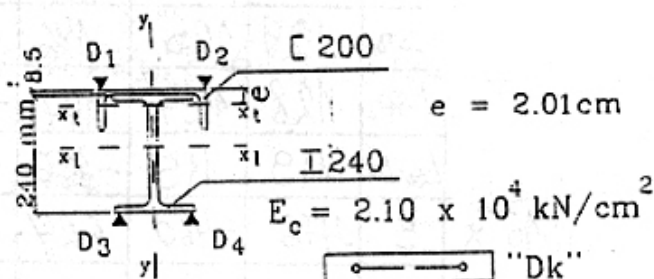




1. Na nosaču kranske staze, prema skici, merene su dilatacije deformetrom Labiskon ($l_0=250\text{mm}$). Odrediti momenat i normalnu silu koji deluju na presek.

stanje	D ₁	D ₂	D ₃	D ₄	D _K
0	2728	2641	1566	3820	3701
P	2855	2764	1418	3670	3709
0	2726	2639	1564	3818	3699

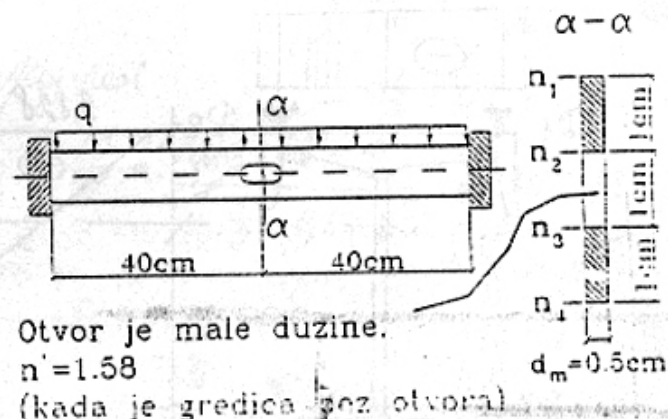


$I_{x-x} = 4250 \text{ cm}^4$

$I_{x-x} = 148 \text{ cm}^4$

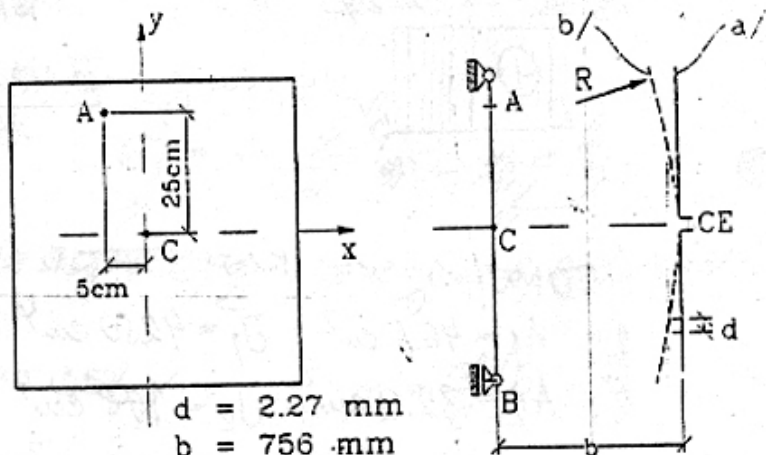
2. Preko modela prikazanog na skici, nađeni su u preseku $\alpha - \alpha$ na ivicama sledeći redovi izohroma: $n_1=2.1$; $n_2=0.9$; $n_3=1.0$; $n_4=2.2$; ($c=0.115$). Odrditi:

- Koncentraciju napona u datim tačkama;
- Naponsko stanje u preseku;
- Veličinu opterećenja;
- Naponsko stanje u prototipu od čelika.



3. Moare metodom ispitivan je model pećurkaste tavanice, prema skici. Dobijene su vrednosti momenata savijanja u tačkki A: $M_{Ax}=0.00756\text{kNcm/cm}$ i $M_{Az}=0.00128\text{kNcm/cm}$, uz $K_s=0.34\text{kNcm}$ i $\nu=0.3$. Koliko se procentualno razlikuju vrednosti momenata ako se uzme u obzir položaj tačke u odnosu na centar ekrana kada je ekran: a/ ravan

b/ zakrivljen sa $R=3.5b$

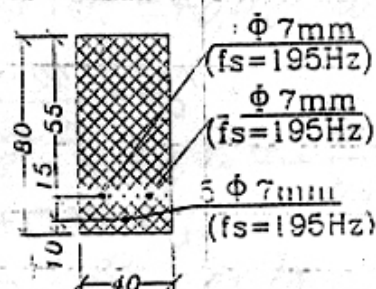
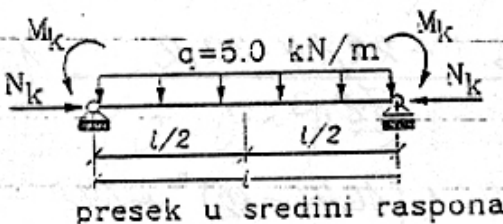


