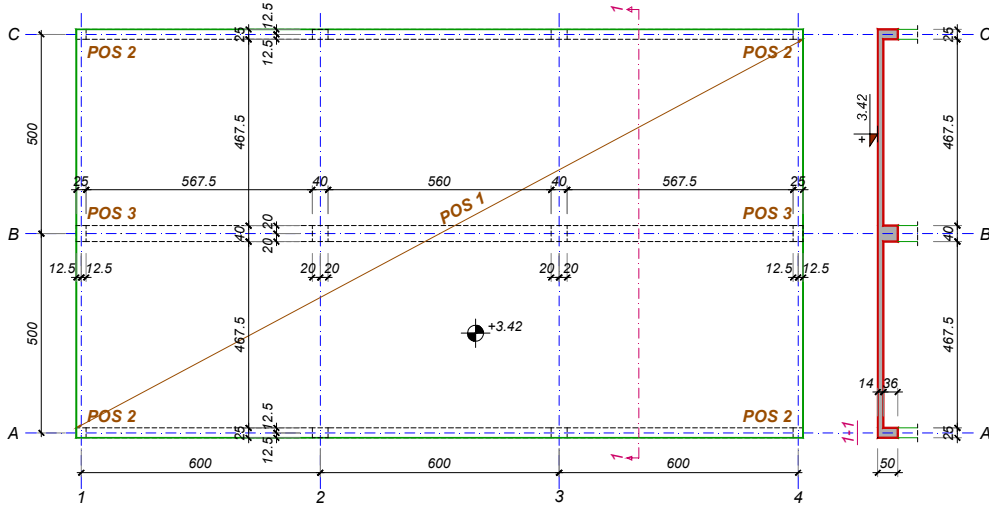


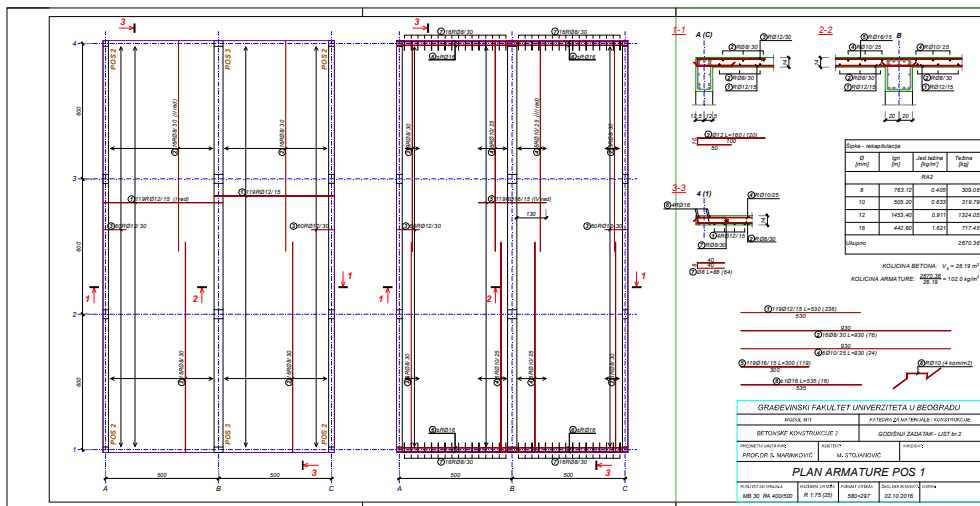
Ploča POS 1 – plan oplata

1



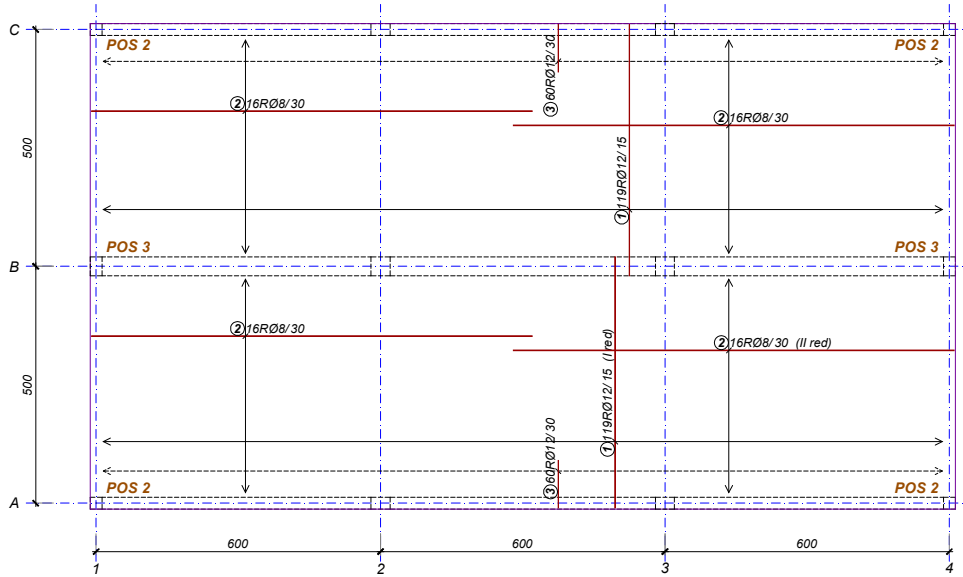
POS 1 – plan armature (varijanta sa pravim šipkama)

