

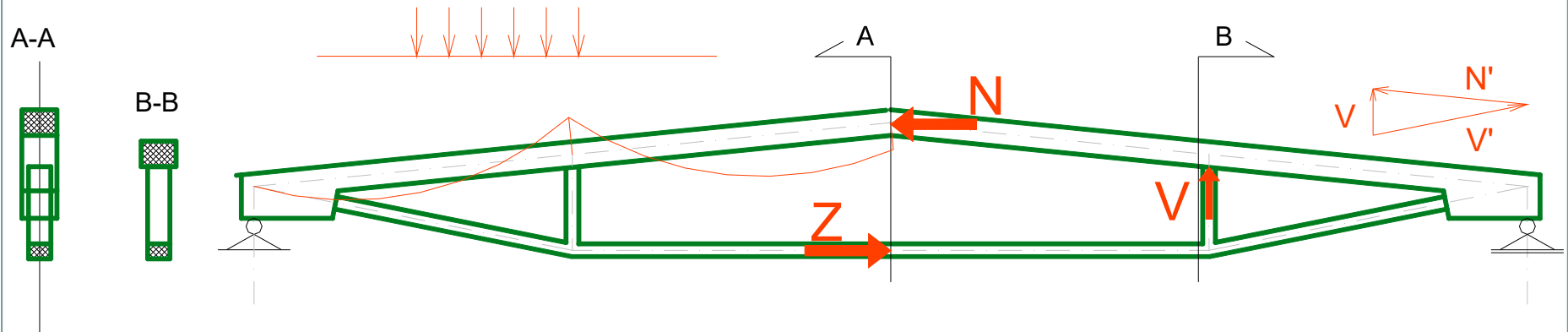
PROJEKTOVANJE I GRAĐENJE BETONSKIH KONSTRUKCIJA 2

3

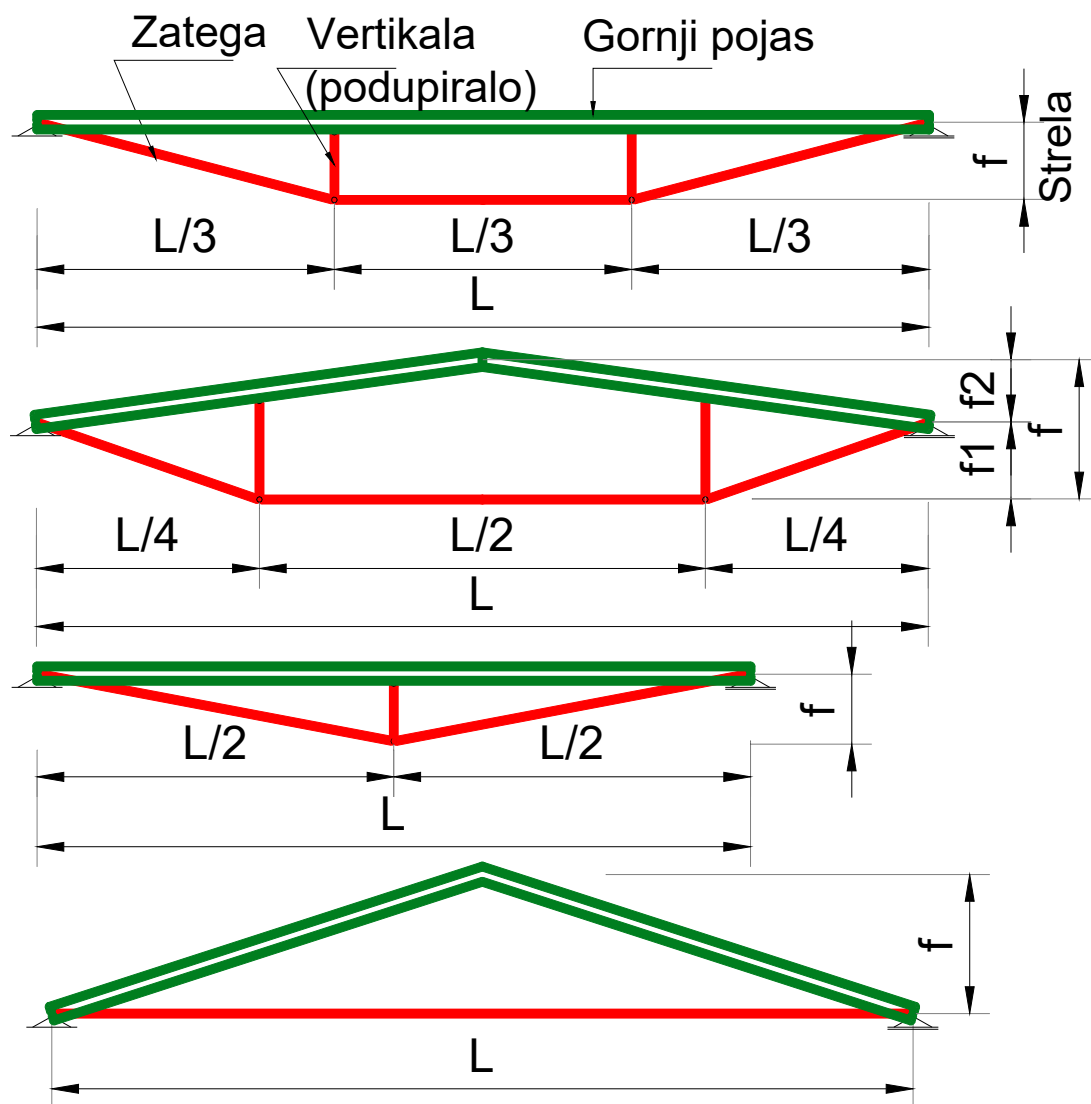
V.prof dr Branko Milosavljević, dipl.građ.inž.



Dvopojasni sistemi – nosač sa zategom



Dvopojasni sistemi – nosač sa zategom



Dva podupirala
ravan gornji pojas

Dva podupirala
gornji pojas u nagibu

Jedno podupiralo
ravan gornji pojas

Bez podupirala
gornji pojas u nagibu

- Donji pojas:

- a) AB zatega (dobra vatrootpornost)

- okruglo ("betonsko") gvožđe

- b) Čelik

- valjani profili

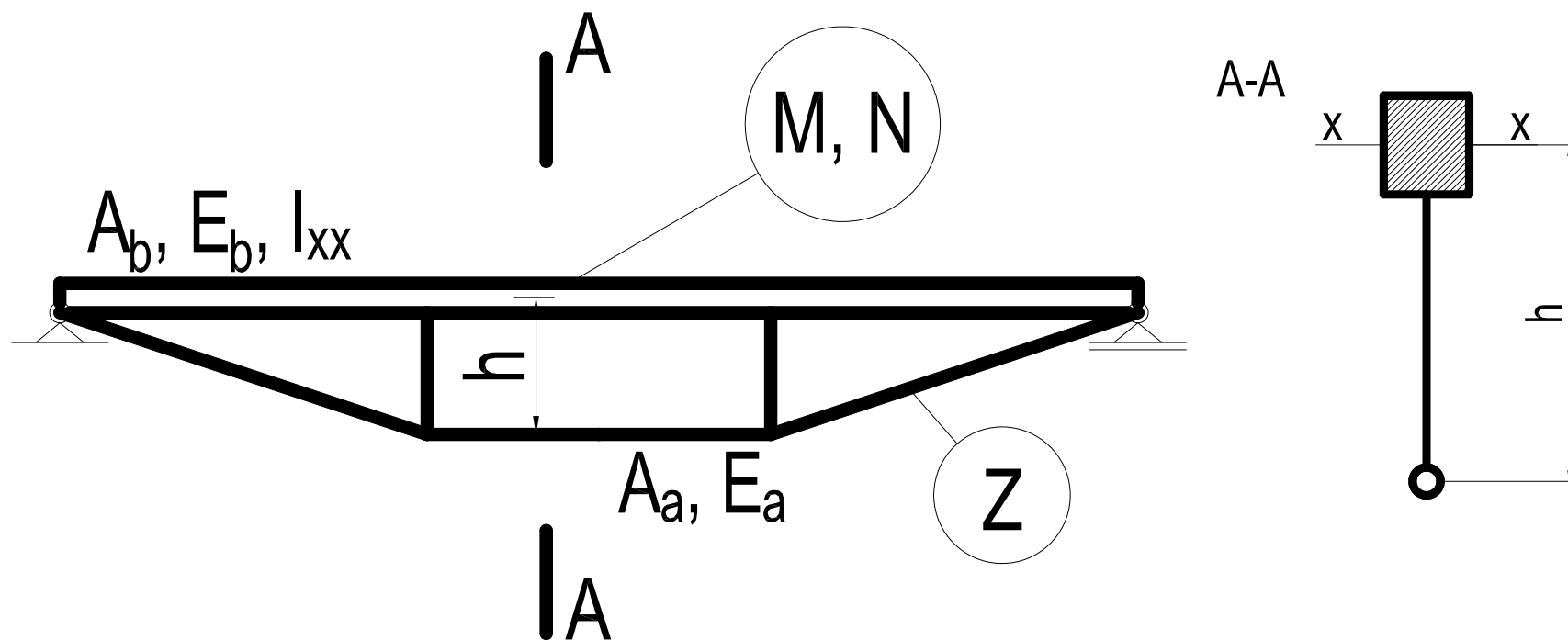
- c) Kablovi za prednaprezanje (visokokvalitetni čelik)

Od nivoa prednaprezanja zavisi slika presečnih sila i deformacija. Anvelopa uticaja po fazama i kombinacijama opt.

