3.1 NASLOVNA STRAN

NAČRT GRADBENE KONSTRUKCIJE ŠT. 27/18-K

INVESTITOR:

UNIVERZITETNI KLIČNI CENTER LJUBLJANA, ZALOŠKA CESTA 2, LJUBLJANA

OBJEKT:

NAMESTITEV NOVIH AVTOKLAVOV V LEKARNI

VRSTA PROJEKTNE DOKUMENTACIJE:

PZR

ZA GRADNJO:

UMESTITEV NOVE OPREME

PROJEKTANT:

INŽENIRING BIRO ARMATURA, UROŠ ŽVAN S.P., ZRKOVSKA 75, 2000 MARIBOR
DIREKTOR: UROŠ ŽVAN, u.d.i.g.

INŽENIRING BIRO ARMATURA
UROŠ ŽVAN s.p., ZRKOVSKA C. 75, MARIBOR

ODGOVORNI PROJEKTANT:

UROŠ ŽVAN, u.d.i.g., IZS G-0028

UROŠ ŽVAN
univ. dipl. inž. grad.
IZS G-0028

ŠTEVILKA NAČRTA:

27/18-K

KRAJ IN DATUM IZDELAVE NAČRTA:

MARIBOR, OKTOBER 2018

3.2 KAZALO VSEBINE NAČRTA GRADBENE KONSTRUKCIJE

3.1 NASLOVNA STRAN 1
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3.3 TEHNIČNO POROČILO

PODATKI O NAROČNIKU IN OBJEKTU

Investitor Univerzitetni klinični center Ljubljana ima namen v lekarni v traktu DTS-G namestiti nove avtoklave. Potrebno je zagotoviti ustrezno nosilnost obstoječe konstrukcije.

KONSTRUKCIJA

OPIS OBSTOJEČE KONSTRUKCIJE OBJEKTA

Obstoječa konstrukcija plošče pod lekarno kamor se nameščajo nove medicinske naprave je izvedena kot kompleksna branasta konstrukcija z armiranobetonskimi nosilci mnogih različnih prerezov. Preko branaste konstrukcije je izvedena 12 cm debela armiranobetonska plošča.

Branasta konstrukcija je podprta z armiranobetonskimi stebri na rastru 12 oziroma 12,52×7 m.

RAZPOLOŽLJIVA PROJEKTNA DOKUMENTACIJA

Na razpolago nam je bil statični račun, ki ga je izdelal »Investicijski zavod za izgradnjo trga revolucije« za objekt »KC DTS II. faza, I. etapa«, z oznako KC F 33, odgovorni projektant: prof., dr. Ervin Prelog, dipl. ing., datum april 1970 kar se nanaša na sosednji zrcalen objekt.

Na razpolago so nam bili tudi armaturni načrt, ki jih je izdelal »Investicijski zavod za izgradnjo trga revolucije« za objekt »KC DTS II. faza, I. etapa«, z oznako KC 33-G 1 do 60, odgovorni projektant: prof., dr. Ervin Prelog, dipl. ing., datum september 1970 kar se nanaša na obravnavno konstrukcijo objekta G.

Pri analizi obstoječe kosntrukcije smo izvedli izračun konstrukcije s podatki iz originalnega statičnega računa, nato smo isto konstrukcijo preračunali z obtežbo novih naprav in primerjali notranje statične količine. Izvedli smo še dimenzioniranje armature za konstrukcijo obremenjeno z novimi napravami in rezultate primerjeli z armaturo prikazano v armaturnih načrtih.

STANJE OBSTOJEČE KONSTRUKCIJE

Z ogledom na licu mesta smo ugotovili, da je stanje konstrukcije solidno, da je dobro vzdrževana in primerna za rekonstrukcijo.

VPLIVI NA KONSTRUKCIJO

Obstoječe vplive na konstrukcijo smo povzeli iz statičnega računa objekta F. Pri analizi obstoječega stanja smo upoštevali stalne vplive podane v statičnem računu in v statičnem računu podano koristno obtežbo, ki znaša 2,00 kN/m^2.

Pri analizi novega stanja smo upoštevali stalne vplive podane v statičnem računu, kot stalne vplive smo upoštevali tudi nove avtoklave. Na vsej preostali obravnavani površini ob novih avtoklavih smo upoštevali v originalnem statičnem računu upoštevano koristno obtežbo, ki znaša 2,00 kN/m^2. V območju namestitve avtoklavov koristne obtežbe nismo upoštevali.

STATIČNI RAČUN IN PRIMERJAVA REZULTATOV

Statični račun horizontalne konstrukcije nad pritličjem smo opravili v segmentu, kjer so predvideni vplivi nove opreme. Statični račun smo opravili za stanje skladno z osnovnim projektom in za stanje po vgradnji novih naprav ter primerjali dobljene rezultate.

Primerjava notranjih statičnih količin kaže, da se z novimi obremenitvami le te v nosilcih povečajo manj kot 5%, armiranobetonski plošči neposreedno pod avtoklavi pa od 20 do 33%

Enaka razmerja veljajo tudi za računsko armaturo v nosilcih in plošči.

Razlika notranjih statičnih količin in računske armature v nosilcih je v okvirih sprejemljive inženirske prakse in lahko smatramo, da je nosilnost le teh ustrezna. Nosilnost AB plošče je neustrezna in jo je potrebno ojačati.

V etaži pod lekarno se odločim izvesti dodatno podpiranje plošče z jeklenimi nosilci vgrajenimi med obstoječe AB nosilce. Na rastru 90 cm se vgradi štiri jeklene nosilce HEA 120, ki se jih v AB nosilce sidra s kemičnimi sidri. Mrebiten prostor med AB ploščo in jeklenimi nosilci se zaklini z jeklenimi klini in zameče s cementno malto.

UPOŠTEVANI STANDARDI

Dimenzioniranje gradbenih konstrukcij je v načrtu št. 19/18-K-B izvedeno izključno v skladu s standardi SIST EN 1990 do SIST EN 1999 (družina standardov Evrokod).

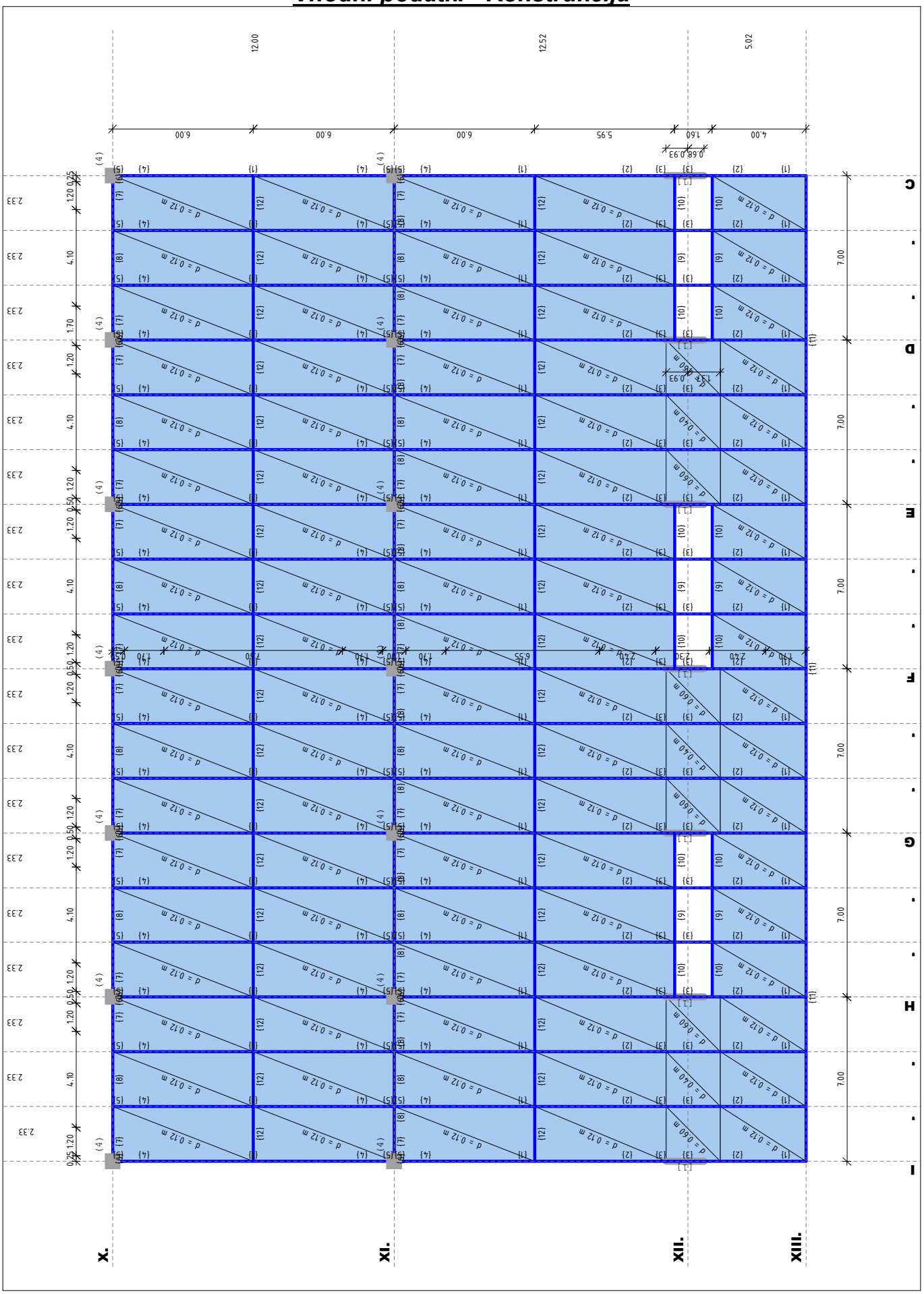
ZAKLJUČEK

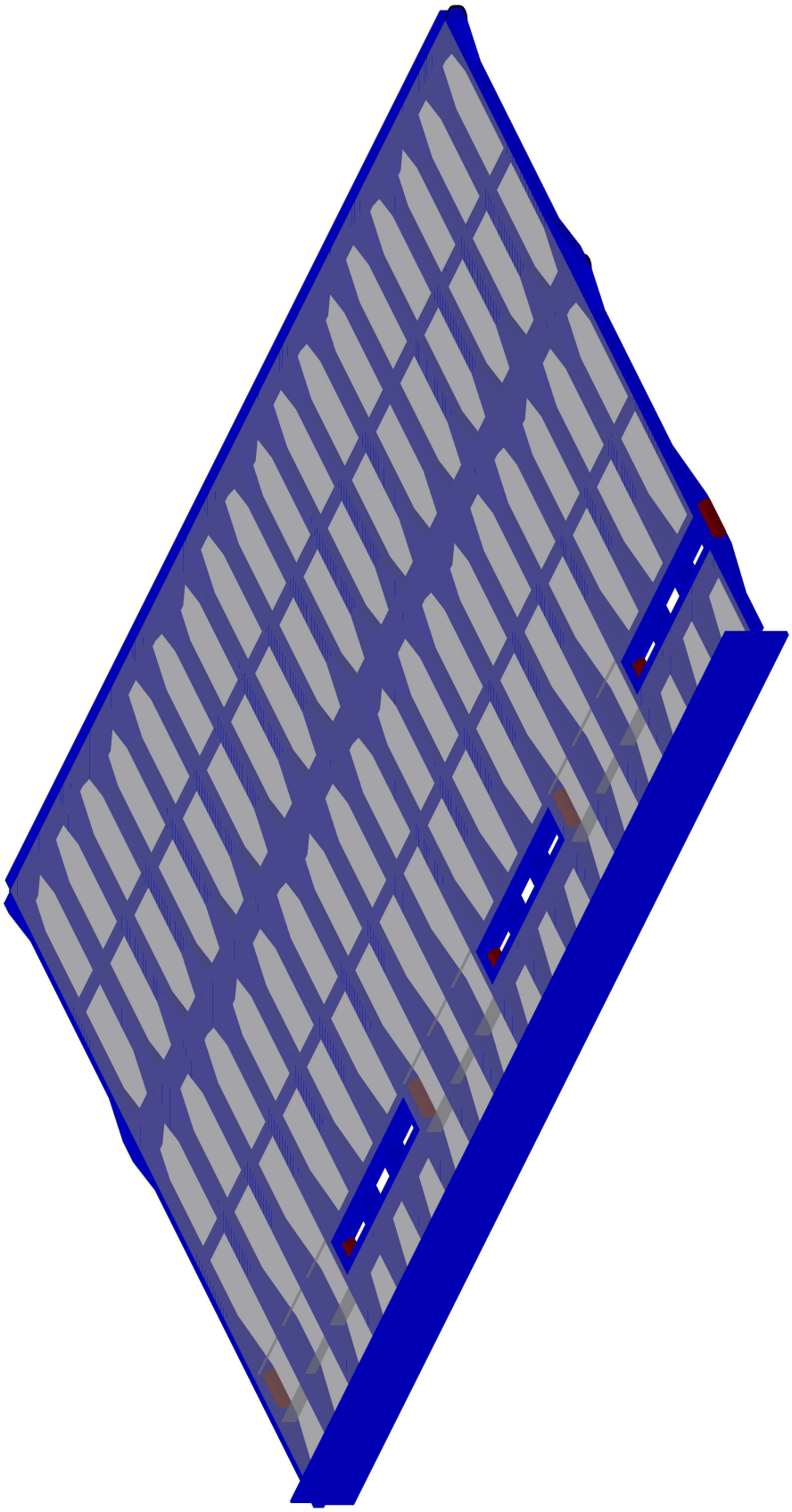
Novo opremo atoklavov se lahko namesti v predvidenem obsegu in v skladu s predvidenim razporedom po vgradnji novih jeklenih nosilcev pod AB ploščo neposredno pod lokacijo namestitve novih avtoklavov.

sestavil:
Uroš ŽVAN, u.d.i.g.

OBSTOJECA AB BRANASTA KONSTRUKCIJA IN PLOSCA

Vhodni podatki - Konstrukcija





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

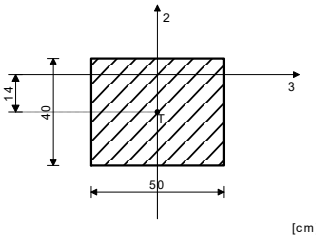
Seti plošč

No	d[m]	e[m]	Material	Tip preračuna	Ortotropija	E2[kN/m2]	G[kN/m2]	α
<1>	0.120	0.060	1	Tanka plošča	Anizotropna	0.000e+0	0.000e+0	0.00
<2>	0.400	0.060	1	Tanka plošča	Izotropna			
<3>	0.600	0.060	1	Tanka plošča	Izotropna			

Seti gred

Set: 1 Prerez: b/d=50/40, Fiktivna ekscentričnost

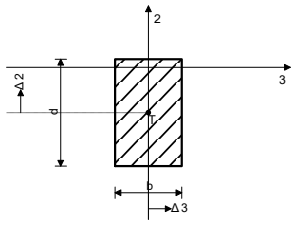
Mat.	A1	A2	A3	I1	I2	I3
1 - Beton C 25/30	2.000e-1	1.667e-1	1.667e-1	5.474e-3	4.167e-3	2.667e-3



Set: 2 Prerez: Spremenljiv, Fiktivna ekscentričnost

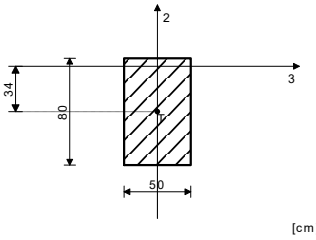
Mat.	Tip spremembe
1 - Beton C 25/30	Relativna linearna sprememba.

