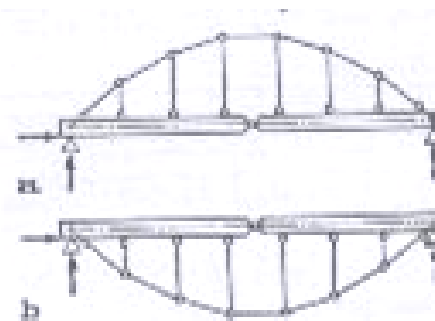
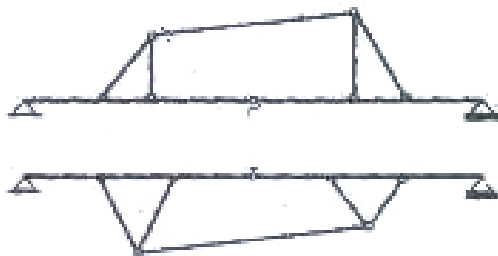
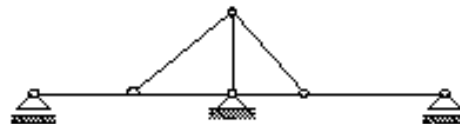
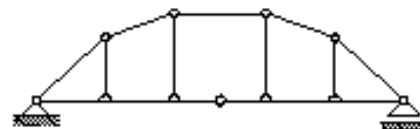
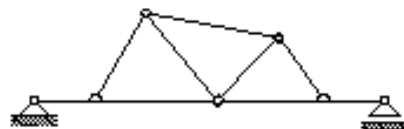
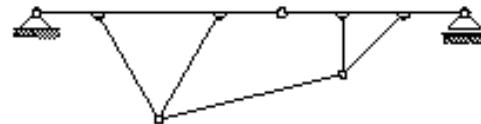
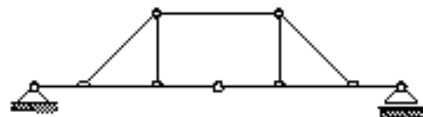


OJAČANE (LAGRANGEOVE) GREDE

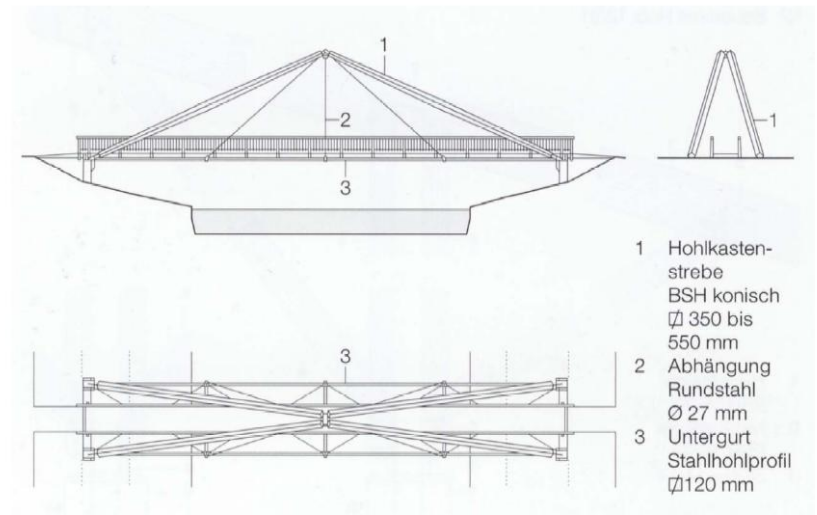


Razlika u predznaku sila ojačanja; gore-tlačne; dolje-vlačne

PRIMJENA



PRIMJENA

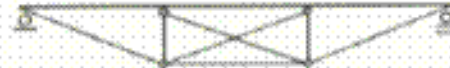


OJAČANE (LAGRANGEOVE) GREDE

OJAČANE GREDE



Sa jednom poduporom



Sa dvije podupore i X ispunom



Sa dvije podupore (savijanje pod nesimetričnim opterećenjem)



Sa nizom podupora (nepodesno za nesimetrična opterećenja)