2



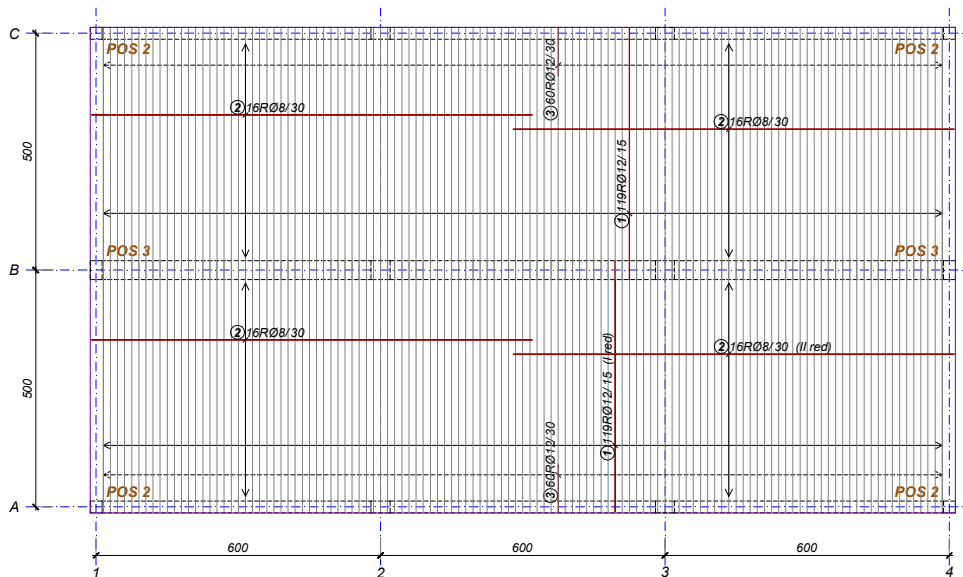
POS 1 – donja zona

3



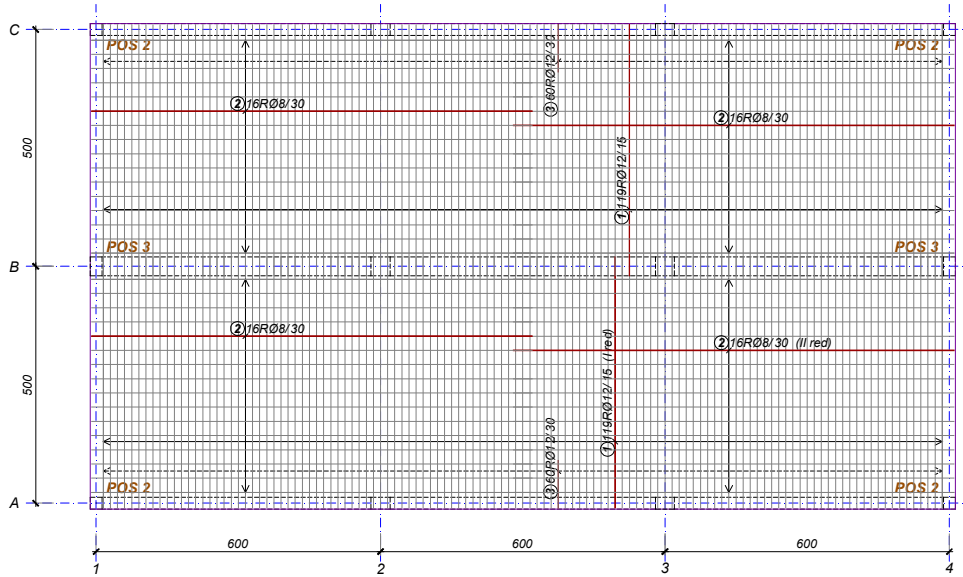
POS 1 – donja zona (1 red)

4



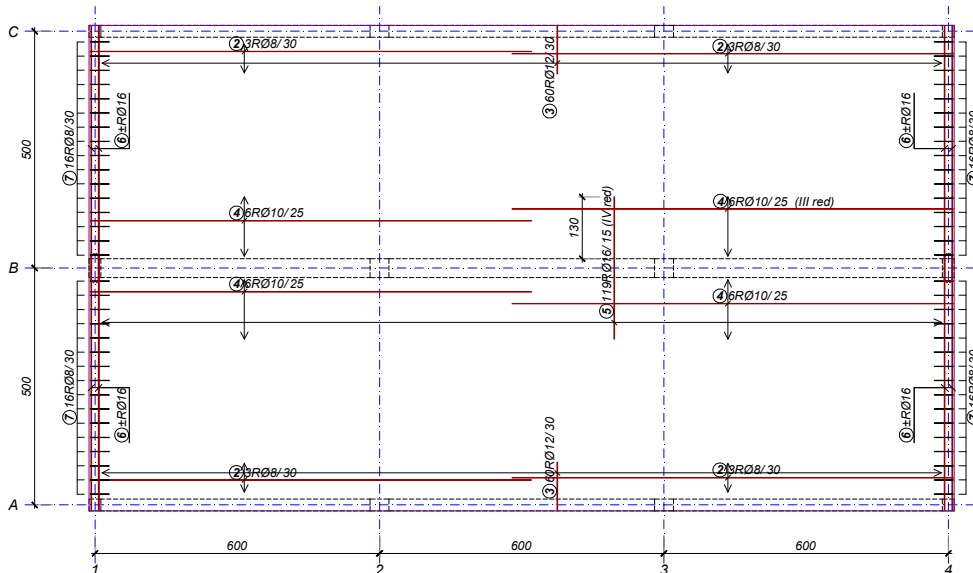
POS 1 – donja zona (II red)

