

Ploče koje prenose opterećenje u dva pravca

- Krstasto armirane ploče –

1. Proračun i dimenzionisanje

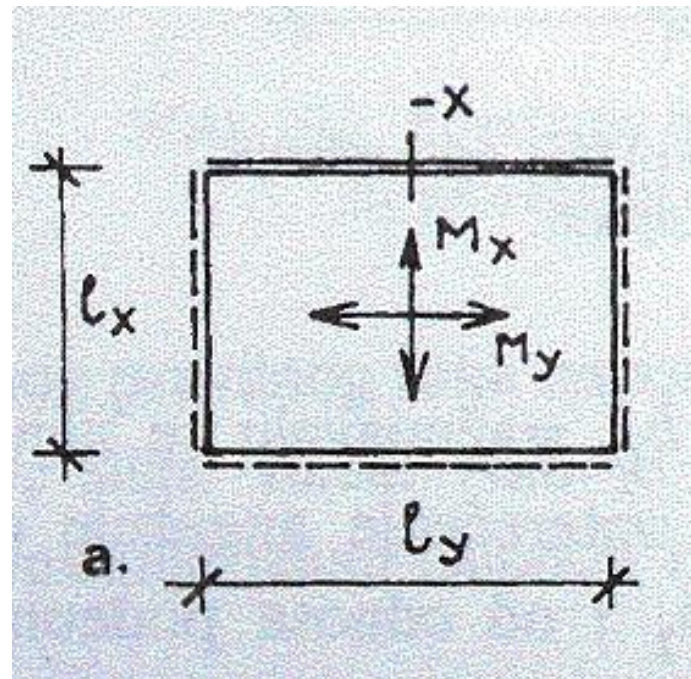
2. Primer 1

***3. Analiza opterećenja i statički proračun
ramovske konstrukcije***

PLOČE KOJE PRENOSE OPTEREČENJE U DVA PRAVCA - KRSTASTO ARMIRANE PLOČE

Ploče koje prenose opterećenje u dva ortogonalna pravca ili krstasto armirane ploče su sve pravougaone ploče oslonjene na četiri strane kod kojih je odnos raspona u dva ortogonalna pravca

$$I_y/I_x \leq 2.$$

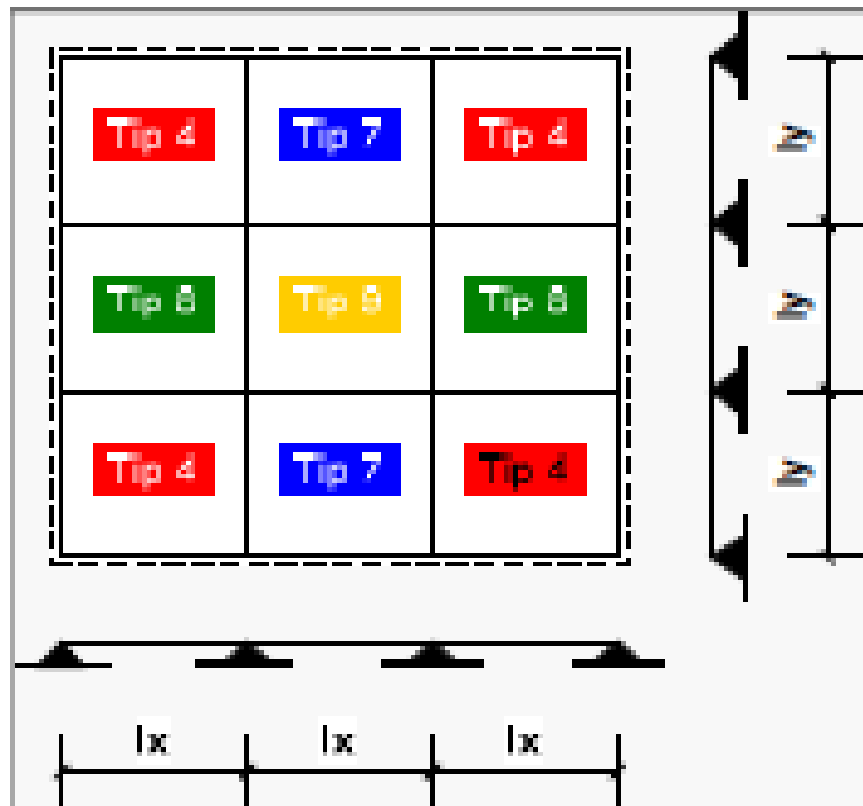


PLOČE KOJE PRENOSE OPTEREĆENJE U DVA PRAVCA - KRSTASTO ARMIRANE PLOČE

Razlikuju se:

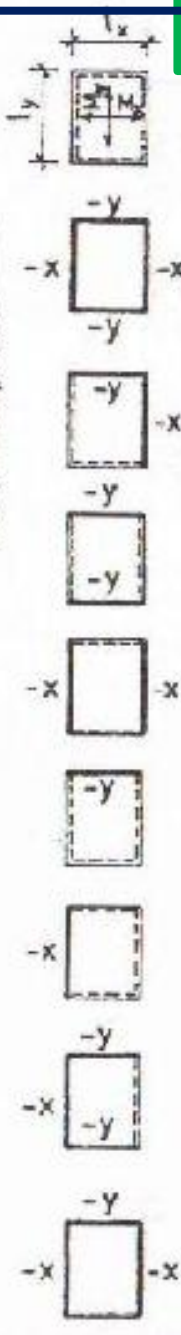
- pojedinačno oslonjene krstasto armirane ploče i
- kontinualne krstasto armirane ploče.

Kontinualne ploče se oslanjaju na krajne i srednje oslonce (sistem međusobno povezanih pojedinačnih ploča).



slobodna ostonjena ivica

uklještena ivica



$l_y = l_x$ 1,0 1,1 1,2 1,3 1,4 1,5 1,6 1,7 1,8 1,9 2,0

Mx	0,044	0,047	0,049	0,051	0,052	0,052	0,053	0,052	0,052	0,051	0,050
My	0,044	0,041	0,038	0,034	0,032	0,029	0,026	0,024	0,022	0,020	0,019
Mx	0,021	0,023	0,023	0,024	0,020	0,020	0,023	0,022	0,022	0,021	0,021
My	0,021	0,019	0,017	0,015	0,013	0,011	0,010	0,008	0,007	0,006	0,005
-X	0,052	0,054	0,053	0,053	0,052	0,051	0,049	0,048	0,046	0,044	0,042
-Y	0,052	0,049	0,047	0,044	0,041	0,038	0,036	0,034	0,032	0,030	0,029
Mx	0,028	0,030	0,032	0,032	0,032	0,032	0,032	0,031	0,031	0,030	0,029
My	0,028	0,025	0,023	0,021	0,019	0,017	0,014	0,014	0,012	0,011	0,010
-X	0,068	0,070	0,071	0,071	0,070	0,069	0,067	0,065	0,063	0,061	0,059
-Y	0,068	0,065	0,062	0,059	0,055	0,051	0,049	0,046	0,043	0,041	0,040
Mx	0,022	0,025	0,028	0,032	0,035	0,037	0,039	0,040	0,041	0,042	0,043
My	0,032	0,032	0,031	0,030	0,029	0,027	0,026	0,024	0,023	0,021	0,020
-Y	0,070	0,072	0,073	0,072	0,072	0,070	0,068	0,066	0,064	0,062	0,060
Mx	0,032	0,031	0,030	0,029	0,028	0,027	0,026	0,024	0,023	0,022	0,021
My	0,022	0,018	0,015	0,013	0,011	0,009	0,008	0,007	0,006	0,005	0,005
-X	0,072	0,067	0,064	0,061	0,059	0,055	0,052	0,050	0,047	0,044	0,042
Mx	0,031	0,035	0,038	0,041	0,043	0,044	0,045	0,046	0,046	0,046	0,046
My	0,037	0,036	0,034	0,032	0,030	0,028	0,026	0,024	0,022	0,021	0,019
-Y	0,084	0,084	0,083	0,080	0,078	0,075	0,072	0,069	0,066	0,064	0,061
Mx	0,037	0,037	0,038	0,037	0,037	0,035	0,034	0,033	0,032	0,031	0,030
My	0,031	0,027	0,023	0,021	0,018	0,016	0,014	0,012	0,011	0,010	0,009
-X	0,084	0,084	0,082	0,079	0,077	0,074	0,071	0,069	0,066	0,063	0,061
Mx	0,021	0,024	0,026	0,028	0,029	0,029	0,029	0,029	0,028	0,028	0,028
My	0,026	0,025	0,023	0,022	0,019	0,017	0,016	0,014	0,012	0,011	0,011
-X	0,055	0,059	0,062	0,063	0,064	0,063	0,062	0,061	0,059	0,058	0,057
-Y	0,050	0,059	0,058	0,055	0,053	0,051	0,048	0,046	0,043	0,041	0,039
Mx	0,026	0,026	0,027	0,027	0,026	0,025	0,024	0,024	0,022	0,022	0,021
My	0,021	0,013	0,016	0,014	0,012	0,010	0,009	0,008	0,007	0,006	0,006
-X	0,060	0,060	0,059	0,057	0,055	0,053	0,050	0,048	0,046	0,044	0,042
-Y	0,055	0,052	0,048	0,044	0,041	0,038	0,036	0,034	0,032	0,030	0,029