$$a = 3 \cdot h$$

$$h = \frac{l}{15} - \frac{l}{20}$$

$$l = 8 - 80 \text{ m}$$

OJAČANE (LAGRANGEOVE) GREDE

OJAČANE GREDE SA DRVENOM ILI ČELIČNOM ZATEGOM



Kosa sa podporom okomitom na gredu



Horizontalna sa V podporama



Kosa sa vertikalnom podporom



Horizontalna sa dvostrukim V podporama

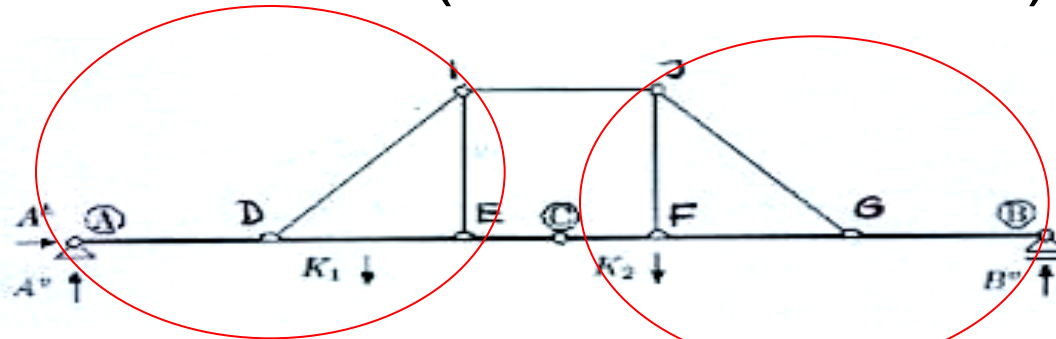


Kosa sa višestrukim podporama

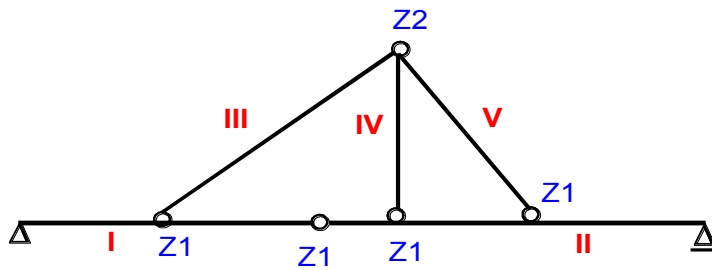


Nadvišena sa dvostrukim V podporama

OJAČANE (LAGRANGEOVE) GREDE

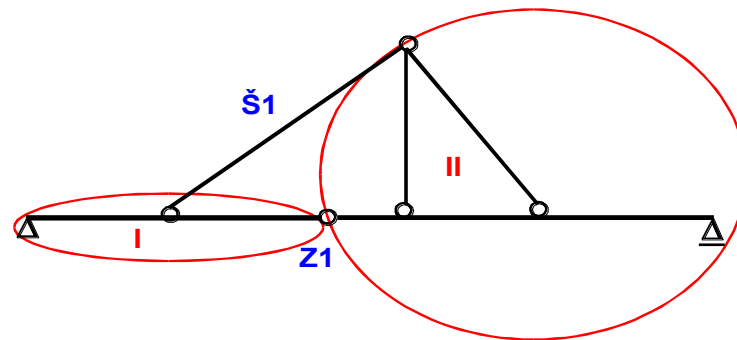


$$S = 3 \cdot 7 - 2 \cdot 5 - 4 \cdot 2 - 3 = 0$$



a) $D=5; Z1=4; Z2=1; L=3$

$$S = 3 \cdot 5 - 2 \cdot 4 - 4 \cdot 1 - 3 = 0$$

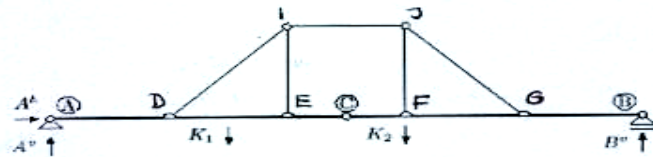


b) $D=2; Z1=1; \check{S}=1; L=3$

$$S = 3 \cdot 2 - 2 \cdot 1 - 1 - 3 = 0$$

OJAČANE (LAGRANGEOVE) GREDE

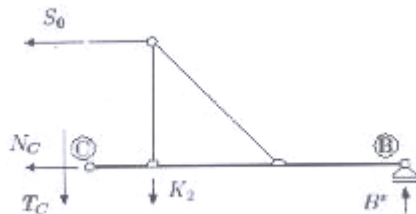
1. REAKCIJE= REAKCIJAMA PROSTE GREDE



$A^V; A^H; B^V \Leftrightarrow$ uvjeti ravnoteže

Posmatra se nosač kao 1 disk-ne uzimaju se u obzir ojačanja, t.j. unutarnja struktura nosača.

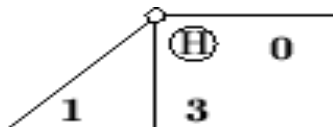
2.



$$M(C) = 0 \Leftrightarrow S_0$$

Presjeca se nosač kroz zglob.

3.

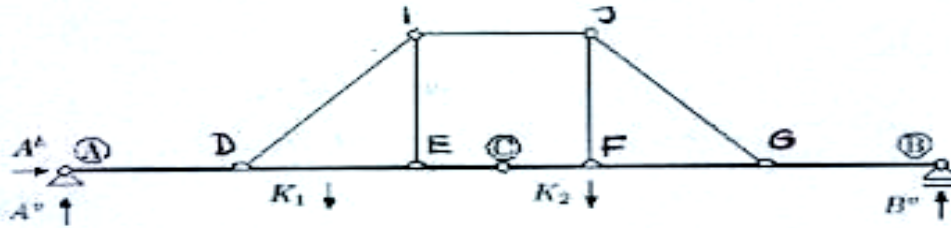


$S_1; S_3 \Leftrightarrow$ uvjeti ravnoteže sila u čvoru

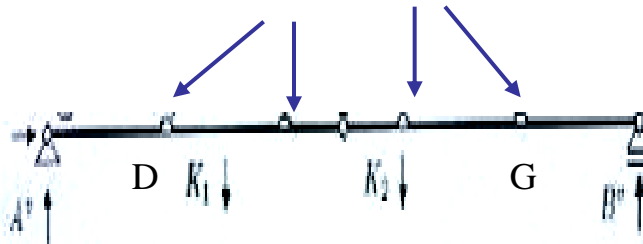
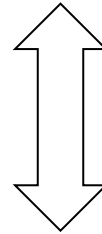
Isjeca se čvor i uspostavlja ravnoteža istoga.

