BETONSKE KONSTRUKCIJE 1
HVE PŽA
Vežba br.3

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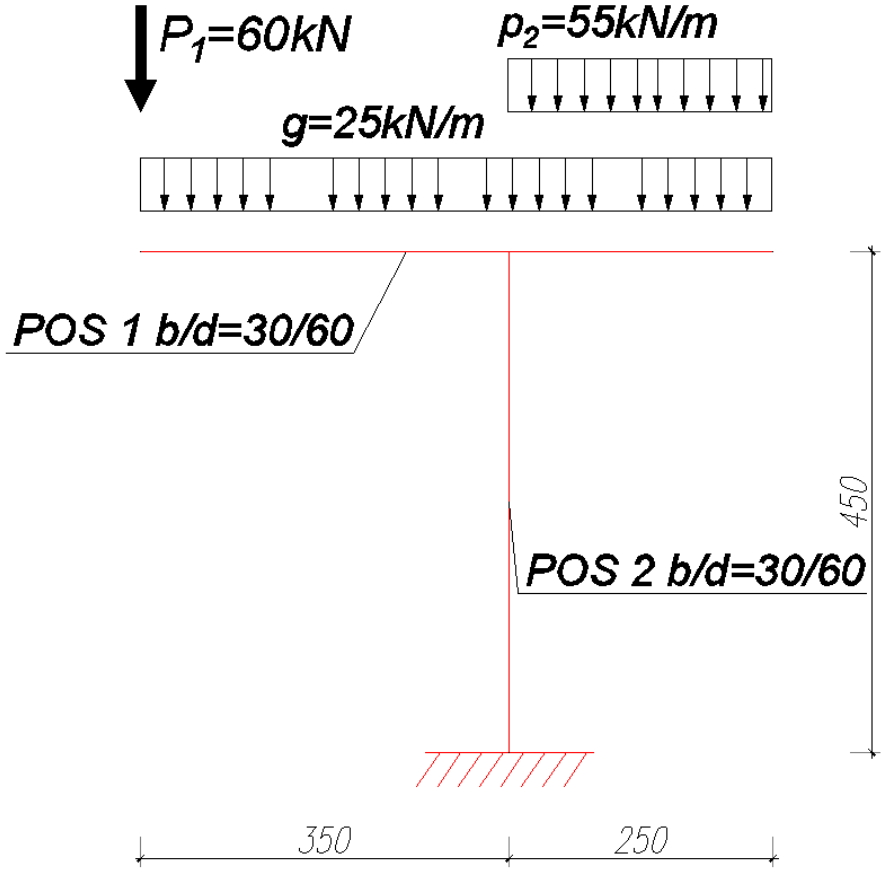
Semestar: V ***ESPB: 6***

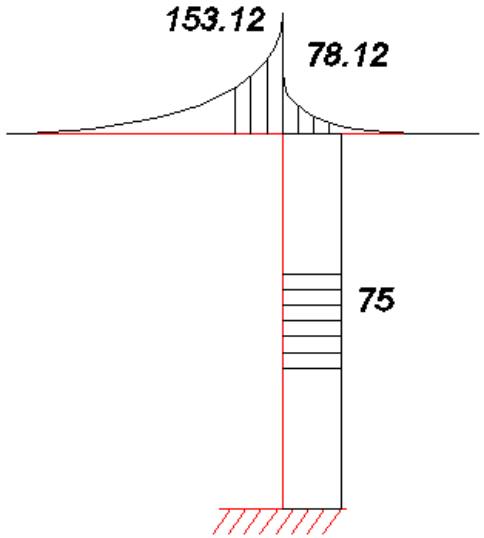
Pismeni ispit 22.08.2013.; 3. zadatak

*Dimenzionisati **POS 1** i **POS 2** koje su opterećene kao na skici u karakterističnim presecima prema **M**. Sopstvena težina je uračunata u zadato stalno opterećenje **g** dok povremena opterećenja P_1 i p_2 ne moraju delovati istovremeno.*