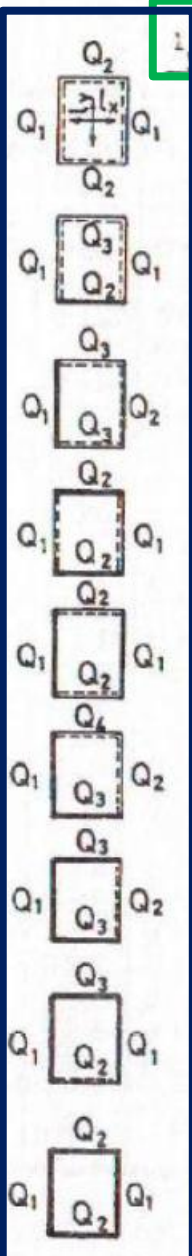
P q l l_y (kN) M $k_l P$ (kNm/m)

Koeficijenti r_j za određivanje rezultante reakcije oslonca krstasto armirane ploče, oslonjene na sve četiri strane, opterećenih jednako podeljenim opterećenjem q (kN/m²)

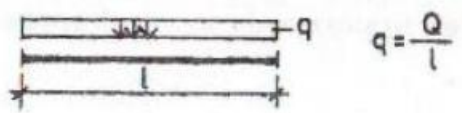
$$P = q l_x l_y \text{ (kN)} \quad Q = r_j P \text{ (kN)}$$

$l_x : l_y$	1,0	1,1	1,2	1,3	1,4	1,5	1,6	1,7	1,8	1,9	2,0
Q_1	0,250	0,260	0,272	0,280	0,288	0,296	0,304	0,310	0,316	0,322	0,327
Q_2	0,250	0,240	0,228	0,220	0,212	0,204	0,196	0,190	0,184	0,178	0,173
Q_1	0,220	0,232	0,244	0,254	0,264	0,273	0,281	0,290	0,296	0,302	0,308
Q_2	0,330	0,313	0,298	0,285	0,272	0,262	0,251	0,242	0,234	0,227	0,220
Q_3	0,230	0,223	0,214	0,207	0,200	0,192	0,187	0,178	0,174	0,169	0,164
Q_1	0,330	0,346	0,362	0,376	0,387	0,399	0,410	0,418	0,426	0,434	0,442
Q_2	0,230	0,240	0,246	0,252	0,257	0,261	0,264	0,270	0,274	0,276	0,278
Q_3	0,220	0,207	0,196	0,186	0,178	0,170	0,163	0,156	0,150	0,145	0,140
Q_1	0,198	0,211	0,223	0,234	0,244	0,254	0,262	0,270	0,278	0,285	0,292
Q_2	0,302	0,289	0,277	0,266	0,256	0,246	0,238	0,230	0,222	0,215	0,208
Q_1	0,302	0,315	0,326	0,334	0,341	0,350	0,356	0,361	0,367	0,372	0,377
Q_2	0,198	0,185	0,174	0,165	0,157	0,150	0,144	0,139	0,133	0,128	0,123
Q_1	0,292	0,313	0,331	0,346	0,360	0,370	0,380	0,390	0,400	0,410	0,419
Q_2	0,208	0,217	0,226	0,233	0,241	0,247	0,252	0,256	0,260	0,263	0,266
Q_3	0,292	0,274	0,257	0,244	0,230	0,221	0,212	0,204	0,196	0,189	0,182
Q_4	0,208	0,196	0,186	0,177	0,169	0,162	0,156	0,150	0,144	0,138	0,133
Q_1	0,262	0,282	0,300	0,316	0,329	0,344	0,354	0,365	0,376	0,386	0,394
Q_2	0,190	0,200	0,210	0,218	0,227	0,234	0,240	0,245	0,250	0,254	0,258
Q_3	0,274	0,259	0,245	0,233	0,222	0,211	0,203	0,195	0,187	0,180	0,174
Q_1	0,274	0,285	0,297	0,309	0,318	0,326	0,334	0,341	0,347	0,353	0,358
Q_2	0,190	0,182	0,174	0,165	0,158	0,152	0,146	0,141	0,136	0,131	0,126
Q_3	0,262	0,248	0,232	0,217	0,206	0,196	0,186	0,177	0,170	0,163	0,158
Q_1	0,250	0,266	0,279	0,291	0,302	0,312	0,320	0,327	0,333	0,339	0,345
Q_2	0,250	0,234	0,221	0,209	0,198	0,188	0,180	0,173	0,167	0,161	0,155

— uključena ivica
 - - - - - slobodno oslonjena ivica



Približno opterećenje oslonjačke grede





Primer 1

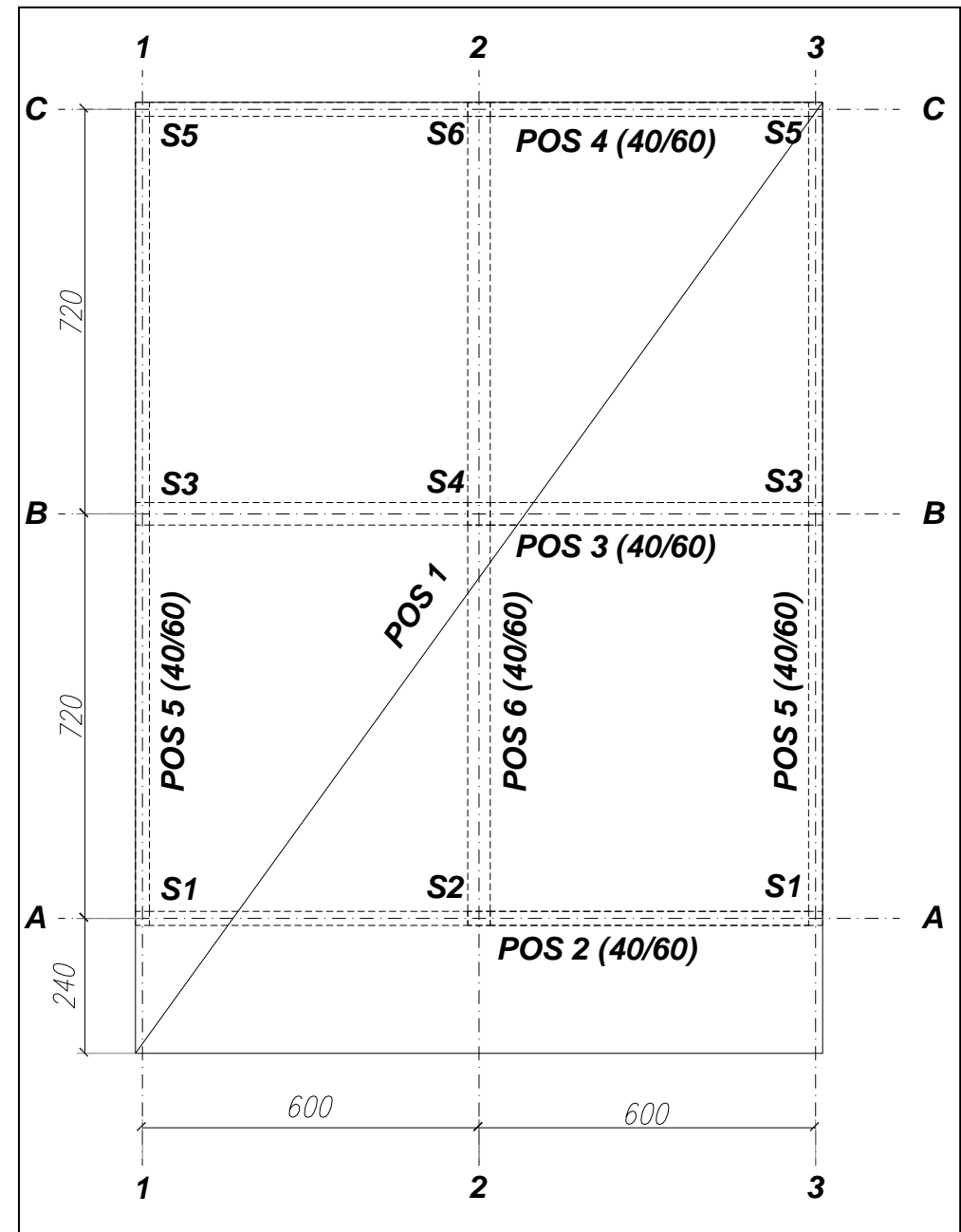
Ploča POS 1, debljine 16 cm je oslonjena na grede POS 2-6 (40/60 cm).