No	dL	Δ3 [cm]	Δ2 [cm]	b [cm]	d [cm]
S	0	0.00	-34.00	50.00	80.00
E	1	0.00	-14.00	50.00	40.00



Set: 3 Prerez: b/d=50/80, Fiktivna ekscentričnost

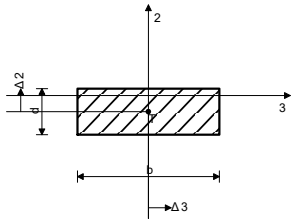
Mat.	A1	A2	A3	I1	I2	I3
1 - Beton C 25/30	4.000e-1	3.333e-1	3.333e-1	2.038e-2	8.333e-3	2.133e-2



Set: 4 Prerez: Spremenljiv, Fiktivna ekscentričnost

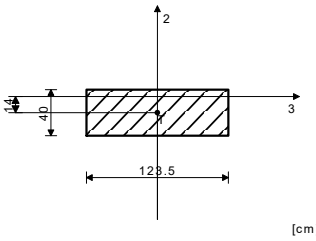
Mat.	Tip spremembe
1 - Beton C 25/30	Relativna linearna sprememba.

No	dL	Δ3 [cm]	Δ2 [cm]	b [cm]	d [cm]
S	0	0.00	-14.00	123.50	40.00
E	1	0.00	-14.00	50.00	40.00



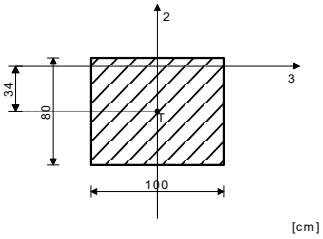
Set: 5 Prerez: b/d=123.5/40, Fiktivna ekscentričnost

Mat.	A1	A2	A3	I1	I2	I3
1 - Beton C 25/30	4.940e-1	4.117e-1	4.117e-1	2.098e-2	6.279e-2	6.587e-3



Set: 6 Prerez: b/d=100/80, Fiktivna ekscentričnost

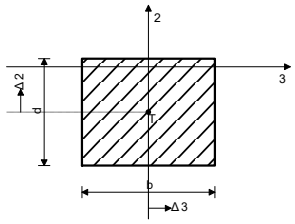
Mat.	A1	A2	A3	I1	I2	I3
1 - Beton C 25/30	8.000e-1	6.667e-1	6.667e-1	8.759e-2	6.667e-2	4.267e-2



Set: 7 Prerez: Spremenljiv, Fiktivna ekscentričnost

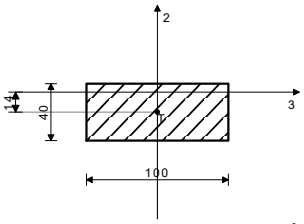
Mat.	Tip spremembe
1 - Beton C 25/30	Relativna linearna sprememba.

No	dL	Δ3 [cm]	Δ2 [cm]	b [cm]	d [cm]
S	0	0.00	-34.00	100.00	80.00
E	1	0.00	-14.00	100.00	40.00



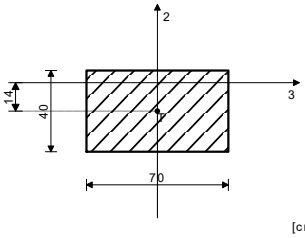
Set: 8 Prerez: b/d=100/40, Fiktivna ekscentričnost

Mat.	A1	A2	A3	I1	I2	I3
1 - Beton C 25/30	4.000e-1	3.333e-1	3.333e-1	1.597e-2	3.333e-2	5.333e-3



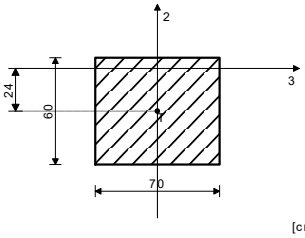
Set: 9 Prerez: b/d=70/40, Fiktivna ekscentričnost

Mat.	A1	A2	A3	I1	I2	I3
1 - Beton C 25/30	2.800e-1	2.333e-1	2.333e-1	9.605e-3	1.143e-2	3.733e-3



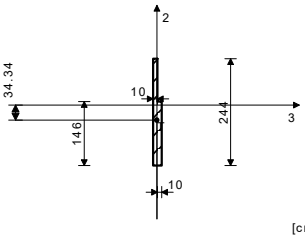
Set: 10 Prerez: b/d=70/60, Fiktivna ekscentričnost

Mat.	A1	A2	A3	I1	I2	I3
1 - Beton C 25/30	4.200e-1	3.500e-1	3.500e-1	2.441e-2	1.715e-2	1.260e-2

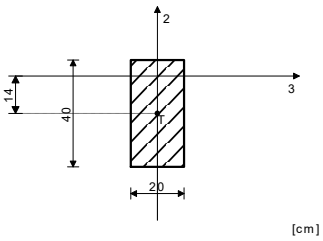


Set: 11 Prerez: ~I 20/244, Fiktivna ekscentričnost

Mat.	A1	A2	A3	I1	I2	I3
1 - Beton C 25/30	3.900e-1	3.253e-1	3.135e-1	2.078e-1	1.238e-3	1.689e-1



Set: 12 Prerez: b/d=20/40, Fiktivna ekscentričnost



Mat.	A1	A2	A3	I1	I2	I3
1 - Beton C 25/30	8.000e-2	6.667e-2	6.667e-2	7.324e-4	2.667e-4	1.067e-3

Seti linijskih podpor

Set	K,R1	K,R2	K,R3	K,M1	Tla [m]
1	1.000e+10	2.000e+5	1.000e+10		

Seti točkovnih podpor

	K,R1	K,R2	K,R3	K,M1	K,M2	K,M3
4	1.000e+10	1.000e+10	1.000e+10	1.000e+10	1.000e+10	

Vhodni podatki - Obtežba

VPLIVI NA STROPNE KONSTRUKCIJE PO OSNOVNEM PROJEKTU (znak: KC-F 33 z dne april 1970)

STALNI VPLIVI:
- finalni tlak 1 cm.....0,20 kN/m2
- estrih 6 cm.....1,45 kN/m2
- hidroizolacija.....0,05 kN/m2
- konstrukcija 20 cm???????.....????.5,00 kN/m2
- svinčena izolacija.....0,20 kN/m2
- tehnični strop.....0,60 kN/m2
- predelne stene.....3,50 kN/m2
- SKUPAJ z lastno težo.....11,00 kN/m2
- SKUPAJ brez lastne teže.....6,00 kN/m2

SPREMENLJIVI VPLIVI:
- koristna obtežba.....2,00 kN/m2

Nenavadna je privzeta teža konstrukcije, kjer projektant operira z debelino konstrukcije 20 cm, čeprav v nadaljevanju projekta prikazuje realno debelino plošče 12 cm. Verjetno gre za poenostavitev upoštevanja lastne teže konstrukcije, kjer v podani obtežbi upošteva tako lastno težo plošče in nosilcev.

VPLIVI NA STROPNE KONSTRUKCIJE - NOVO STANJE V OBMOČJU POSTAVITVE AVTOKLAVOV:

STALNI VPLIVI:
- finalni tlak 1 cm.....0,20 kN/m2
- estrih 6 cm.....1,45 kN/m2
- hidroizolacija.....0,05 kN/m2
- konstrukcija 12 cm.....3,00 kN/m2
- svinčena izolacija.....0,20 kN/m2
- tehnični strop.....0,60 kN/m2
- predelne stene.....3,50 kN/m2
- SKUPAJ z lastno težo.....9,00 kN/m2
- SKUPAJ brez lastne teže.....6,00 kN/m2

SPREMENLJIVI VPLIVI:
V območju postavitve avtoklavovo ni spremenljivih vplivov.

VPLIVI AVTOKLAVOV

Postavljena bosta dva avtoklava tik drug ob drugem. Teža vsakega od njiju je lahko največ 30 kN (odvisno od dobavitelja). Oba avtoklava skupaj pokrivata površino 4,40×1,70 m. Nadomestna enakomerna zvezna obtežba pod avtoklavoma tako znaša 2×30 / (4,40×1,70) = 8,00 kN/m2

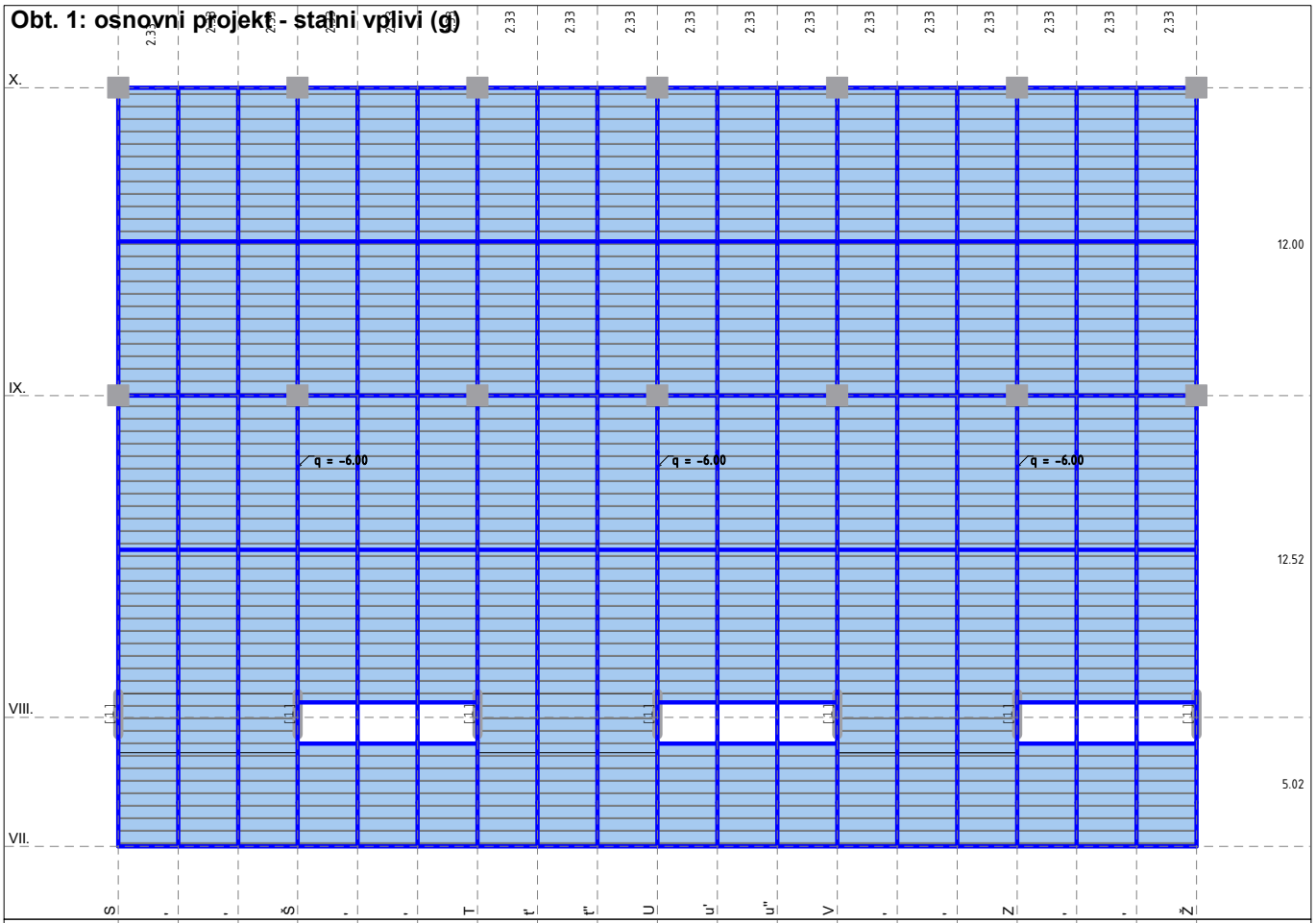
Skupni stalni vplivi pod avtoklavi tako znašajo 6,00 + 8,00 kN/m2 + lastna teža konstrukcije, ki jo program generira avtomatsko.