5



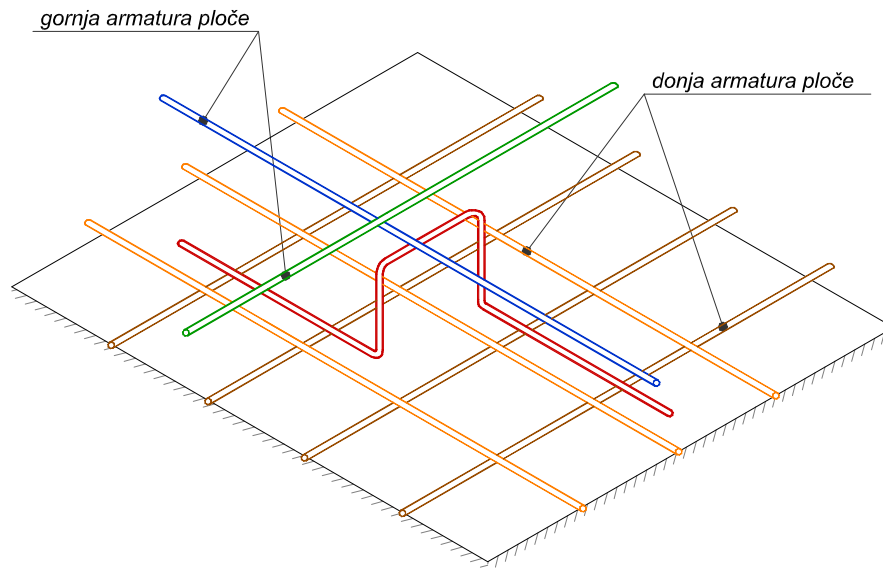
POS 1 – gornja zona

6



Detalj postavljanja distancera za gornju zonu

7



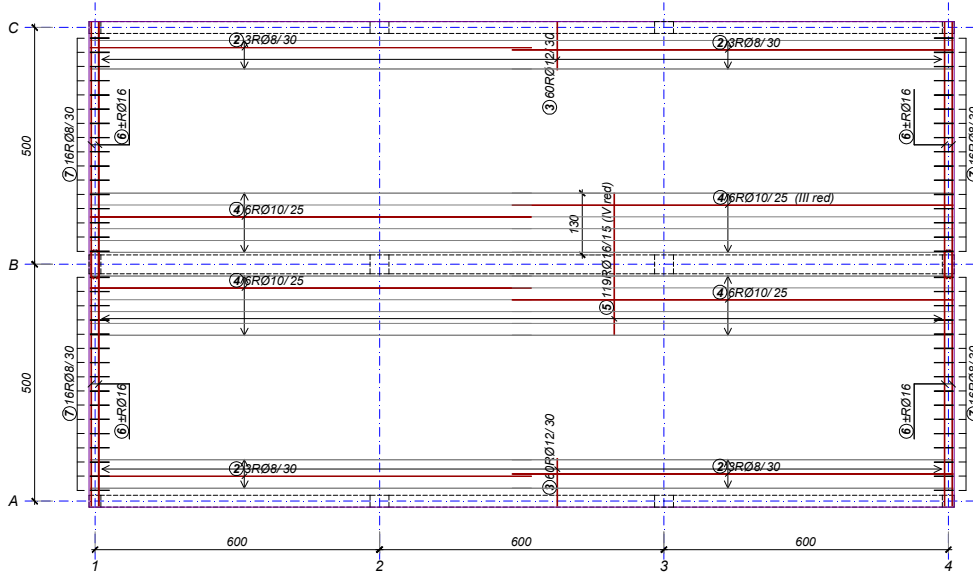
Distanceri za gornju zonu

8



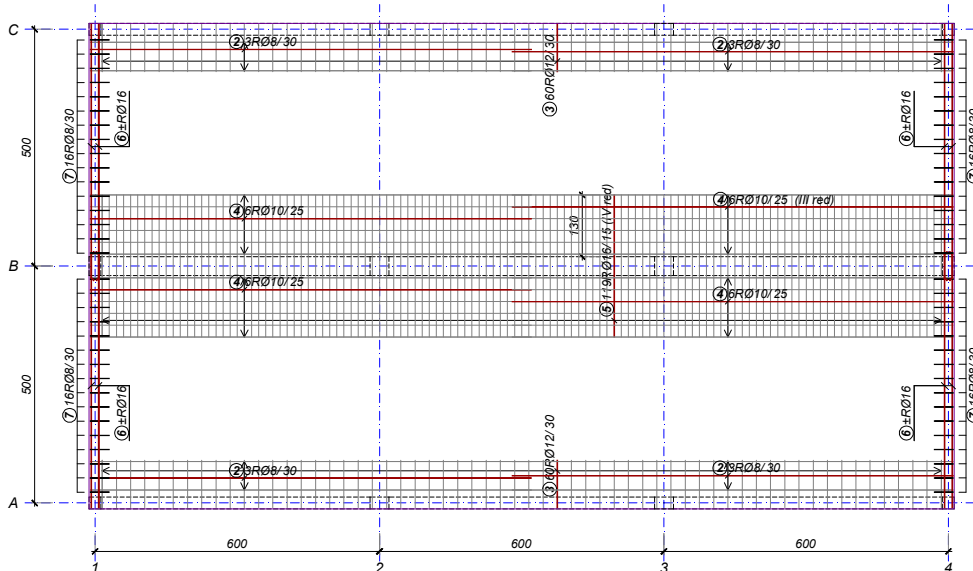
POS 1 – gornja zona (III red)