Pored sopstvene težine na ploču deluje dodatno stalno opterećenje $\Delta g=2 \text{ kN/m}^2$ i povremeno opterećenje $p=10 \text{ kN/m}^2$.

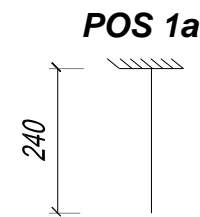
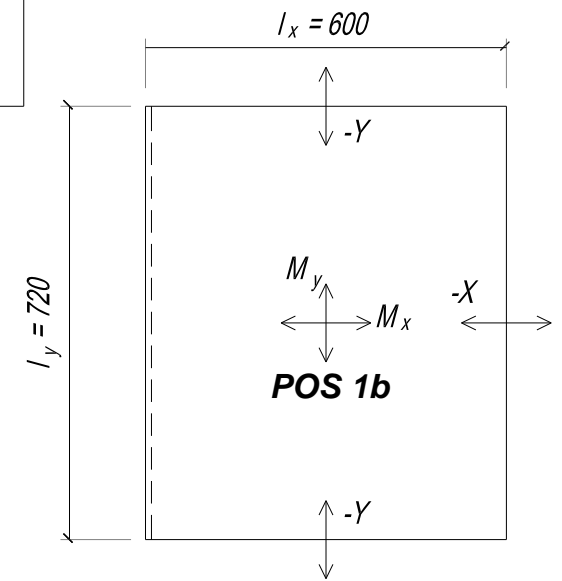
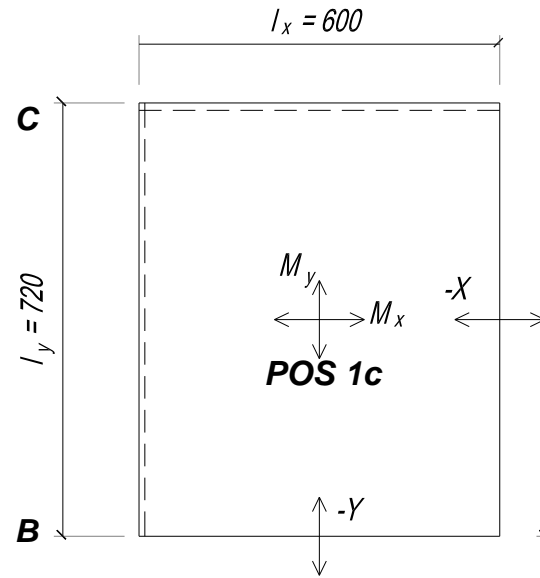
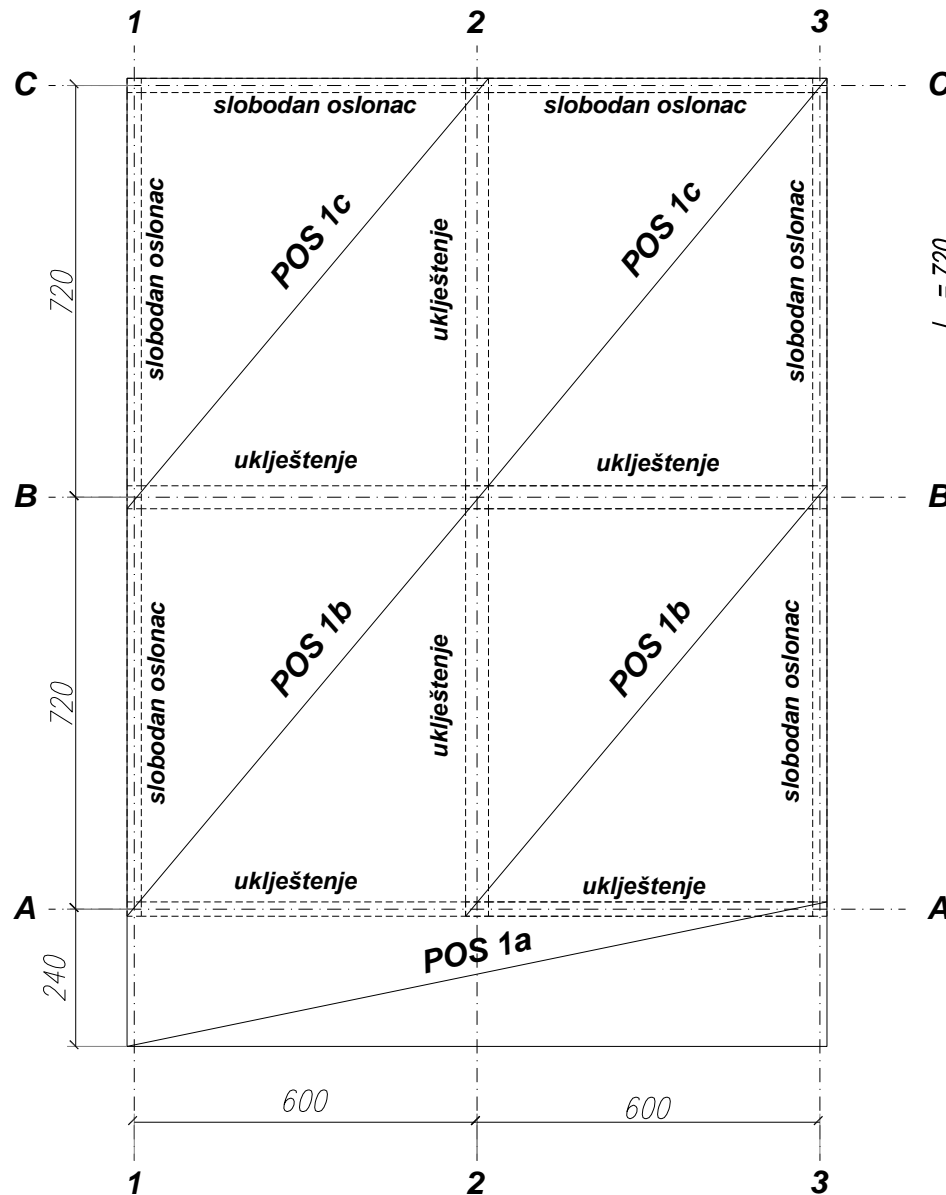
Dimenzionisati ploču POS 1 i odrediti silu u stubu POS S5.