Lista obtežnih primerov

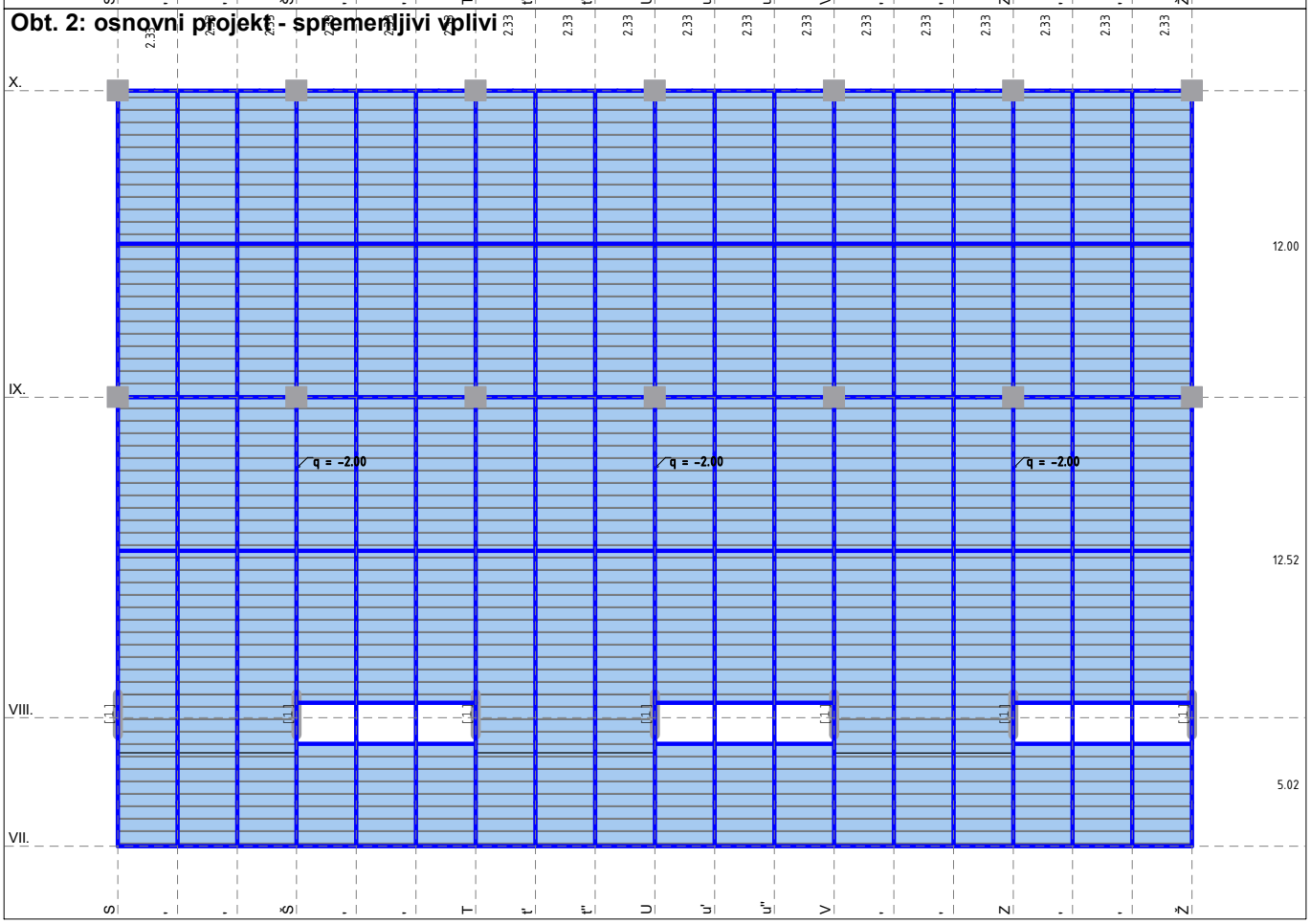
LC	Naziv
1	osnovni projekt - stalni vplivi (g)
2	osnovni projekt - spremenljivi vplivi
3	novo - stalni vplivi (g)
4	novo - spremenljivi vplivi

LC	Naziv
5	Komb.: MSN - osnovni projekt (1.35xI+1.5xII)
6	Komb.: MSU - osnovni projekt (I+II)
7	Komb.: MSN - novo (1.35xIII+1.5xIV)
8	Komb.: MSU - novo (III+IV)

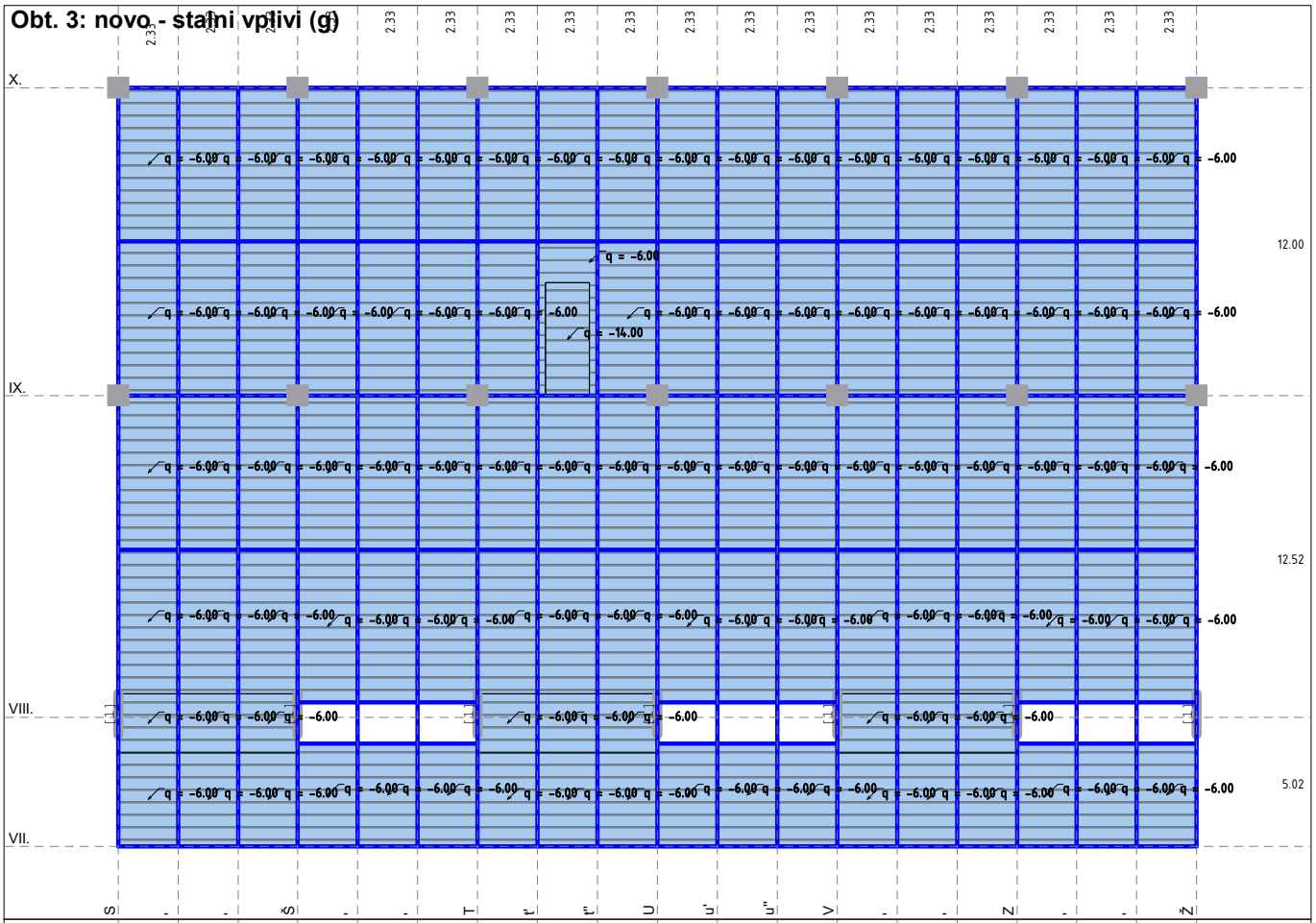
Obt. 1: osnovni projekt - stalni vplivi (g)



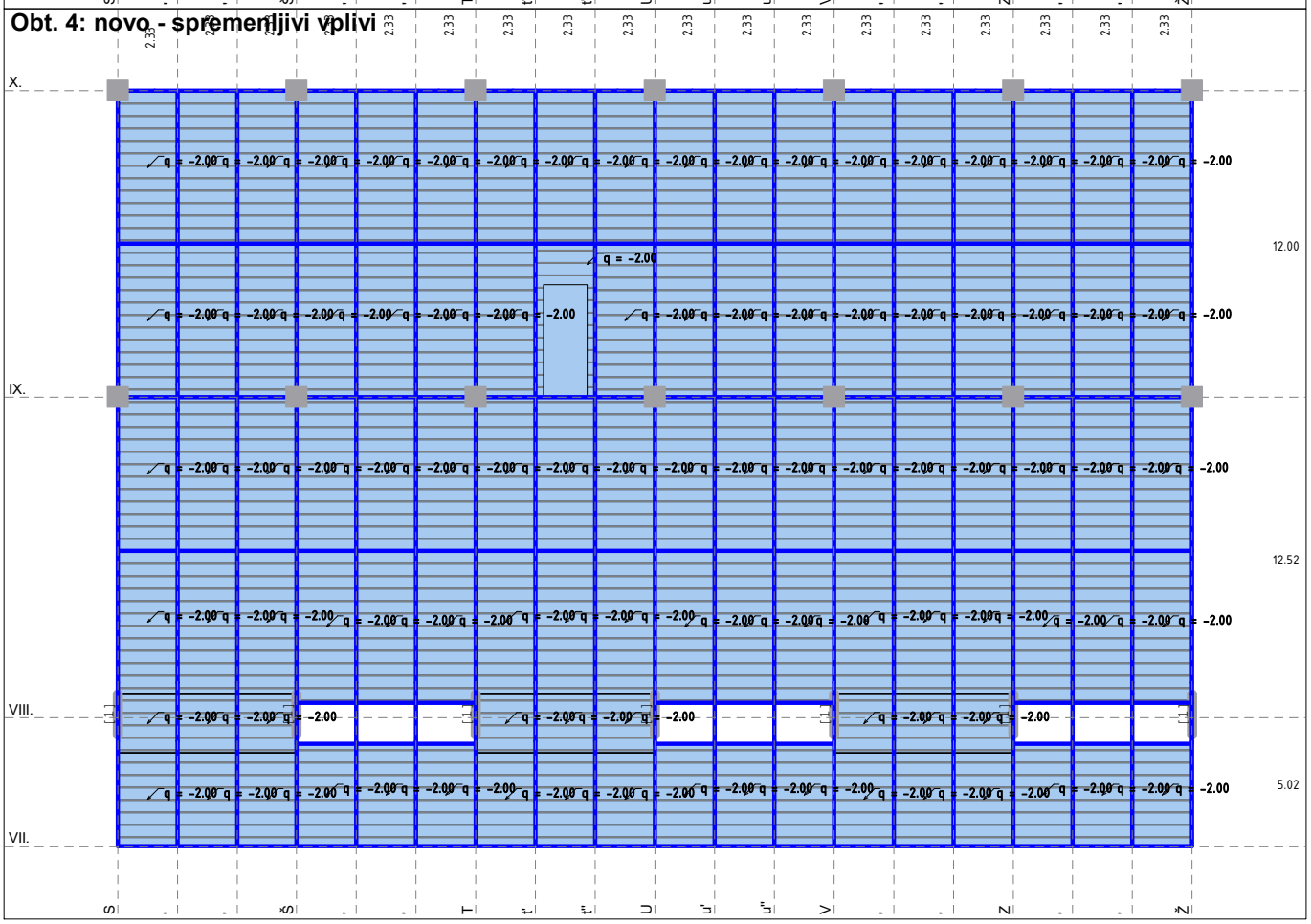
Obt. 2: osnovni projekt - spremenljivi vplivi



Obt. 3: novo - stalni vplivi (g)

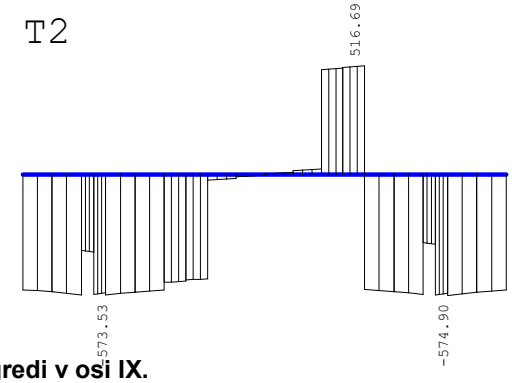


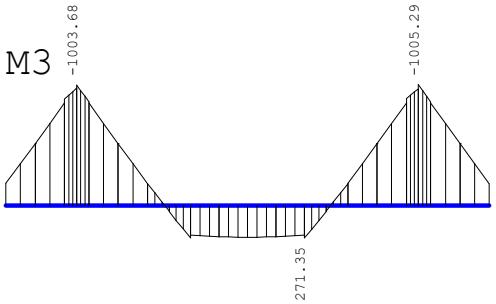
Obt. 4: novo - spremenljivi vplivi



Statični preračun

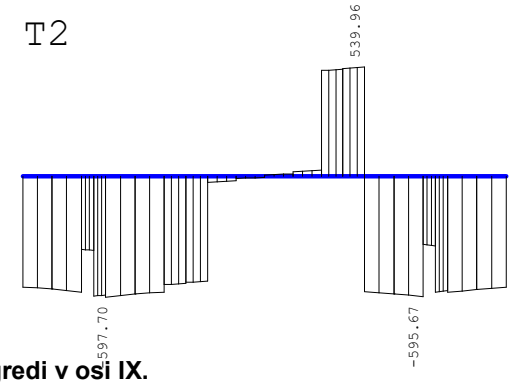
Obt. 5: MSN - osnovni projekt

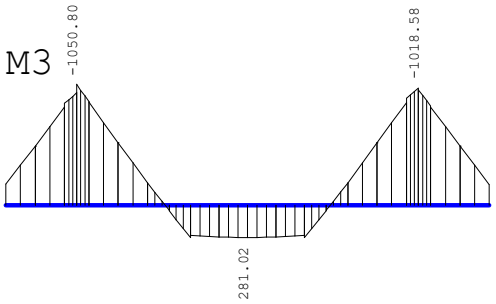




Vplivi v gredi v osi IX.
T2 [kN], M3 [kNm]

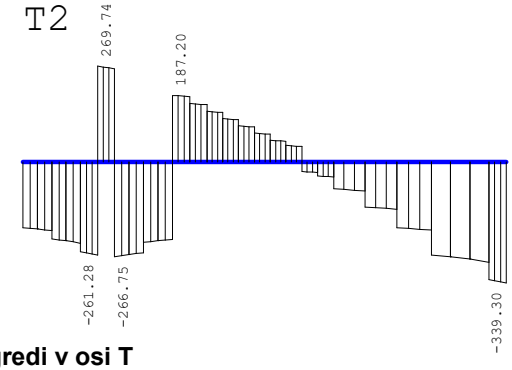
Obt. 7: MSN - novo

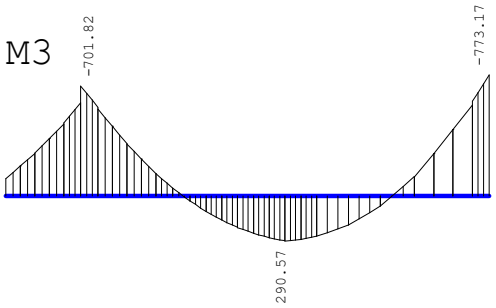




Vplivi v gredi v osi IX.
T2 [kN], M3 [kNm]

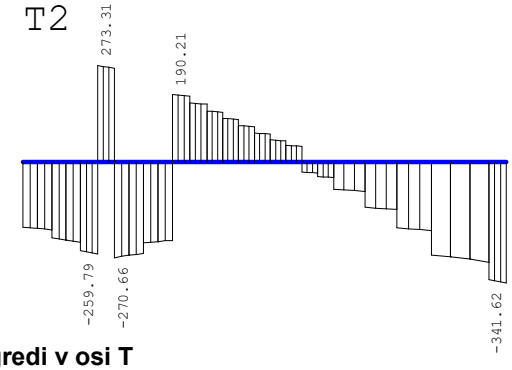
Obt. 5: MSN - osnovni projekt

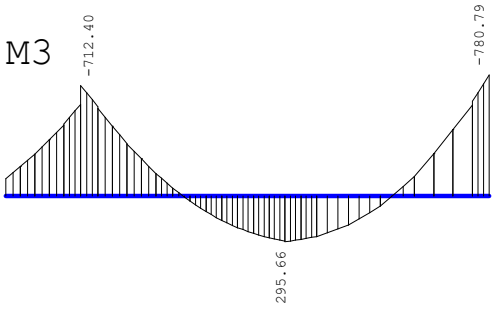




Vplivi v gredi v osi T
T2 [kN], M3 [kNm]

