 cm
		točkovni temelji (kozolec)	C25/37 XC2 Cl 0,2 D_{max} 16	5 cm
		stene (senik in kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16	3 cm
		oporni zidovi (senik) in obbetoniran del stebrov (kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16	4 cm
		plošča nad pritličjem (senik)	C25/30 XC1 Cl 0,2 D_{max} 16	2,5 cm
		plošča nad pritličjem (kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16	3,5 cm
jeklo za armiranje	SIST EN 10080: 2005	vsi AB elementi	S500 B	
konstrukcijsko jeklo	SIST EN 10025	pločevine, profili	S235 JR	

KOZOLEC - TOČKOVNI TEMELJI (ARMATURA IN DET.) Št. lista: 4

Sprememba:	Datum spremembe:
	Podpis:

STATIKA, PROJEKTIRANJE, SVETOVANJE
SPS
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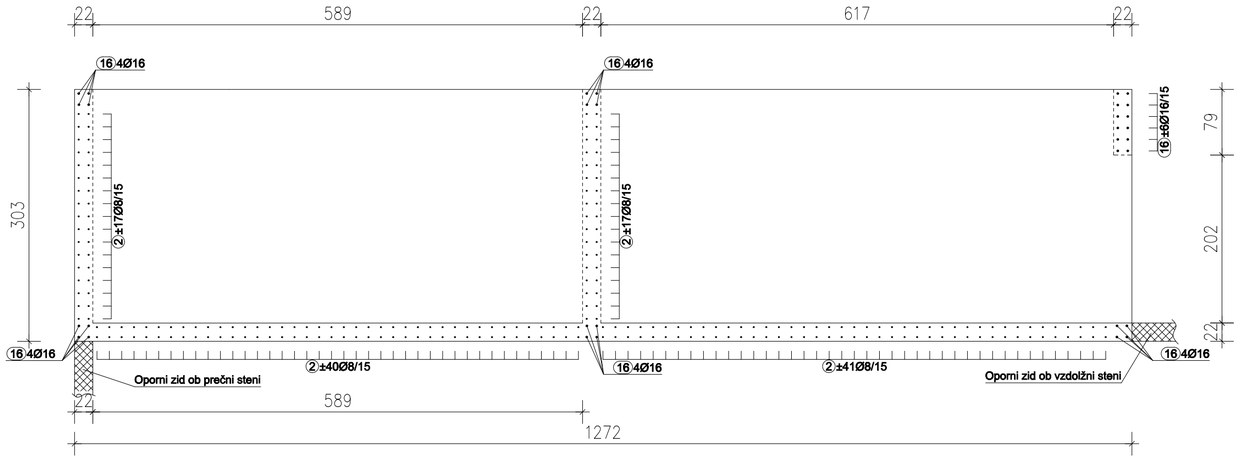
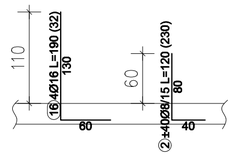
gsm: +386(0)31 225533
jan.pajer@siol.net
DDV ID: SI40988708

Investitor:	OBČINA BISTRICA OB SOTLI Bistrica ob Sotli 17, 3256 Bistrica ob Sotli			
Objekt:	BRATUŠEVA DOMAČIJA Medgeneracijski center z varovanimi stanovanji			
Vrsta projekta:	PZI			
Vrsta načrta:	NAČRT GRADBENIH KONSTRUKCIJ		**Št. načrta:**	JP-12/22
Vsebina risbe:	KOZOLEC - TOČKOVNI TEMELJI (ARMATURA IN DETAJLI)		**Merilo:**	1:25, 1:10
Odgovorni proj.:	Jan Pajer, u.d.i.g.	IZS G-2755	**Datum:**	december 2022
Sodelavec proj.:	mag. Jerica Rihar, u.d.i.g.	IZS G-3418	**Št. projekta:**	A198