MB 30

RA 400/500



PLOČA POS 1



PLOČA POS 1a – Konzolna ploča

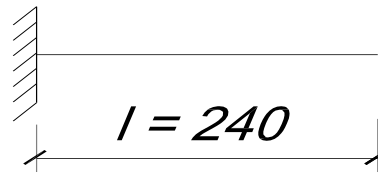
1.1 ANALIZA OPTEREĆENJA POS 1

stalno opterećenje:

sopstvena težina ploče	$g_{pl} = d_p \times \gamma_b = 0.16 \times 25.0$	$= 4.0 \text{ kN/m}^2$
dodatno stalno opterećenje	$\Delta g =$	$\underline{\hspace{2cm}} = 2.0 \text{ kN/m}^2$
		$g = 6.0 \text{ kN/m}^2$

povremeno opterećenje:

$p = 10.0 \text{ kN/m}^2$



1.2 STATIČKI UTICAJI POS 1a

$$M_g = 6.0 \times 2.4^2 / 2 = 17.28 \text{ kNm/m} \quad ; \quad M_p = 10.0 \times 2.4^2 / 2 = 28.8 \text{ kNm/m}$$

$$T_g = 6.0 \times 2.4 = 14.4 \text{ kN/m} \quad ; \quad T_p = 10.0 \times 2.4 = 24.0 \text{ kN/m}$$

$$M_u = 1.6 \times 17.28 + 1.8 \times 28.8 = 79.49 \text{ kNm/m}$$

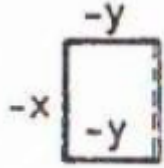
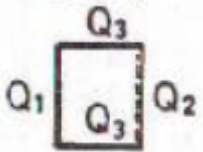
PLOČA POS 1b – Ploča uklještena duž tri ivice i slobodno oslonjena duž duže ivice

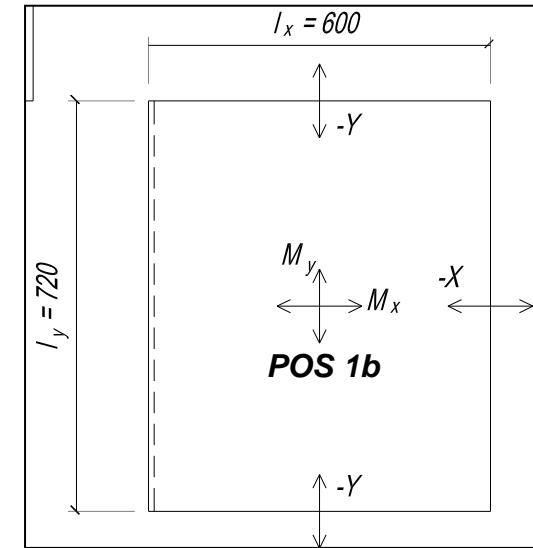
1.3 STATIČKI UTICAJI POS 1b

$$L_y/L_x = 7.2/6.0 = 1.20$$

$$G = 6.0 \times 7.2 \times 6.0 = 259.2 \text{ kN}$$

$$P = 10.0 \times 7.2 \times 6.0 = 432 \text{ kN}$$

		$l_y : l_x \quad 1,2$	
	M_x	0,026	
	M_y	0,023	
	$-X$	0,062	
	$-Y$	0,058	
	Q_1	0,300	
	Q_2	0,210	
	Q_3	0,245	



$$M_{Xg} = 259.2 \times 0.026 = 6.74 \text{ kNm/m};$$

$$X_g = 259.2 \times 0.062 = 16.07 \text{ kNm/m};$$

$$M_{Xp} = 432 \times 0.026 = 11.23 \text{ kNm/m}$$

$$X_p = 432 \times 0.062 = 26.78 \text{ kNm/m}$$

$$M_{Xu} = 1.6 \times 6.7 + 1.8 \times 11.23 = 31.0 \text{ kNm/m}$$

$$X_u = 1.6 \times 16.07 + 1.8 \times 26.78 = 73.92 \text{ kNm/m}$$

$$M_{Yg} = 259.2 \times 0.023 = 5.96 \text{ kNm/m};$$

$$Y_g = 259.2 \times 0.058 = 15.03 \text{ kNm/m};$$

$$M_{Yp} = 432 \times 0.023 = 9.94 \text{ kNm/m}$$

$$Y_p = 432 \times 0.058 = 25.06 \text{ kNm/m}$$

$$M_{Yu} = 1.6 \times 5.96 + 1.8 \times 9.94 = 27.42 \text{ kNm/m}$$

$$Y_u = 1.6 \times 15.03 + 1.8 \times 25.06 = 69.15 \text{ kNm/m}$$

$$Q_{1,g} = 259.2 \times 0.300 = 77.8 \text{ kN}$$

;

$$Q_{1,p} = 432 \times 0.300 = 129.6 \text{ kN}$$

$$Q_{2,g} = 259.2 \times 0.210 = 54.4 \text{ kN}$$

;

$$Q_{2,p} = 432 \times 0.210 = 90.7 \text{ kN}$$

$$Q_{3,g} = 259.2 \times 0.245 = 63.5 \text{ kN}$$

;

$$Q_{3,p} = 432 \times 0.245 = 105.8 \text{ kN}$$

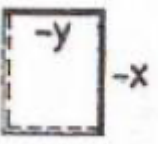
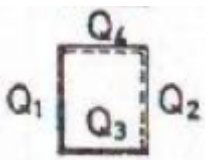
PLOČA POS 1b – Ploča uklještena duž tri ivice i slobodno oslonjena duž duže ivice

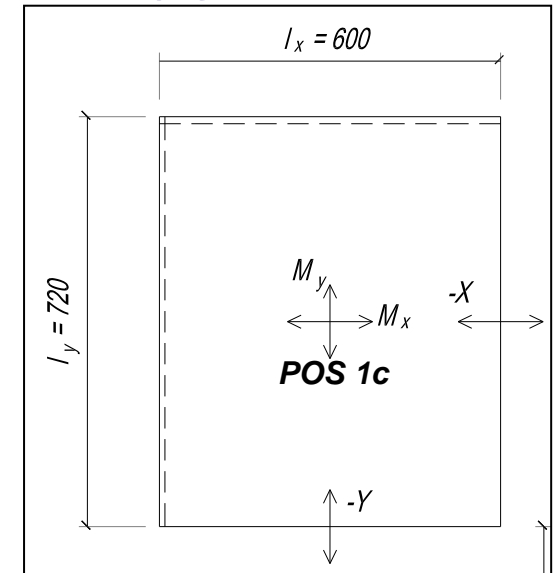
1.4 STATIČKI UTICAJI POS 1c

$$L_y/L_x = 7.2/6.0 = 1.20$$

$$G = 6.0 \times 7.2 \times 6.0 = 259.2 \text{ kN}$$

$$P = 10.0 \times 7.2 \times 6.0 = 432 \text{ kN}$$

		$l_y : l_x$	1,2
	M_x	0,032	
	M_y	0,023	
	$-X$	0,071	
	$-Y$	0,062	
	Q_1	0,331	
	Q_2	0,226	
	Q_3	0,257	
	Q_4	0,186	