4. Naći raspone grede (L) pod uslovima:

a/ Da je ukupni napon na donjoj ivici $\sigma_d=0$;

b/ Da je ukupno napon na gornjoj ivici preseka

$\sigma_g=0.5\text{kN/cm}^2$ (pritisak).



1. РЕЗУЛЬТАТЫ МЕРЕБЫ:

Ст.	D1	D2	D3	D4	Dк
Δ1	127	123	-148	-150	8
Δ2	129	125	-146	-148	10
Δsr	128	124	-147	-149	9
ΔsrΔк	119	115	-156	-158	
10 ⁻⁶ × E	476	-460	624	632	
κ/см ² σ	9,996	-9,66	13,104	13,272	

Лабукоп $l = 250 \text{ mm}$

$p = 4 \cdot 10^6 \text{ kn/m}$

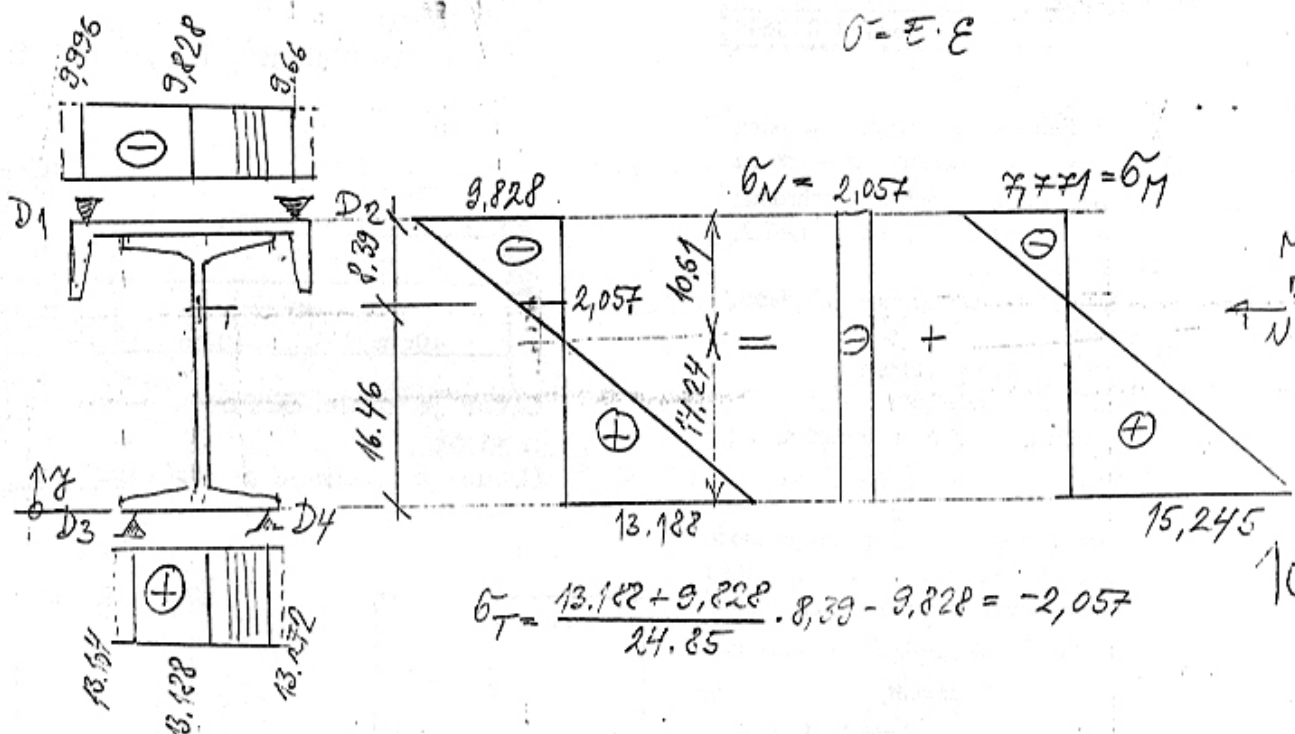
+ прирост

свойства конструкции
+ заделывание

$E = 2,1 \cdot 10^4 \text{ kn/cm}^2$

$\epsilon = -p \cdot \Delta C$

$\sigma = E \cdot \epsilon$



РЕЗУЛЬТАТЫ КАРАКТЕРИСТИК ПРИБОРА:

1. $A_1 = 46.1 \text{ cm}^2$ $J_1 = 4250 \text{ cm}^4$ (I 240) $r_1 = 12 \text{ cm}$

2. $A_2 = 32.2 \text{ cm}^2$ $J_2 = 148 \text{ cm}^4$ $r_2 = 24 + 0,85 - 2,01 = 22,84 \text{ cm}$

$A = 46.1 + 32.2 = 78,3 \text{ cm}^2$

$r_T = \frac{12 \cdot 46.1 + 22,84 \cdot 32,2}{78,3} = 16,46 \text{ cm}$

$J = 4250 + 46.1 \cdot (16,46 - 12)^2 + 148 + 32.2 \cdot (22,84 - 16,46)^2 = 6695,68 \text{ cm}^4$

$r_g = 24,25 - 16,46 = 8,39 \Rightarrow$

$r_{ol} = 16,46 \text{ cm}$

$W_g = \frac{6695,68}{8,39} = 799,71 \text{ cm}^3$

$W_d = \frac{6695,68}{16,46} = 407,53 \text{ cm}^3$

ПРЕСЕЧНЕ ОУМЕР:

$$N = \sigma_m \cdot A = -2,057 \cdot 78,3 = -161,06 \text{ kN} \quad 5$$

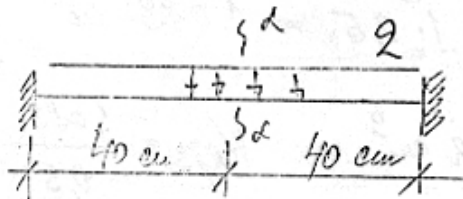
$$M' = 7,771 \cdot 789,71 = 6137 \text{ kNcm} = 61,37 \text{ kNm}$$

$$M'' = 15,245 \cdot 402,53 = 6137 \text{ kNcm} = 61,37 \text{ kNm}$$

$$M = \frac{1}{2} (M' + M'') = 61,37 \text{ kNm}$$

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2.



$$M_{\text{d-d}} = \frac{2l^2}{24} - \frac{9 \cdot 80^2}{24} = 266,667 \text{ kNcm}$$

$$[q] = \text{kN/cm}$$

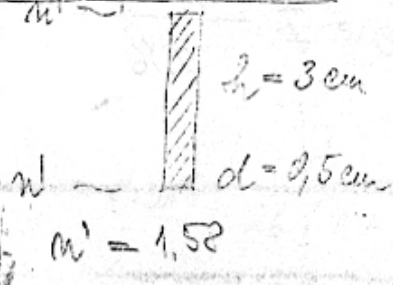
- ОПРЕДЕЛЕНИЕ:

$$c = 0,115 \text{ kN/cm} \cdot \text{rad}$$

$$m = \frac{d}{c} (\sigma_1 - \sigma_2)$$

$$\sigma = \frac{M}{W} = \frac{266,667 \cdot 2}{\frac{1}{6} \cdot 0,5 \cdot 3^2} = 355,556 \text{ g}$$

(это σ в m по x по z по y по x по z по y)



$$1,58 = \frac{0,5}{0,115} \cdot 355,556 \text{ g} \Rightarrow \text{g} = 0,00102 \text{ kN/cm}$$

- это σ в m по x по z по y по x по z по y по x по z по y

$$\sigma_2 = -355,556 \text{ g} \quad \sigma_1 = -\frac{2}{d} = -2 \text{ g}$$

$$1,58 = \frac{0,5}{0,115} \cdot (-2 + 355,556) \text{ g} \Rightarrow \text{g} = 0,00103 \text{ kN/cm}$$

- НАПРЯЖЕНИЕ ОТДЕЛ ПРЭСЕЧУ: $m = \frac{d}{c} (\sigma_1 - \sigma_2)$

ТАЧКА 1:

$$m_1 = 2,1 = \frac{0,5}{0,115} (-2 + 0,00103 \cdot \sigma_2^1) \Rightarrow \sigma_2^1 = -0,485 \text{ kN/cm}^2$$

ТАЧКА 2:

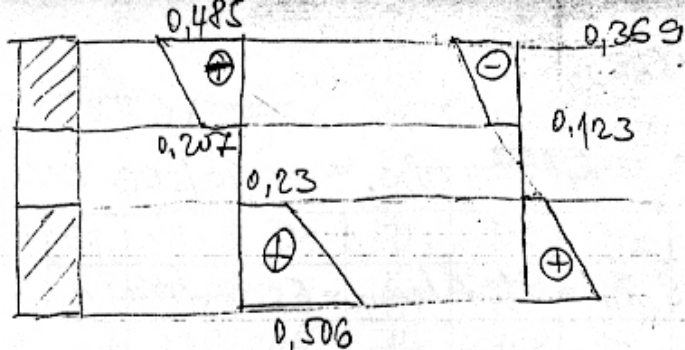
$$m_2 = 0,9 = \frac{0,5}{0,115} (0 - \sigma_2^2) \Rightarrow \sigma_2^2 = -0,207 \text{ kN/cm}^2$$

ТАЧКА 3:

$$m_3 = 1,0 = \frac{0,5}{0,115} (\sigma_1^3 - 0) \Rightarrow \sigma_1^3 = 0,23 \text{ kN/cm}^2$$

ТАЧКА 4:

$$m_4 = 2,2 = \frac{0,5}{0,115} (\sigma_1^4 - 0) \Rightarrow \sigma_1^4 = 0,506 \text{ kN/cm}^2$$



- РАЧУНСКИ НАПОНИ :

$$J = \frac{1}{12} \cdot 3 \cdot 0,5^3 - \frac{1}{12} \cdot 1 \cdot 0,5^3 = 1,083 \text{ см}^4$$

$$W_{1,4} = \frac{1,083}{1,5} = 0,722 \text{ см}^3$$

$$W_{2,3} = \frac{1,083}{0,5} = 2,16 \text{ см}^3$$

$$M = 266,667 \cdot 0,001$$

$$\sigma_{1,4}^{\text{par}} = \pm \frac{266,667 \cdot 10^{-3}}{0,722} = \pm 0,369 \frac{\text{кв}}{\text{см}^2}$$

$$\sigma_{2,3}^{\text{par}} = \pm \frac{266,667 \cdot 10^{-3}}{2,16} = \pm 0,123 \frac{\text{кв}}{\text{см}^2}$$

- КОЕФИЦИЈЕНТИ КОНЦЕНТРАЦИЈЕ :

$$dk_1 = \frac{0,485}{0,369} = 1,31$$

$$dk_2 = \frac{0,207}{0,123} = 1,68$$

$$dk_3 = \frac{0,230}{0,123} = 1,87$$

$$dk_4 = \frac{0,506}{0,369} = 1,37$$

- НАПОРАНО СТАЊЕ НА ПРОТОТИПУ ОД ЧЕХУКА :

$$\sigma_p = 2,1 \cdot 10^4 \text{ кв/см}^2 \quad \sigma_m = 300 \text{ кв/см}^2 \quad \sigma_e = \sigma_0$$

$$\text{УСЛОЖЕНО } \sigma_e = 0,3 \Rightarrow \sigma_0 = \sigma_e \cdot \sigma_e = 21$$

$$\sigma_{p1} = -0,485 \cdot 21 = -10,185 \text{ кв/см}^2$$

$$\sigma_{p2} = -0,207 \cdot 21 = -4,347 \text{ " "}$$

$$\sigma_{p3} = 0,23 \cdot 21 = 4,83 \text{ " "}$$

$$\sigma_{p4} = 0,506 \cdot 21 = 10,626 \text{ " "}$$

8) ЗАКРУЩЕНІЕ КРПАН ЗА $R=3,56$

$$\alpha = \frac{\alpha}{2\beta} = \alpha_{\text{свб}} \text{ за } C \leq 40 \text{ см}$$

$$\Delta \gamma = \Delta \gamma = 0\%$$

4. - ОПРЕДЕЛЕНИЕ СИЛ ПРЯХОДНОГО НАПРЯЖЕНИЯ:

$$\sigma_{\bar{x}} = C \cdot l_i^2 \cdot f_i^2$$

условия ($l_i = 100 \text{ см}$)

$$\sigma_{\bar{x}_1} = 3,2 \cdot 10^{-7} \cdot 100^2 \cdot 195^2 = 121,68 \text{ кн/см}^2$$

$$\sigma_{\bar{x}_2} = 3,2 \cdot 10^{-7} \cdot 100^2 \cdot 195^2 = 121,68 \text{ кн/см}^2$$

$$N_{k1} = A_{\bar{x}_1} \cdot \sigma_{\bar{x}_1} \Rightarrow N_{k1} = 2 \cdot 0,385 \cdot 121,68 = 93,69 \text{ кн}$$