$$S_{1H} = S_0 \Rightarrow S_1 = S_0 / \cos \alpha$$

OJAČANE (LAGRANGEOVE) GREDE



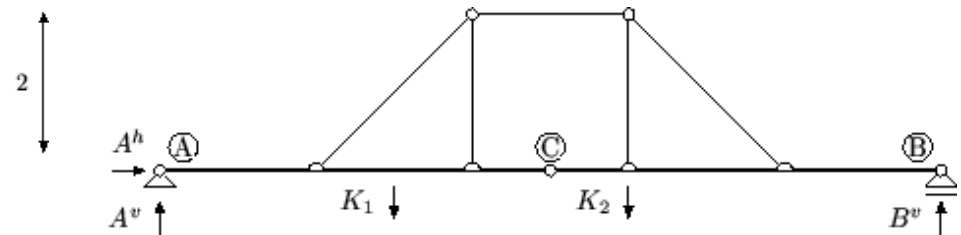
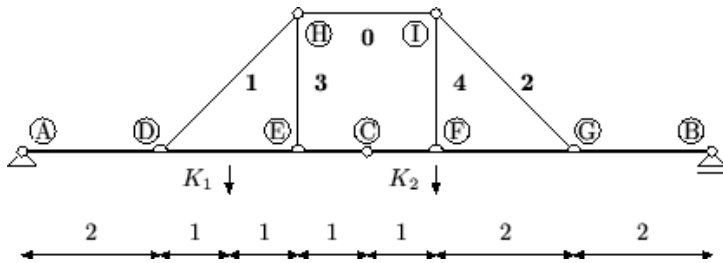
Unutarnje sile



U crtanju unutarnjih sila štapovi ojačanja se uzimaju kao opterećenje-uz vanjsko opterećenje.

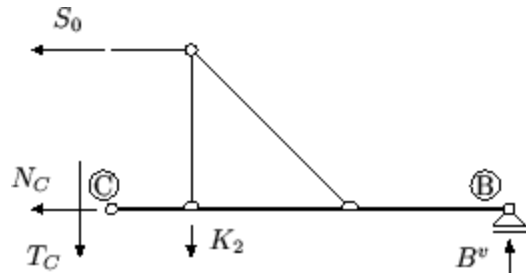
Nosač se posmatra kao prosta greda.

PRIMJER



1. $F_x = 0$ $A_h = 0$ kN,
2. $M(B) = 0$ $-A_v \cdot 10 + K_1 \cdot 7 + K_2 \cdot 4 = 0$ $A_v = 90$ kN,
3. $M(A) = 0$ $B_v \cdot 10 - K_1 \cdot 3 - K_2 \cdot 6 = 0$ $B_v = 60$ kN.
4. $F_y = 0$ $A_v + B_v - K_1 - K_2 = 0$ $90 + 60 - (100 + 50) = 0.$

PRIMJER



$$M(C) = 0$$

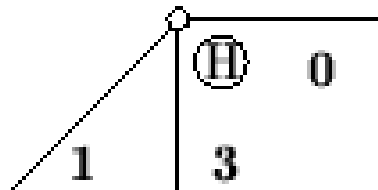
$$B_v \cdot 5 - K_2 \cdot 1 + S_0 \cdot 2 = 0$$

$$S_0 = -125 \text{ kN.}$$

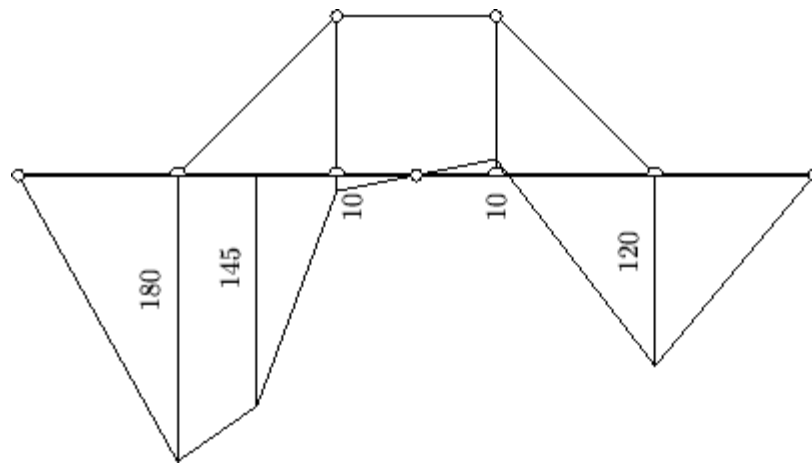
$$F_x = 0 \quad S_{1h} = S = -125 \text{ kN,}$$

$$S_{1v} = S_{1h} \cdot \text{tg} = -125 \text{ kN} \quad \text{i} \quad S_1 = -125 \text{ kN;}$$