$$M_{Xg} = 259.2 \times 0.032 = 8.29 \text{ kNm/m};$$

$$M_{Xp} = 432 \times 0.023 = 13.82 \text{ kNm/m}$$

$$M_{Xu} = 1.6 \times 8.29 + 1.8 \times 13.92 = 38.15 \text{ kNm/m}$$

$$M_{Yg} = 259.2 \times 0.023 = 5.96 \text{ kNm/m};$$

$$M_{Yp} = 432 \times 0.023 = 9.94 \text{ kNm/m}$$

$$M_{Yu} = 1.6 \times 5.96 + 1.8 \times 9.94 = 27.42 \text{ kNm/m}$$

$$Q_{1,g} = 259.2 \times 0.331 = 85.8 \text{ kN}$$

$$Q_{2,g} = 259.2 \times 0.226 = 58.6 \text{ kN}$$

$$Q_{3,g} = 259.2 \times 0.257 = 66.6 \text{ kN}$$

$$Q_{4,g} = 259.2 \times 0.186 = 48.2 \text{ kN}$$

$$X_g = 259.2 \times 0.071 = 18.40 \text{ kNm/m};$$

$$X_p = 432 \times 0.071 = 30.67 \text{ kNm/m}$$

$$X_u = 1.6 \times 18.40 + 1.8 \times 30.67 = 84.65 \text{ kNm/m}$$

$$Y_g = 259.2 \times 0.062 = 16.07 \text{ kNm/m};$$

$$Y_p = 432 \times 0.062 = 26.78 \text{ kNm/m}$$

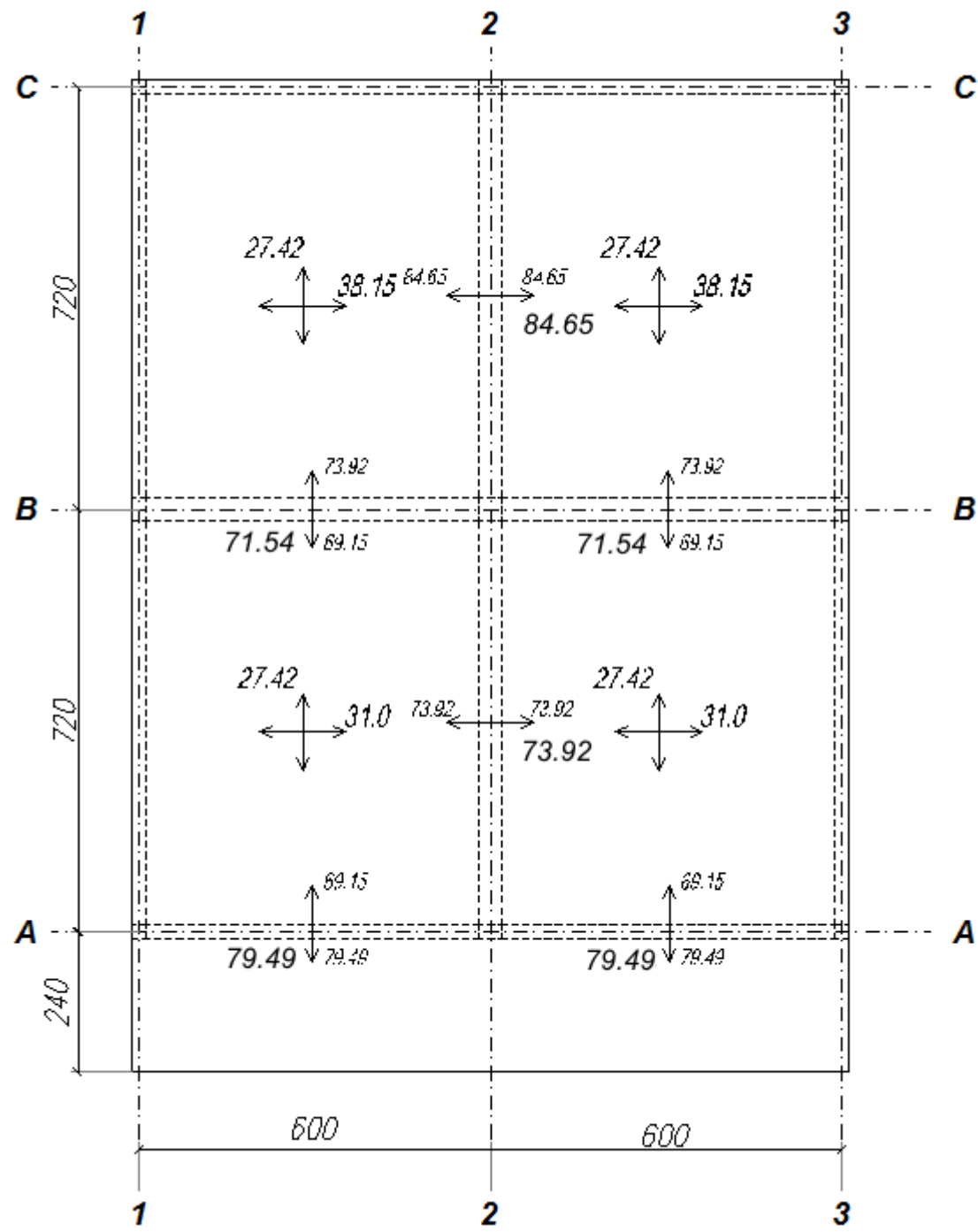
$$Y_u = 1.6 \times 16.07 + 1.8 \times 26.78 = 73.92 \text{ kNm/m}$$

$$Q_{1,p} = 432 \times 0.331 = 143.0 \text{ kN}$$

$$Q_{2,p} = 432 \times 0.226 = 97.6 \text{ kN}$$

$$Q_{3,p} = 432 \times 0.257 = 111.0 \text{ kN}$$

$$Q_{4,p} = 432 \times 0.186 = 80.4 \text{ kN}$$



PLOČA POS 1

1.5 DIMENZIONISANJE POS 1

Gornja zona, kraći pravac:

$$\text{MB 30} \quad \Rightarrow f_B = 20.5 \text{ MPa} = 2.05 \text{ kN/cm}^2$$

$$\text{RA 240/360} \quad \Rightarrow \sigma_v = 400 \text{ MPa} = 40.0 \text{ kN/cm}^2$$

$$\text{pretp. } a_1 = 3.0 \text{ cm} \Rightarrow h = 16.0 - 3.0 = 13.0 \text{ cm} ; b = 100 \text{ cm} = 1.0 \text{ m}$$

$$X_u = 84.65 \text{ kNm/m}$$

$$k = \frac{13}{\sqrt{\frac{84.65 \times 10^2}{100 \times 2.05}}} = 2.023 \Rightarrow \varepsilon_b/\varepsilon_a = 3.50/6.388\% ; \bar{\mu} = 28.653\%$$

$$A_{a,potr.} = 28.653 \times \frac{100 \times 13}{100} \times \frac{2.05}{40} = 19.09 \text{ cm}^2/\text{m}$$

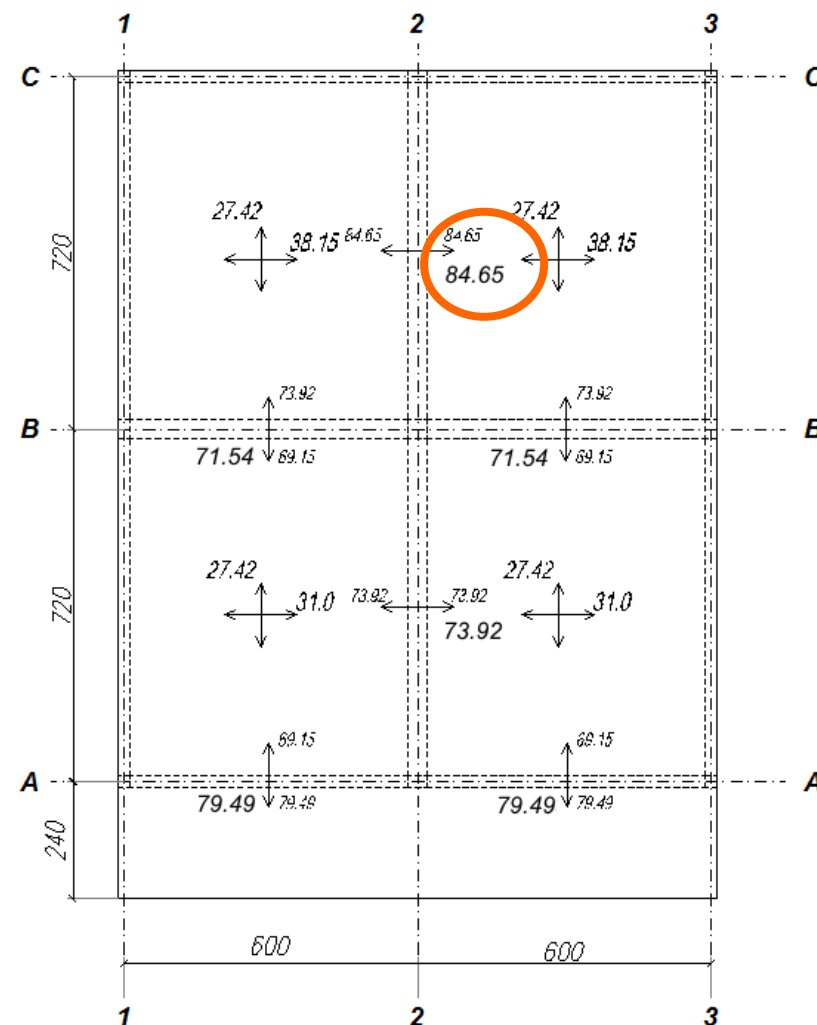
$$\text{pretp. } \text{Ø}16 (a_a^{(1)} = 2.01 \text{ cm}^2) \Rightarrow e_a = \frac{100 \times a_a^{(1)}}{A_{a,potr.}} = \frac{100 \times 2.01}{19.09} = 10.53 \text{ cm}$$