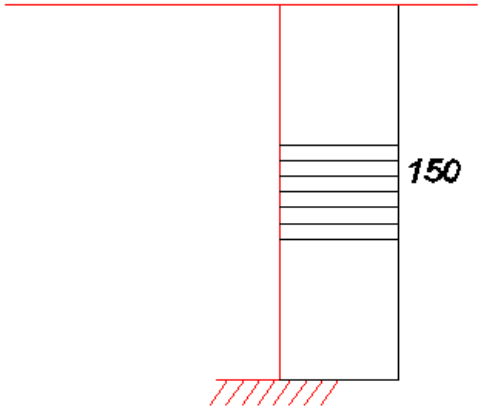
MB 30
RA 400/500



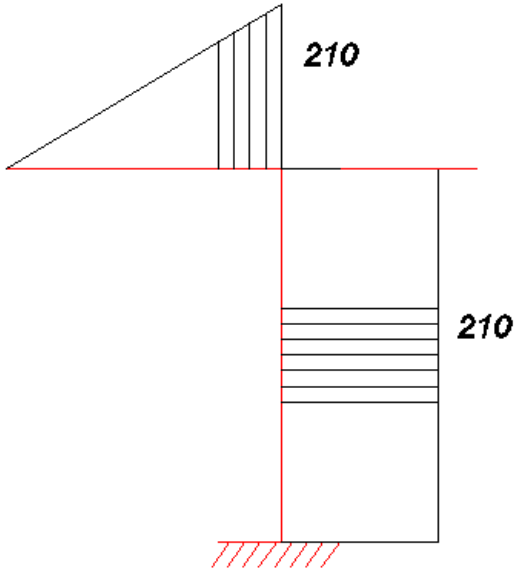
Statički uticaji:



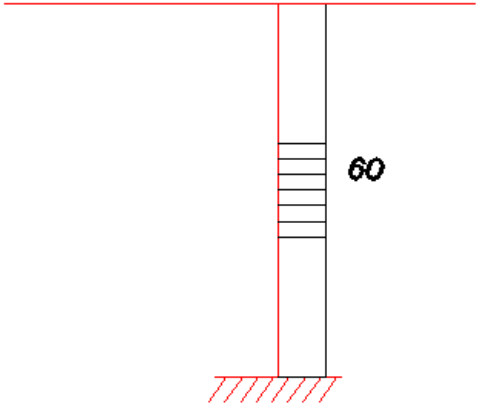
M_g



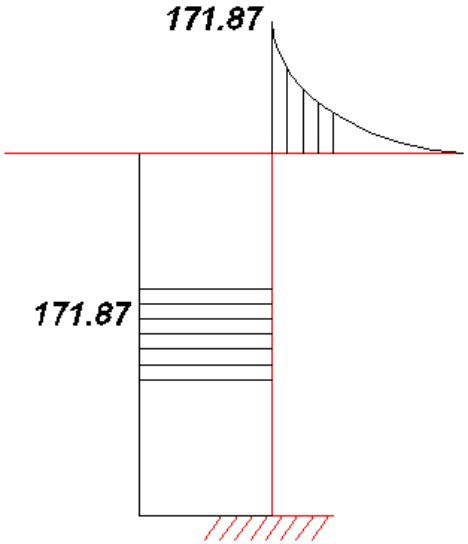
N_g



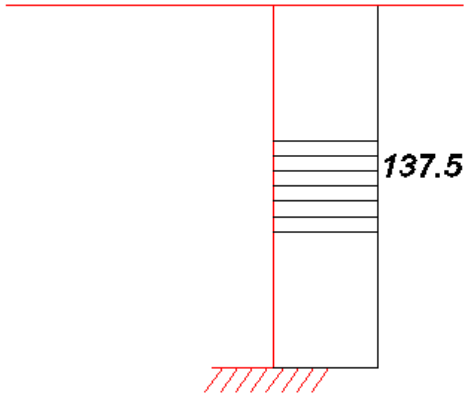
M_{p1}



N_{p1}

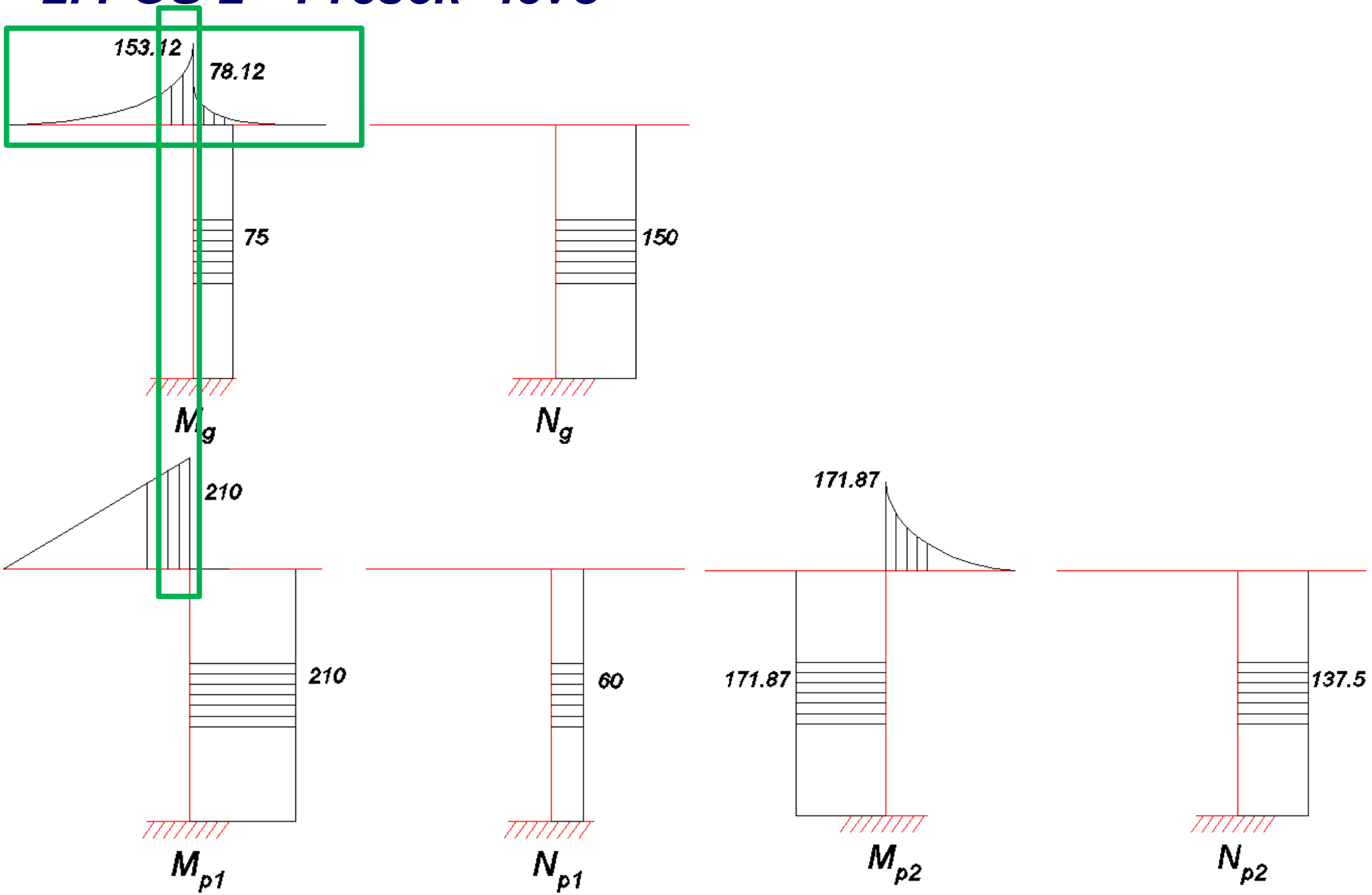


M_{p2}



N_{p2}

1. POS 1 Presek "levo"



1. POS 1 Presek "levo"

M_u =1.6×153.12 +1.8×210= 623 kNm

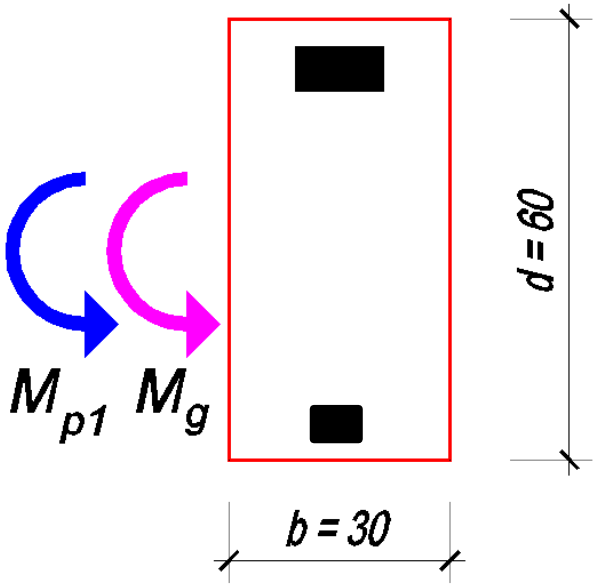
pretp. a_1 = 8 cm

h = 60 - 8 = 52 cm

MB 30 $\Rightarrow$ f_B = 2.05 kN/cm²

RA 400/500 $\Rightarrow$ σ_v = 40 kN/cm²

$$k = \frac{h}{\sqrt{\frac{M_u}{b \times f_B}}} = \frac{52}{\sqrt{\frac{623 \times 10^2}{30 \times 2.05}}} = 1.634$$



$$\varepsilon_b / \varepsilon_a = 3.5 / 2.10‰ \Rightarrow$$

DVOJNO ARMIRANJE!

1. POS 1 Presek "levo"

$$\varepsilon_a = 3.0‰ \Rightarrow k^* = 1.719 \Rightarrow \zeta^* = 0.776$$

$$M_{bu} = (\frac{h}{k^*})^2 \times b \times f_B = (\frac{52}{1.719^*})^2 \times 25 \times 2.05 \times 10^{-2} = 562.77 kNm$$