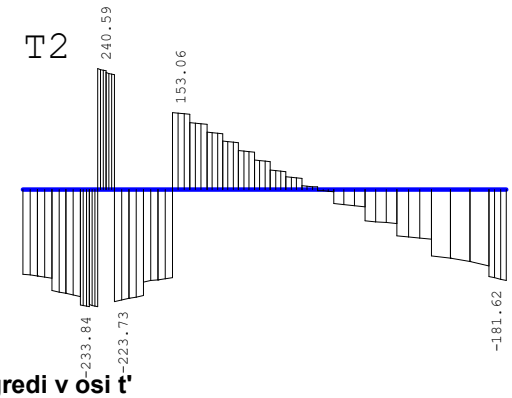
Obt. 7: MSN - novo

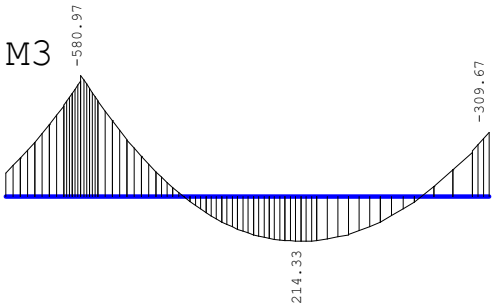




Vplivi v gredi v osi T
T2 [kN], M3 [kNm]

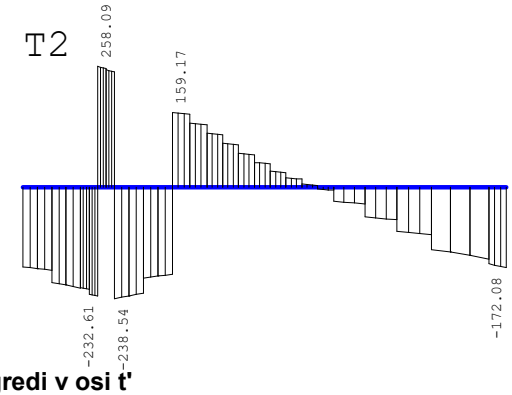
Obt. 5: MSN - osnovni projekt

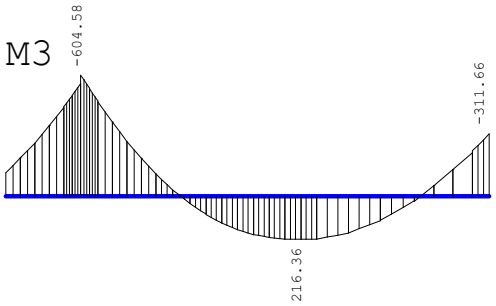




Vplivi v gredi v osi t'
T2 [kN], M3 [kNm]

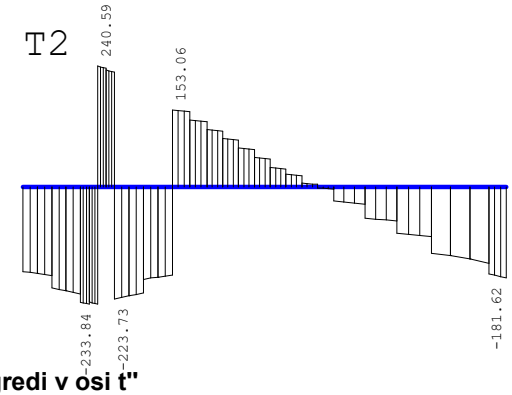
Obt. 7: MSN - novo

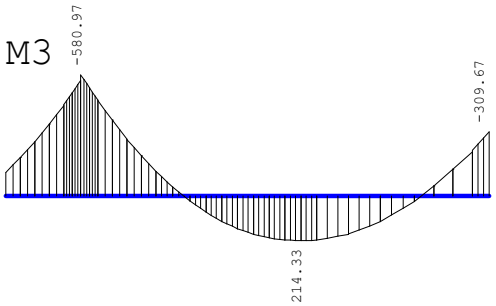




Vplivi v gredi v osi t'
T2 [kN], M3 [kNm]

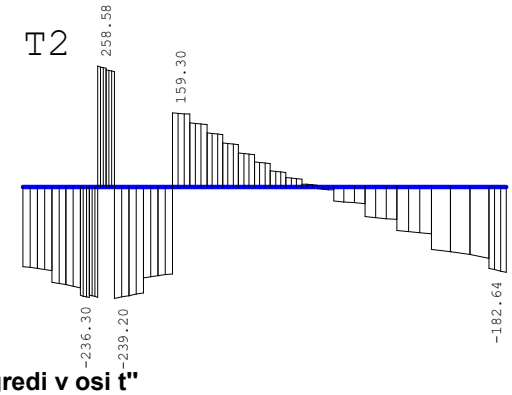
Obt. 5: MSN - osnovni projekt

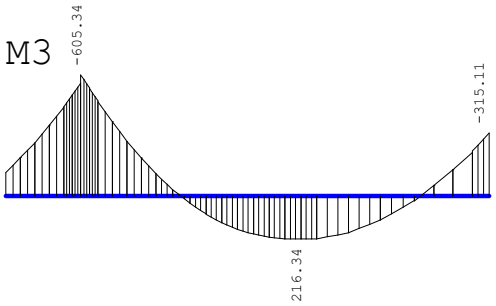




Vplivi v gredi v osi t''
T2 [kN], M3 [kNm]

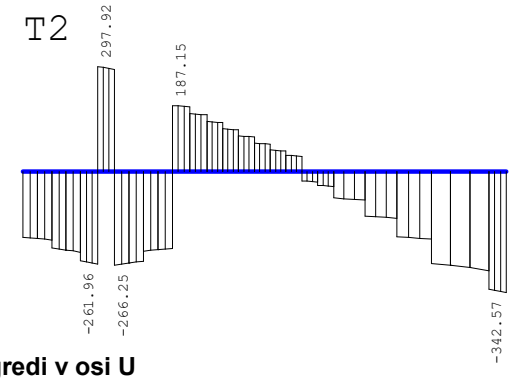
Obt. 7: MSN - novo

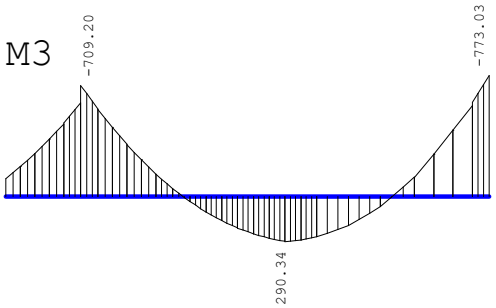




Vplivi v gredi v osi t''
T2 [kN], M3 [kNm]

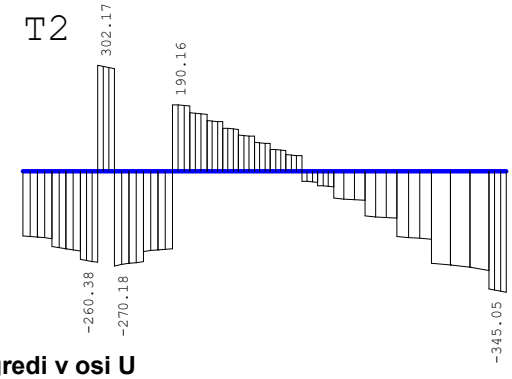
Obt. 5: MSN - osnovni projekt

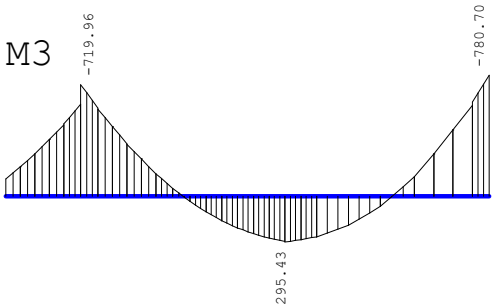




Vplivi v gredi v osi U
T2 [kN], M3 [kNm]

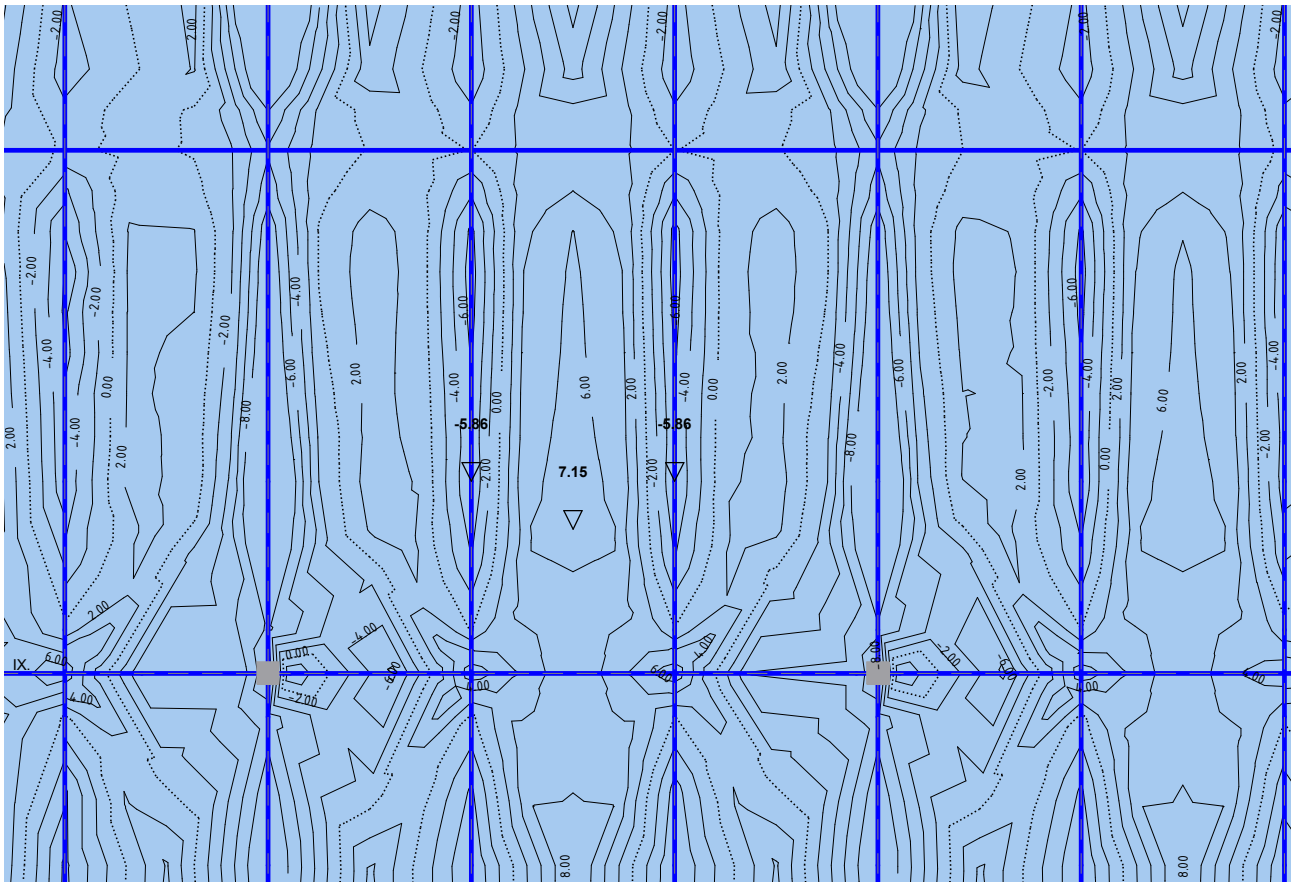
Obt. 7: MSN - novo





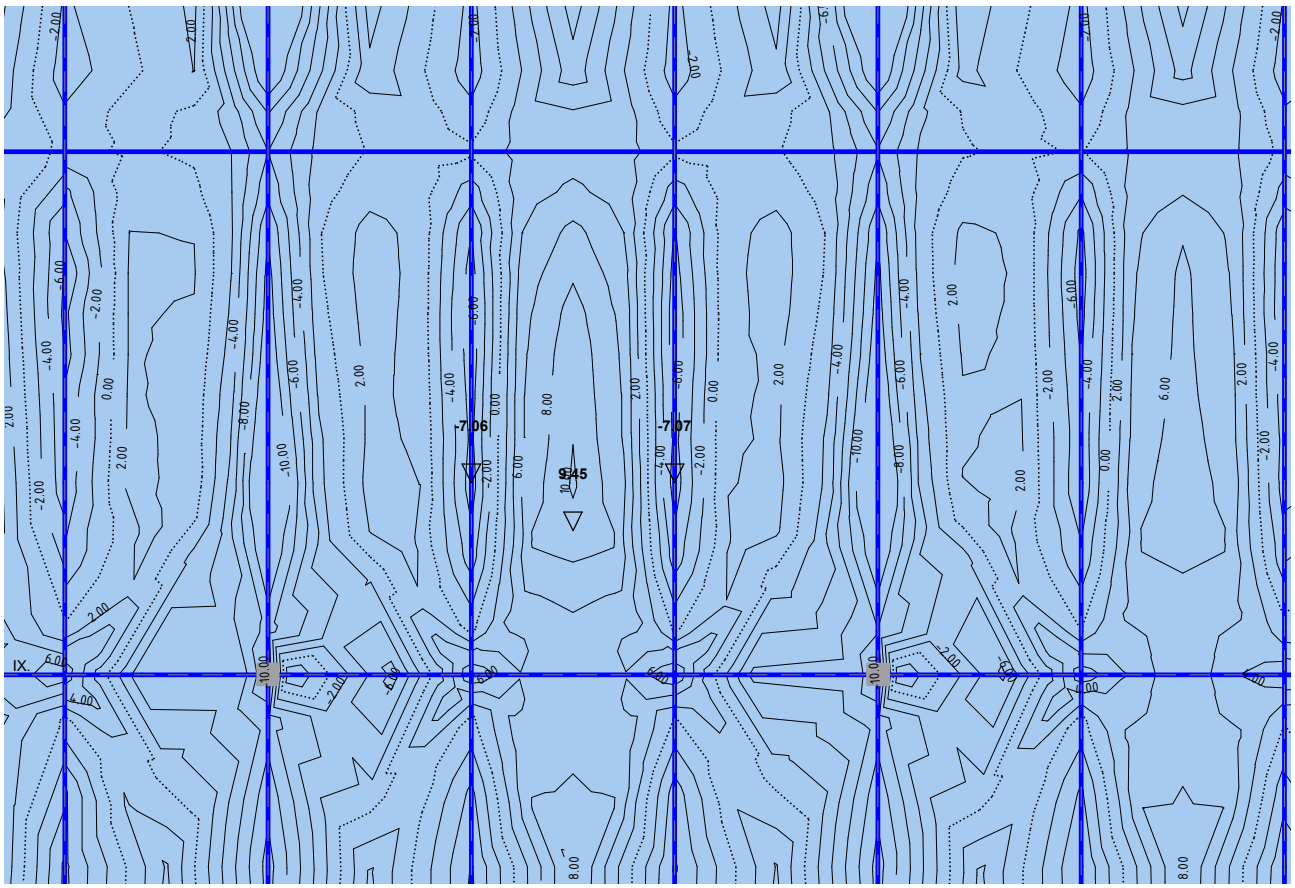
Vplivi v gredi v osi U
T2 [kN], M3 [kNm]