$$F_y = 0 \quad V_3 = -S_{1v} = 125 \text{ kN}$$

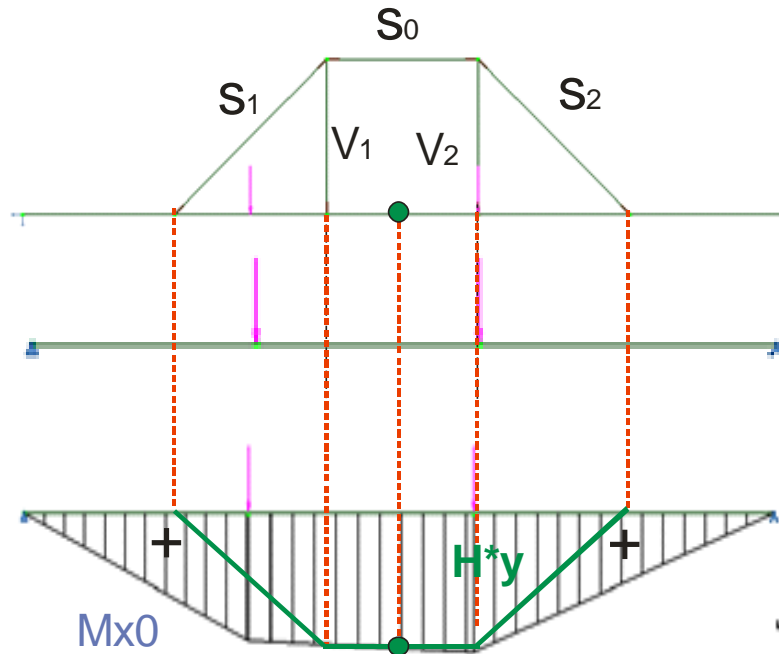


PRIMJER



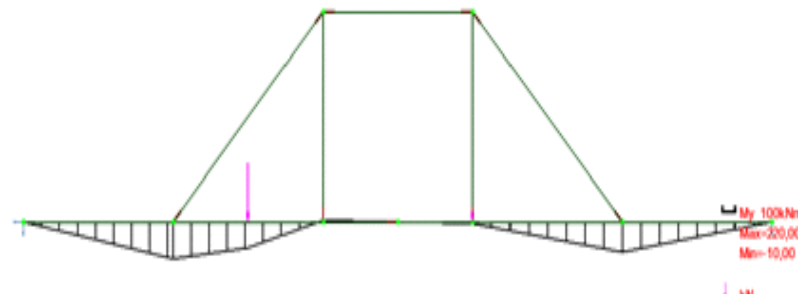
M

UNUTARNJE SILE-GRAFOANALITIČKI

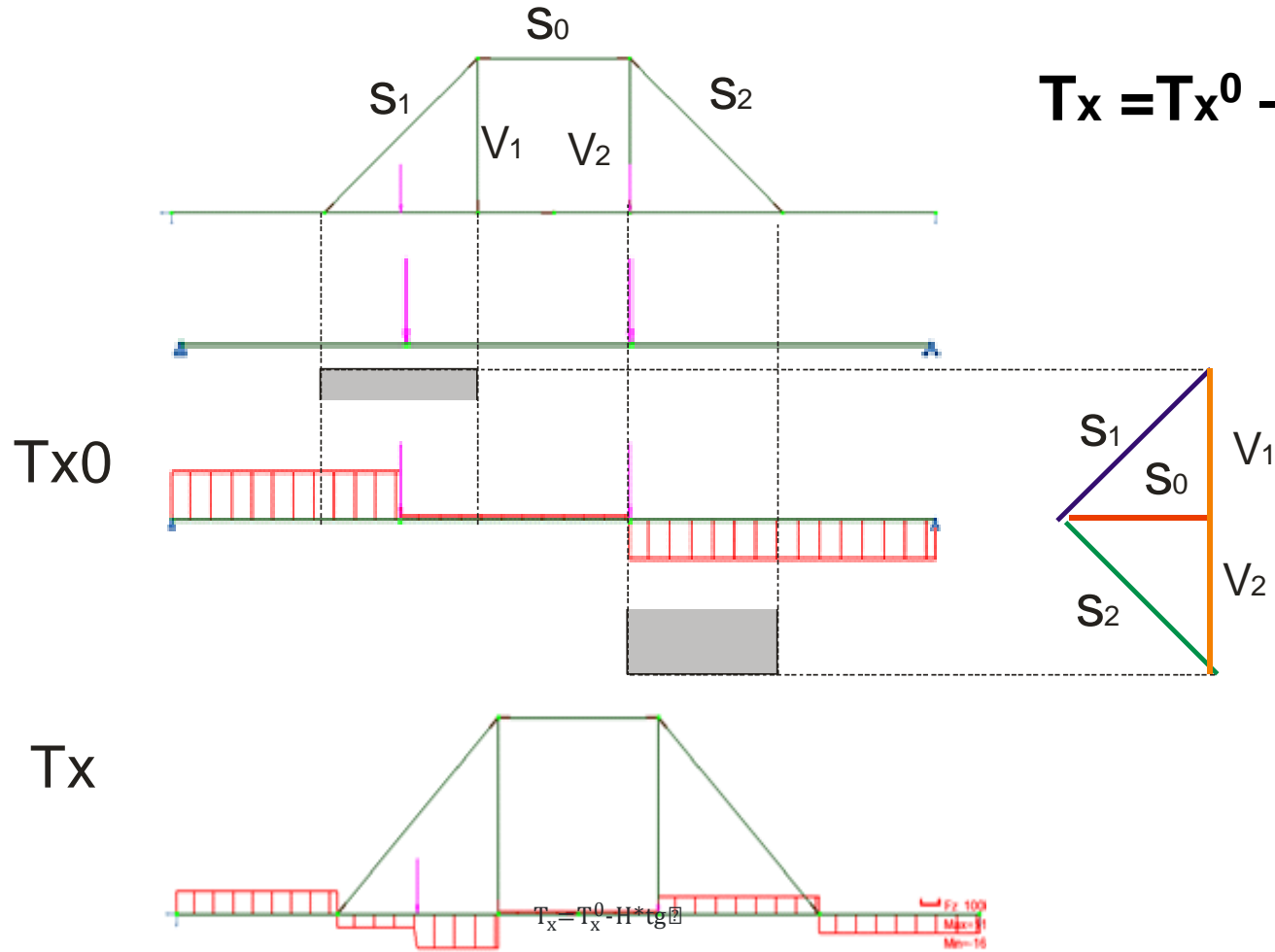


$$M_x = M_x^0 - H \cdot y$$

M_x



UNUTARNJE SILE