$$A_{\bar{x}_2} = 0,7 \frac{\pi}{4} = 0,385 \text{ см}^2 \quad N_{k2} = 5 \cdot 0,385 \cdot 121,68 = 234,23 \text{ кн}$$

$$M_{k1} = -93,69 \cdot (40 - 25) = -1405,35 \text{ кн/см} = -14,05 \text{ кн/м}$$

$$M_{k2} = -234,23 (40 - 10) = -7027,02 \text{ кн/см} = -70,27 \text{ кн/м}$$

$$N_k = \sum N_{ki} = 93,69 + 234,23 \text{ кн} = 327,92 \text{ кн} \quad (\text{сила сжатия})$$

$$M_k = \sum M_{ki} = -14,05 - 70,27 = -84,32 \text{ кн/м} \quad (\text{знаменатель поворота})$$

- СРАВНИВАНИЕ НАПОНА В ПРЕСЕКУ И СРЕДНИХ РАСПОНА:

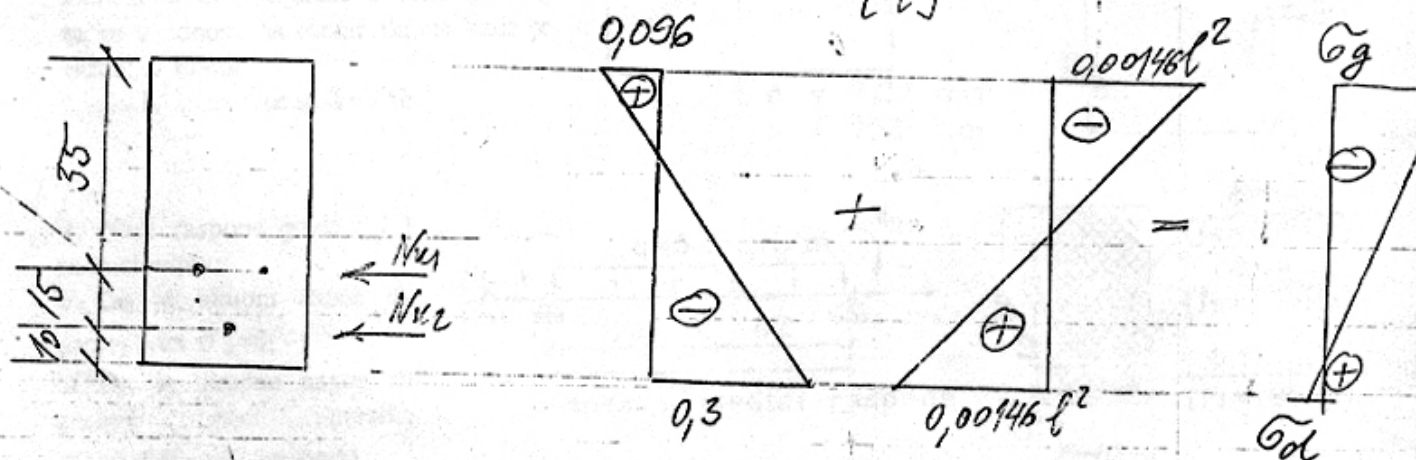
$$\sigma_{\bar{x},g}^{d-d} = \frac{N_k}{A_b} \pm \frac{M}{W_b} = \frac{-327,92}{40 \cdot 80} \pm \frac{+8432}{40 \cdot 80^2} \cdot 6 = -0,102 \pm 0,158$$

$$\sigma_{\bar{x},d}^{d-d} = -0,3 \text{ кн/см}^2$$

$$\sigma_{\bar{x},g}^{d-d} = 0,096 \text{ кн/см}^2$$

$$\sigma_{\bar{x},d}^{d-d} = \pm \frac{M_{d-d}^2}{W_b} = \pm \frac{5,0 \cdot l^2}{8 \cdot 40 \cdot 80^2} \cdot 6 \cdot 100 = \pm 0,00146 \cdot l^2$$

$$[l] = \text{м}$$



a) условие $\bar{\sigma}_d = 0$

$$\bar{\sigma}_d = -0,3 + 0,00146 l^2 = 0 \Rightarrow \underline{l = 14,33 \text{ м}}$$

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б) условие $\bar{\sigma}_g = -0,5 \text{ кН/см}^2$

$$\bar{\sigma}_g = 0,096 - 0,00146 l^2 = -0,5 \Rightarrow \underline{l = 20,2 \text{ м}}$$

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