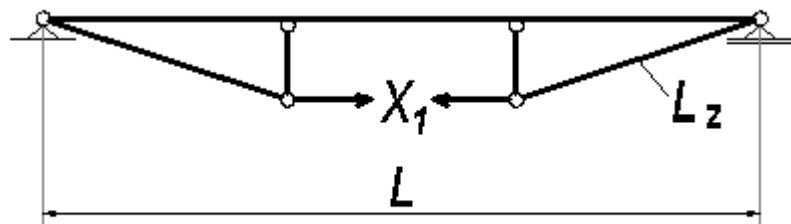


- Oslonački čvor → sidrenje zatege i uravnoteženje sila (!)
- Način izrade → najčešće u horizontalnom položaju, zatim okretanje u vertkalu, podizanje i montiranje.

Geometrijske karakteristike i krutost elemenata nosača sa zategom

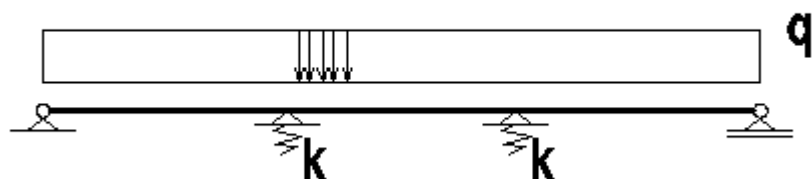


STATIČKI SISTEM

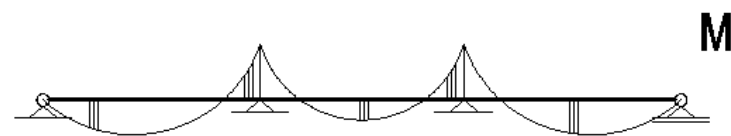


Uslovna jednačina pomeranja

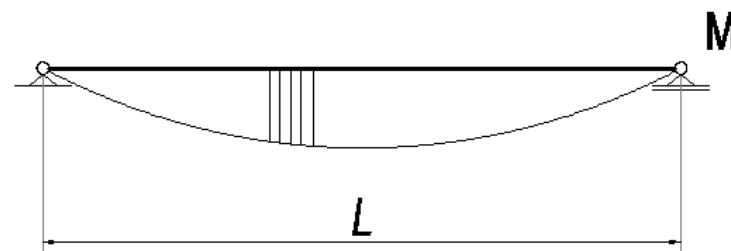
$$\delta_{ij} = \int_0^L \frac{M \bar{M}}{E_b I_b} ds + \int_0^L \frac{N \bar{N}}{E_b A_b} ds + \int_0^{L_z} \frac{Z \bar{Z}}{E_a A_a} ds$$



a) $A_a \rightarrow \infty \Rightarrow k \rightarrow \infty$

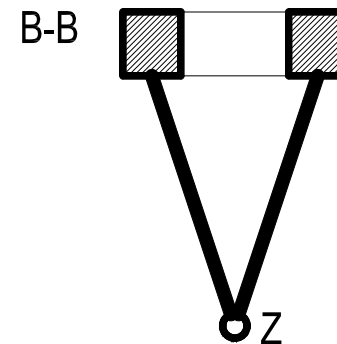
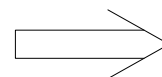
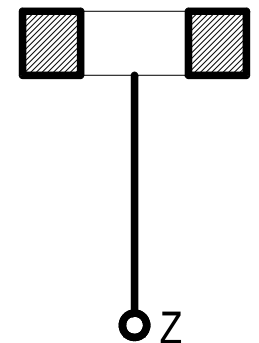
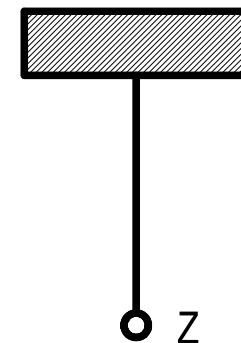
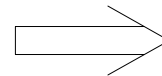
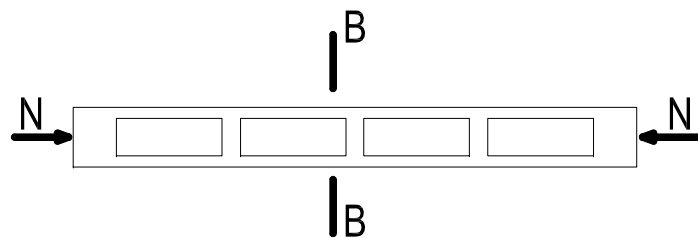
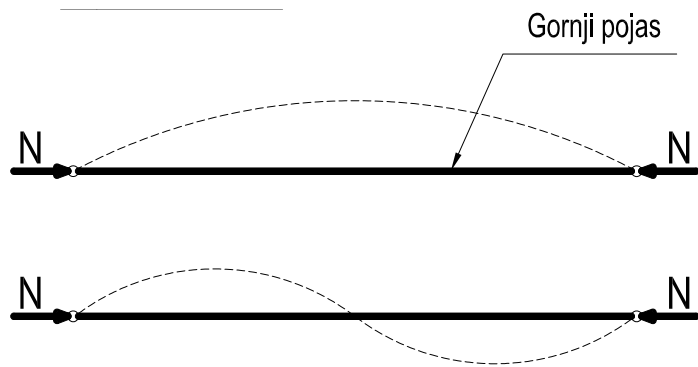


b) $A_a \rightarrow 0 \Rightarrow k \rightarrow 0$

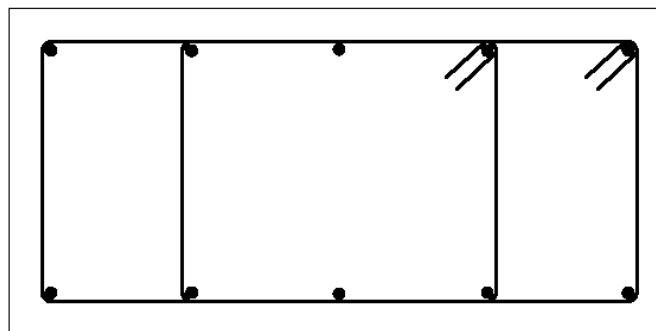


Problem bočne stabilnosti nosača

- karaterističan za fazu montaže
- oblikovane gornjeg pojasa



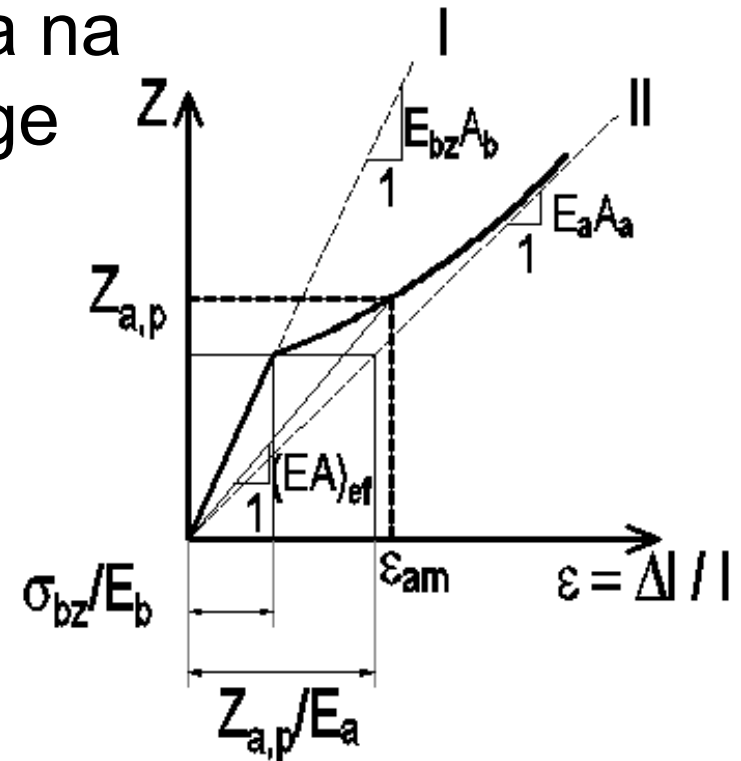
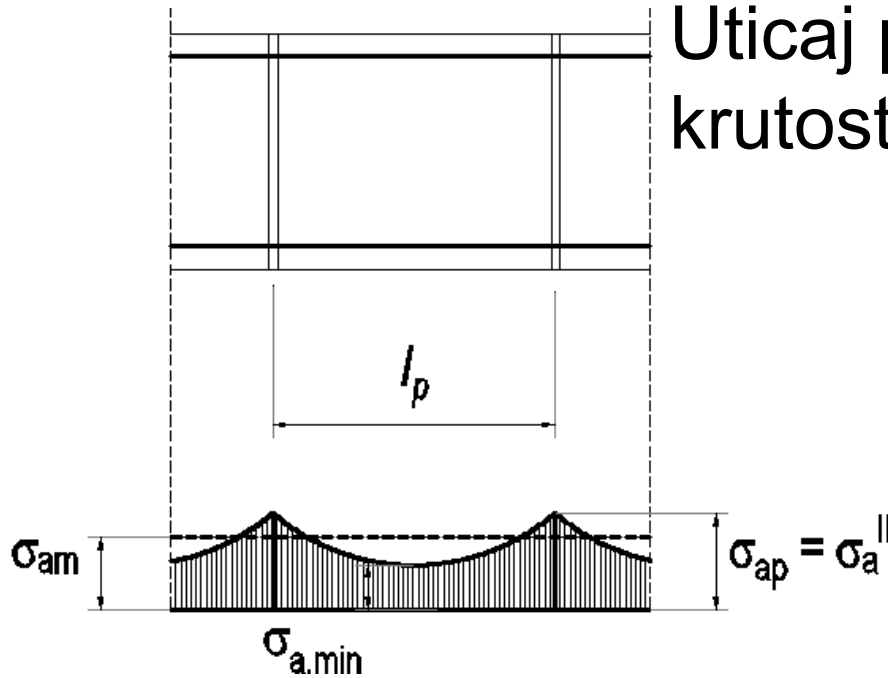
- Kod velikih raspona:
 - proračun po teoriji II reda,
 - geometrijske karakteristike sa prslinama u betonu,
 - uzima se u obzir tečenje i skupljanje betona i uticaj temperature.
- U gornjem pojasu treba težiti da vrednosti M^+ i M^- budu približne
- Armiranje gornjeg pojasa:



$$\mu' = 0.4\%$$

$$\mu = 0.4\%$$

Uticaj prslina na krutost zatege



$$Z/A_b = \sigma_b \geq \sigma_{bz} \rightarrow \text{prslina}$$

$$(Z \geq Z_{ap})$$

$$(EA)_{ef} = f(Z)$$

$$\epsilon_{am} = \sigma_{am}/E_a = Z/(EA)_{ef}$$

$$(EA)_{ef} = E_a A_{ef}$$

npr. Branson $Z \geq Z_{ap}$

$$A_{ef} = (Z_{ap}/Z)^3 A_b + [1 - (Z_{ap}/Z)^3] A_a$$

EC2:

$$\xi = 1 - \beta(\sigma_{sr} / \sigma_s)^2,$$

$\beta=1.0$ za kratotrajno opt.

$\beta=0.5$ za dugotrajno opt.

$$Z \geq Z_{ap}$$

$$\sigma_s = Z/A_a, \sigma_{sr} = Z_{ap}/A_a$$

$$A_{ef} = (1 - \xi) A_b + \xi A_a$$

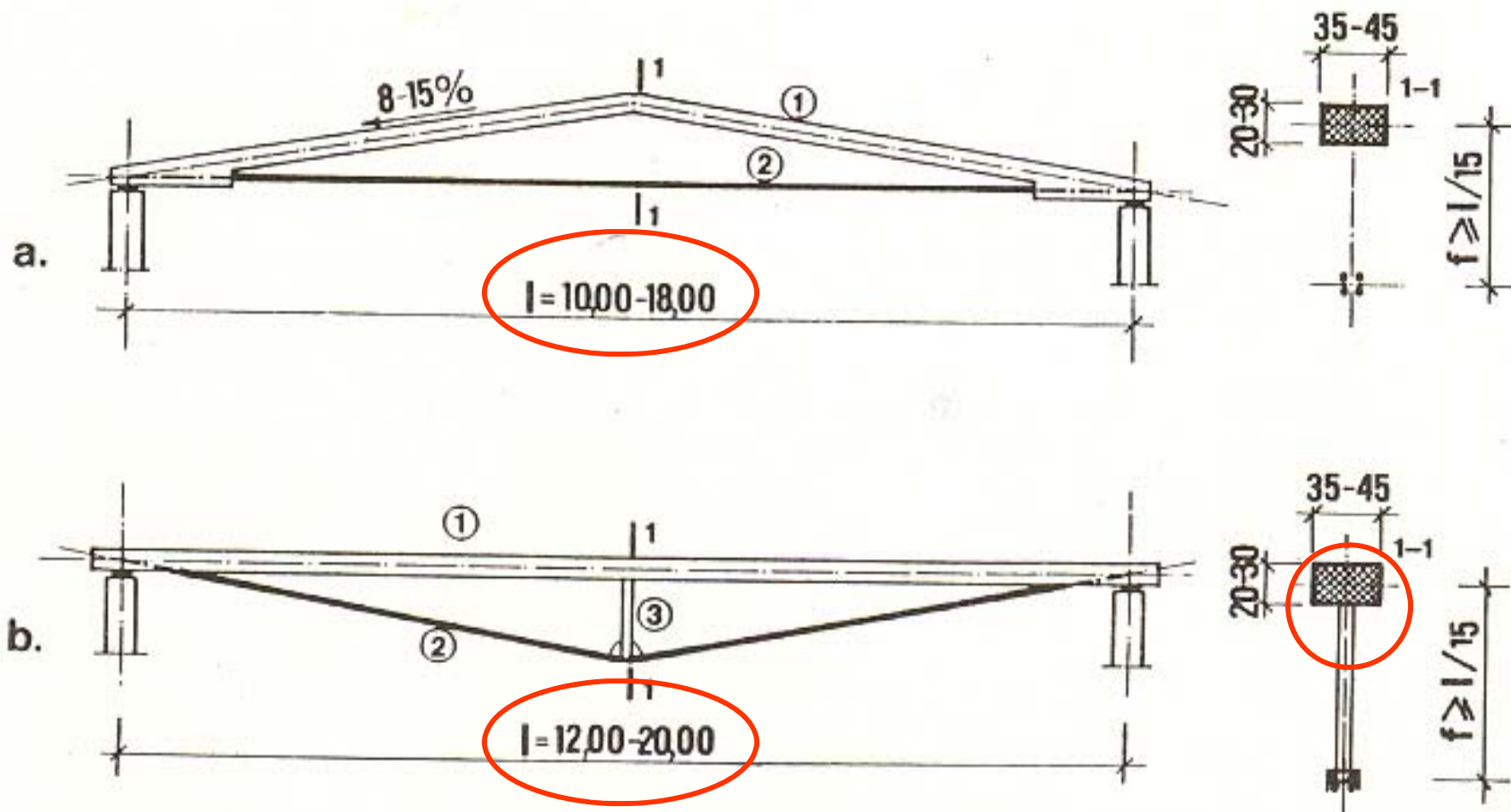


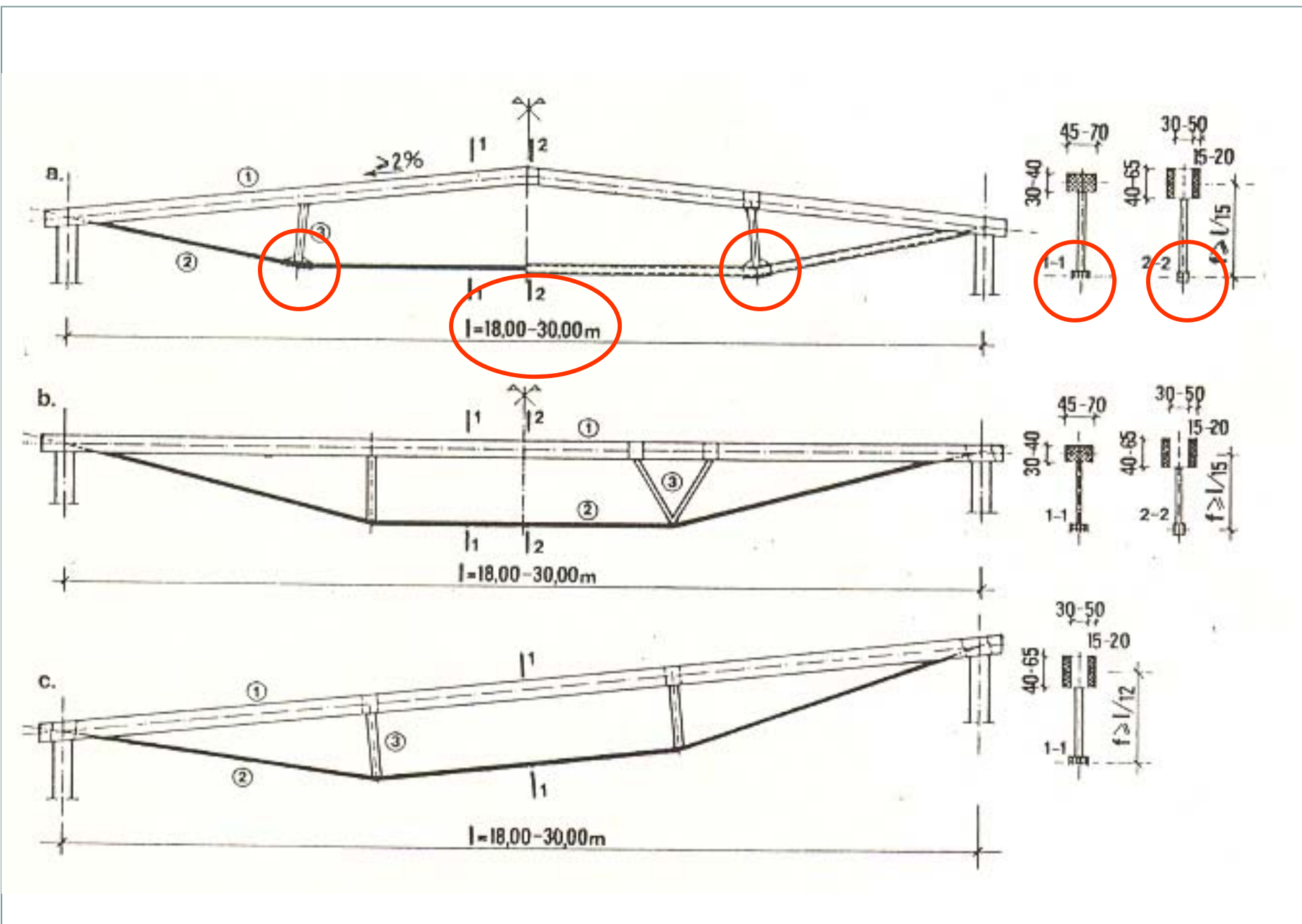


Nosač sa čeličnom zategom

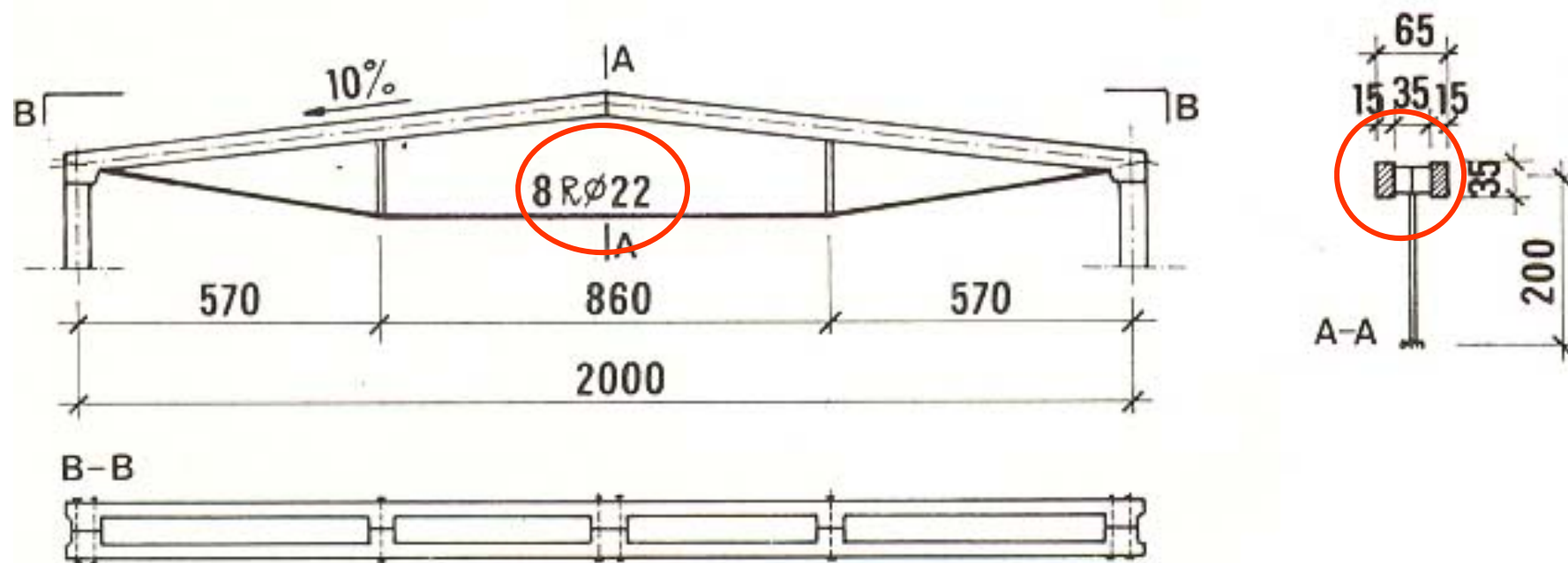


Nosači sa čeličnom zategom

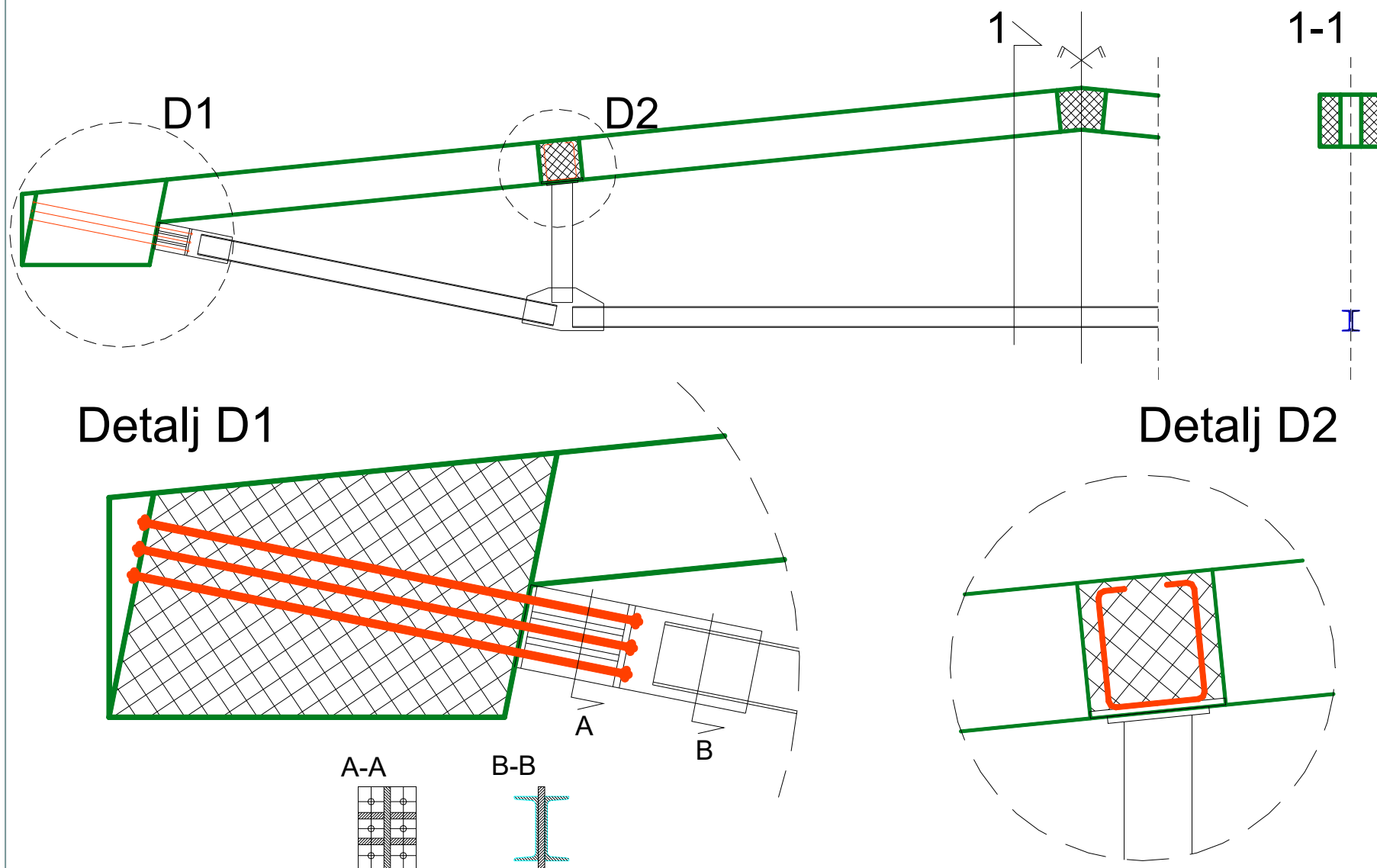


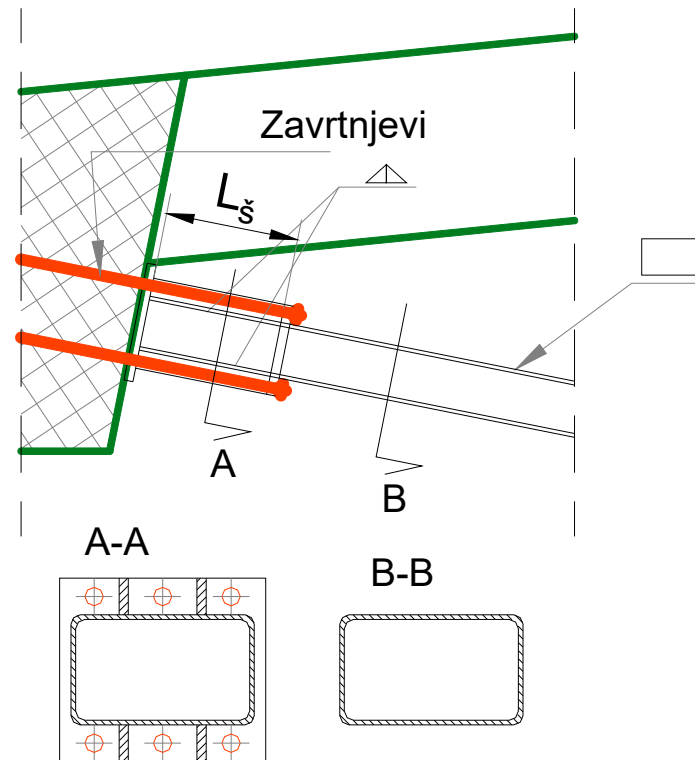
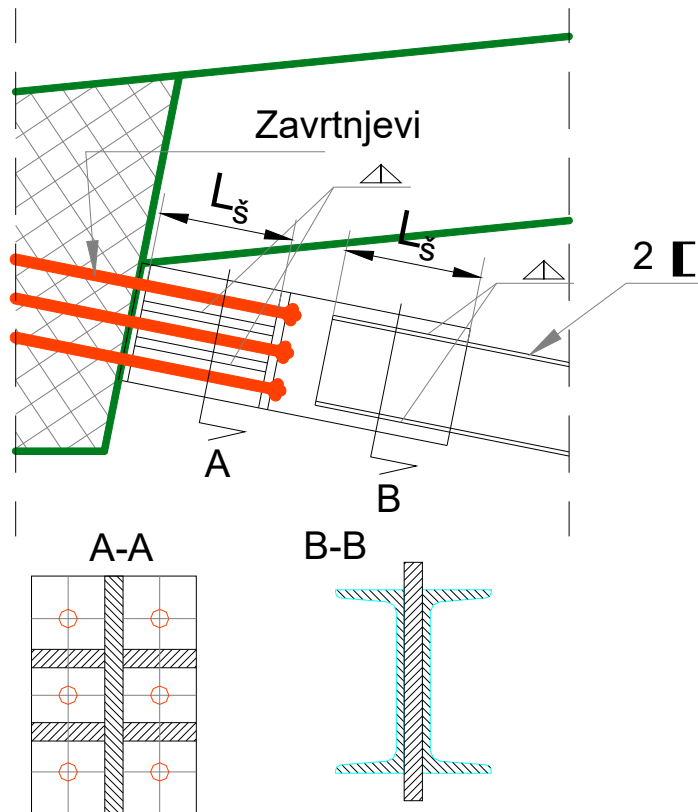