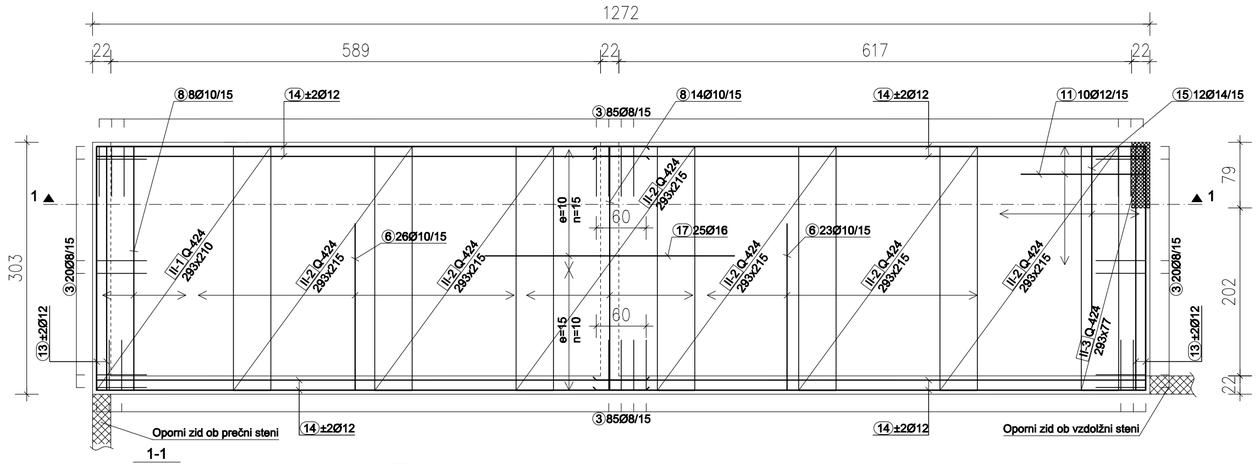
SIDRA ZA AB STENE

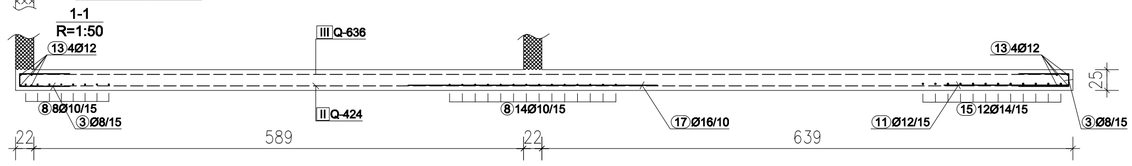


# TEMELJNA PLOŠČA
d=25 cm

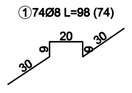


spodnja armatura

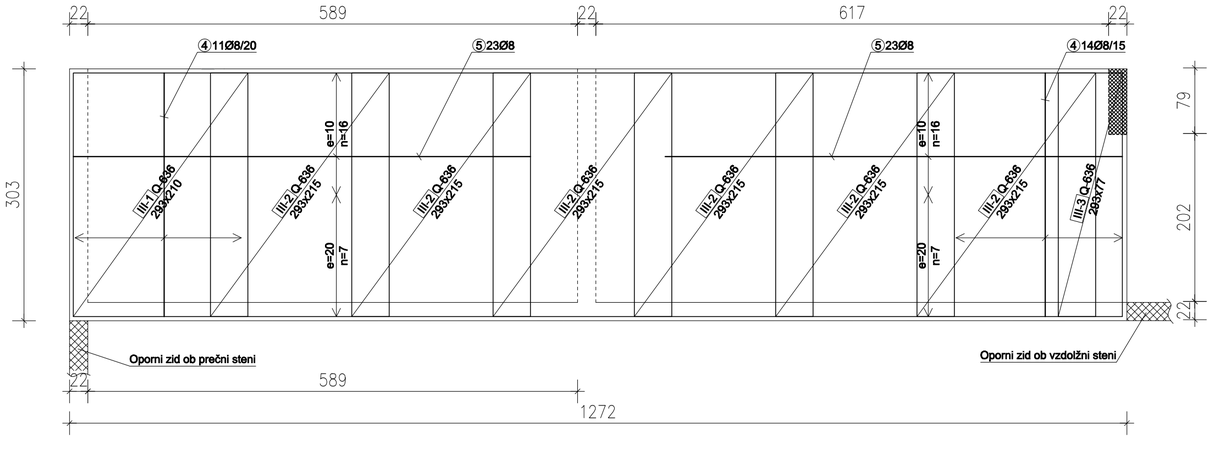




Distančnki za zgornjo armaturo (2 kom/m2)

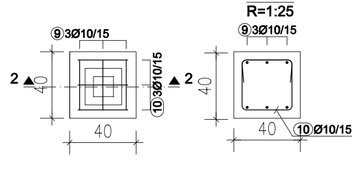


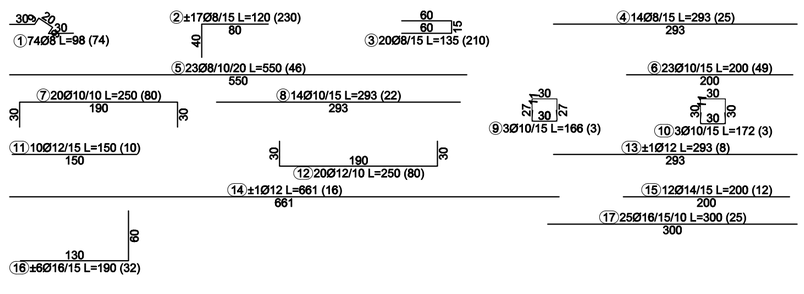
zgornja armatura



TOČKOVNI TEMELJ STEBRA HEB 220

40/40 cm





Preklopi, ki niso kotirani:

Ø8 mm - 40 cm
Ø10 mm - 50 cm
Ø12 mm - 60 cm
Ø14 mm - 70 cm
Ø16 mm - 80 cm
Ø20 mm - 100 cm
Ø25 mm - 125 cm

VSE MERE PREVERITI NA LICU MESTA!
UPOŠTEVATI NAČRTE ARHITEKTURE, STROJNIH INŠTALACIJ IN ZUNANJE UREDITVE!

material	standard	konstrukcijski element	oznaka	zaščitni sloj
beton	SIST EN 206: 2013 SIST EN 1026: 2016	temeljna plošča (senik in kozolec)	C25/30 XC2 Cl 0,2 D_{max} 16	4 cm
		točkovni temelji (kozolec)	C25/37 XC2 Cl 0,2 D_{max} 16	5 cm
		stene (senik in kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16	3 cm
		oporni zidovi (senik) in obbetoniran del stebrov (kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16	4 cm
		plošča nad pritličjem (senik)	C25/30 XC1 Cl 0,2 D_{max} 16	2,5 cm
		plošča nad pritličjem (kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16	3,5 cm
jeklo za armiranje	SIST EN 10080: 2005	vsi AB elementi	S500 B	
konstrukcijsko jeklo	SIST EN 10025	pločevine, profili	S235 JR	

KOZOLEC - TEMELJNA PLOŠČA IN SIDRA **Št. lista: 5**

Sprememba: **Datum spremembe:**

Podpis:

STATIKA, PROJEKTIRANJE, SVETOVANJE
SPS Jan Pajer s.p.
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tel./fax.: +386(0)1 5051588
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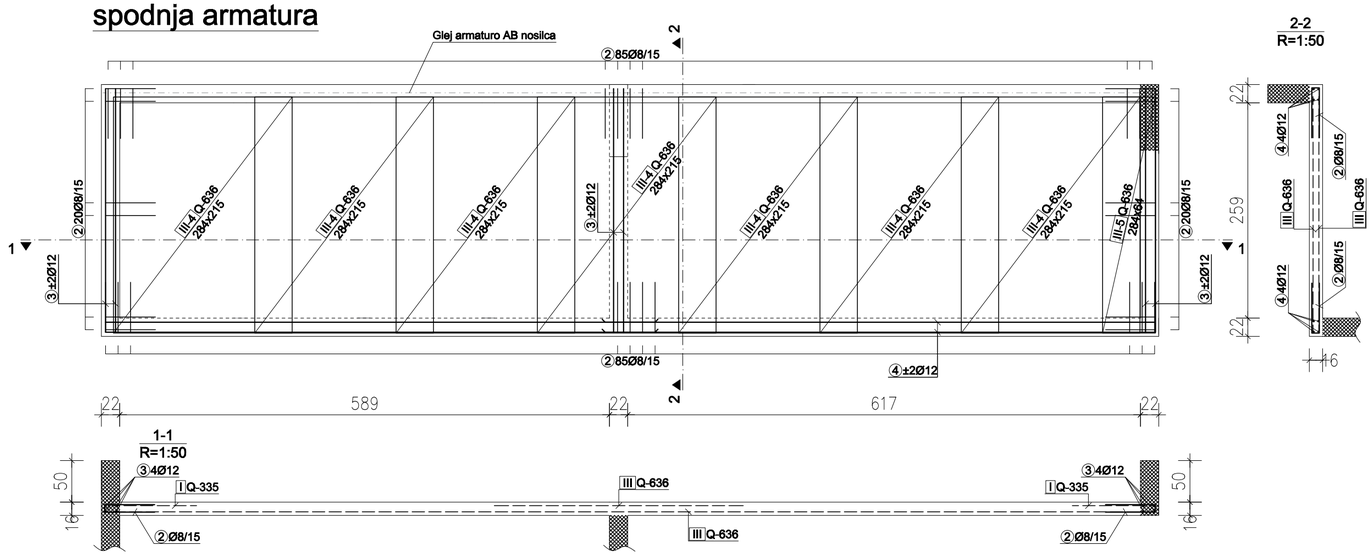
DDV ID: SI40988708

Investitor:	OBČINA BISTRICA OB SOTLI Bistrica ob Sotli 17, 3256 Bistrica ob Sotli			
Objekt:	BRATUŠEVA DOMAČIJA Medgeneracijski center z varovanimi stanovanji			
Vrsta projekta:	PZI			
Vrsta načrta:	NAČRT GRADBENIH KONSTRUKCIJ		**Št. načrta:**	JP-12/22
Vsebina risbe:	KOZOLEC - TEMELJNA PLOŠČA IN SIDRA		**Merilo:**	1:50, 1:25
Odgovorni proj.:	Jan Pajer, u.d.i.g.	IZS G-2755	**Datum:**	december 2022
Sodelavec proj.:	mag. Jerica Rihar, u.d.i.g.	IZS G-3418	**Št. projekta:**	A198

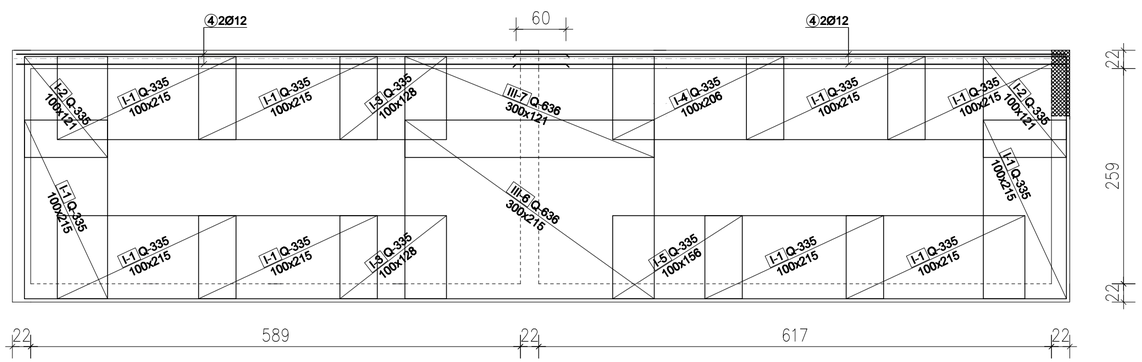
STREŠNA PLOŠČA
d=16 cm

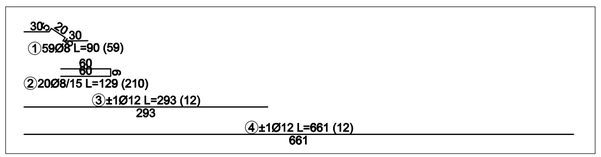
spodnja armatura



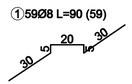
STREŠNA PLOŠČA
d=16 cm

zgornja armatura





Distančnki za zgornjo armaturo
(2 kom/m2)



VSE MERE PREVERITI NA LICU MESTA!
UPOŠTEVATI NAČRTE ARHITEKTURE, STROJNIH INŠTALACIJ IN ZUNANJE UREDITVE!

material	standard	konstrukcijski element	oznaka	zaščitni sloj
beton	SIST EN 206: 2013 SIST EN 1026: 2016	temeljna plošča (senik in kozolec)	C25/30 XC2 Cl 0,2 D_{max} 16	4 cm
		točkovni temelji (kozolec)	C25/37 XC2 Cl 0,2 D_{max} 16	5 cm
		stene (senik in kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16	3 cm
		oporni zidovi (senik) in obbetoniran del stebrov (kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16	4 cm
		plošča nad pritličjem (senik)	C25/30 XC1 Cl 0,2 D_{max} 16	2,5 cm
		plošča nad pritličjem (kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16	3,5 cm
jeklo za armiranje	SIST EN 10080: 2005	vsi AB elementi	S500 B	
konstrukcijsko jeklo	SIST EN 10025	pločevine, profili	S235 JR	

KOZOLEC - PLOŠČA NAD PRITLIČJEM

Št. lista: 6

Sprememba:	**Datum spremembe:**
	Podpis:

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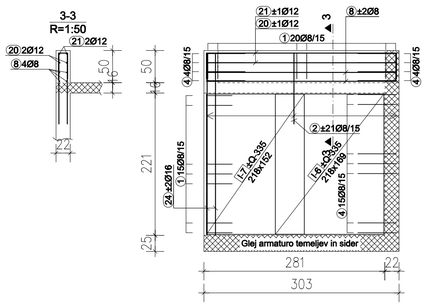
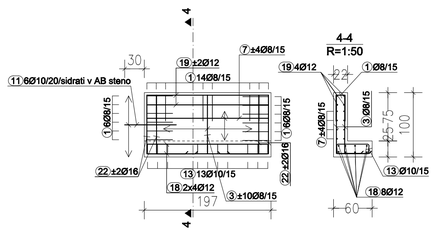
jan.pajer@siol.net
DDV ID: SI40988708

Investitor:	OBČINA BISTRICA OB SOTLI Bistrica ob Sotli 17, 3256 Bistrica ob Sotli				
Objekt:	BRATUŠEVA DOMAČIJA Medgeneracijski center z varovanimi stanovanji				
Vrsta projekta:	PZI				
Vrsta načrta:	NAČRT GRADBENIH KONSTRUKCIJ			**Št. načrta:**	JP-12/22
Vsebina risbe:	KOZOLEC - PLOŠČA NAD PRITLIČJEM			**Merilo:**	1:50, 1:25
Odgovorni proj.:	Jan Pajer, u.d.i.g.	IZS G-2755	Jan Pajer	**Datum:**	december 2022
Sodelavec proj.:	mag. Jerica Rihar, u.d.i.g.	IZS G-3418	Jerica Rihar	**Št. projekta:**	A198

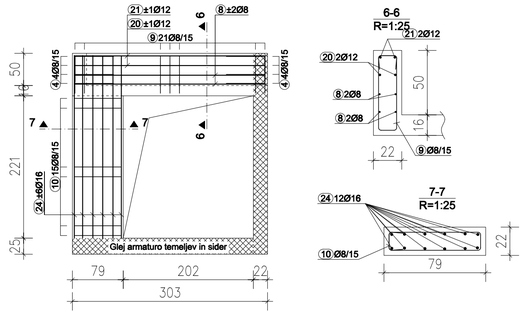
AB PREČNA STENA - LEVO
d=22 cm



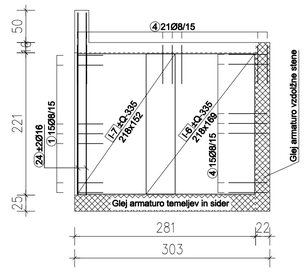
OPORNI ZID OB PREČNI STENI
d=22 cm



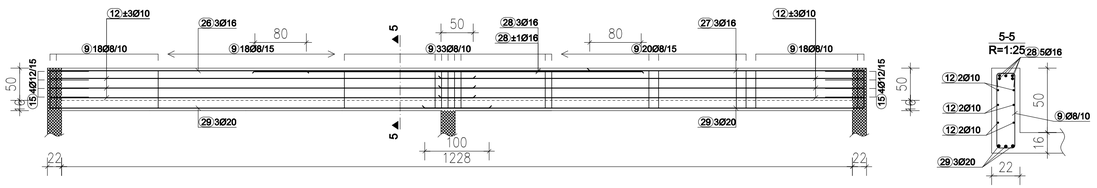
AB PREČNA STENA - SLOP
d=22 cm



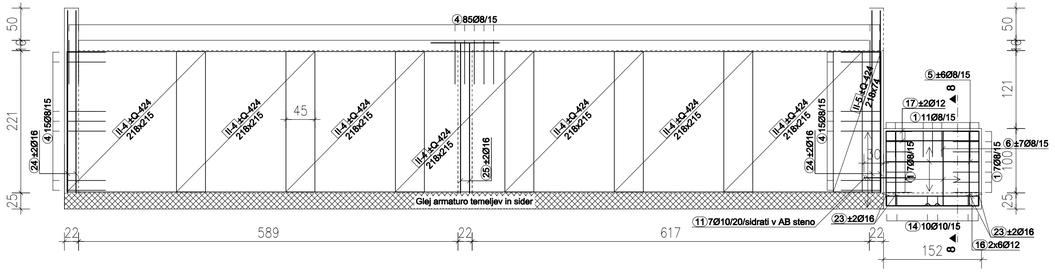
AB PREČNA VMESNA STENA
d=22 cm



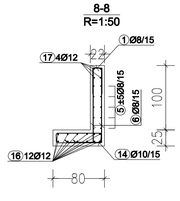
AB NOSILEC
22/66 cm

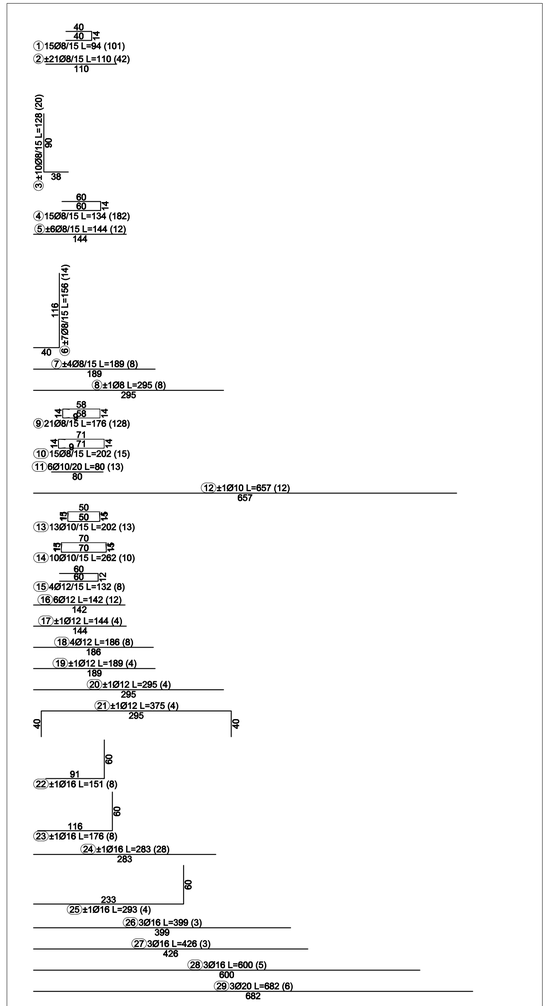


AB VZDOLŽNA STENA
d=22 cm



OPORNI ZID OB VZDOLŽNI STENI, d = 22 cm





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Ø10 mm - 50 cm
Ø12 mm - 60 cm
Ø14 mm - 70 cm
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VSE MERE PREVERITI NA LICU MESTA!
UPOŠTEVATI NAČRTE ARHITEKTURE, STROJNIH INŠTALACIJ IN ZUNANJE UREDITVE!