$$T_x = T_x^0 - H \cdot \operatorname{tg} \alpha$$

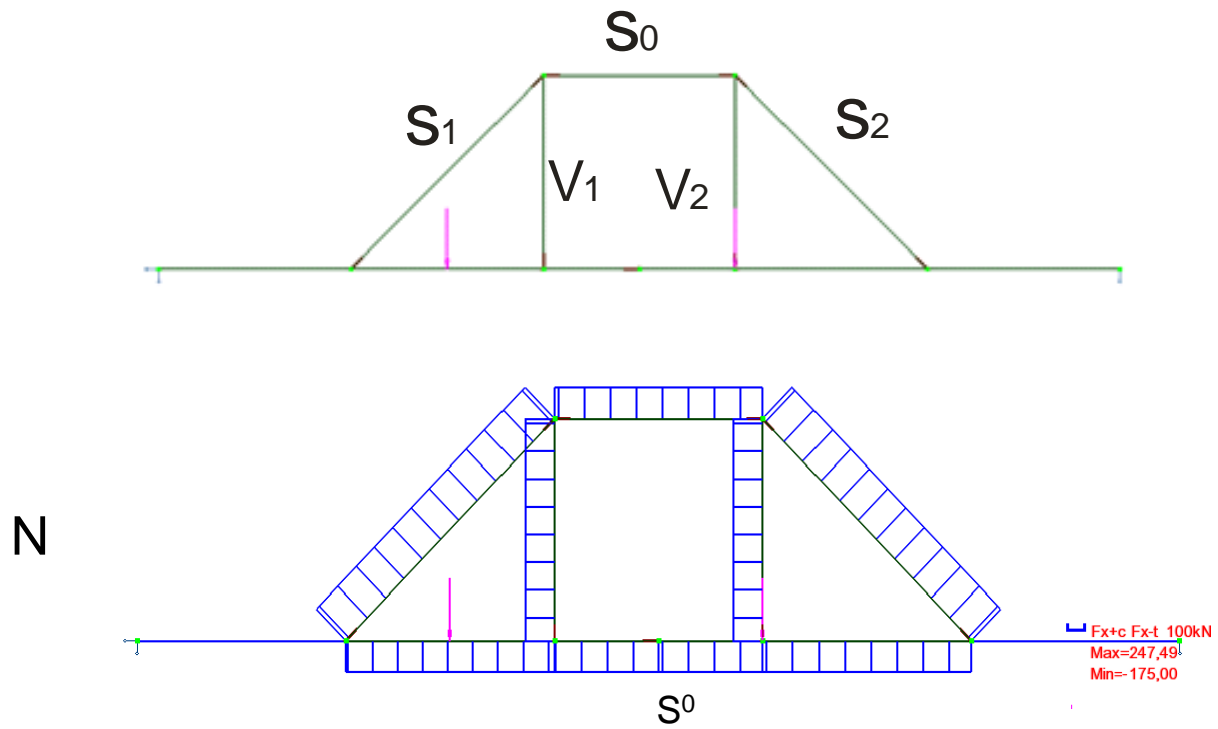
T_{x0}

T_x

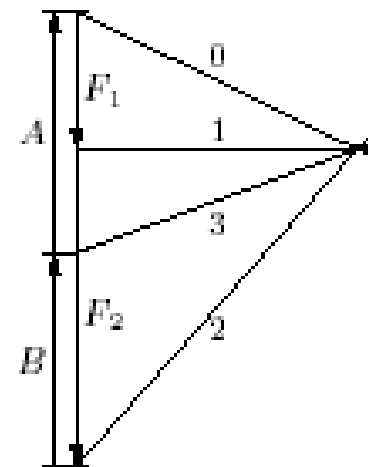
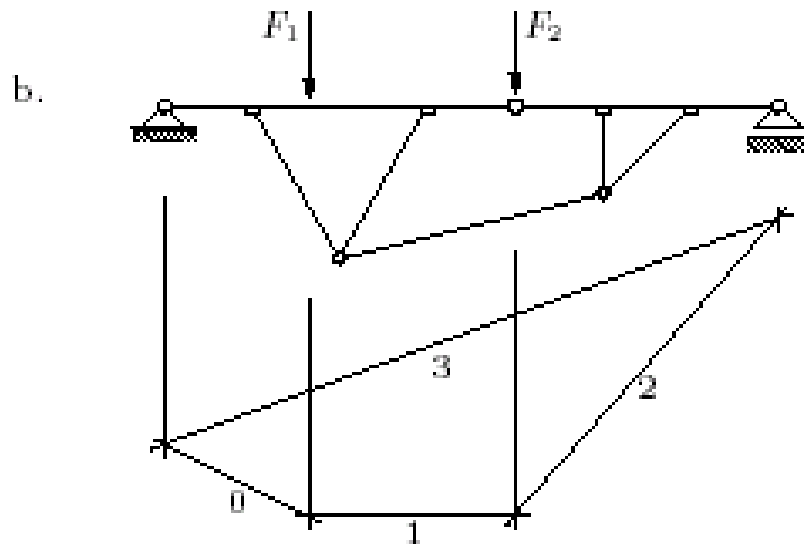
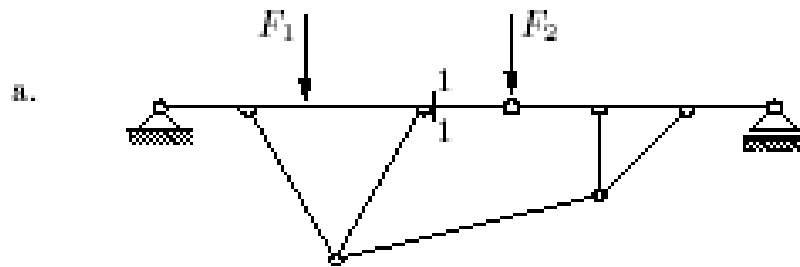
$$T_x = T_x^0 - H \cdot \operatorname{tg} \alpha$$