Nosači sa udvojenim gornjim pojasom

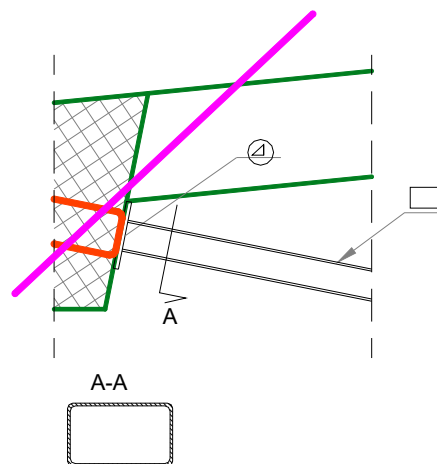


Nosač sa čeličnom zategom - detalji veza



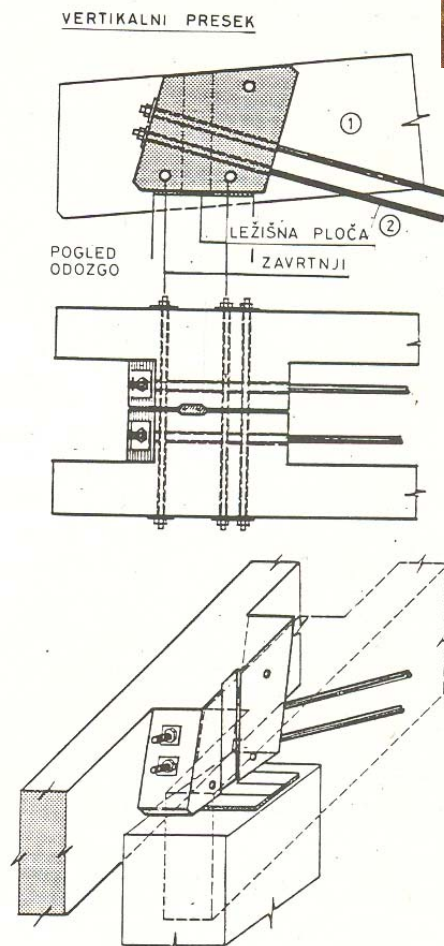
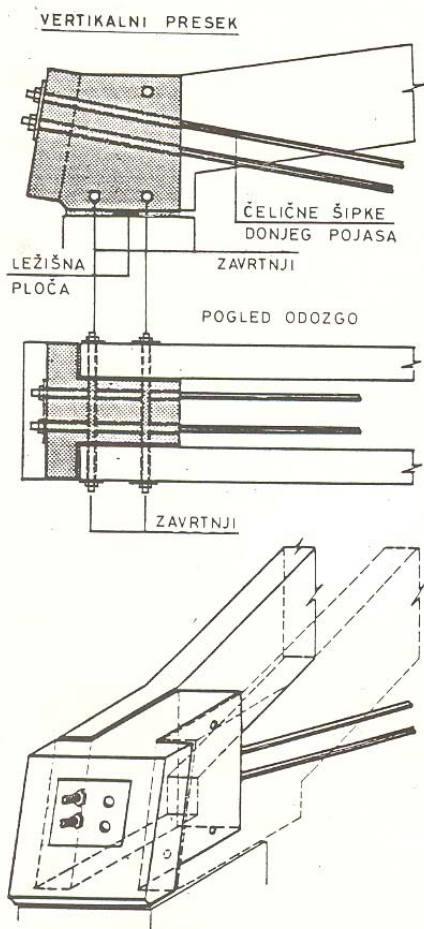
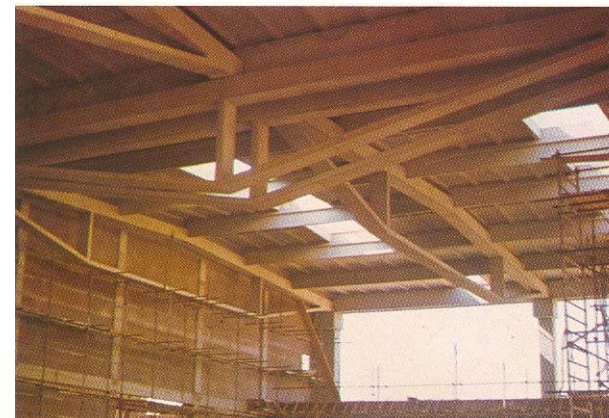


Detalj D1



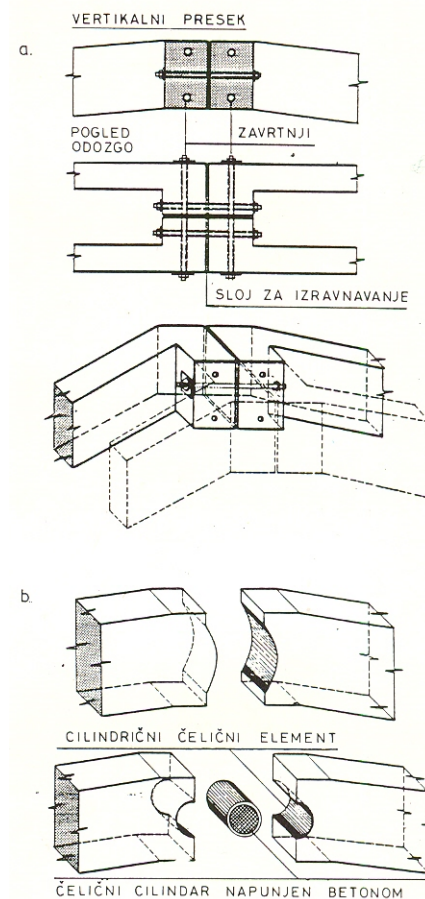
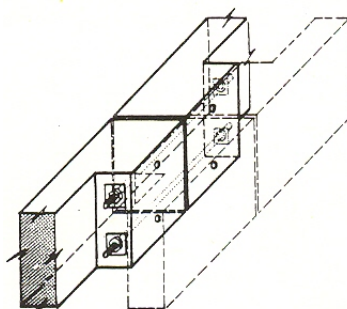
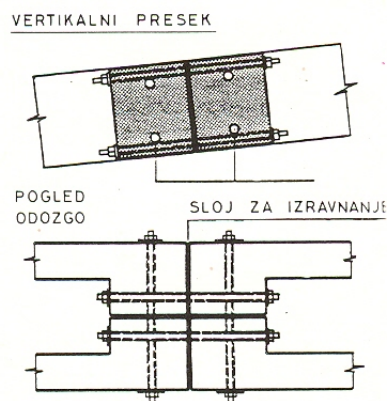
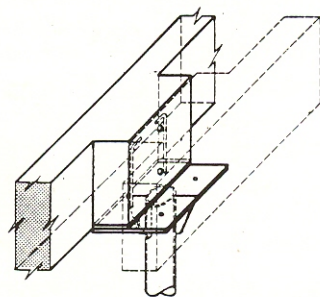
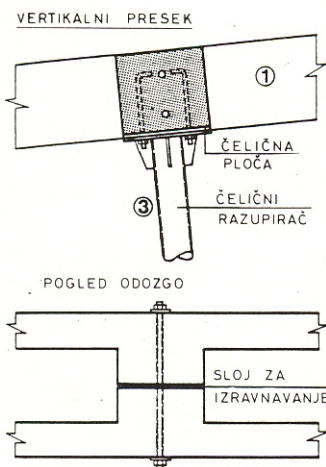
Montažni dvopojasni nosači