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		točkovni temelji (kozolec)	C25/37 XC2 Cl 0,2 D_{max} 16	5 cm
		stene (senik in kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16	3 cm
		oporni zidovi (senik) in obbetoniran del stebrov (kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16	4 cm
		plošča nad pritličjem (senik)	C25/30 XC1 Cl 0,2 D_{max} 16	2,5 cm
		plošča nad pritličjem (kozolec)	C30/37 XC4 Cl 0,2 D_{max} 16	3,5 cm
jeklo za armiranje	SIST EN 10080: 2005	vsi AB elementi	S500 B	
konstrukcijsko jeklo	SIST EN 10025	pločevine, profili	S235 JR	

KOZOLEC - STENE, NOSILEC IN OPORNA ZIDOVA **Št. lista: 7**

Sprememba:	**Datum spremembe:**
	Podpis:

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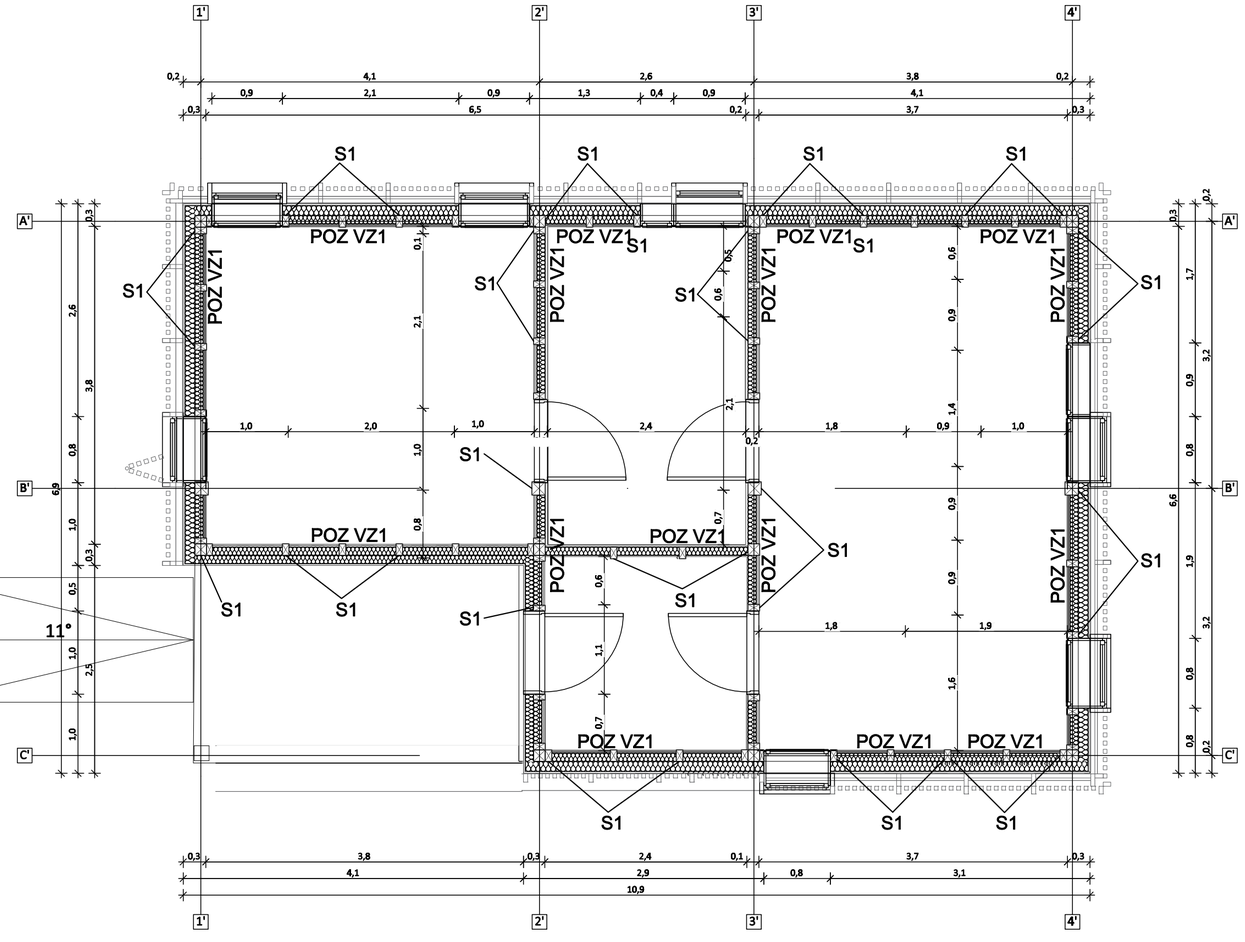
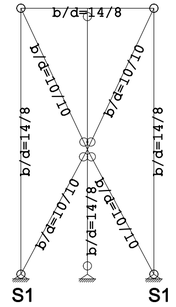
DDV ID: SI40988708

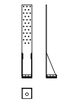
Investitor:	OBČINA BISTRICA OB SOTLI Bistrica ob Sotli 17, 3256 Bistrica ob Sotli			
Objekt:	BRATUŠEVA DOMAČIJA Medgeneracijski center z varovanimi stanovanji			
Vrsta projekta:	PZI			
Vrsta načrta:	NAČRT GRADBENIH KONSTRUKCIJ		**Št. načrta:**	JP-12/22
Vsebina risbe:	KOZOLEC - STENE, NOSILEC IN OPORNA ZIDOVA		**Merilo:**	1:50, 1:25
Odgovorni proj.:	Jan Pajer, u.d.i.g.	IZS G-2755	**Datum:**	december 2022
Sodelavec proj.:	mag. Jerica Rihar, u.d.i.g.	IZS G-3418	**Št. projekta:**	A198



POZ VZ1 - VERTIKALNO ZAVERTOVANJE
shematski prikaz, 16 kom



S1 - kotnik WHT 440
32 kom



Opomba:
Vsi preostali vertiklani elementi se sidrajo s kotniki WBR100 (1 kom/element).