usvojeno: **Ø16/10** (20.1 cm²/m)

$$A_{ap} = 0.20 \times A_{a,potr.} = 0.20 \times 19.09 = 3.82 \text{ cm}^2/\text{m}$$

$$\text{pretp. } \text{Ø}10 (a_a^{(1)} = 0.785 \text{ cm}^2) \Rightarrow e_{ap} = \frac{100 \times a_a^{(1)}}{A_{ap,potr.}} = \frac{100 \times 0.785}{3.82} = 20.55 \text{ cm}$$

usvojeno: **Ø10/20** (3.93 cm²/m)



PLOČA POS 1

1.5 DIMENZIONISANJE POS 1

$$X_u = 73.92 \text{ kNm/m}$$

$$k = \frac{13}{\sqrt{\frac{73.92 \times 10^2}{100 \times 2.05}}} = 2.165 \Rightarrow \varepsilon_b/\varepsilon_a = 3.50/8.114\% ; \bar{\mu} = 24.396\%$$

$$A_{a, \text{potr.}} = 24.396 \times \frac{100 \times 13}{100} \times \frac{2.05}{40} = 16.25 \text{ cm}^2/\text{m}$$

$$A_{a, \text{min.}} = 0.10 \times \frac{100 \times 16}{100} = 1.60 \text{ cm}^2/\text{m} < A_{a, \text{potr.}} = 16.25 \text{ cm}^2/\text{m}$$

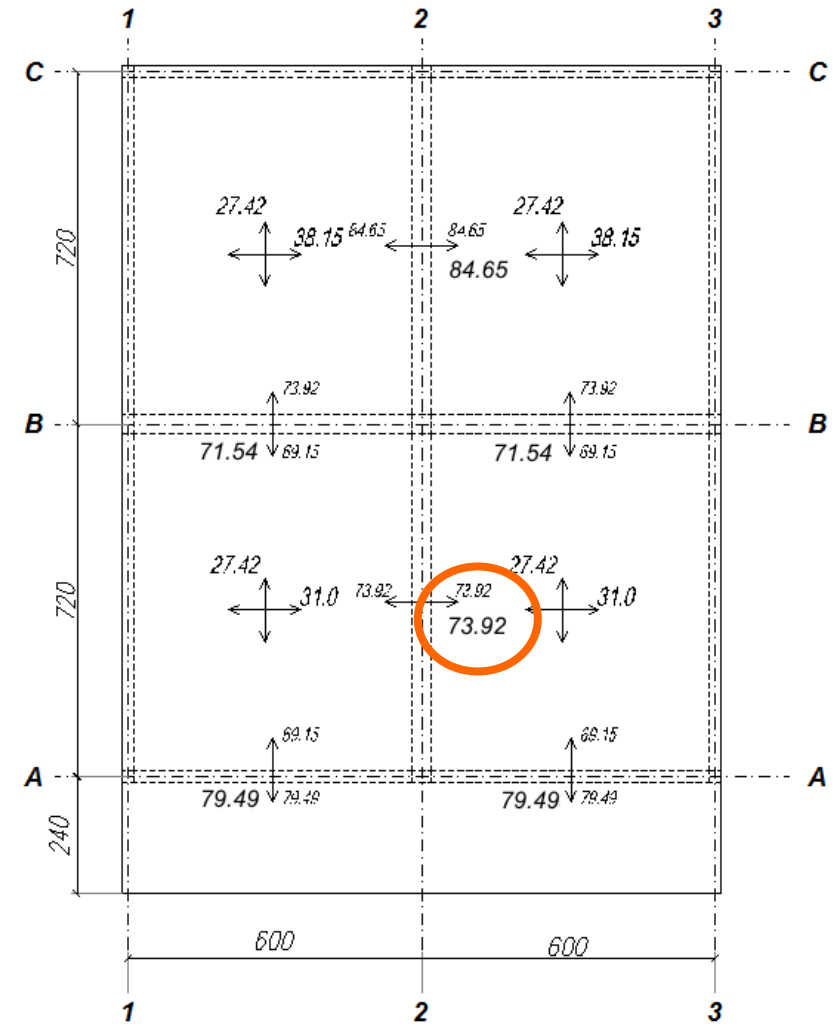
$$\text{pretp. } \emptyset 16 (a_a^{(1)} = 2.01 \text{ cm}^2) \Rightarrow e_a = \frac{100 \times a_a^{(1)}}{A_{a, \text{potr.}}} = \frac{100 \times 2.01}{16.25} = 12.37 \text{ cm}$$

usvojeno: $\emptyset 16/10$ (20.1 cm²/m)

$$A_{ap} = 0.20 \times A_{a, \text{potr.}} = 0.20 \times 16.25 = 3.25 \text{ cm}^2/\text{m}$$

$$\text{pretp. } \emptyset 10 (a_a^{(1)} = 0.785 \text{ cm}^2) \Rightarrow e_{ap} = \frac{100 \times a_a^{(1)}}{A_{ap, \text{potr.}}} = \frac{100 \times 0.785}{3.25} = 24.15 \text{ cm}$$

usvojeno: $\emptyset 10/20$ (3.93 cm²/m)



PLOČA POS 1

1.5 DIMENZIONISANJE POS 1

Gornja zona, duži pravac:

$$\text{pretp. } a_1 = a_0 + \varnothing_x + \varnothing_y/2 = 2 + 1.6 + 0.8 = 4.4 \text{ cm}$$

$$\Rightarrow h = 16.0 - 4.4 = 11.6 \text{ cm} ; b = 100 \text{ cm} = 1.0 \text{ m}$$

$$Y_u = 79.49 \text{ kNm/m}$$

$$k = \frac{11.6}{\sqrt{\frac{79.49 \times 10^2}{100 \times 2.05}}} = 1.863 \Rightarrow \varepsilon_b/\varepsilon_a = 3.5/4.55 \text{ ‰} ; \bar{\mu} = 35.197\%$$

$$A_{a,\text{potr.}} = 35.197 \times \frac{100 \times 11.6}{100} \times \frac{2.05}{40} = 20.92 \text{ cm}^2/\text{m}$$