Oslonački detalji



Montažni dvopojasni nosači

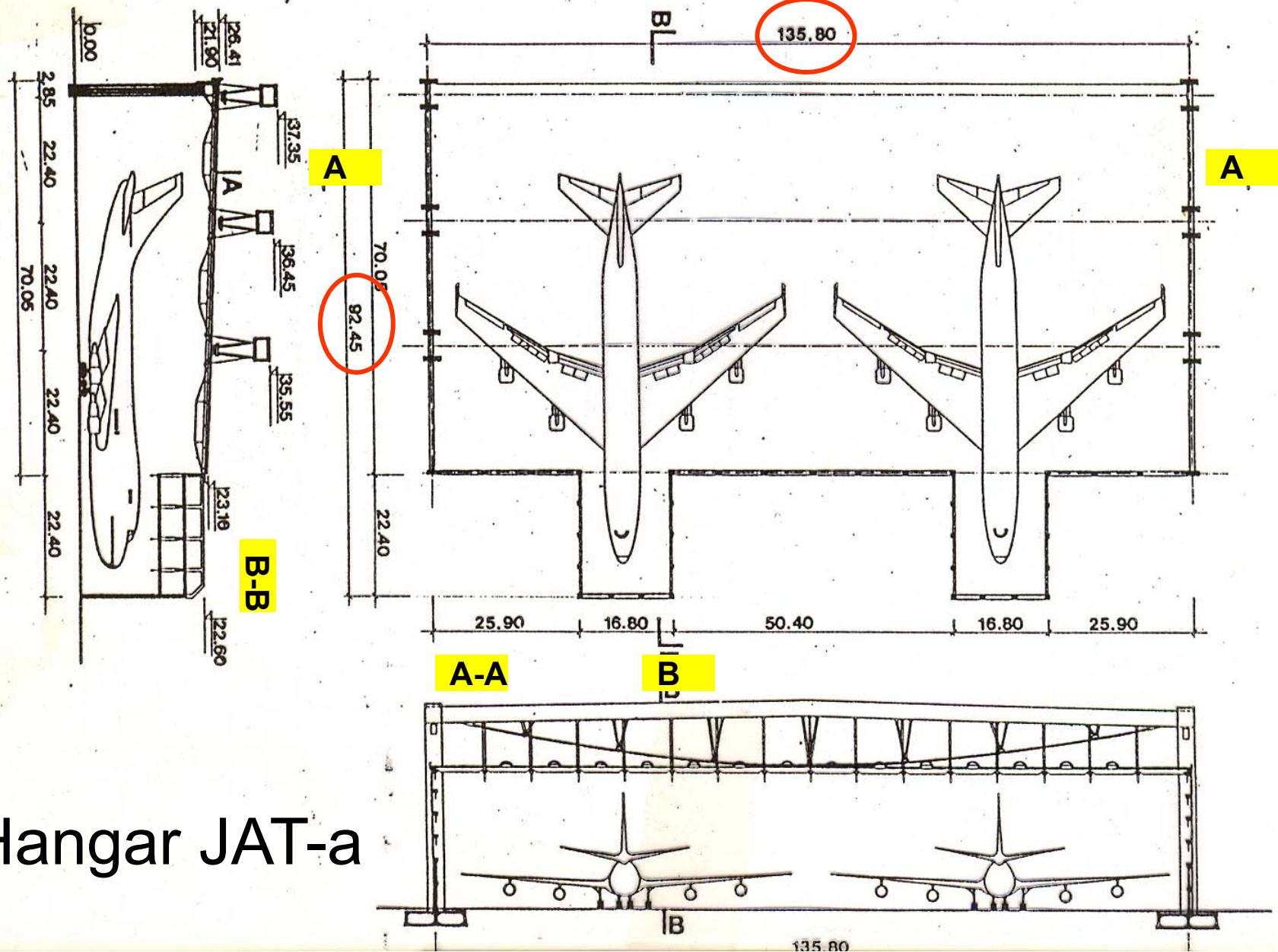
Detalji veza a podupiralom i u slemenu



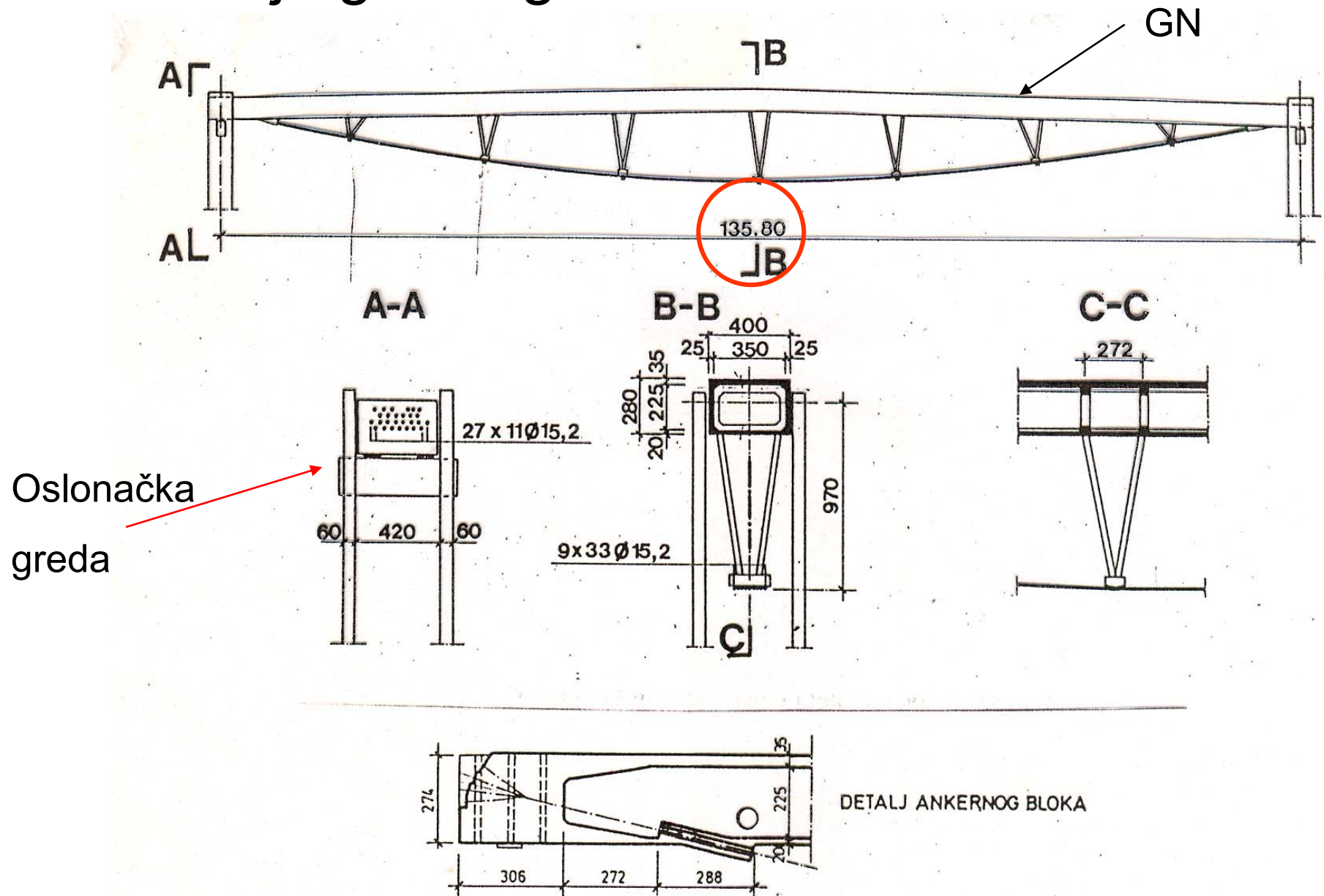


Hangar JAT-a

Hangar JAT-a

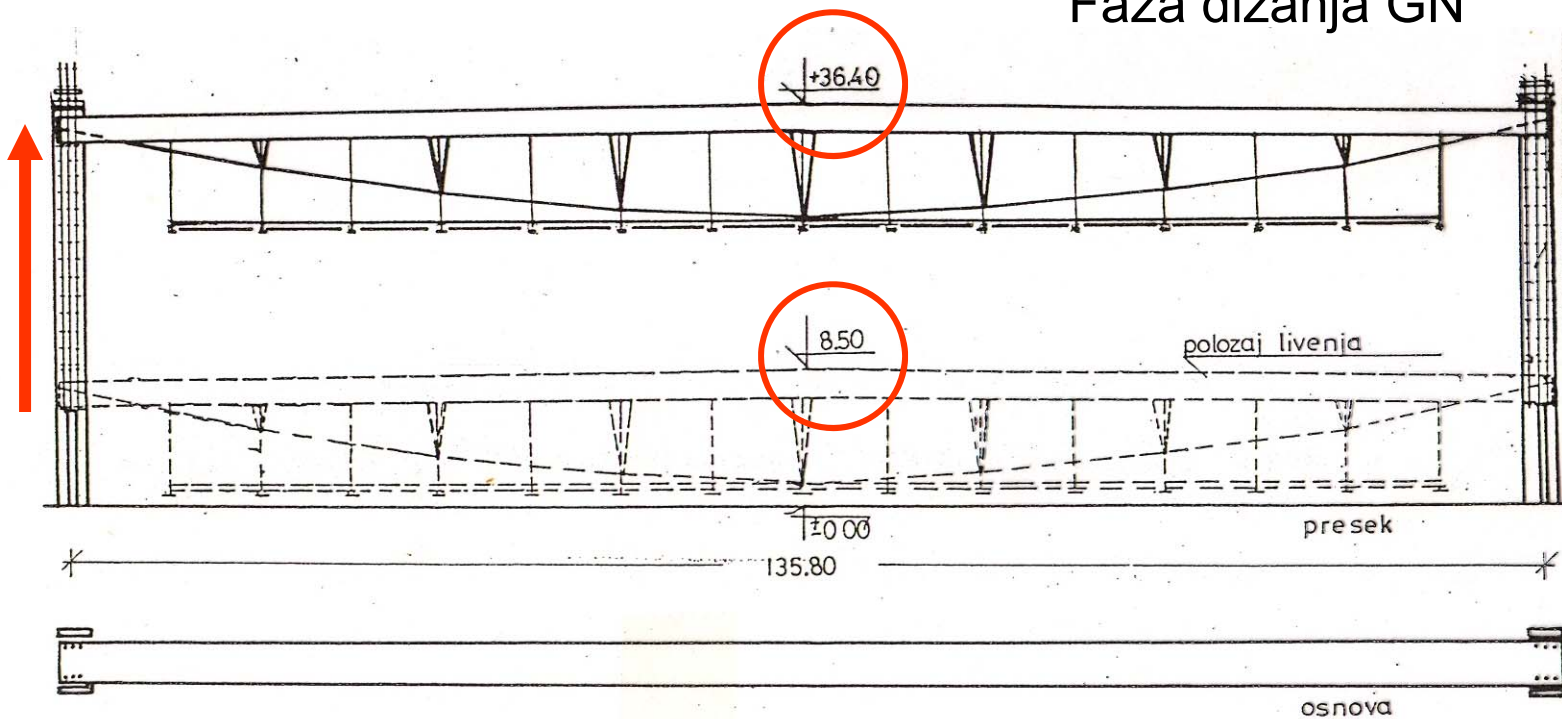