$$\Delta M_u = M_u - M_{bu} = 623 - 562.77 = 60.23 kNm$$

pretp. a_2 = 5 cm

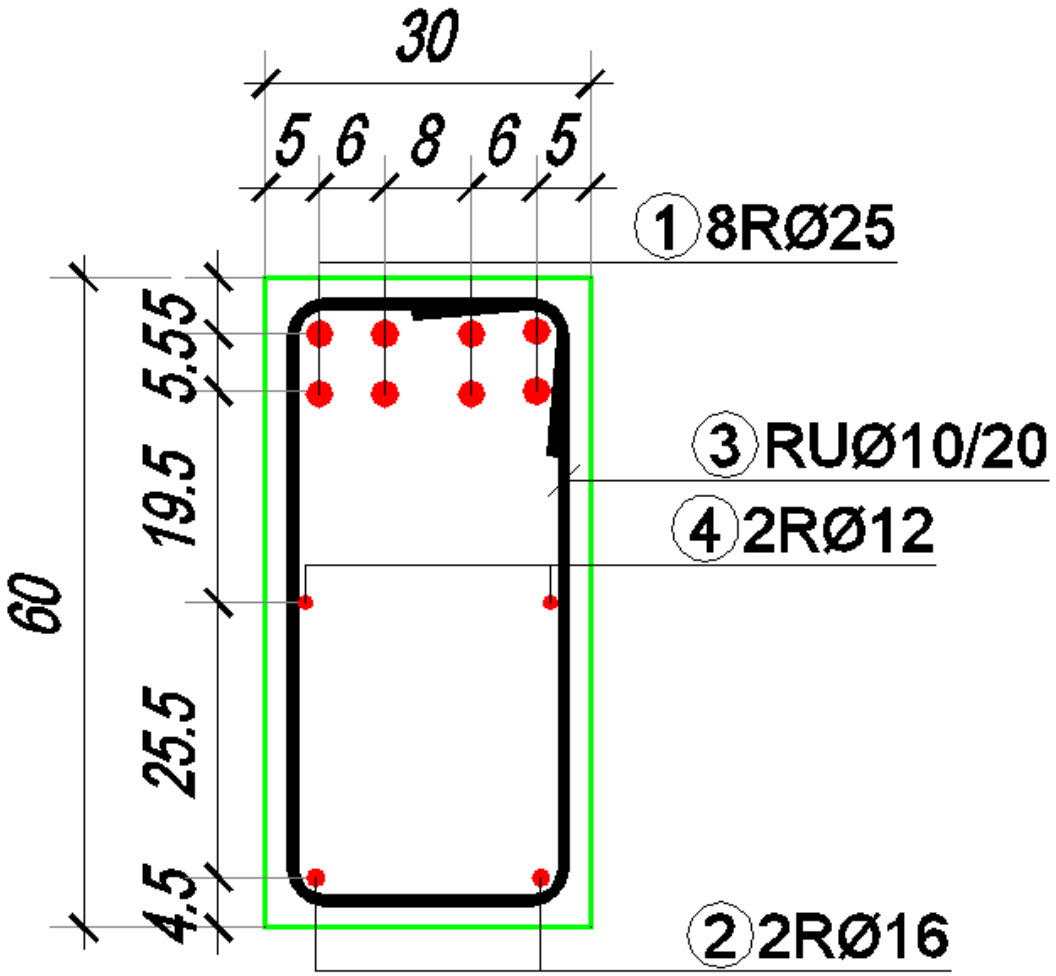
$$A_{a2} = \frac{\Delta M_u}{(h - a_2) \times \sigma_v} = \frac{60.23 \times 10^2}{(52 - 5) \times 40} = 3.2 cm^2$$

usvojeno: ***2RØ16*** *(4.02 cm²)*

$$A_{a1} = \frac{M_{bu}}{\zeta^* \times h \times \sigma_v} + A_{a2} = \frac{562.77 \times 10^2}{0.776 \times 52 \times 40} + 3.2 = 38.07 cm^2$$