DISPOZICIJA VERTIKALNIH POVEZIJ IN SIDRANJA (SENIK) Št. lista: 8

Sprememba:	Datum spremembe:
	Podpis:

STATIKA, PROJEKTIRANJE, SVETOVANJE
SPS
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jan.pajer@siol.net
DDV ID: SI40988708

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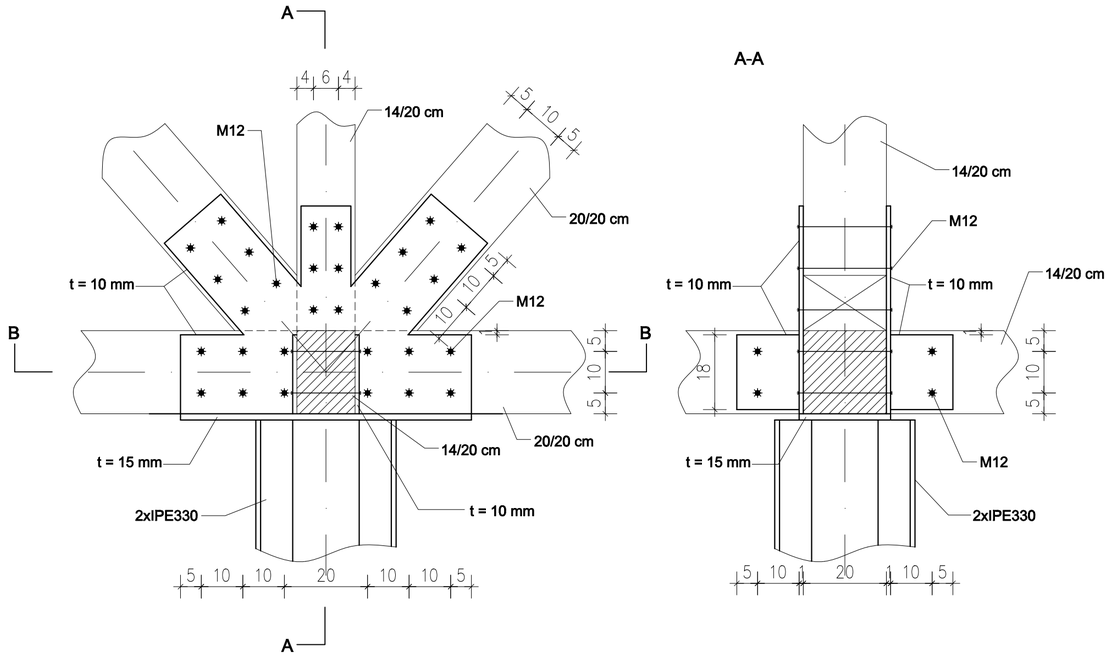
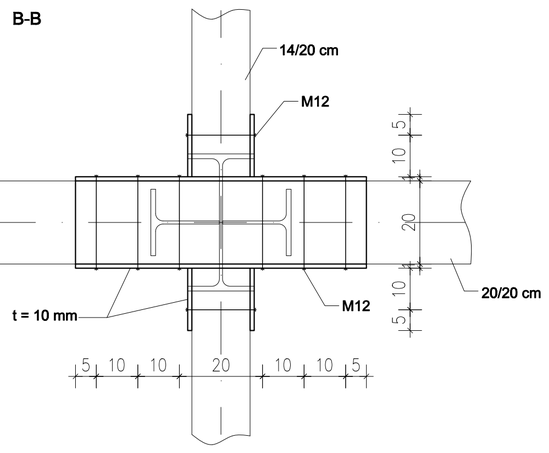
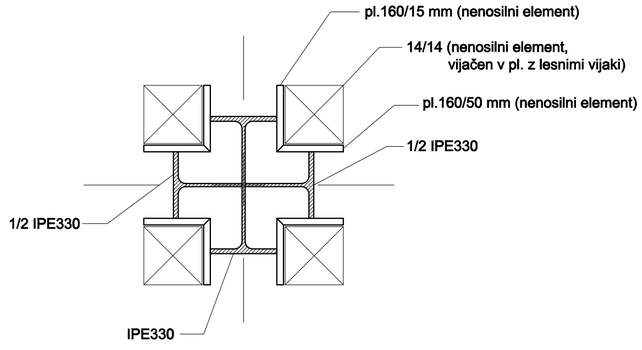
Objekt:	BRATUŠEVA DOMAČIJA Medgeneracijski center z varovanimi stanovanji			
Vrsta projekta:	PZI			
Vrsta načrta:	NAČRT GRADBENIH KONSTRUKCIJ		**Št. načrta:**	JP-12/22
Vsebina risbe:	DISPOZICIJA VERTIKALNIH POVEZIJ IN SIDRANJA (SENIK)		**Merilo:**	1:50, 1:25
Odgovorni proj.:	Jan Pajer, u.d.i.g.	IZS G-2755	**Datum:**	december 2022
Sodelavec proj.:	mag. Jerica Rihar, u.d.i.g.	IZS G-3418	**Št. projekta:**	A198

DETAJL VOZLIŠČA NA VRHU JEKLENIH STEBROV





DETAJL JEKLENIH STEBROV - PREČNI PREREZ



VSE MERE KONTROLIRATI PRED IZDELAVO DELAVNIŠKIH RISB!

jeklo:	S235
vijaki:	kvaliteta 8.8: M12, M16, M20

Opombe:

-Izdelava in montaža konstrukcije skladno s standardom SIST EN1090-2, razred izdelave EXC2.
-Potrebne korekture zaradi vpliva varilnih deformacij mora predvideti izvajalec, enako velja za tolerance profilov.
-Vsi kotni zvari, ki niso posebej označeni so debeline $0{,}7t_{min}$ (t_{min}=debelina priključne pločevine).
-AKZ po tehničnem poročilu (vroče cinkano).