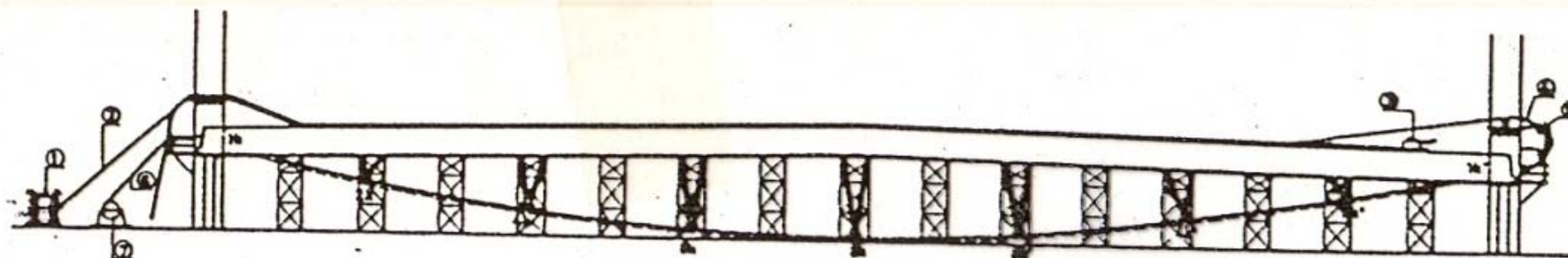
Geometrija glavnog nosača



Faza izrade GN

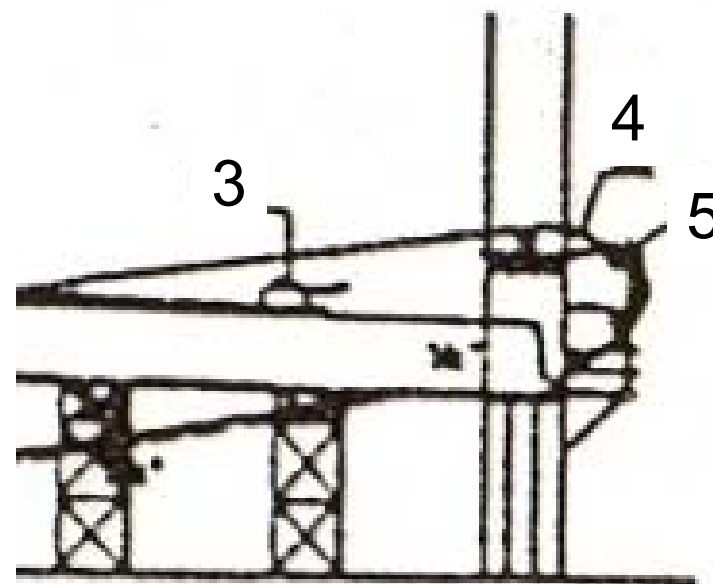
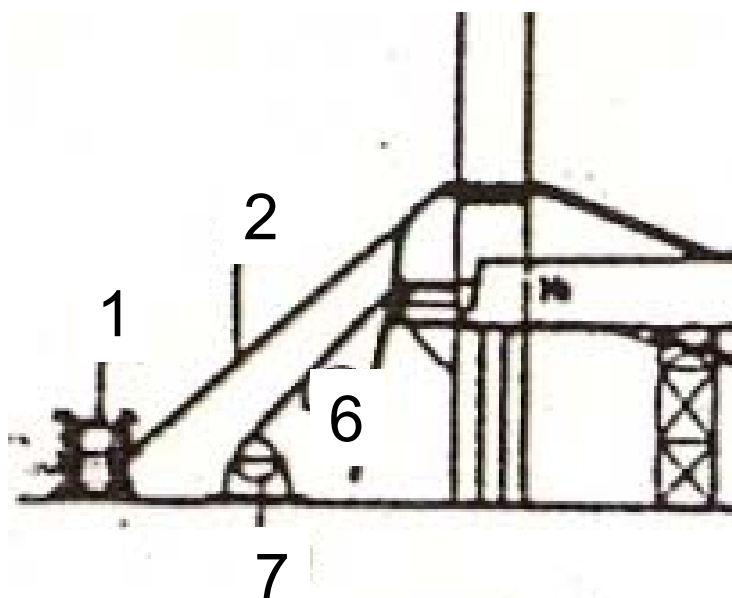
Faza dizanja GN



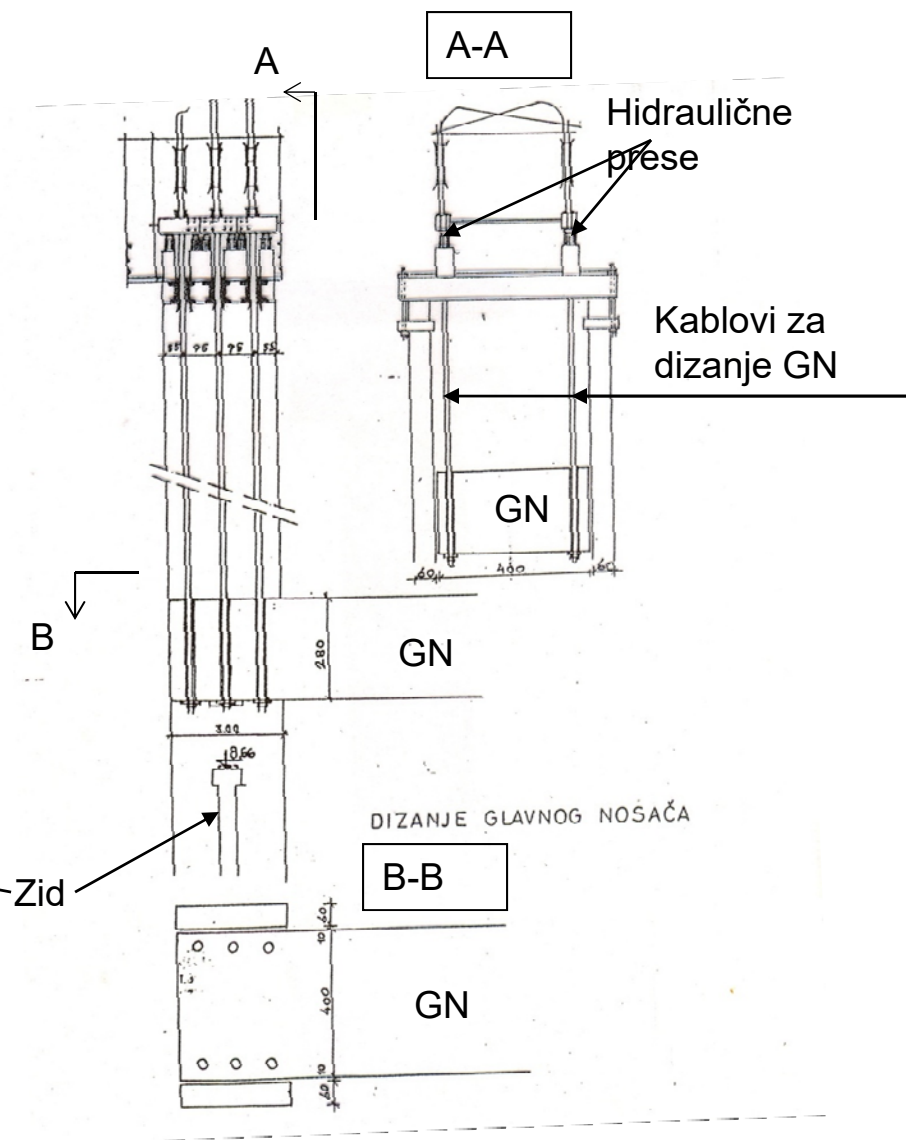
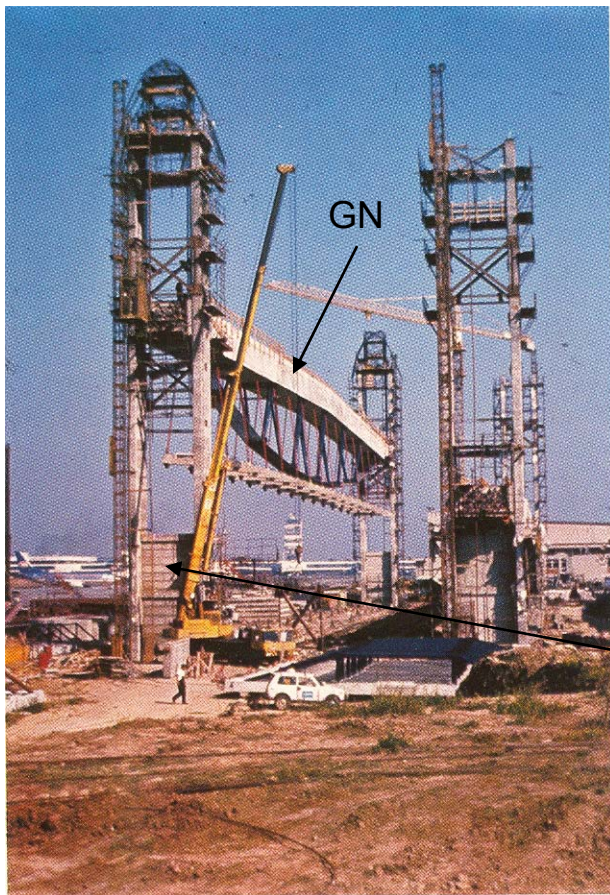