usvojeno: ***8RØ25*** *(39.28 cm²)*

1. POS 1 Presek “levo”



$a^I = a_0 + Ø_u + Ø/2$

$a^I = 2.5 + 1.0 + 2.5/2 = 4.75$ cm

usv. $a^I = 5.0$ cm

$a^{II} = a^I + e_V + 2\times Ø/2$

$a^{II} = 5.0 + 3.0 + 2\times 2.5/2 = 10.5$ cm

usv. $a^{II} = 10.5$ cm

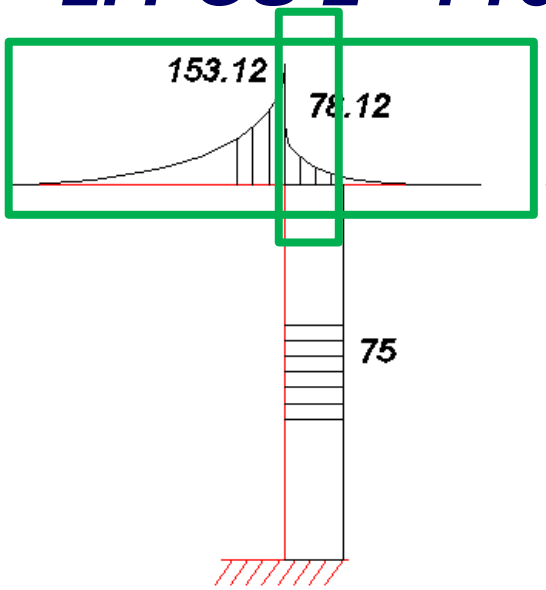
$a_1 = (4\times 5.0 + 4\times 10.5)/8$

$a_1 = 7.75$ cm

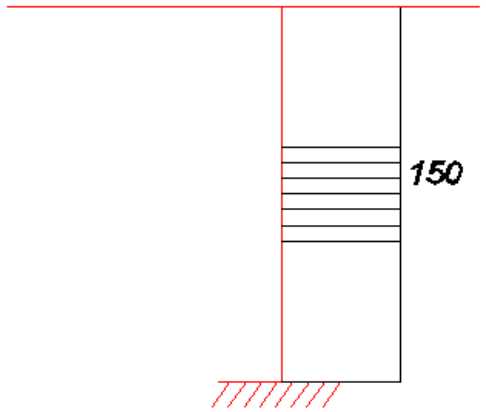
$h = 60 - 7.75 = 52.25$ cm $> h_{pretp.}$

$a_2 = 4.5$ cm

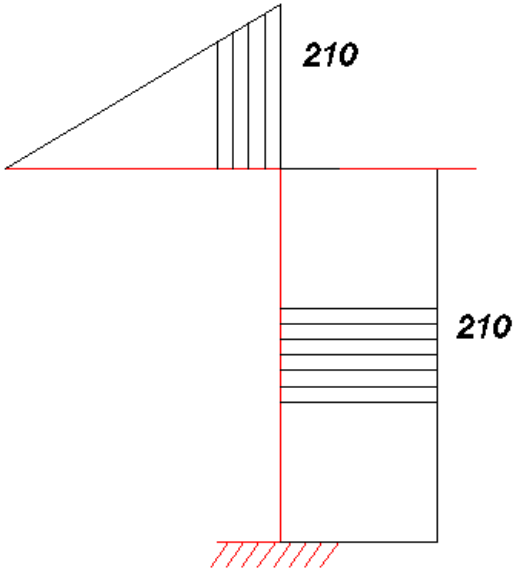
1. POS 1 Presek “desno”