Obt. 5: MSN - osnovni projekt



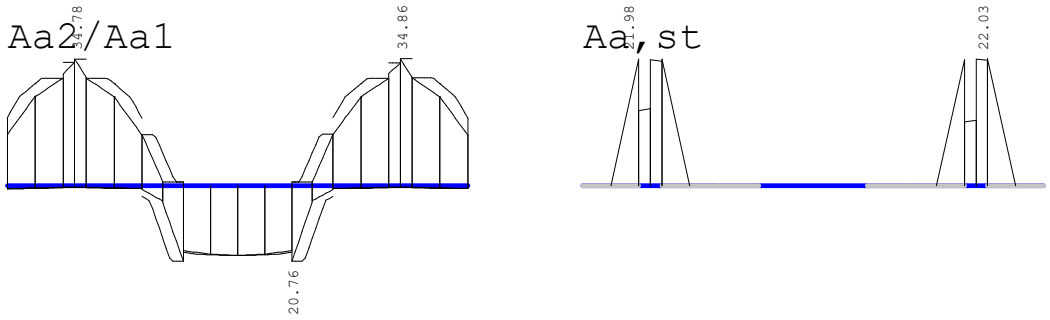
Vplivi v plošči: max Mx= 275.44 / min Mx= -435.73 kNm/m

Obt. 7: MSN - novo

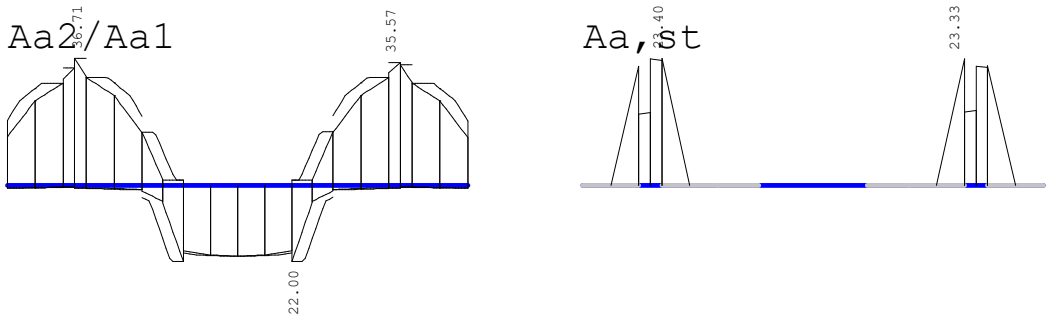


Vplivi v plošči: max Mx= 275.46 / min Mx= -435.76 kNm/m

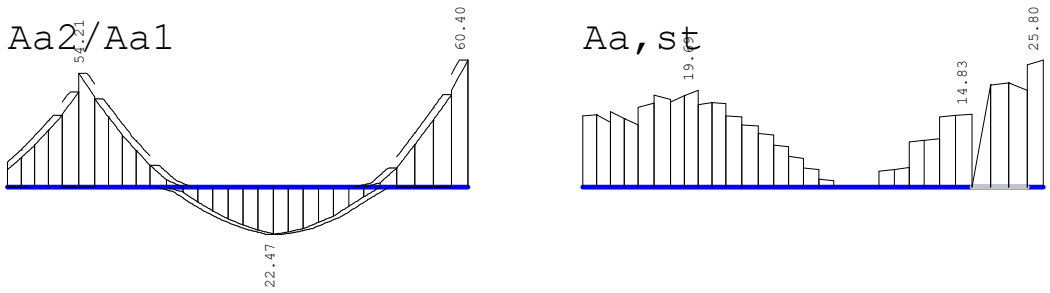
Dimenzioniranje (beton)



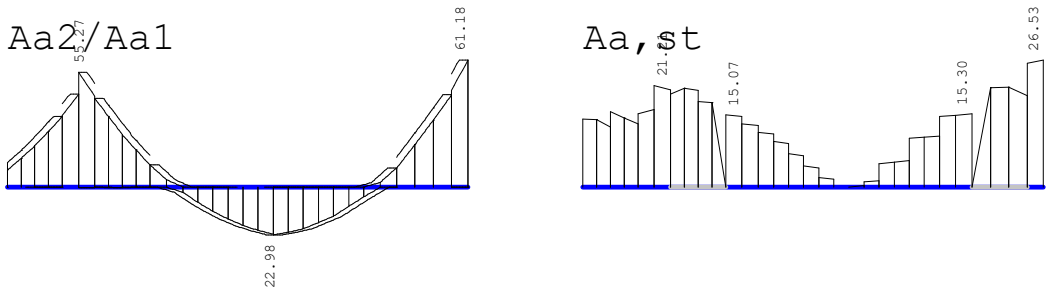
Armatura v gredi v osi IX.



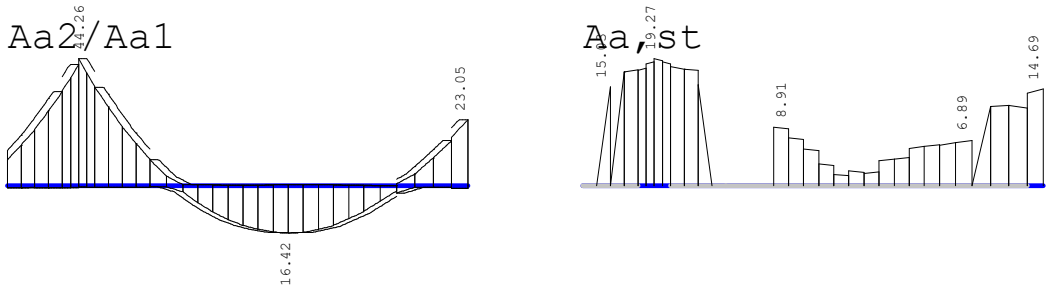
Armatura v gredi v osi IX.



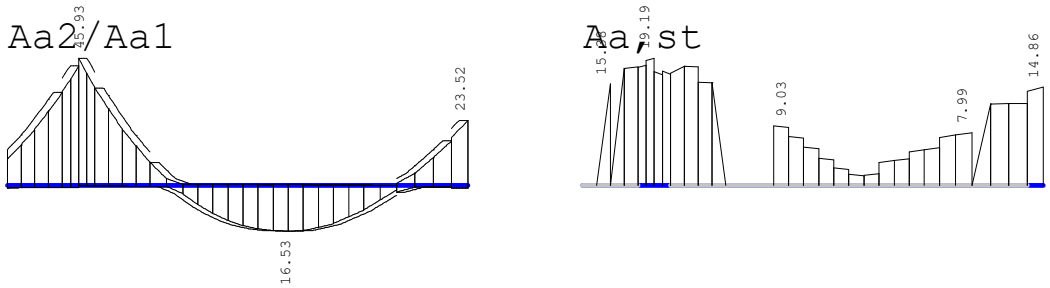
Armatura v gredi v osi T



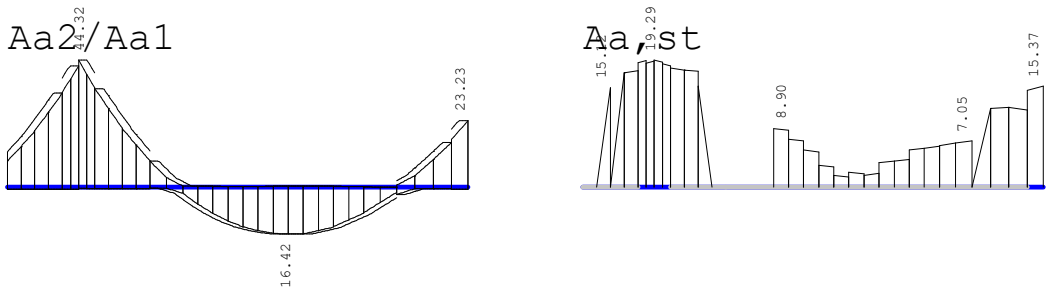
Armatura v gredi v osi T



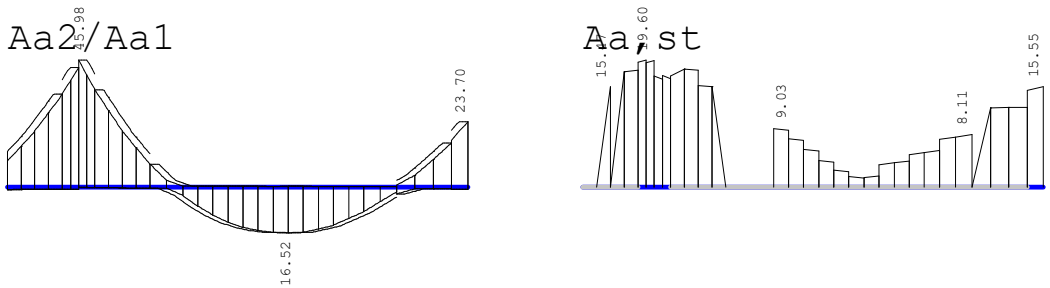
Armatura v gredi v osi t'



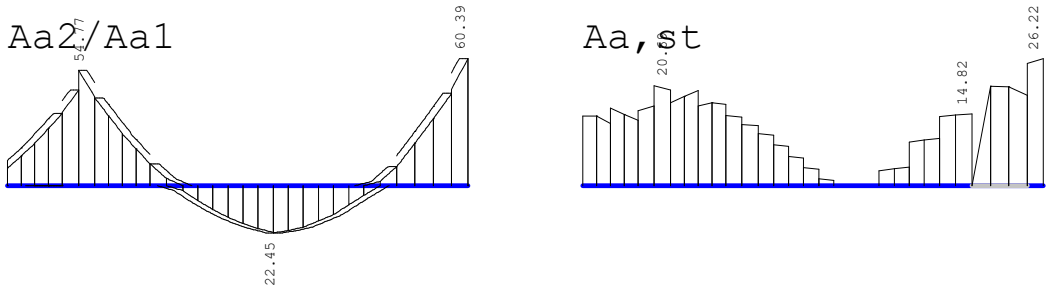
Armatura v gredi v osi t'



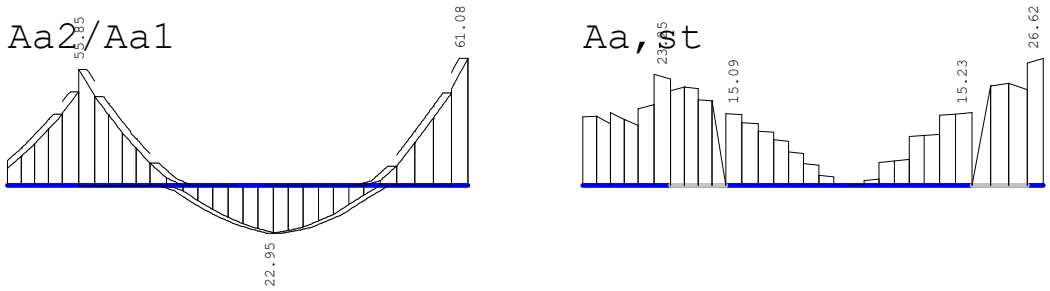
Armatura v gredi v osi t''



Armatura v gredi v osi t''