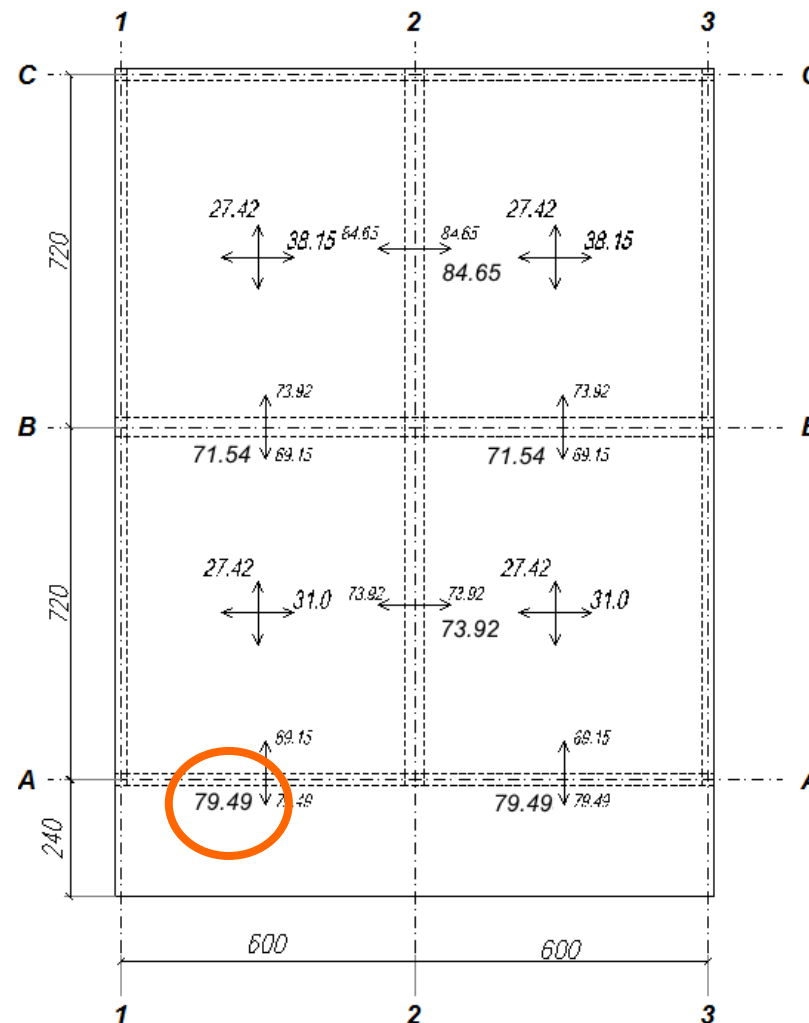
$$\text{pretp. } \varnothing 19 \left(a_a^{(1)} = 2.84 \text{ cm}^2 \right) \Rightarrow e_a = \frac{100 \times a_a^{(1)}}{A_{a,\text{potr.}}} = \frac{100 \times 2.84}{20.92} = 13.57 \text{ cm}$$

usvojeno: $\varnothing 19/12.5$ (22.72 cm²/m)

$$A_{a,p} = 0.2 \times A_{a,\text{potr.}} = 4.18 \text{ cm}^2/\text{m}$$

$$\text{pretp. } \varnothing 10 \left(a_a^{(1)} = 0.785 \text{ cm}^2 \right) \Rightarrow e_a = \frac{100 \times a_a^{(1)}}{A_{a,\text{potr.}}} = \frac{100 \times 0.785}{4.18} = 18.78 \text{ cm}$$

usvojeno: $\varnothing 10/15$ (22.72 cm²/m)



PLOČA POS 1

1.5 DIMENZIONISANJE POS 1

$$Y_u = 71.54 \text{ kNm/m}$$

$$k = \frac{11.6}{\sqrt{\frac{71.54 \times 10^2}{100 \times 2.05}}} = 1.964 \Rightarrow \varepsilon_b/\varepsilon_a = 3.50/5.696\% ; \bar{\mu} = 30.811\%$$

$$A_{a,potr.} = 30.811 \times \frac{100 \times 11.6}{100} \times \frac{2.05}{40} = 18.32 \text{ cm}^2/\text{m}$$

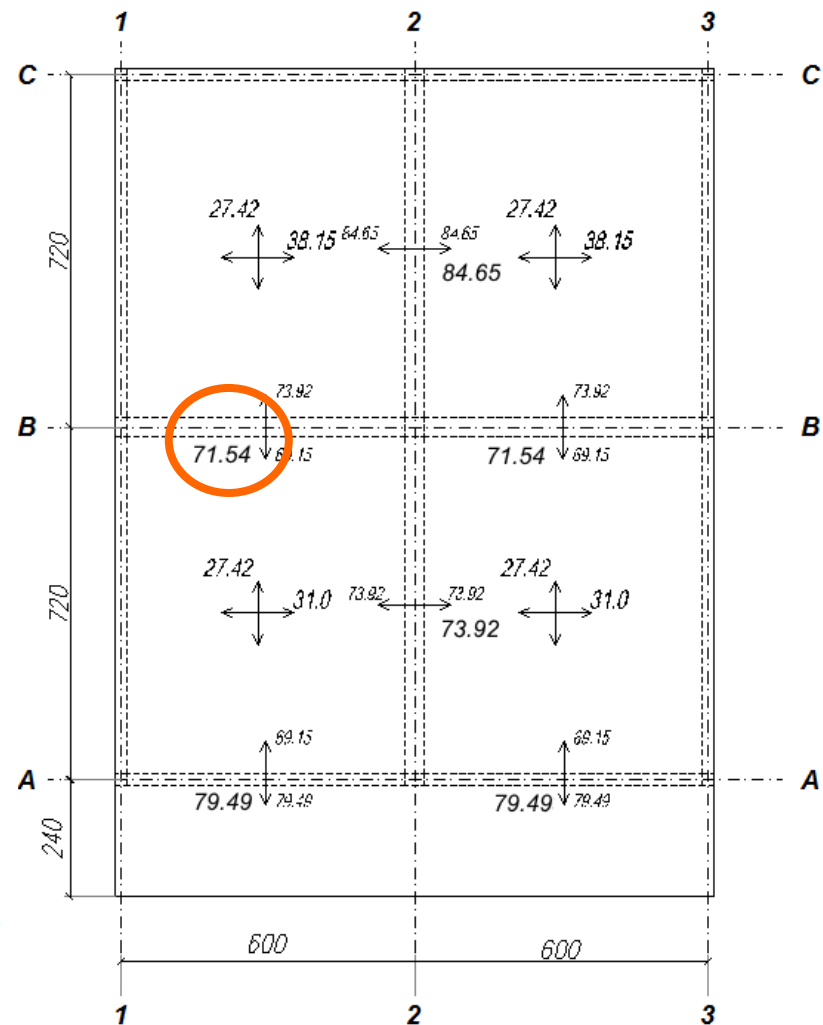
$$\text{pretp. } \varnothing 16 (a_a^{(1)} = 2.01 \text{ cm}^2) \Rightarrow e_a = \frac{100 \times a_a^{(1)}}{A_{a,potr.}} = \frac{100 \times 2.01}{18.32} = 10.97 \text{ cm}$$

usvojeno: $\varnothing 16/10$ (20.1 cm²/m)

$$A_{ap} = 0.20 \times A_{a,potr.} = 0.20 \times 18.32 = 3.66 \text{ cm}^2/\text{m}$$

$$\text{pretp. } \varnothing 10 (a_a^{(1)} = 0.785 \text{ cm}^2) \Rightarrow e_{ap} = \frac{100 \times a_a^{(1)}}{A_{ap,potr.}} = \frac{100 \times 0.785}{3.66} = 21.42 \text{ cm}$$

usvojeno: $\varnothing 10/20$ (3.93 cm²/m)



PLOČA POS 1

1.5 DIMENZIONISANJE POS 1

Donja zona, kraći pravac:

$$\text{pretp. } a_1 = 3.0 \text{ cm} \Rightarrow h = 16.0 - 3.0 = 13.0 \text{ cm} ; b = 100 \text{ cm} = 1.0 \text{ m}$$