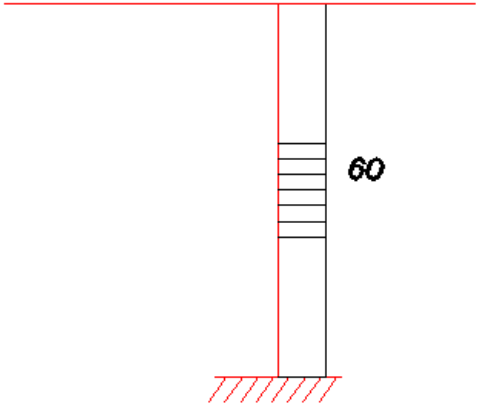
M_g



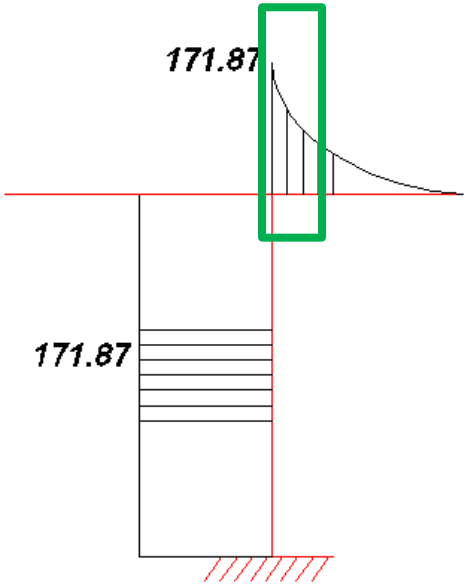
N_g



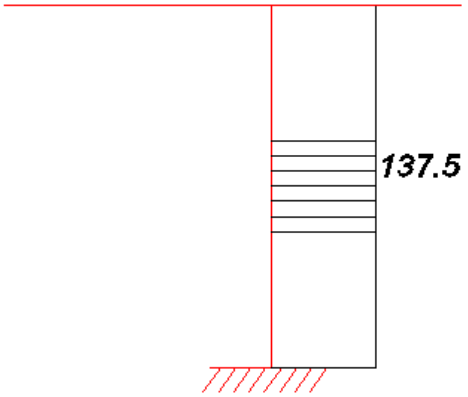
M_{p1}



N_{p1}



M_{p2}



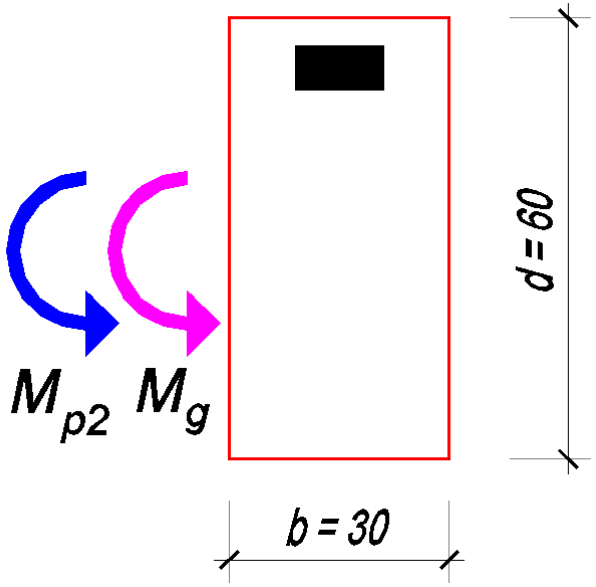
N_{p2}

1. POS 1 Presek "desno"

M_u =1.6×78.12 +1.8×171.87= 434.36 kNm

pretp. a_1 = 7 cm

h = 60 - 7 = 53 cm



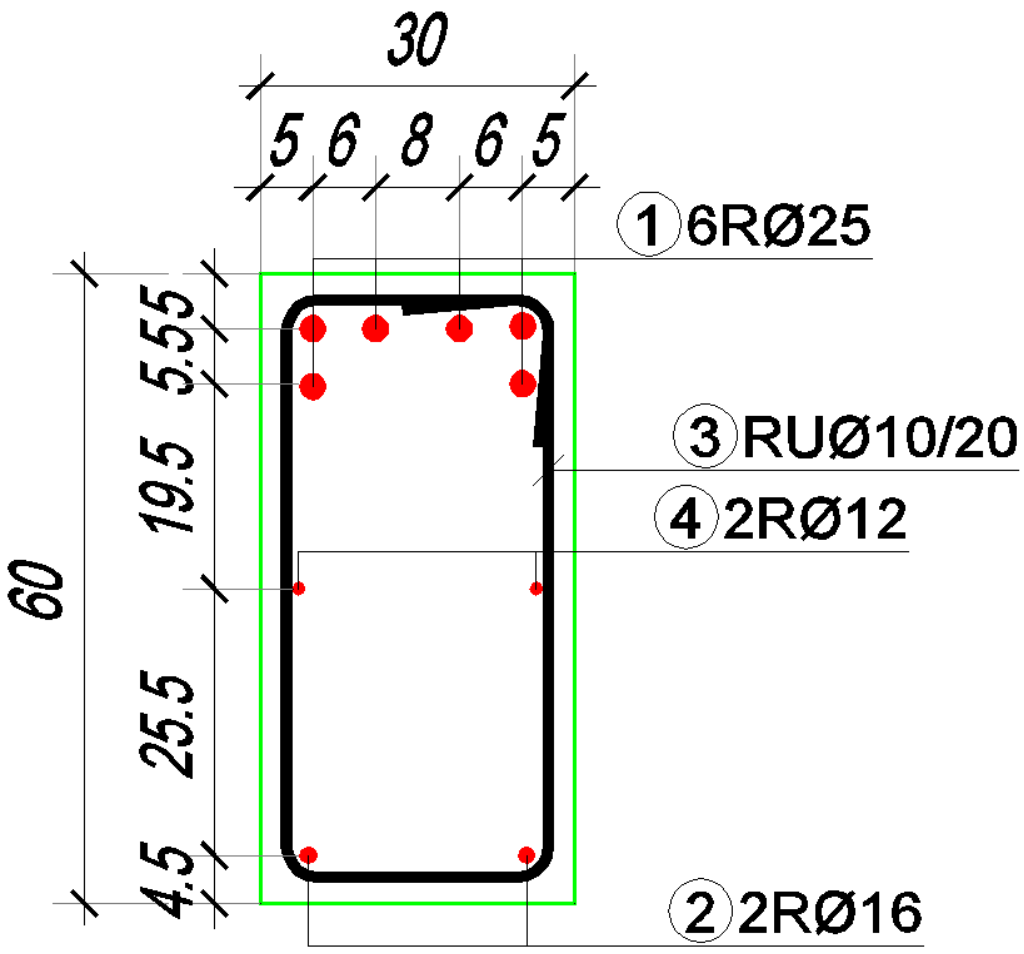
$$k = \frac{h}{\sqrt{\frac{M_u}{b \times f_B}}} = \frac{53}{\sqrt{\frac{434.36 \times 10^2}{30 \times 2.05}}} = 1.994$$

$$\varepsilon_b / \varepsilon_a = 3.5 / 6.05‰ \Rightarrow \zeta = 0.848$$

$$A_{a1} = \frac{M_u}{\zeta \times h \times \sigma_v} = \frac{434.36 \times 10^2}{0.848 \times 53 \times 40} = 24.16 cm^2$$

usvojeno: **6RØ25** (29.46 cm^2)