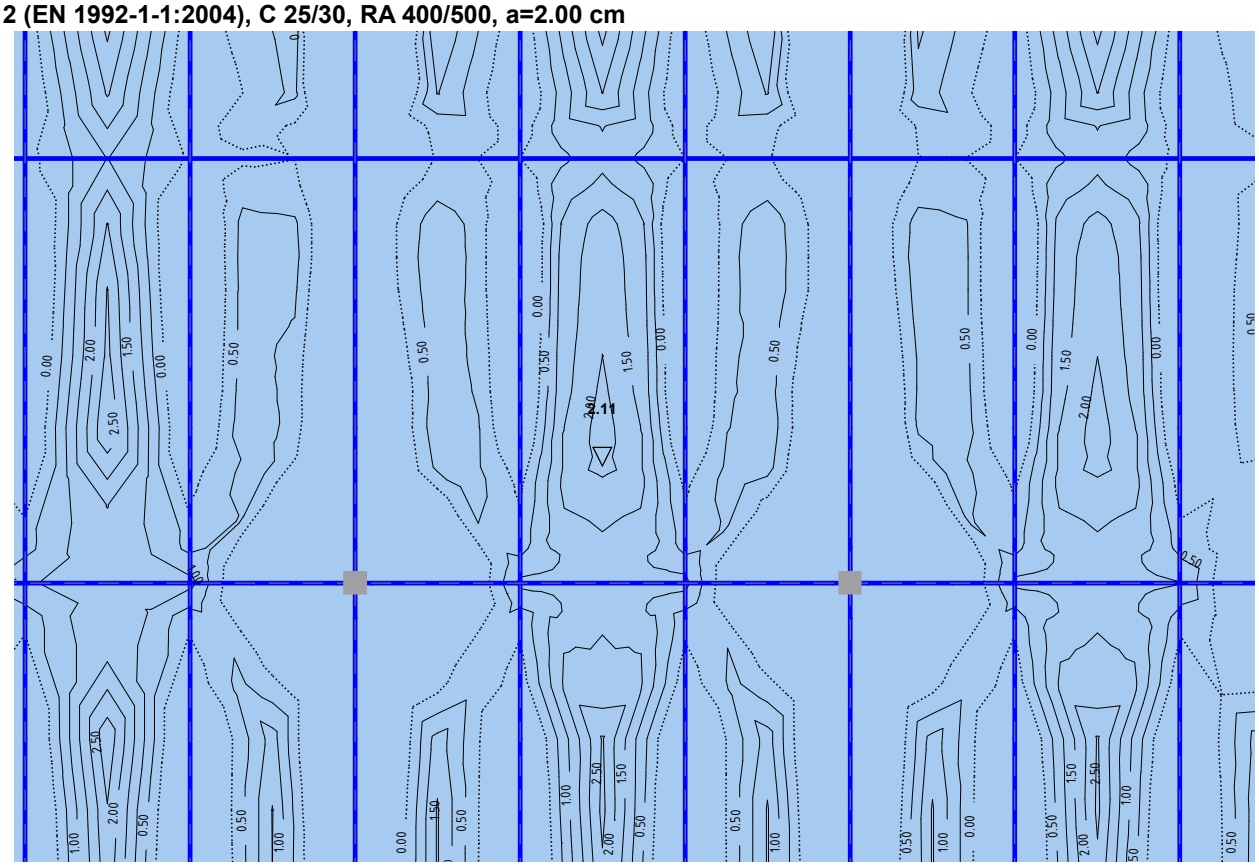


Armatura v gredi v osi U



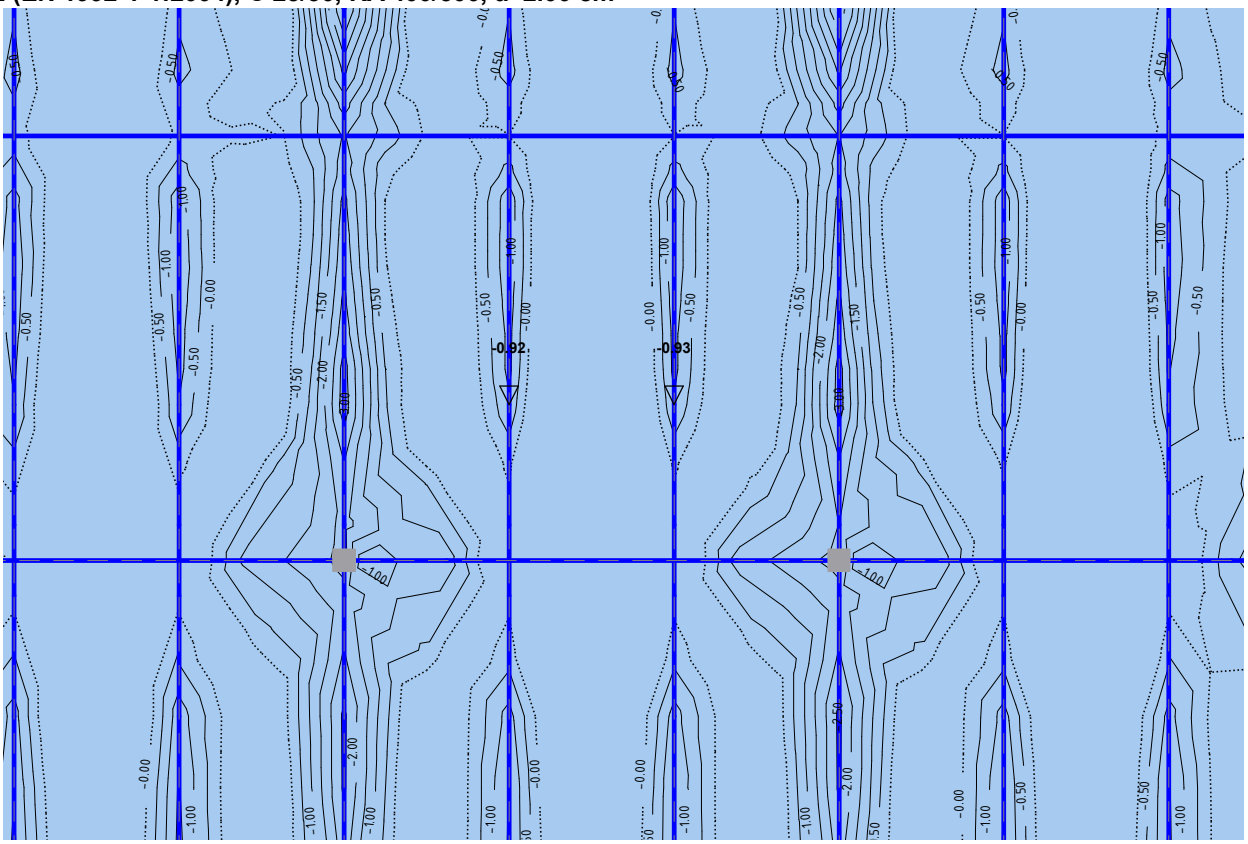
Armatura v gredi v osi U

Merodajna obtežba: 1.35xI+1.50xII
EC 2 (EN 1992-1-1:2004), C 25/30, RA 400/500, a=2.00 cm



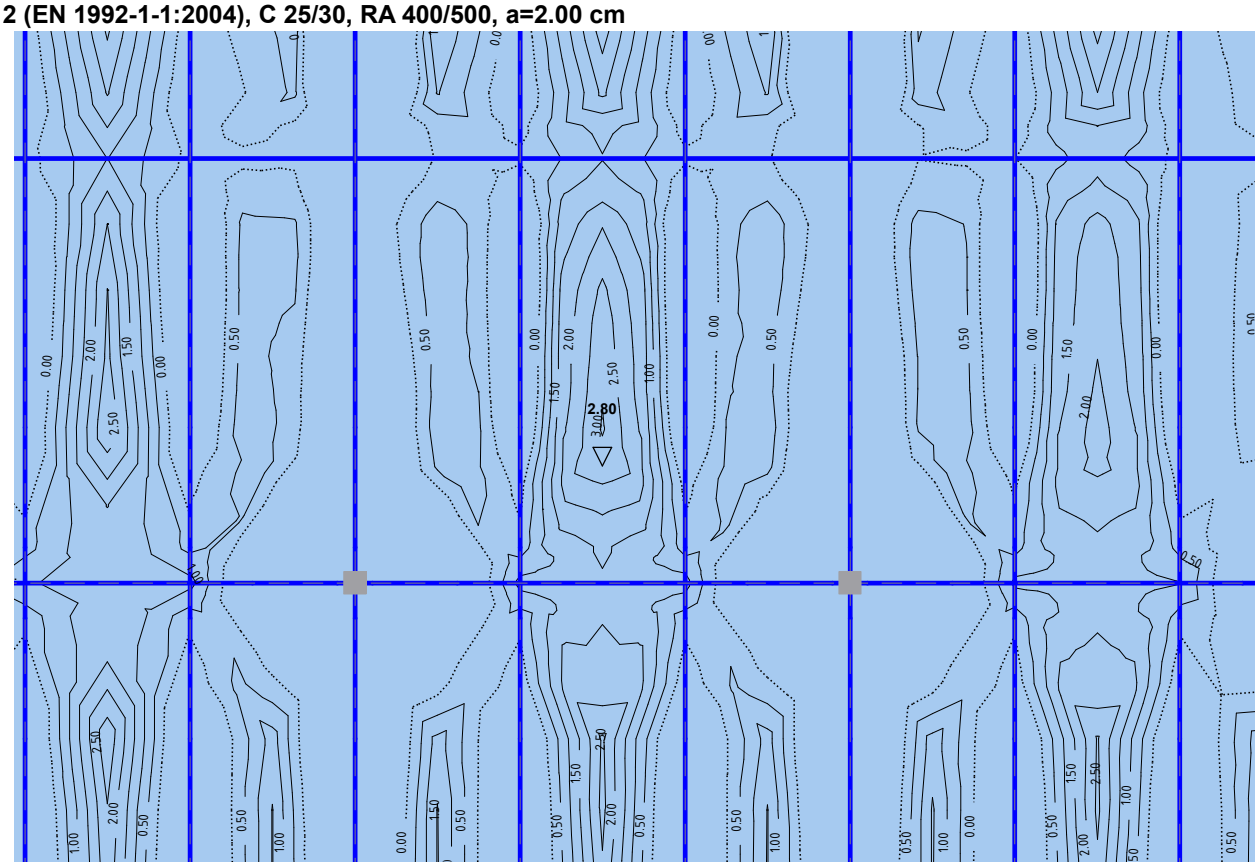
Aa - sp.cona - Smer 1 - max Aa1,s= 116.71 cm²/m

Merodajna obtežba: 1.35xI+1.50xII
EC 2 (EN 1992-1-1:2004), C 25/30, RA 400/500, a=2.00 cm



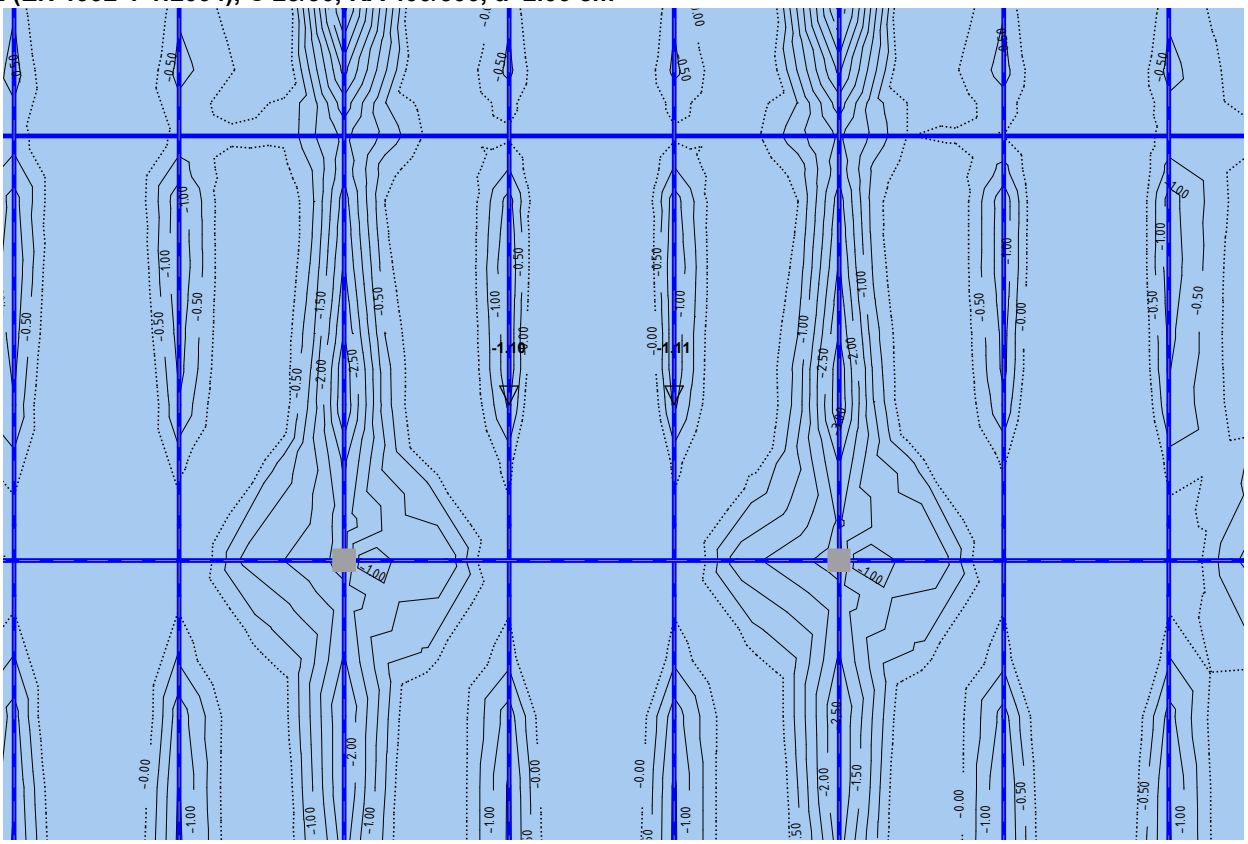
Aa - zg.cona - Smer 1 - max Aa1,z= -139.80 cm²/m

Merodajna obtežba: 1.35xIII+1.50xIV
EC 2 (EN 1992-1-1:2004), C 25/30, RA 400/500, a=2.00 cm



Aa - sp.cona - Smer 1 - max Aa1,s= 116.72 cm²/m

Merodajna obtežba: 1.35xIII+1.50xIV
EC 2 (EN 1992-1-1:2004), C 25/30, RA 400/500, a=2.00 cm



Aa - zg.cona - Smer 1 - max Aa1,z= -139.80 cm²/m

Zaključek

NOSILCI:
Notranje statične količine in armatura nosilcev se za stanje pred umestitvijo avtoklavov in po njej rezlikujejo minimalno in ne presegajo 5%. Odstopanja so v okviru sprejemljive inženirske prakse, pa tudi količina dejansko vgrajene armature je vedno nekaj večja od izračunane. Za nosilce lahko smatramo, da so sposobni prevzeti obtežbo avtklavov.

PLOŠČA:
Notranje statične količine in izračunana armatura v območju pod novimi avtoklavi je bistveno večjo po vgradnji avtoklavov, kot pred njo. Notranje statične količine in računska armatura se po vgradnji avtokalvov poveča za 20% do 33%.
Ploščo se ojača z dodatnimi jeklenimi nosilci med AB nosilci pod ploščo.

UROŠ ŽVAN s.p., ZRKOVSKA 75, 2000 MARIBOR

NOVI JEKLENI NOSILCI

Vhodni podatki - Konstrukcija, Vhodni podatki - Obtežba

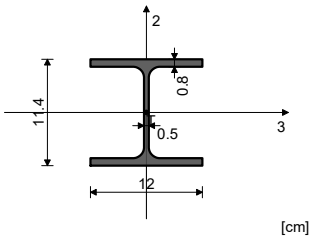
Tabele materialov

No	Naziv materiala	E[kN/m2]	μ	γ[kN/m3]	αt[1/C]	Em[kN/m2]	μm
1	Jeklo S 235	2.100e+8	0.30	78.50	1.000e-5	2.100e+8	0.30

Seti gred

Set: 1 Prerez: HEA 120, Fiktivna ekscentričnost

Mat.	A1	A2	A3	I1	I2	I3
1 - Jeklo S 235	2.530e-3	8.420e-4	1.688e-3	6.020e-8	2.310e-6	6.060e-6

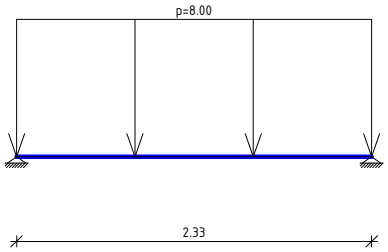


Seti točkovnih podpor

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

Novi dodatni nosilci morajo prevzeti dodatno stalno obtežbo avtoklavov, ki znaša 8 kN/m2. Pri izračunu upoštevam razdaljo 1,00 m med novimi dodatnimi nosilci. Tako nosilce dimenzioniram na stalno enakomerno zvezno obtežbo 8,00 kN/m'.