9



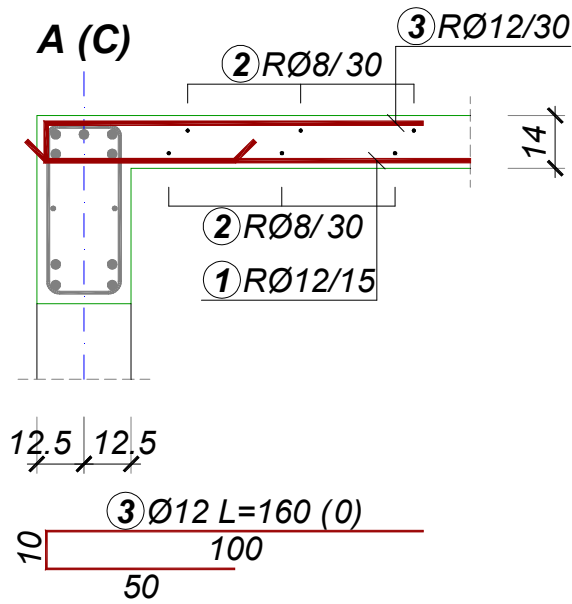
POS 1 – gornja zona (IV red)

10



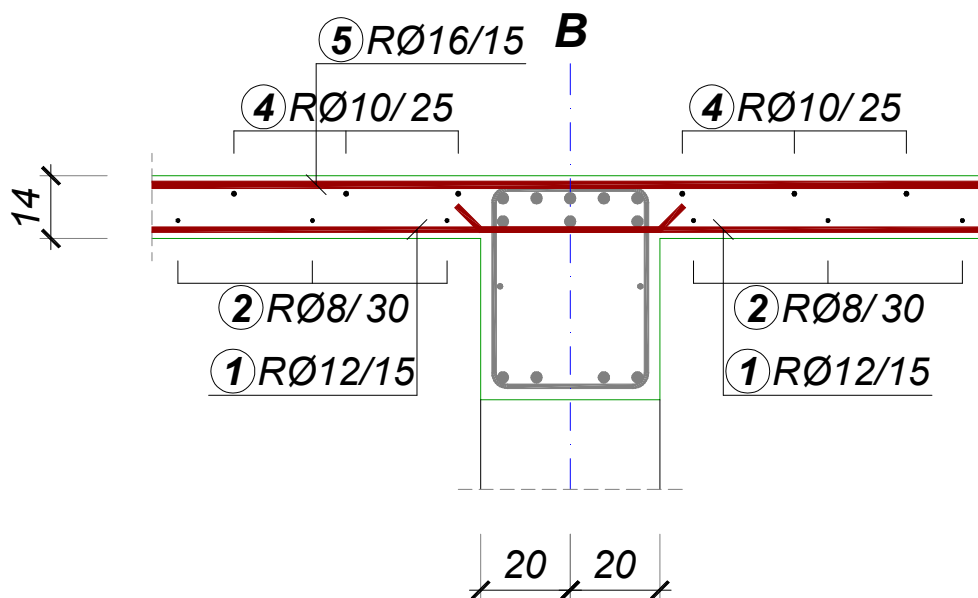
POS 1 – lokalni presek 1-1

11



POS 1 – lokalni presek 2-2

12

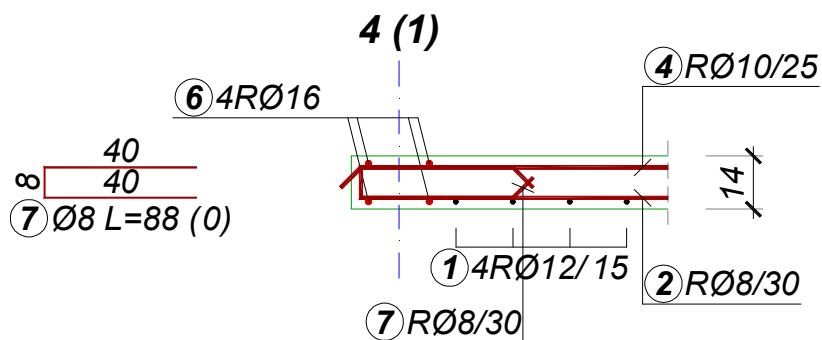


Detalj ojačanja slobodne ivice ploče (presek 3-3)

13

210

Duž slobodne ivice ploče bez oslonca, pored potrebne armature za momente savijanja, mora se dati podužna armatura iz konstruktivnih razloga, koja se sastoji od najmanje po jednog profila u gornjem i donjem uglu. Podužne šipke uz ivicu debljih polja, raspoređuju se i po visini ploče. Poprečna armatura duž slobodne ivice, koja obuhvata podužnu armaturu, sastoji se od uzengija "ukosnica", zatvorenih uzengija ili armature ploče upravne na slobodnu ivicu ploče (slika 52c).