Ex 100
M=91
M=16

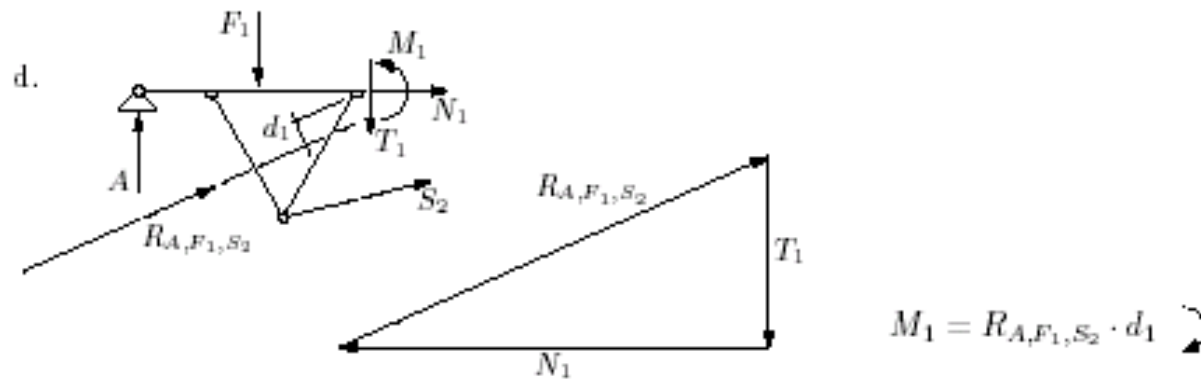
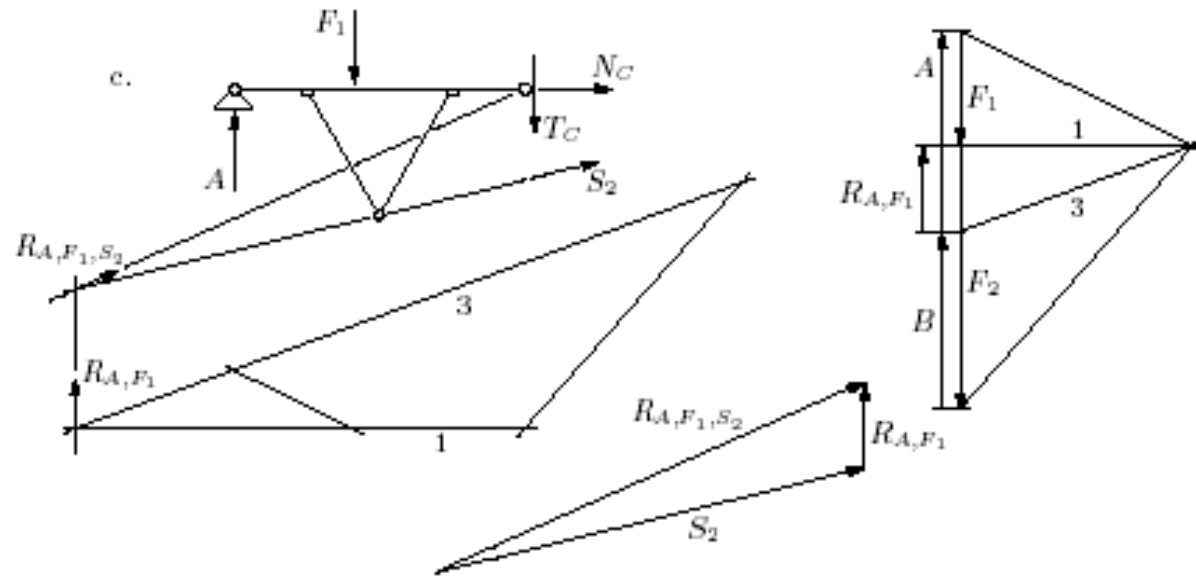
UNUTARNJE SILE