Obt. 1:



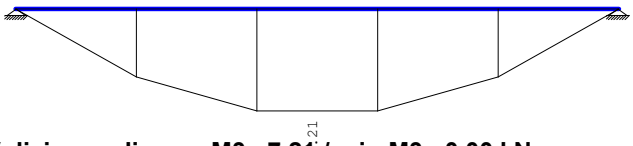
Lista obtežnih primerov

LC	Naziv
1	dodatna stalna obtežba (g)
2	Komb.: MSN (1.35xI)

LC	Naziv
3	Komb.: MSU (I)

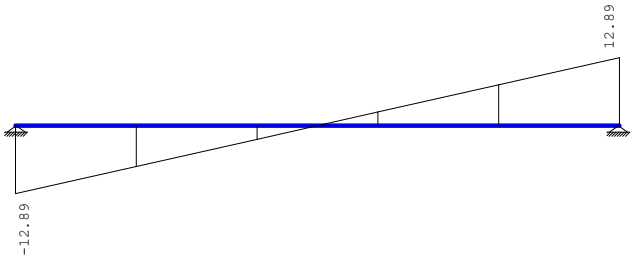
Statični preračun

Obt. 2: MSN



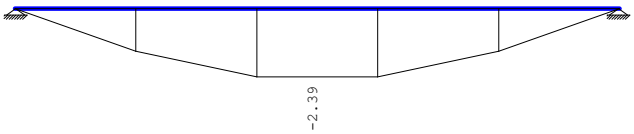
Vplivi v gredi: max M3= 7.21 / min M3= 0.00 kNm

Obt. 2: MSN



Vplivi v gredi: max T2= 12.89 / min T2= -12.89 kN

Obt. 3: MSU



Vplivi v gredi: max u2= -0.00 / min u2= -2.39 m / 1000

Obt. 1: dodatna stalna obtežba (g)

Reakcije podpor

Obt. 2: MSN

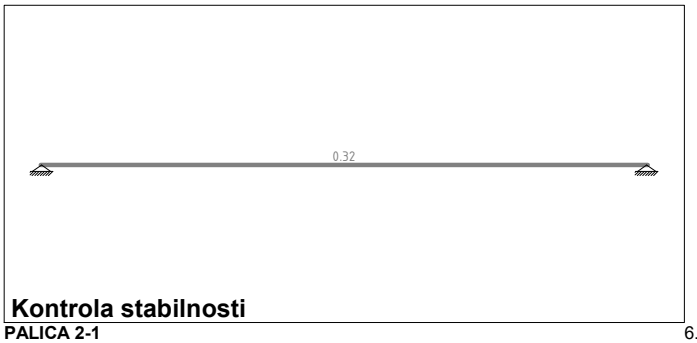
Reakcije podpor

Dimenzioniranje (jeklo)

Merodajna obtežba - EUROCODE 3 (EN 1993-1-1:2005)

No	Obtežni primeri
1	dodatna stalna obtežba (g)

No	Kombinacije obtežb	
2	MSN (1.35xI)	+

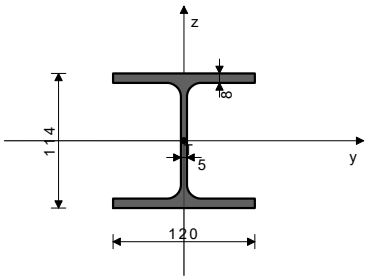


Kontrola stabilnosti

PALICA 2-1

PREČNI PREREZ: HEA 120 [S 235] [Set: 1]
EUROCODE 3 (EN 1993-1-1:2005)

GEOMETRIJSKE KARAKTERISTIKE prereza



[mm]

Ax =	25.300	cm2
Ay =	16.880	cm2
Az =	8.420	cm2
Ix =	6.020	cm4
Iy =	606.00	cm4
Iz =	231.00	cm4
Wy =	106.32	cm3
Wz =	38.500	cm3
Wy,pl =	116.40	cm3
Wz,pl =	57.600	cm3
γM0 =	1.000	
γM1 =	1.000	
γM2 =	1.250	
Anet/A =	0.900	

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

FAKTORJI IZKORIŠČENOSTI PO KOMBINACIJAH OBTEŽB
2. γ=0.32

PALICA IZPOSTAVLJENA UPOGIBU
(obtežni primer 2, na 97.1 cm od začetka palice)

Prečna sila v z smeri	$V_{Ed,z}$ =	-2.149 kN
Upogibni moment okoli y osi	$M_{Ed,y}$ =	7.211 kNm
Sistemska dolžina palice	L =	233.00 cm

5.5 KLASIFIKACIJA PREČNIH PREREZOV
Razred prereza 1

6.2 NOSILNOST PREČNIH PREREZOV
6.2.5 Upogib y-y
Upoštevajo se tudi luknje za vezna sredstva.

Efektivni odpornostni moment	Wy,eff =	94.469 cm3
Računska nosilnost na upogib	$M_{c,Rd}$ =	22.200 kNm

Pogoj 6.12: $M_{Ed,y}$ <= $M_{c,Rd,y}$ (7.21 <= 22.20)

6.2.6 Strig

Računska strižna nosilnost	$V_{pl,Rd,z}$ =	66.482 kN
Računska strižna nosilnost	$V_{c,Rd,z}$ =	66.482 kN

Pogoj 6.17: $V_{Ed,z}$ <= $V_{c,Rd,z}$ (2.15 <= 66.48)

6.2.8 Upogib in strig
Ni potrebno zmanjšanje upogibne nosilnosti
Pogoj: $V_{Ed,z}$ <= 50%$V_{pl,Rd,z}$

6.3 NOSILNOST ELEMENTA NA UKLON
6.3.2.1 Nosilnost na bočno-torzijski uklon

Koeficient	C1 =	1.132
Koeficient	C2 =	0.459
Koeficient	C3 =	0.525
Koef.ukl.dolžine za uklon	k =	1.000
Koef.ukl.dolžine za vbočenje	kw =	1.000
Koordinata	zg =	5.700 cm
Koordinata	zj =	0.000 cm
Razmak med bočnimi podporami	L =	233.00 cm
Sektorski vztrajnostni moment	Iw =	6471.9 cm6
Krit.moment bočne zvrnitve	Mcr =	68.587 kNm
Ustrezni odpornostni moment	W_y =	116.40 cm3
Koeficient imperf.	αLT =	0.210
Brezdimenz.vitkost	λLT_ =	0.632
Koeficient zmanjšanja	χLT =	0.878
Računska uklonska nosilnost	$M_{b,Rd}$ =	24.007 kNm

Pogoj 6.54: $M_{Ed,y}$ <= $M_{b,Rd}$ (7.21 <= 24.01)

KONTROLA STRIŽNE NOSILNOSTI
(obtežni primer 2, na 19.4 cm od začetka palice)

Prečna sila v z smeri	$V_{Ed,z}$ =	-10.745 kN
Upogibni moment okoli y osi	$M_{Ed,y}$ =	2.003 kNm
Sistemska dolžina palice	L =	233.00 cm

6.2 NOSILNOST PREČNIH PREREZOV
6.2.6 Strig

Računska strižna nosilnost	$V_{pl,Rd,z}$ =	66.482 kN
Računska strižna nosilnost	$V_{c,Rd,z}$ =	66.482 kN

Pogoj 6.17: $V_{Ed,z}$ <= $V_{c,Rd,z}$ (10.75 <= 66.48)

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Phone I Fax:	|	Date:	12.10.2018
E-Mail:	info@armatura-uz.si		

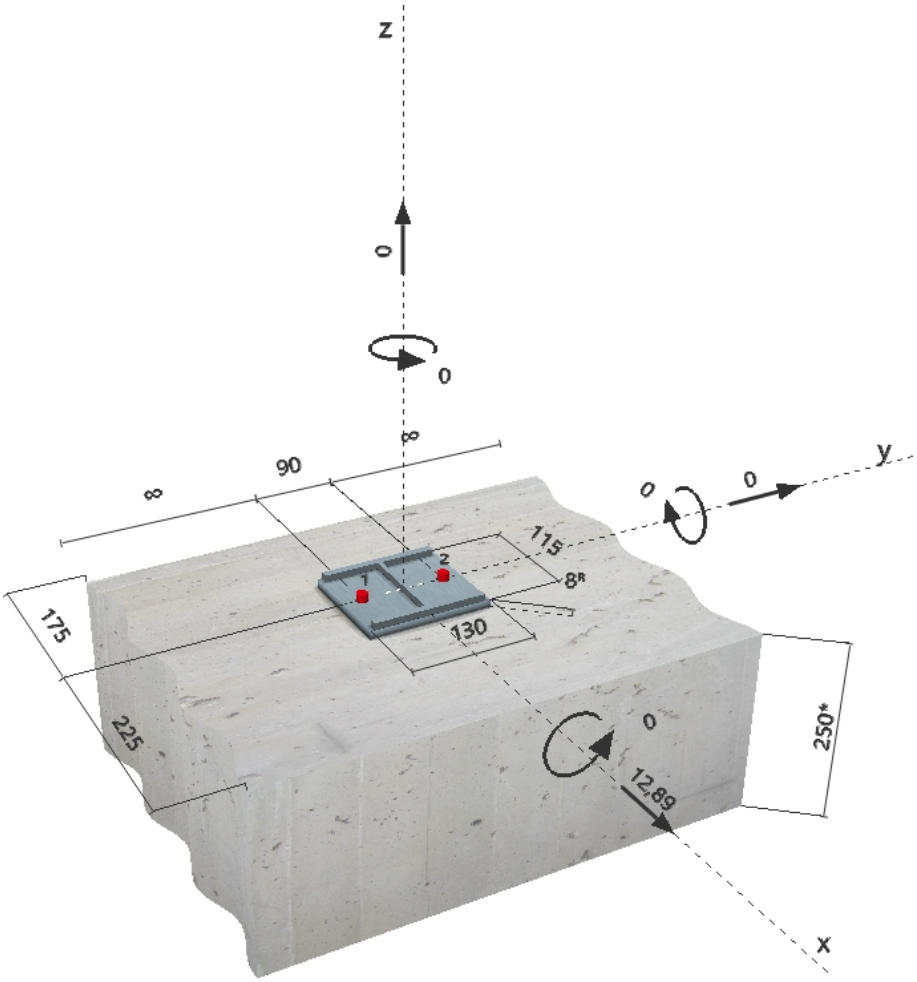
Specifier's comments:

1 Input data

Anchor type and size:	**HIT-HY 200-A + HIT-V (5.8) M12**
Effective embedment depth:	$h_{ef,opti}$ = 70 mm ($h_{ef,limit}$ = 220 mm)
Material:	5.8
Approval No.:	ETA 11/0493
Issued I Valid:	28.7.2017 | -
Proof:	Design method ETAG BOND (EOTA TR 029)
Stand-off installation:	e_b = 0 mm (no stand-off); t = 8 mm
Baseplate:	S 235; E = 210.000,00 N/mm^2; f_{yk} = 235,00 N/mm^2; γ_{Ms} = 1,100
	l_x x l_y x t = 115 mm x 130 mm x 8 mm; (Recommended plate thickness: calculated (3 mm))
Profile:	IPBi/HEA; (L x W x T x FT) = 114 mm x 120 mm x 5 mm x 8 mm
Base material:	uncracked concrete, C25/30, $f_{c,cube}$ = 30,00 N/mm^2; h = 250 mm, Temp. short/long: 40/24 °C
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	No reinforcement or Reinforcement spacing >= 150 mm (any Ø) or >= 100 mm (Ø <= 10 mm)
	no longitudinal edge reinforcement

[R] - user is responsible to ensure a rigid base plate for the entered thickness with appropriate solutions (stiffeners,...)

Geometry [mm] & Loading [kN, kNm]



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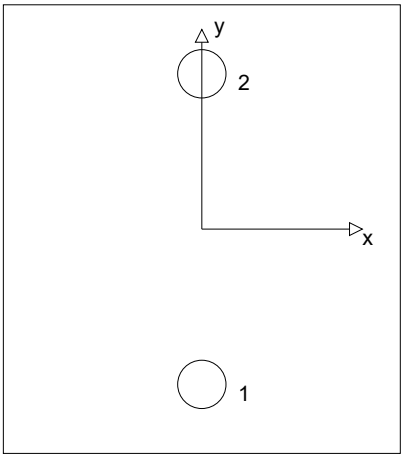
2 Load case/Resulting anchor forces

Load case: Design loads



Anchor reactions [kN]
Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	0,000	6,445	6,445	0,000
2	0,000	6,445	6,445	0,000

max. concrete compressive strain:	- [‰]
max. concrete compressive stress:	- [N/mm^2]
resulting tension force in (x/y)=(0/0):	0,000 [kN]
resulting compression force in (x/y)=(0/0):	0,000 [kN]

Anchor forces based on a rigid base plate assumption!

3 Tension load (EOTA TR 029, Section 5.2.2)

	Load [kN]	Capacity [kN]	Utilisation β_N [%]	Status
Steel failure*	N/A	N/A	N/A	N/A
Combined pullout-concrete cone failure**	N/A	N/A	N/A	N/A
Concrete cone failure**	N/A	N/A	N/A	N/A
Splitting failure**	N/A	N/A	N/A	N/A

* most unfavourable anchor **anchor group (anchors in tension)

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E-Mail:	info@armatura-uz.si		

4 Shear load (EOTA TR 029, Section 5.2.3)

	Load [kN]	Capacity [kN]	Utilisation β_V [%]	Status
Steel failure (without lever arm)*	6,445	16,800	39	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout failure**	12,890	61,712	21	OK
Concrete edge failure in direction x+**	12,890	41,976	31	OK

* most unfavourable anchor **anchor group (relevant anchors)

4.1 Steel failure (without lever arm)

$V_{Rk,s}$ [kN]	$\gamma_{M,s}$	$V_{Rd,s}$ [kN]	V_{Sd} [kN]
21,000	1,250	16,800	6,445

4.2 Pryout failure (concrete cone relevant)

$A_{c,N}$ [mm^2]	$A^0_{c,N}$ [mm^2]	$c_{cr,N}$ [mm]	$s_{cr,N}$ [mm]	k-factor	k_1
63.000	44.100	105	210	2,000	10,100

$e_{c1,V}$ [mm]	$\psi_{ec1,N}$	$e_{c2,V}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$
0	1,000	0	1,000	1,000	1,000

$N^0_{Rk,c}$ [kN]	$\gamma_{M,c,p}$	$V_{Rd,cp}$ [kN]	V_{Sd} [kN]
32,399	1,500	61,712	12,890

4.3 Concrete edge failure in direction x+

h_{ef} [mm]	d_{nom} [mm]	k_1	α	β
70	12,0	2,400	0,056	0,056

c_1 [mm]	$A_{c,V}$ [mm^2]	$A^0_{c,V}$ [mm^2]
225	191.250	227.813

$\psi_{s,V}$	$\psi_{h,V}$	$\psi_{\alpha,V}$	$e_{c,V}$ [mm]	$\psi_{ec,V}$	$\psi_{re,V}$
1,000	1,162	1,000	0	1,000	1,000

$V^0_{Rk,c}$ [kN]	$\gamma_{M,c}$	$V_{Rd,c}$ [kN]	V_{Sd} [kN]
64,551	1,500	41,976	12,890

5 Displacements (highest loaded anchor)

Short term loading:

N_{Sk} = 0,000 [kN] δ_N = 0,000 [mm]

V_{Sk} = 4,774 [kN] δ_V = 0,239 [mm]

δ_{NV} = 0,239 [mm]

Long term loading:

N_{Sk} = 0,000 [kN] δ_N = 0,000 [mm]

V_{Sk} = 4,774 [kN] δ_V = 0,382 [mm]

δ_{NV} = 0,382 [mm]

Comments: Tension displacements are valid with half of the required installation torque moment for uncracked concrete! Shear displacements are valid without friction between the concrete and the baseplate! The gap due to the drilled hole and clearance hole tolerances are not included in this calculation!