Specifikacija armature

14

Šipke - specifikacija						
ozn.	oblik i mere [cm]	C	Ø	lg [cm]	n [kom]	lg _n [m]
POS 1 (1 kom)						
1	530	RA2	12	530	238	1261.40
2	930	RA2	8	930	76	706.80
3	100 50	RA2	12	160	120	192.00
4	930	RA2	10	930	24	223.20
5	300	RA2	16	300	119	357.00
6	535	RA2	16	535	16	85.60
7	40 40	RA2	8	88	64	56.32
8	25 30 25	RA2	10	94	300	282.00

Rekapitulacija armature

15

Šipke - rekapitulacija			
Ø [mm]	lgn [m]	Jedinicna težina [kg/m']	Težina [kg]
RA2			
8	763.12	0.405	309.06
10	505.20	0.633	319.79
12	1453.40	0.911	1324.05
16	442.60	1.621	717.45
Ukupno			2670.36

Donja zona – varijanta 2 (sa mrežama)

16

$$h = d - (a_o + \frac{\varnothing}{2}) = 14 - (2 + \frac{1.2}{2}) = 11.4 \text{ cm}$$

$$k = \frac{11.4}{\sqrt{\frac{29.5}{2.05}}} = 3.004 \Rightarrow \varepsilon_p/\varepsilon_a = 2.103/10\text{‰} ; \bar{\mu} = 11.864\%$$

$$A_a = 11.864 \times 11.4 \times \frac{2.05}{40} = 6.93 \text{ cm}^2/\text{m} \quad \Rightarrow \quad e_a \leq \frac{100 \times 1.13}{6.93} = 16.3 \text{ cm}$$

usvojeno: **RØ12/15** (7.54 cm²/m)

$$A_{ap} = 0.2 \times 6.93 = 1.39 \text{ cm}^2/\text{m} > A_{ap, \min.} = 0.085 \times 14 = 1.19 \text{ cm}^2/\text{m}$$

$$\text{usv. } \varnothing 8 (a_a^{(1)} = 0.503 \text{ cm}^2): \quad e_{ap} \leq \frac{100 \times 0.503}{1.39} = 36.2 \text{ cm}$$

usvojeno: **RØ8/30** (1.68 cm²/m)

Za usvojeno MA 500/560 ($\sigma_v = 500 \text{ MPa} = 50 \text{ kN/cm}^2$):

$$A_a = 11.864 \times 11.4 \times \frac{2.05}{50} = 6.93 \times \frac{40}{50} = 5.54 \frac{\text{cm}^2}{\text{m}}$$

usvojeno: R-636
glavna armatura: Ø9/10 (6.36 cm²/m)
poprečna armatura: Ø6/25 (1.13 cm²/m)

Preklapanje mreža – član 163 PBAB 87

17

Tabela 28. Dužina preklopa nosivih žica mrežaste armature

Podužne žice u nosivom pravcu	Prečnik ϕ (u mm)	Uslovi adhezije	Dužina preklopa (u cm)		Najmanji broj poprečnih žica (čvorova)	
			MAG	MAR	MAG	MAR
Jednostruke žice	$\phi < 12$	dobri	40	35	4	3
		lošiji	40	35	5	3
Dvostruke žice	$\phi \leq 8,5$	dobri	40	35	4	3
		lošiji	40	35	5	4
Dvostruke žice	$8,5 < \phi \leq 12$	dobri	50	45	5	4
		lošiji	50	45	6	5

Dužina preklopa glatke i orebrane nenosive žice mrežaste armature data je u tabeli 29.

Tabela 29 Dužina preklopa nenosivih žica mrežaste armature

Poprečne žice	Prečnik žice	Uslovi adhezije	Dužina preklopa (u cm)	Broj podužnih žica (čvorova)
Jednostruke i dvostruke žice	$\phi < 6,5$	dobri	15	2
	$\phi > 6,5$	lošiji	20	3