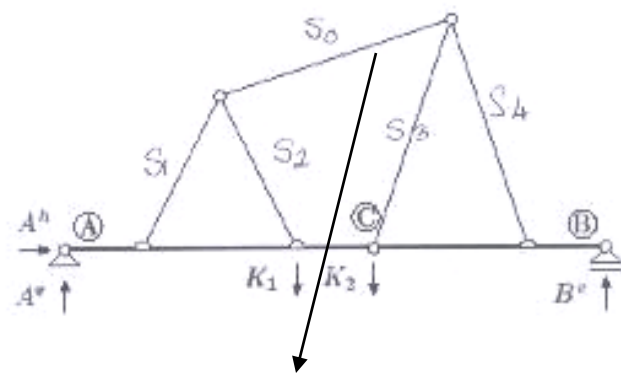
GRAFIČKI POSTUPCI



GRAFIČKI POSTUPCI

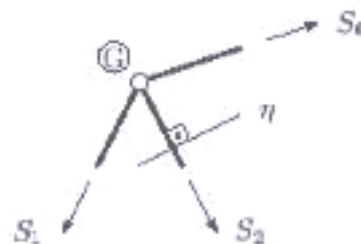


OJAČANE (LAGRANGEOVE) GREDE

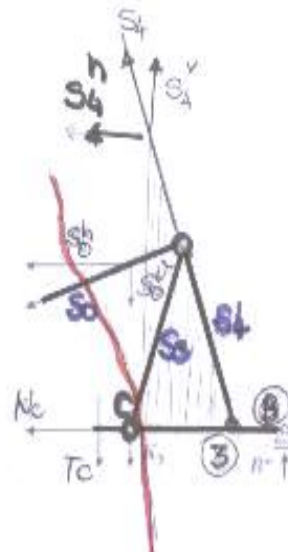
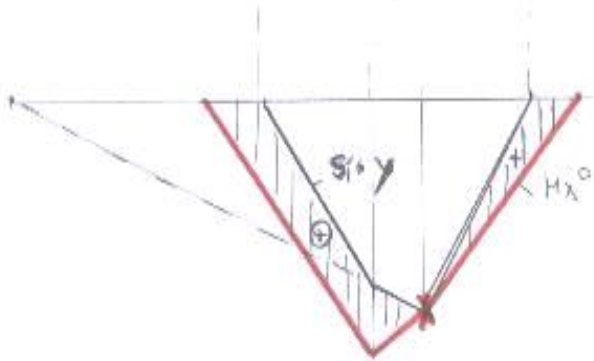
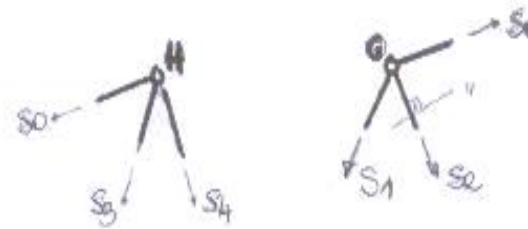
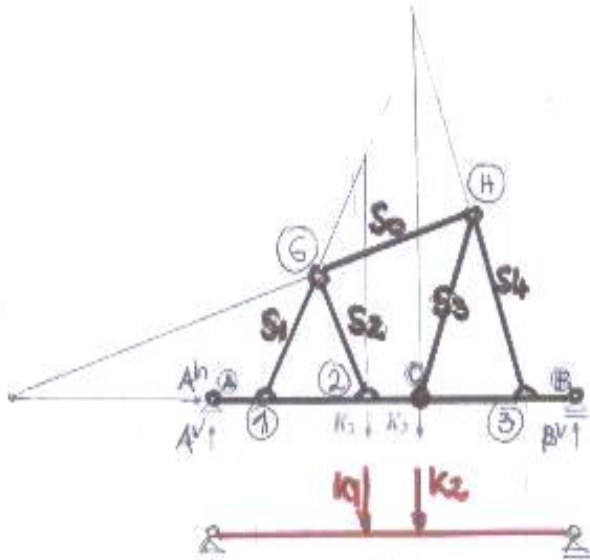