$$M_{Xu} = 38.15 \text{ kNm/m}$$

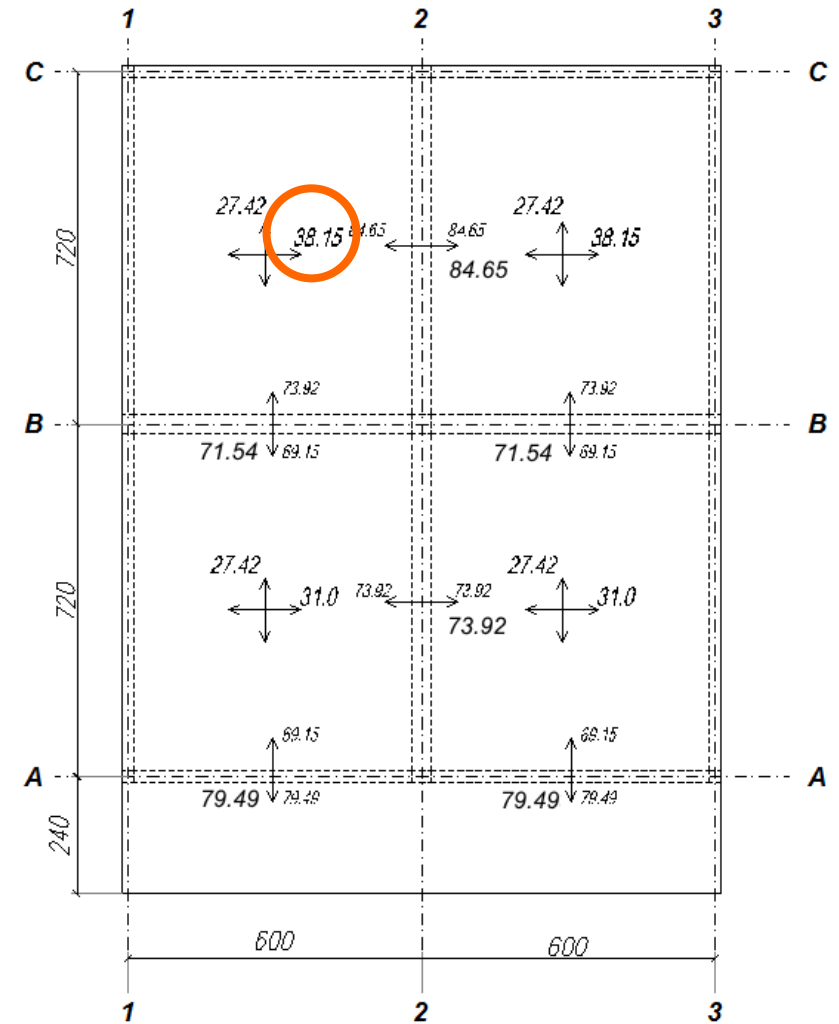
$$k = \frac{13}{\sqrt{\frac{38.15 \times 10^2}{100 \times 2.05}}} = 3.106 \Rightarrow \varepsilon_b/\varepsilon_a = 1.992/10.0\% ; \bar{\mu} = 11.053\%$$

$$A_{a,potr.} = 11.053 \times \frac{100 \times 13}{100} \times \frac{2.05}{40} = 7.59 \text{ cm}^2/\text{m}$$

$$A_{a,min.} = 0.10 \times \frac{100 \times 16}{100} = 1.60 \text{ cm}^2/\text{m} < A_{a,potr.} = 7.59 \text{ cm}^2/\text{m}$$

$$\text{pretp. } \emptyset 10 (a_a^{(1)} = 0.785 \text{ cm}^2) \Rightarrow e_a = \frac{100 \times a_a^{(1)}}{A_{a,potr.}} = \frac{100 \times 0.785}{7.59} = 10.34 \text{ cm}$$

usvojeno: $\emptyset 10/10 (7.85 \text{ cm}^2/\text{m})$



PLOČA POS 1

1.5 DIMENZIONISANJE POS 1

$$M_{Xu} = 31.0 \text{ kNm/m}$$

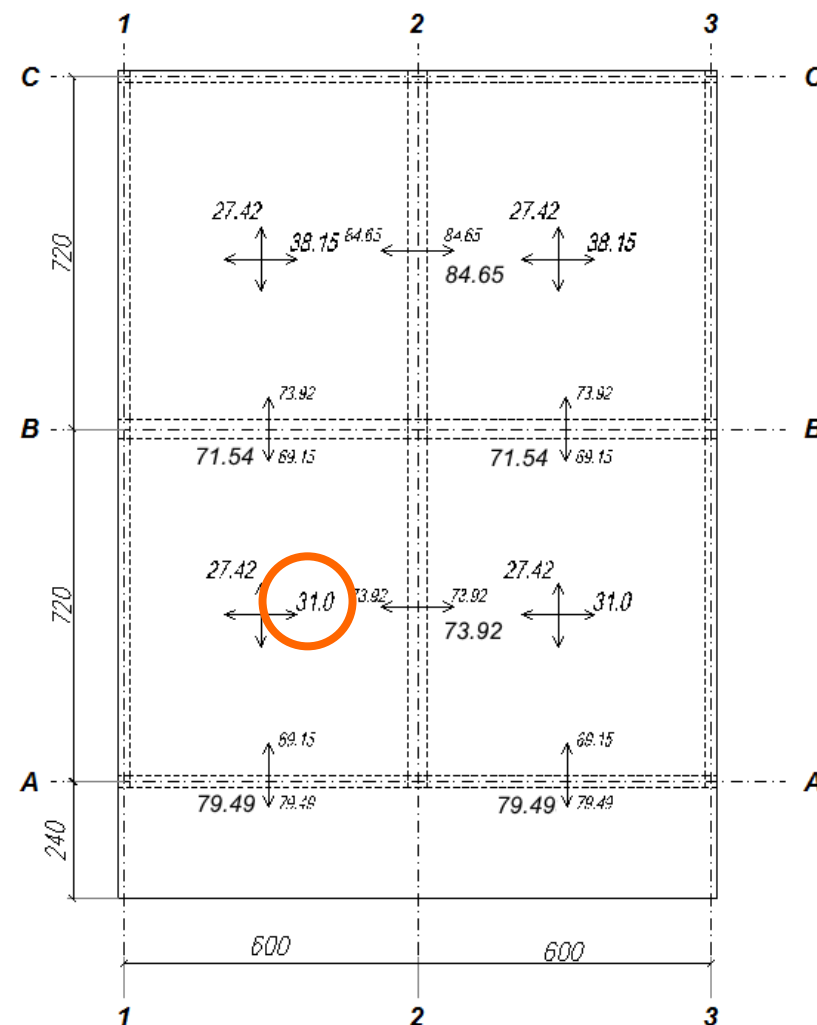
$$k = \frac{13}{\sqrt{\frac{31.0 \times 10^2}{100 \times 2.05}}} = 3.446 \Rightarrow \varepsilon_b/\varepsilon_a = 1.706/10.0\% ; \bar{\mu} = 8.897\%$$

$$A_{a, \text{potr.}} = 8.897 \times \frac{100 \times 13}{100} \times \frac{2.05}{40} = 6.11 \text{ cm}^2/\text{m}$$

$$A_{a, \text{min.}} = 0.10 \times \frac{100 \times 16}{100} = 1.60 \text{ cm}^2/\text{m} < A_{a, \text{potr.}} = 6.11 \text{ cm}^2/\text{m}$$

$$\text{pretp. } \varnothing 10 (a_a^{(1)} = 0.785 \text{ cm}^2) \Rightarrow e_a = \frac{100 \times a_a^{(1)}}{A_{a, \text{potr.}}} = \frac{100 \times 0.785}{6.11} = 12.85 \text{ cm}$$

usvojeno: $\varnothing 10/12.5 (6.28 \text{ cm}^2/\text{m})$



PLOČA POS 1

1.5 DIMENZIONISANJE POS 1

Donja zona, duži pravac:

$$\text{pretp. } a_1 = a_0 + \varnothing_x + \varnothing_y / 2 = 2 + 1.0 + 0.5 \text{ cm} = 3.5 \text{ cm}$$

$$\Rightarrow h = 16.0 - 3.5 = 12.5 \text{ cm} ; b = 100 \text{ cm} = 1.0 \text{ m}$$

$$M_{Yu} = 27.42 \text{ kNm/m}$$

$$k = \frac{12.5}{\sqrt{\frac{27.42 \times 10^2}{100 \times 2.05}}} = 3.336 \Rightarrow \varepsilon_b / \varepsilon_a = 1.788 / 10.0\% ; \bar{\mu} = 9.520\%$$

$$A_{a, \text{potr.}} = 9.520 \times \frac{100 \times 12.5}{100} \times \frac{2.05}{40} = 5.95 \text{ cm}^2/\text{m}$$

$$A_{a, \text{min.}} = 0.10 \times \frac{100 \times 16}{100} = 1.60 \text{ cm}^2/\text{m} < A_{a, \text{potr.}} = 5.95 \text{ cm}^2/\text{m}$$

$$\text{pretp. } \varnothing 10 (a_a^{(1)} = 0.785 \text{ cm}^2) \Rightarrow e_a = \frac{100 \times a_a^{(1)}}{A_{a, \text{potr.}}} = \frac{100 \times 0.785}{5.95} = 13.19 \text{ cm}$$

usvojeno: $\varnothing 10/12.5$ (6.28 cm²/m)