DETAJLI 1 (KOZOLEC) **Št. lista: 9**

Sprememba:	**Datum spremembe:**
	Podpis:

STATIKA, PROJEKTIRANJE, SVETOVANJE
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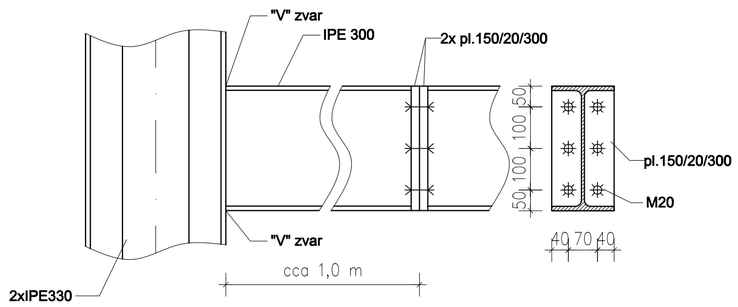
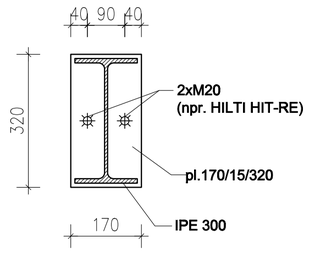
Objekt:	BRATUŠEVA DOMAČIJA Medgeneracijski center z varovanimi stanovanji			
Vrsta projekta:	PZI			
Vrsta načrta:	NAČRT GRADBENIH KONSTRUKCIJ		**Št. načrta:**	JP-12/22
Vsebina risbe:	DETAJLI 1 (KOZOLEC)		**Merilo:**	1:10
Odgovorni proj.:	Jan Pajer, u.d.i.g.	IZS G-2755	**Datum:**	december 2022
Sodelavec proj.:	mag. Jerica Rihar, u.d.i.g.	IZS G-3418	**Št. projekta:**	A198

DETAJLI - KOZOLEC

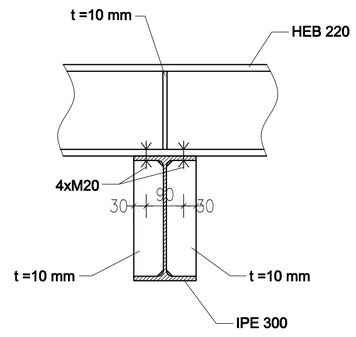
DETAJL VARJENEGA PRIKLJUČKA PREČNEGA NOSILCA NA STEBER IN MONTAŽNEGA VIJAČNEGA SPOJA