1. POS 1 Presek “desno”



$a^I = a_0 + Ø_u + Ø/2$

$a^I = 2.5 + 1.0 + 2.5/2 = 4.75$ cm

usv. $a^I = 5.0$ cm

$a^{II} = a^I + e_V + 2\times Ø/2$

$a^{II} = 5.0 + 3.0 + 2\times 2.5/2 = 10.5$ cm

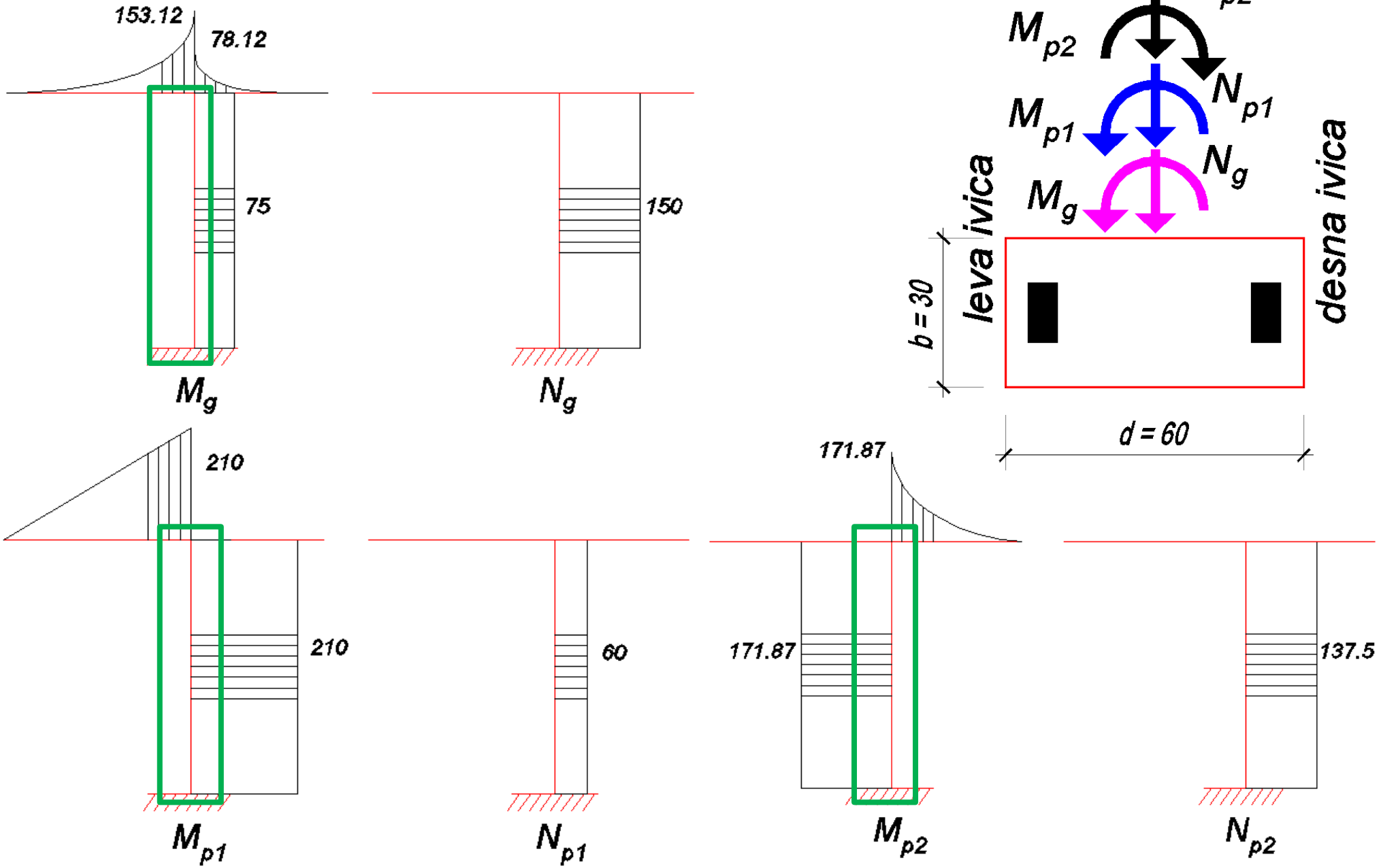
usv. $a^{II} = 10.5$ cm

$a_1 = (4\times 5.0 + 2\times 10.5)/6$

$a_1 = 6.83$ cm

$h = 60 - 6.83 = 53.17$ cm $> h_{pretp.}$

1. POS 2


153.12
78.12
75
M_g
150
N_g
210
210
M_{p1}
60
N_{p1}
171.87
171.87
M_{p2}
137.5
N_{p2}
N_{p2}
M_{p2}
N_{p1}
M_{p1}
N_g
M_g
leva ivica
desna ivica
b = 30
d = 60