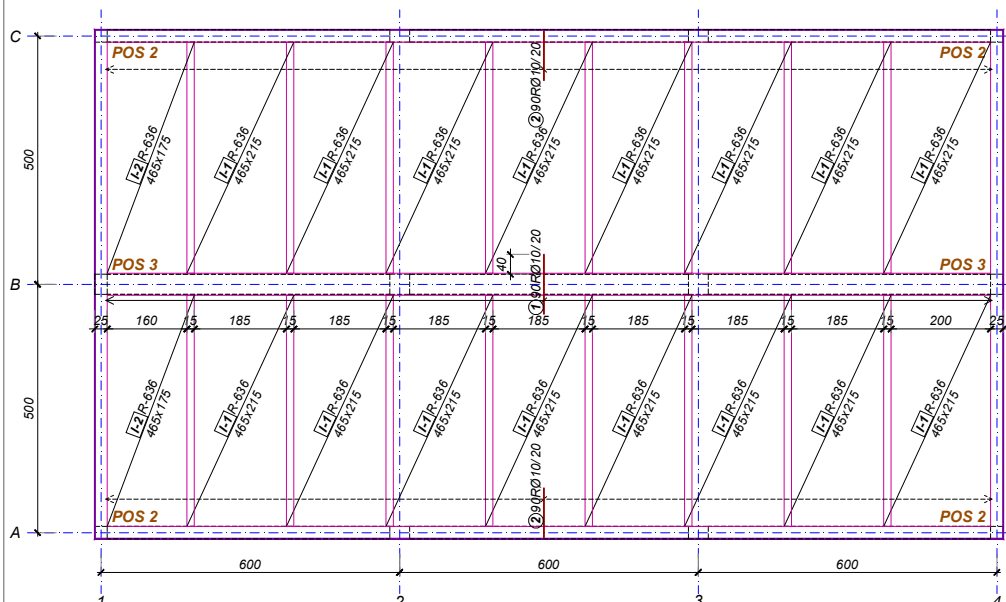
usvojeno: R-636

preklop glavne armature ($\emptyset 9$): $(4-1) \times 25 = 75 \text{ cm}$

preklop poprečne armature ($\emptyset 6$): $(2-1) \times 10 = 10 < 15 \text{ cm} \Rightarrow \text{usv. } 15 \text{ cm}$

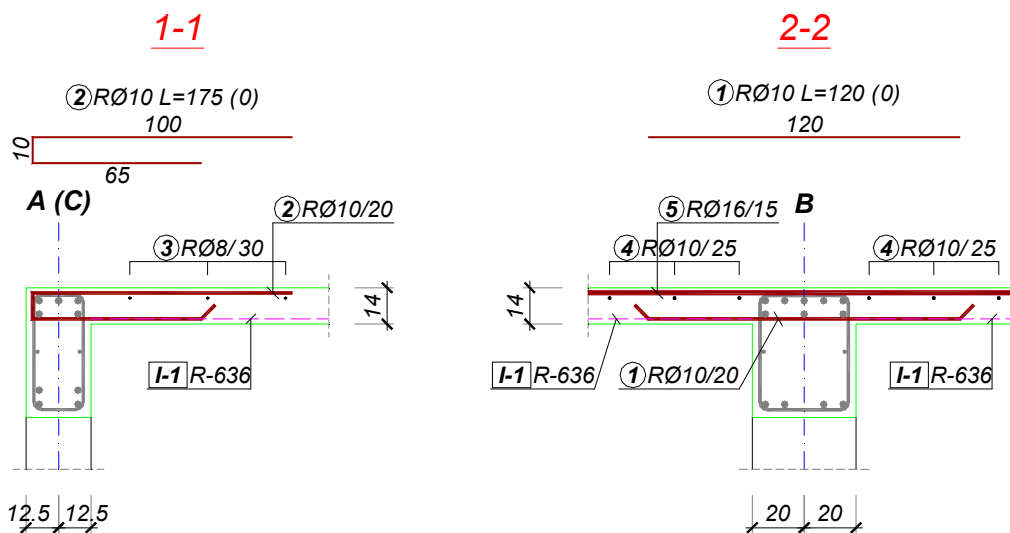
POS 1 – donja zona (varijanta sa mrežama)

18



Detalji poprečnog preseka – varijanta MREŽE

19



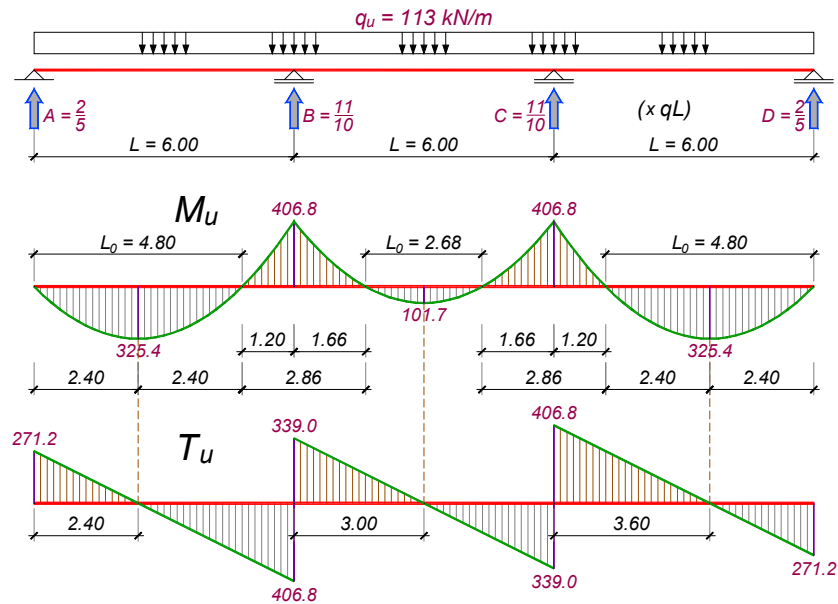
Specifikacija i rekapitulacija mreža

20

Mreže - specifikacija						
Pozicija	Oznaka mreže	B [cm]	L [cm]	n	Jedinicna težina [kg/m ²]	Ukupna težina [kg]
POS 1 (varijanta 2) (1 kom)						
I-1	R-636	215	465	16	6.054	968.40
I-2	R-636	175	465	2	6.054	98.53
Ukupno						1066.93
Mreže - rekapitulacija						
Oznaka mreže	B [cm]	L [cm]	n	Jedinicna težina [kg/m ²]	Ukupna težina [kg]	
R-636	215	600	18	6.054	1405.74	
Ukupno						1405.74
Mreže - plan secenja						
POS 1 (varijanta 2)						
R-636 (215 cm x 600 cm)						
16x		I-1 215 x 465		2x		I-2 175 x 465