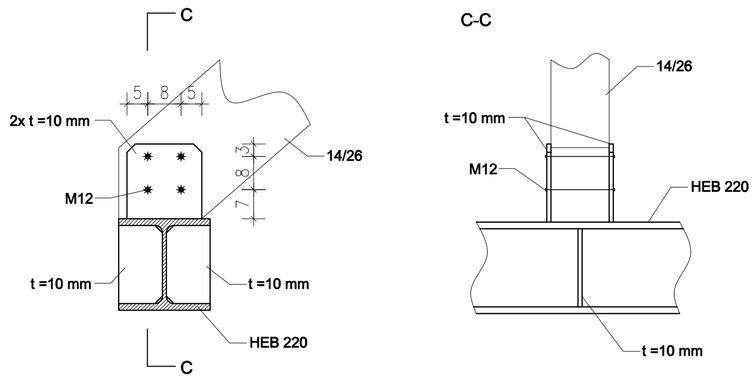
DETAJL SIDRANJA PREČNEGA NOSILCA V AB KONSTRUKCIJO



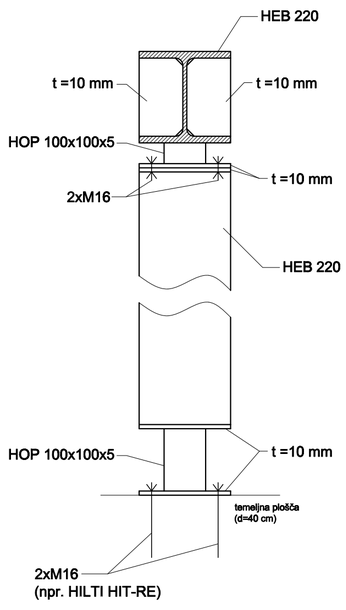
DETAJL SPOJA MED VZDOLŽNIM IN PREČNIM NOSILCEM



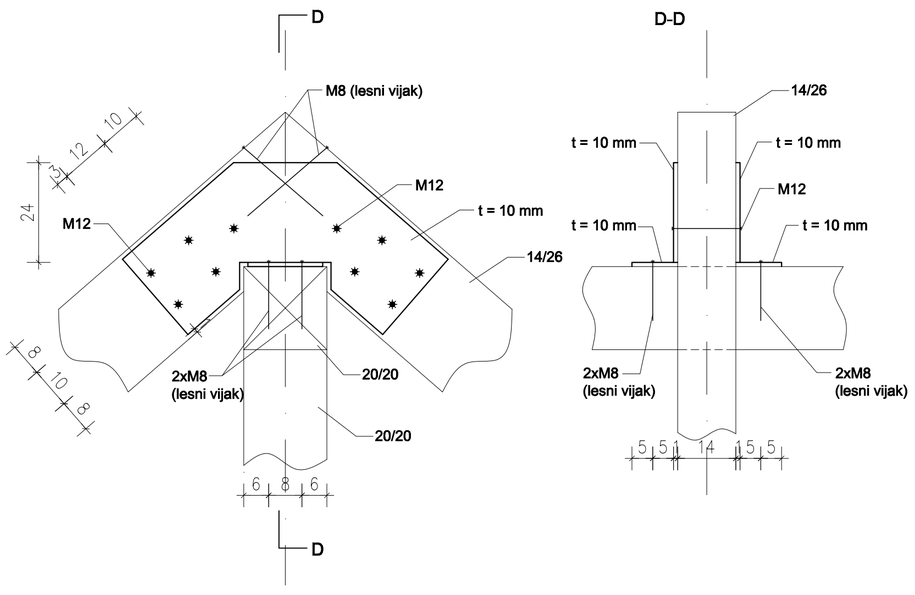
DETAJL SIDRANJA ŠPIROVCEV NA JEKLEN VZDOLŽNI (KAPNI) NOSILEC



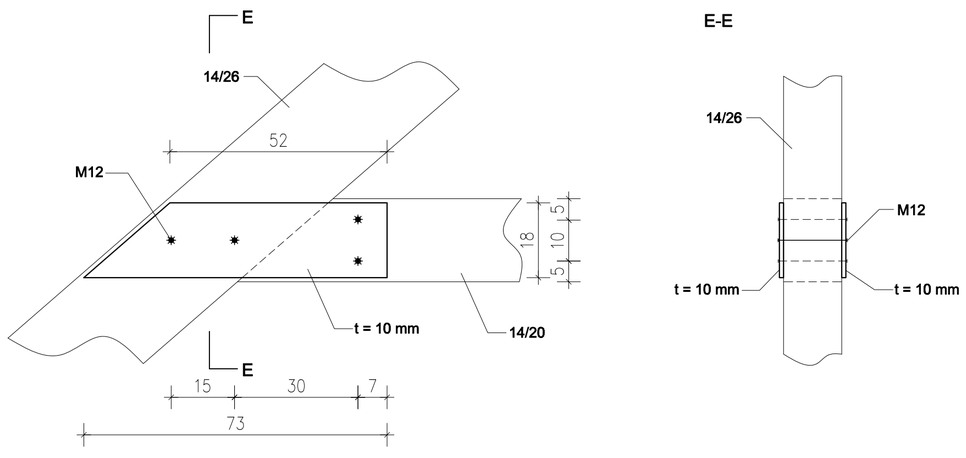
DETAJL SIDRANJA PREČNEGA NOSILCA V AB KONSTRUKCIJO



DETAJL SIDRANJA ŠPIROVCEV V SLEMENU



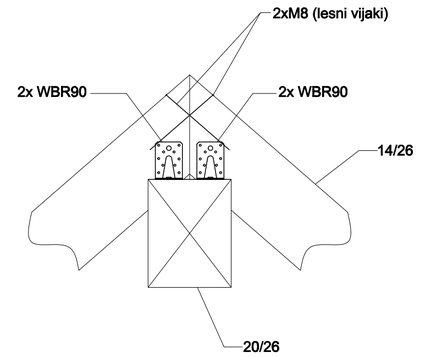
DETAJL VOZLIŠČA ŠPIROVCEV IN HORIZONTALNIH POVEZNIKOV



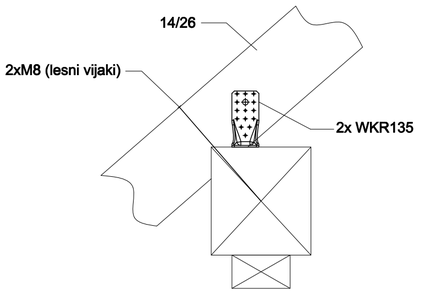
les:	C24
jeklo:	S235
vijaki:	M12 8.8, M20 8.8

DETAJLI - SENIK

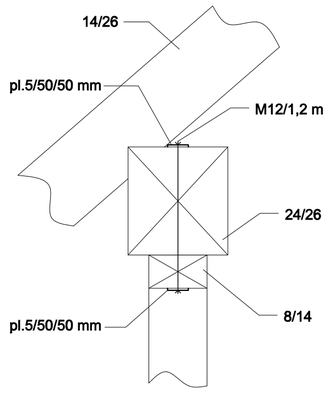
DETAJL SIDRANJA ŠPIROVCEV V SLEMENSKO LEGO



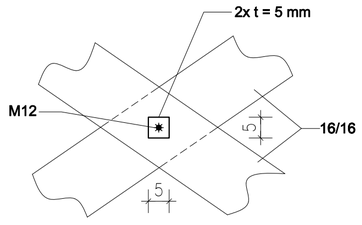
DETAJL SIDRANJA ŠPIROVCEV V KAPNO LEGO



DETAJL SIDRANJA KAPNE LEGE V STENE



DETAJL VOZLIŠČA VERTIKALNEGA ZAVETROVANJA OSTREŠJA (SENIK)



VSE MERE KONTROLIRATI PRED IZDELAVO DELAVNIŠKIH RISB!

DETAJLI 2 (KOZOLEC, SENIK) **Št. lista: 10**

Sprememba:	**Datum spremembe:**
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Investitor:	OBČINA BISTRICA OB SOTLI Bistrica ob Sotli 17, 3256 Bistrica ob Sotli			
Objekt:	BRATUŠEVA DOMAČIJA Medgeneracijski center z varovanimi stanovanji			
Vrsta projekta:	PZI			
Vrsta načrta:	NAČRT GRADBENIH KONSTRUKCIJ		**Št. načrta:**	JP-12/22
Vsebina risbe:	DETAJLI 2 (KOZOLEC, SENIK)		**Merilo:**	1:10
Odgovorni proj.:	Jan Pajer, u.d.i.g.	IZS G-2755	**Datum:**	december 2022
Sodelavec proj.:	mag. Jerica Rihar, u.d.i.g.	IZS G-3418	**Št. projekta:**	A198