1. POS 2 Zategnuta desna ivica

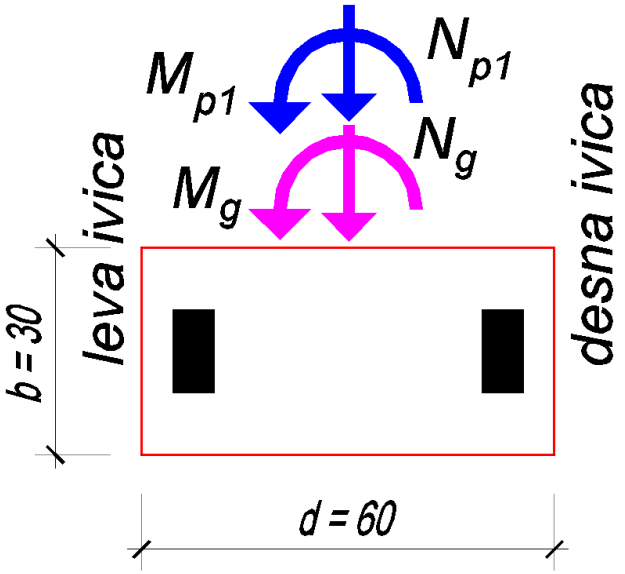
M_u =1.6×75 +1.8×210= 498 kNm

N_u =1.6×150 +1.8×60= 348 kNm

pretp. a_1 = 7 cm

h = 60 - 7 = 53 cm

M_{au} =498+348×(0.6/2-0.07)= 578.04 kNm



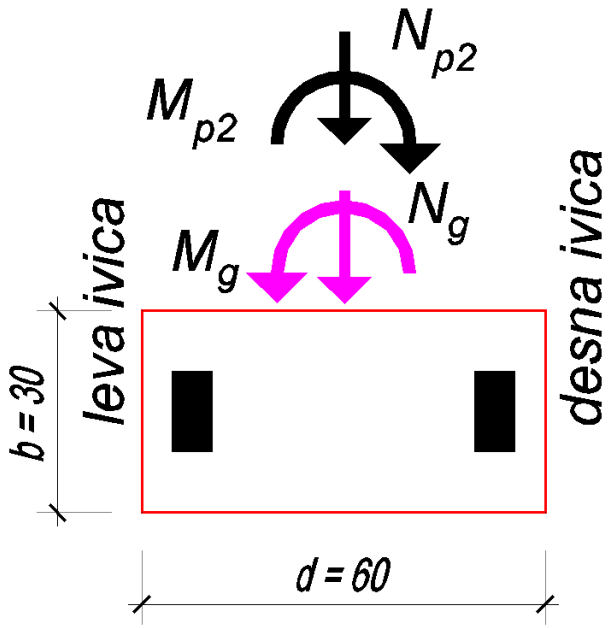
$$k = \frac{h}{\sqrt{\frac{M_{au}}{b \times f_B}}} = \frac{53}{\sqrt{\frac{578.04 \times 10^2}{30 \times 2.05}}} = 1.729$$

$$\varepsilon_b / \varepsilon_a = 3.5/3.1‰ \Rightarrow \zeta = 0.779$$

$$A_{a,desno} = \frac{M_{au}}{\zeta \times h \times \sigma_v} - \frac{N_u}{\sigma_v} = \frac{578.04 \times 10^2}{0.779 \times 53 \times 40} - \frac{348}{40} = 26.3 cm^2$$

usvojeno: **6RØ25** (29.46 cm²)

1. POS 2 Zategnuta leva ivica



M_u =1.0×(-75) +1.8×171.87= 234.37 kNm

N_u =1.0×150 +1.8×137.5= 397.5 kNm

pretp. a_1 = 6 cm

h = 60 - 6 = 54 cm

M_{au} =234.37+397.5×(0.6/2-0.06)= 329.77 kNm

$$k = \frac{h}{\sqrt{\frac{M_{au}}{b \times f_B}}} = \frac{54}{\sqrt{\frac{329.77 \times 10^2}{30 \times 2.05}}} = 2.332$$

$$\varepsilon_b / \varepsilon_a = 3.5 / 3.425‰ \Rightarrow \zeta = 0.894$$

$$A_{a,levo} = \frac{M_{au}}{\zeta \times h \times \sigma_v} - \frac{N_u}{\sigma_v} = \frac{329.77 \times 10^2}{0.894 \times 54 \times 40} - \frac{397.5}{40} = 7.14 cm^2$$

usvojeno: **2RØ25** (9.82 cm²)

1. POS 2

$a_{desno} = (4\times5.0 + 4\times10.5)/8$

$a_{desno} = 7.75$ cm

$h_d = 60 - 7.75 = 52.25$ cm $> h_{pretp.}$

$a_{levo} = 5.0$ cm

$h_d = 60 - 5 = 55$ cm $> h_{pretp.}$