The acceptable anchor displacements depend on the fastened construction and must be defined by the designer!

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6 Warnings

- The anchor design methods in PROFIS Anchor require rigid anchor plates per current regulations (ETAG 001/Annex C, EOTA TR029, etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Anchor calculates the minimum required anchor plate thickness with FEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid base plate assumption is valid is not carried out by PROFIS Anchor. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Checking the transfer of loads into the base material is required in accordance with EOTA TR 029, Section 7!
- The design is only valid if the clearance hole in the fixture is not larger than the value given in Table 4.1 of EOTA TR029! For larger diameters of the clearance hole see Chapter 1.1. of EOTA TR029!
- The accessory list in this report is for the information of the user only. In any case, the instructions for use provided with the product have to be followed to ensure a proper installation.
- Drilled hole cleaning must be performed according to instructions for use (blow twice with oil-free compressed air (min. 6 bar), brush twice, blow twice with oil-free compressed air (min. 6 bar)).
- Characteristic bond resistances depend on short- and long-term temperatures.
- Please contact Hilti to check feasibility of HIT-V rod supply.
- Edge reinforcement is not required to avoid splitting failure

Fastening meets the design criteria!

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E-Mail:	info@armatura-uz.si		

7 Installation data

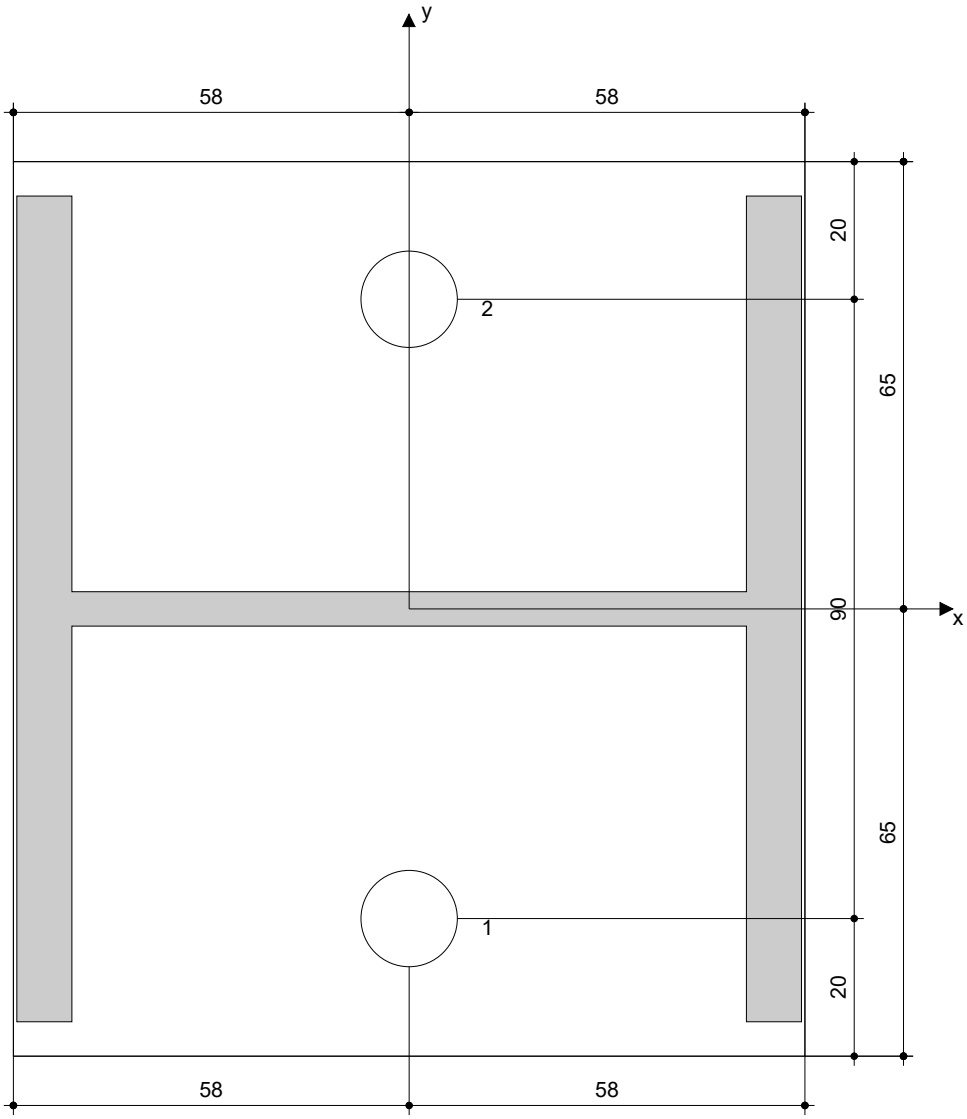
Baseplate, steel: S 235; E = 210.000,00 N/mm^2; f_{yk} = 235,00 N/mm^2
Profile: IPBi/HEA; 114 x 120 x 5 x 8 mm
Hole diameter in the fixture: d_f = 14 mm
Plate thickness (input): 8 mm
Recommended plate thickness: calculated (3 mm)
Drilling method: Hammer drilled
Cleaning: Compressed air cleaning of the drilled hole according to instructions for use is required

Anchor type and size: HIT-HY 200-A + HIT-V (5.8) M12
Installation torque: 0,040 kNm
Hole diameter in the base material: 14 mm
Hole depth in the base material: 70 mm
Minimum thickness of the base material: 100 mm

[R] - user is responsible to ensure a rigid base plate for the entered thickness with appropriate solutions (stiffeners,...)

7.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Compressed air with required accessories to blow from the bottom of the hole • Proper diameter wire brush	• Dispenser including cassette and mixer • Torque wrench



Coordinates Anchor [mm]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	0	-45	175	225	-	-
2	0	45	175	225	-	-

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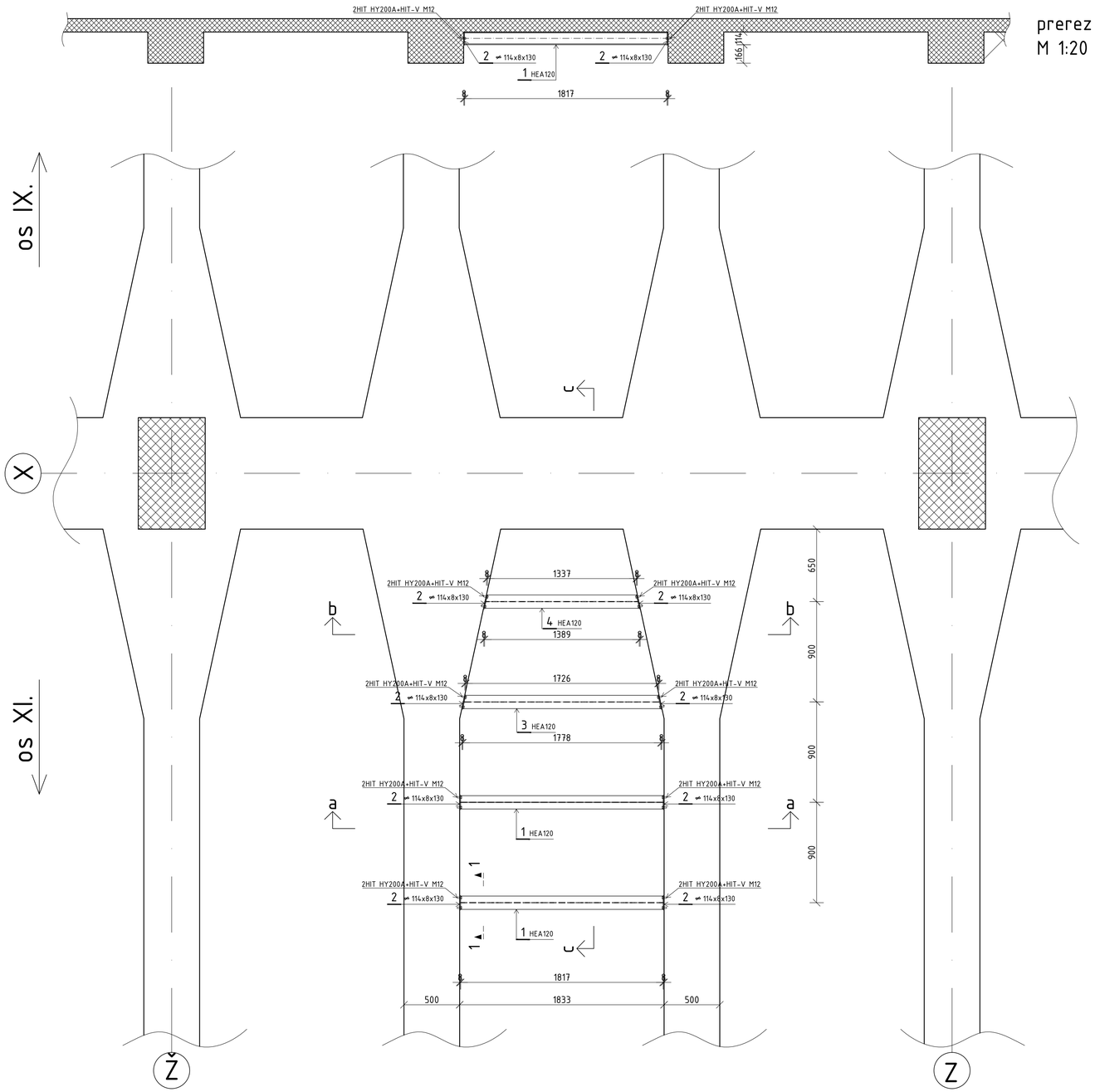
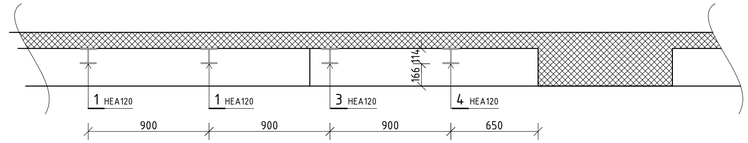
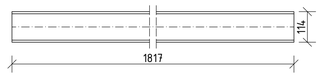


prerez a-a
M 1:20

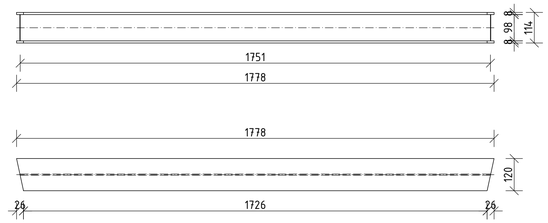


prerez c-c
M 1:20

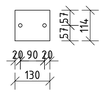
POZ 1, HEA120, l=1817 mm, 2 kom.



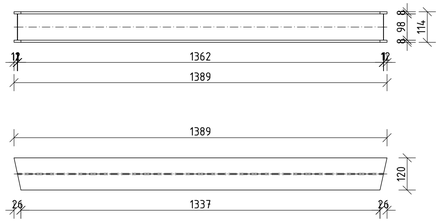
POZ 3, HEA120, l=1778 mm, 1 kom.



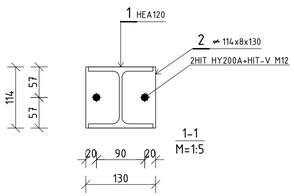
POZ 2 (130x114, d=8) , 8 kom.

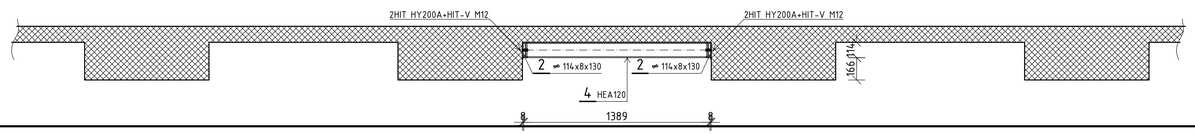


POZ 4, HEA120, l=1389 mm, 1 kom.



Palice in pločevine - specifikacija									
POZ	Tip	Material	n [kos]	Širina [mm]	Debelina [mm]	Dolžina [mm]	Enotna teža [kg/m]	Teža na kos. [kg]	Skupna teža [kg]
ojačitev (1 kos)									
1	HEA120	S235JR	2			1817.33	19.89	36.14	72.29
2	⌀ 114x8x130	S235JR	8	114.00	8.00	130.00	64.00	0.95	7.59
3	HEA120	S235JR	1			1778.05	19.89	35.36	35.36
4	HEA120	S235JR	1			1388.94	19.89	27.62	27.62
Skupaj									142.86
Zbirni izvleček									
Sklop						Skupna teža [kg]			
ojačitev (1 kos)									142.86
Skupaj									142.86
Skupaj (+ za spojna sredstva 3%)									147.15





prerez b-b
M 1:20

S 235 JR
EXC 2

opombe
- vse mere preveriti na licu mesta
- prostor med nosilcem in AB ploščo zakliniti z jeklenimi klini in zametati s cementno malto

sprememba:

INŽENIRING BIRO
ARMATURA
PROJEKTIRANJE IN TEHNIČNO SVETOVANJE INŽENIRING BIRO ARMATURA, UROŠ ŽVAN s.p., ZRKOVSKA C. 75, MARIBOR
ID. ŠT.: 2377 - IZS, E-POŠTA: info@armatura-uz.si, TEL./FAX: +386 (02) 47 02 420, M-TEL. +386 (041) 425 341

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investitor:	UNIVERZITETNI KLIČNI CENTER LJUBLJANA, ZALOŠKA 2, LJUBLJANA	
objekt:	POSTAVITEV NOVEGA AVTOKLAVA V LEKARNI V 1. KLETI TRAKTA G	
vrsta projekta:	PZR	
odgovorni vodja projekta:		
odgovorni projektant:	UROŠ ŽVAN, UDIG	IZS G-0028
sodelavec:		
kontrola:		
načrt, št. načrta:	GR. KONSTRUKCIJA	27/18-K-A
risba, merilo:	OJAČITEV PLOŠČE NAD 2. KLETJO Z JEKLENIMI NOSILCI	1:50 1:25
št. risbe:	27/18-K-A-1	
datum, št. lista:	SEPTEMBER 2018	1