POS 3 - granično opterećenje (1.6×G+1.8×P)

21



2.7.1.2 Preseci u krajnjim poljima

22

$$L_0 = 0.8 \times 600 = 480 \text{ cm} \Rightarrow B = \min. \left\{ \begin{array}{l} 40 + 20 \times 14 = 320 \\ 40 + 0.25 \times 480 = 160 \end{array} \right\} = 160 \text{ cm}$$

$$k = \frac{45}{\sqrt{\frac{325.4 \times 10^2}{160 \times 2.05}}} = 4.518 \Rightarrow \left\{ \begin{array}{l} \varepsilon_b / \varepsilon_a = 1.193 / 10\text{‰} \\ s = 0.107 \Rightarrow x = 0.107 \times 45 = 4.8 \text{ cm} < d_p = 14 \text{ cm} \\ \bar{\mu} = 5.092\% \end{array} \right.$$

$$A_a = 5.092 \times \frac{160 \times 45}{100} \times \frac{2.05}{40} = 18.79 \text{ cm}^2 \Rightarrow \text{usv.: } \mathbf{5R\text{Ø}22} \text{ (19.01 cm}^2\text{)}$$

2.7.1.3 Presek u srednjem polju

$$L_0 = \frac{L}{\sqrt{5}} = \frac{600}{\sqrt{5}} = 268 \text{ cm} \Rightarrow B = \min. \left\{ \begin{array}{l} 40 + 20 \times 14 = 320 \\ 40 + 0.25 \times 268 = 107 \end{array} \right\} = 107 \text{ cm}$$

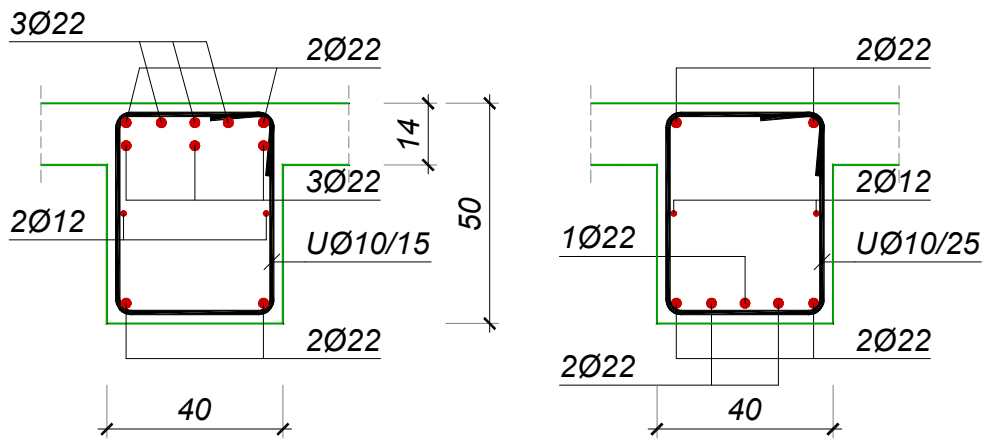
$$k = \frac{45}{\sqrt{\frac{101.7 \times 10^2}{107 \times 2.05}}} = 6.611 \Rightarrow \left\{ \begin{array}{l} \varepsilon_b / \varepsilon_a = 0.76 / 10\text{‰} \\ s = 0.071 \Rightarrow x = 0.071 \times 45 = 3.2 \text{ cm} < d_p = 14 \text{ cm} \\ \bar{\mu} = 2.345\% \end{array} \right.$$

$$A_a = 2.179 \times \frac{107 \times 45}{100} \times \frac{2.05}{40} = 5.79 \text{ cm}^2 > A_{a,\min} = 0.2 \times \frac{40 \times 50}{100} = 4.0 \text{ cm}^2$$

$$\text{usvojeno: } \mathbf{2R\text{Ø}22} \text{ (7.60 cm}^2\text{)}$$

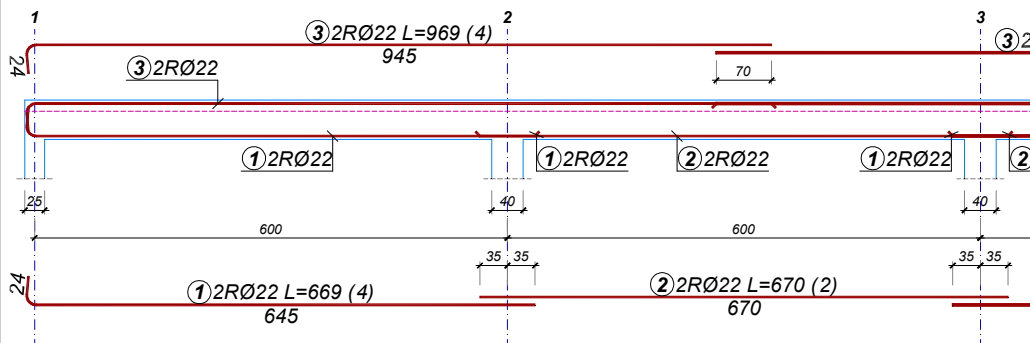
POS 3 – preseci nad osloncem i u krajnjem polju