$$M_c=0; \quad S_0^h = M_c^0 / f$$

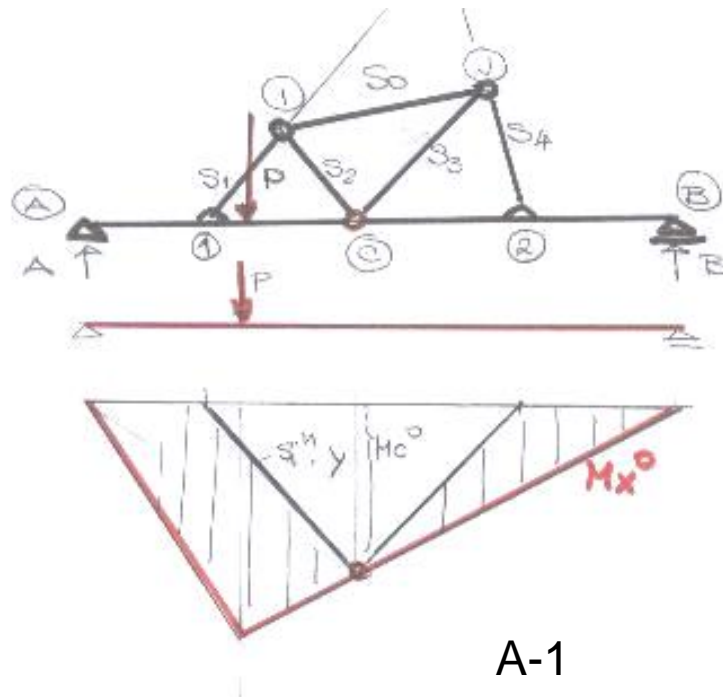
$$S_3^h \neq S_4^h \neq S_0^h$$



OJAČANE (LAGRANGEOVE) GREDE



PRIMJER



A-1

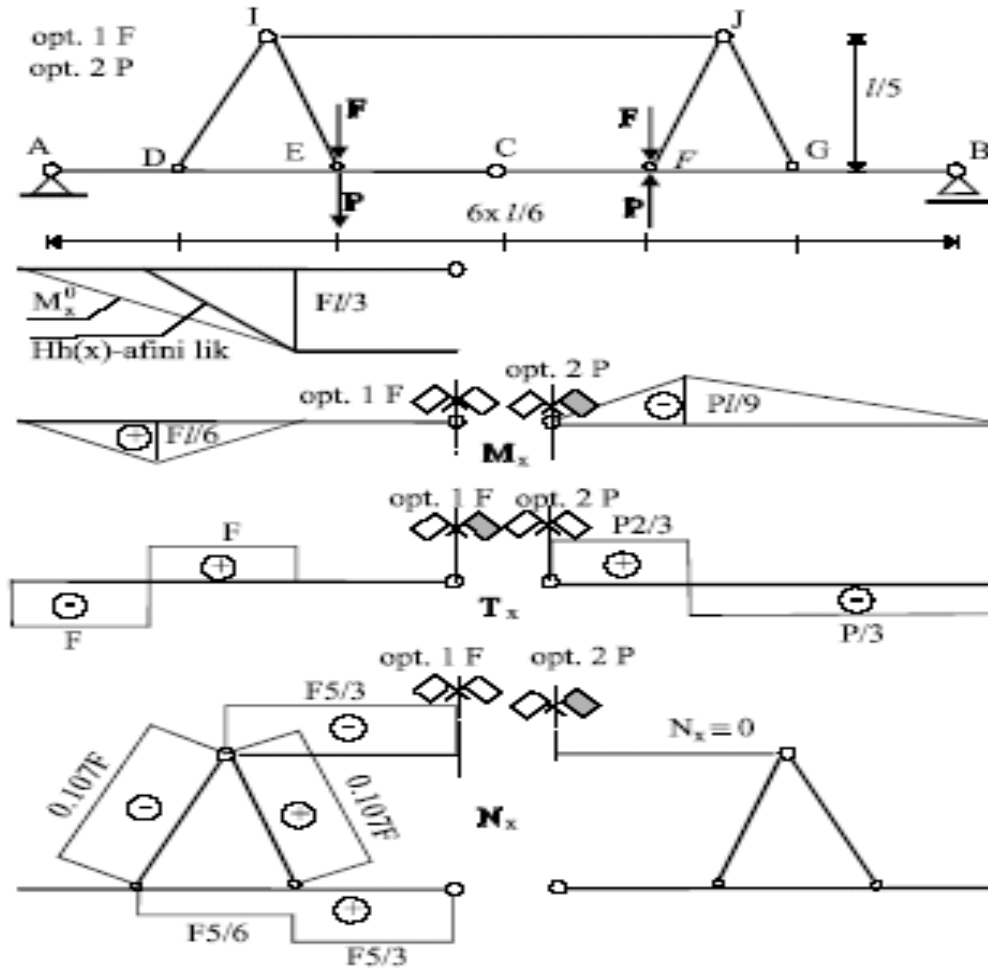
$$M_x = M_x^0$$

2-B

$$M_x = M_x^0 - S_1^h \cdot y$$

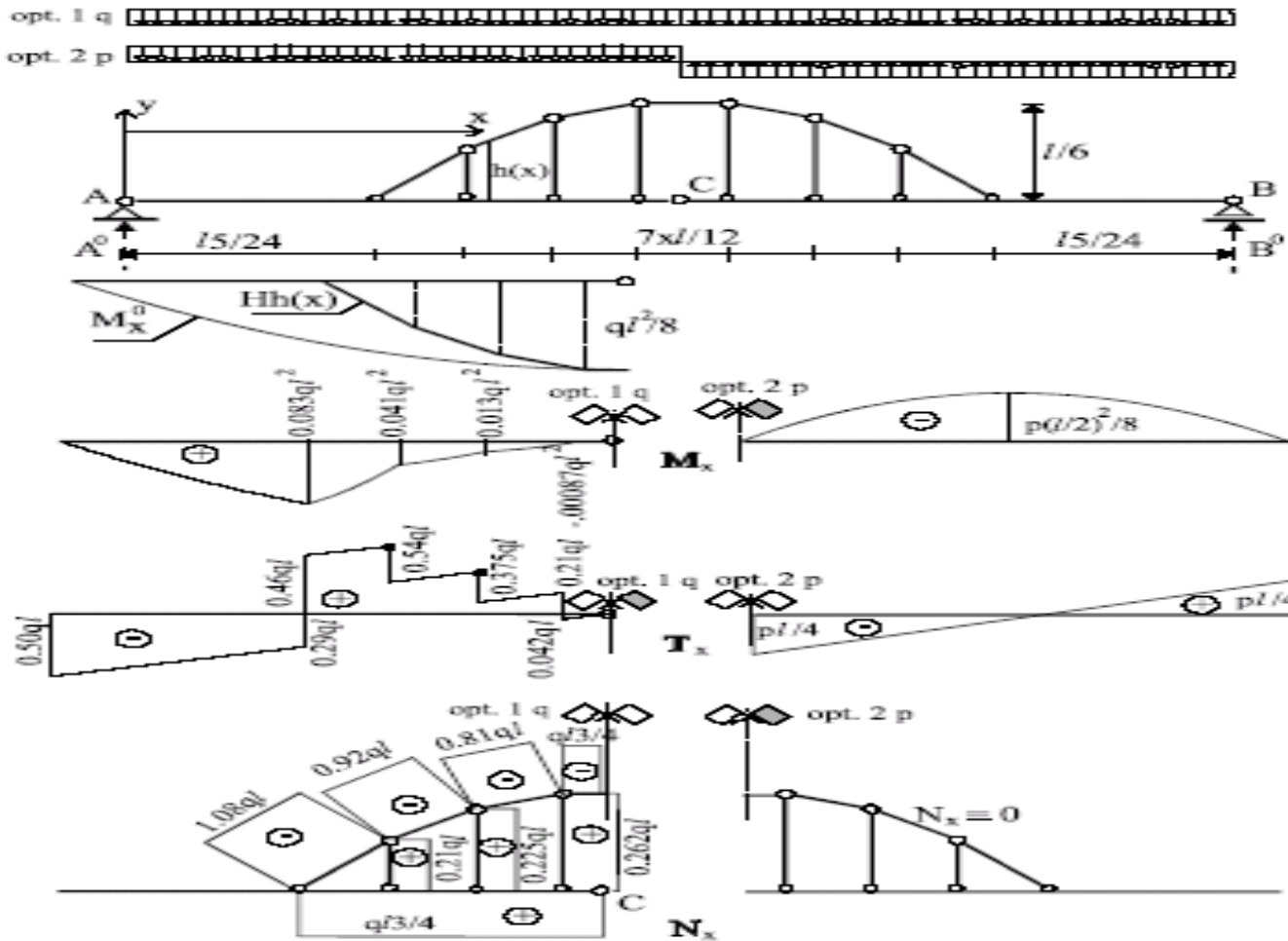
$$M_x = M_x^0 - S_4^h \cdot y$$

PRIMJER



Crtež 2.35 Langerova greda

PRIMJER



Crtež 2.36 Ojačana greda