23



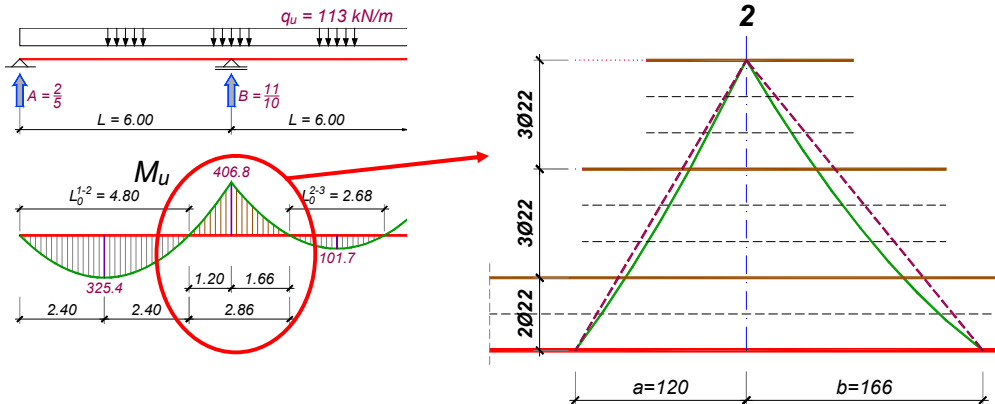
Armatura kontinualne grede – ugaone šipke

24



Procena dužine šipki u gornjoj zoni

25

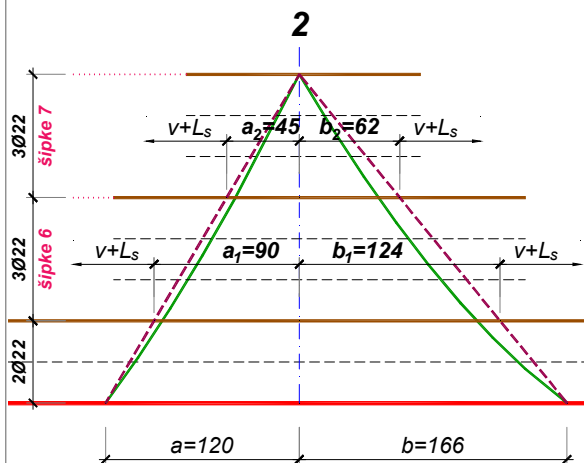


$$L_0^{1-2} = 0.8 \times L = 0.8 \times 600 = 480 \text{ cm} \Rightarrow a = L - L_0^{1-2} = 600 - 480 = 120 \text{ cm}$$

$$L_0^{2-3} = \frac{L}{\sqrt{5}} = \frac{600}{\sqrt{5}} = 268 \text{ cm} \Rightarrow b = \frac{L - L_0^{2-3}}{2} = \frac{600 - 268}{2} = 166 \text{ cm}$$

Procena dužine šipki u gornjoj zoni

26



$$v = 0.75 \times 43 \approx 32 \text{ cm}$$

$$MB 30 \Rightarrow \tau_p = 1.75 \text{ MPa}$$

$$L_{s1} = \frac{400}{4 \times 1.8 \times 1.75} \varnothing = 31.75 \times \varnothing$$

$$L_{s2} = 1.5 \times L_{s1} = 47.6 \times 2.2 \approx 105 \text{ cm}$$

$$v + L_{s2} = 32 + 105 = 137 \approx 140 \text{ cm}$$

$$a_1 = a \times \frac{6\varnothing22}{8\varnothing22} = 0.75 \times 120 = 90 \text{ cm}$$

$$a_2 = a \times \frac{3\varnothing22}{8\varnothing22} = 0.375 \times 120 = 45 \text{ cm}$$

$$b_1 = b \times \frac{6\varnothing22}{8\varnothing22} = 0.75 \times 166 = 124 \text{ cm}$$

$$b_2 = b \times \frac{3\varnothing22}{8\varnothing22} = 0.375 \times 166 = 62 \text{ cm}$$

$$L^{\text{POS6}} = 140 + 90 + 124 + 140 = 494 \approx 495 \text{ cm}$$

$$L^{\text{POS7}} = 140 + 45 + 62 + 140 = 387 \approx 390 \text{ cm}$$

Procena dužine šipki u donjoj zoni

29

$$x^{POS5} = L_0 \times \sqrt{\frac{M_1}{M}} = L_0 \times \sqrt{\frac{2\emptyset22}{5\emptyset22}} = 4.80 \times \sqrt{0.4} = 3.04 \text{ m}$$

$$v + L_s = v + L_{s1} = 0.75 \times h + L_{s1} \approx 32 + 31.75 \times 2.2 \approx 102 \text{ cm}$$

$$L^{POS5} \approx v + L_s + x^{POS5} + v + L_s = 102 + 304 + 102 = 508 \approx 510 \text{ cm}$$

$$x^{POS4} = L_0 \times \sqrt{\frac{M_2}{M}} = L_0 \times \sqrt{\frac{3\emptyset22}{5\emptyset22}} = 4.80 \times \sqrt{0.6} = 3.72 \text{ m}$$

$$L^{POS4} \approx v + L_s + x_2 + v + L_s = 102 + 372 + 102 = 576 \approx 580 \text{ cm}$$

Šipke su simetrično postavljene u odnosu na mesto maksimalnog momenta u polju ($x = 2.4 \text{ m}$ od ose 1 ka osi 2)

Procena dužine šipki u donjoj zoni – krajnja polja

30