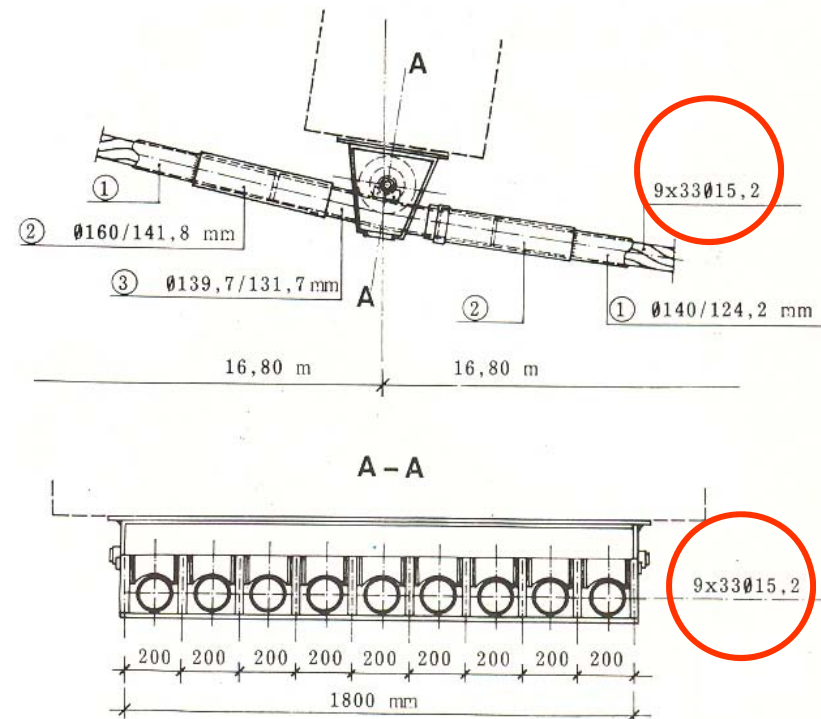
1.koševi za užad
2.užad 2 Ø 15,2 mm
3.vitlo za krojenje

4.snopovi užadi(11,6,5)koja se uvlače
5.skela i rolne za uvlačenje kablova
6.vučna sajla
7.vitlo za povlačenje užadi

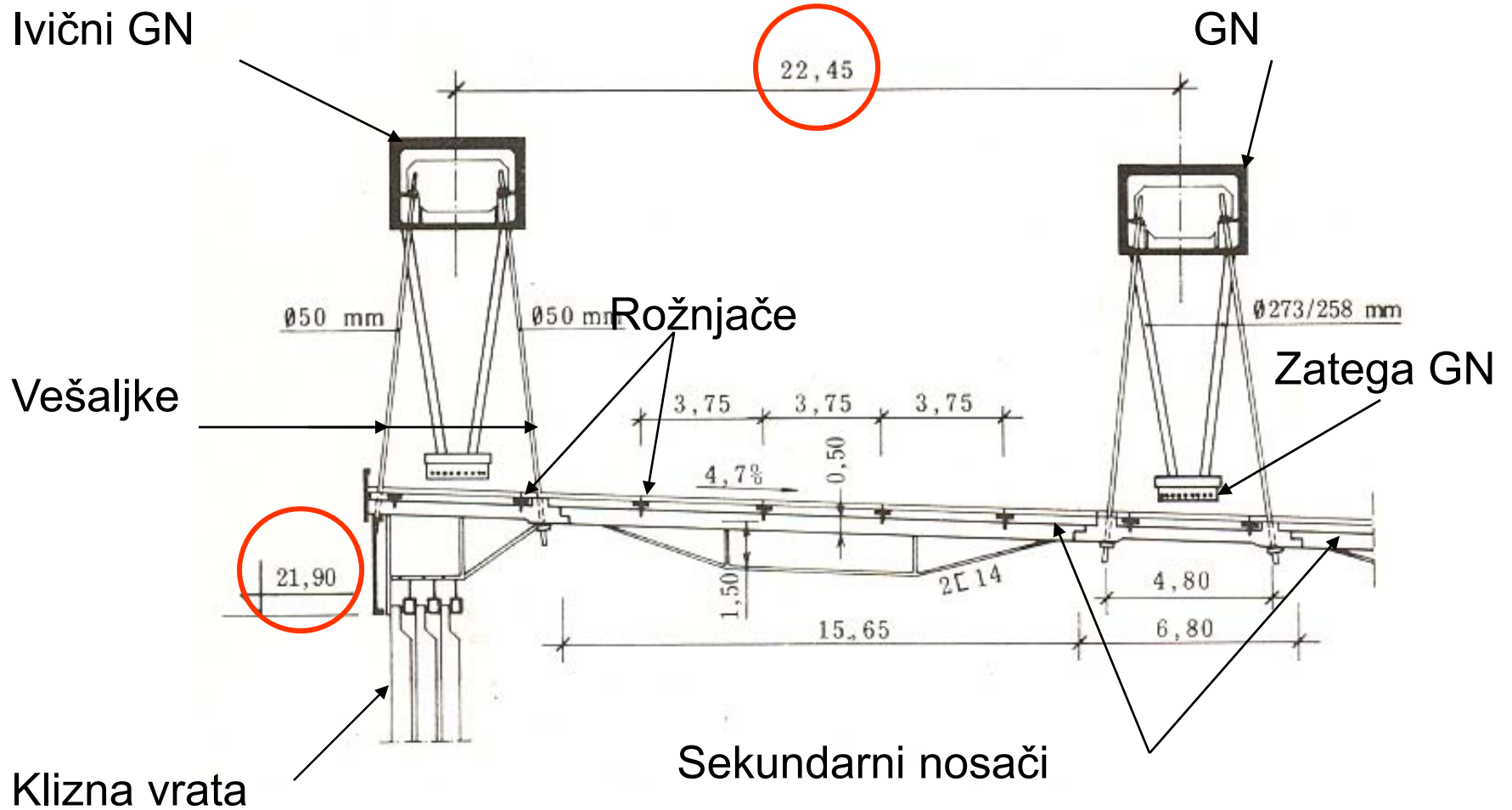


Dizanje GN

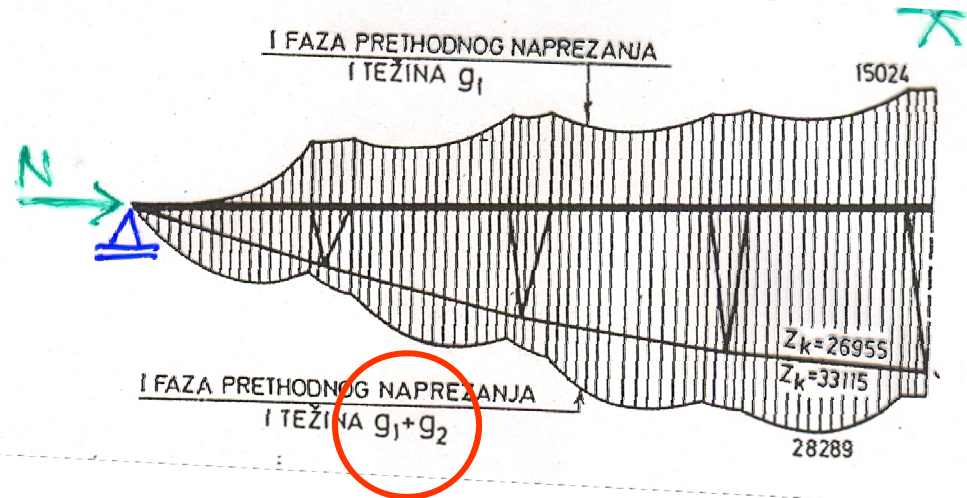




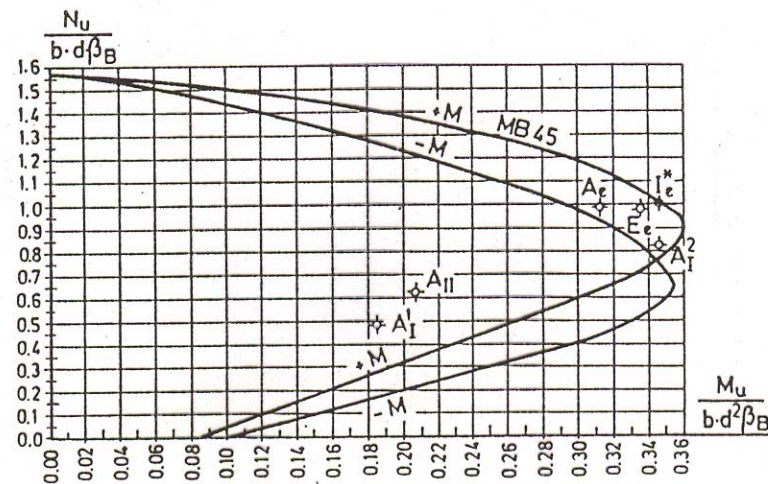
Poprečni presek



Dijagram momenta savijanja GN



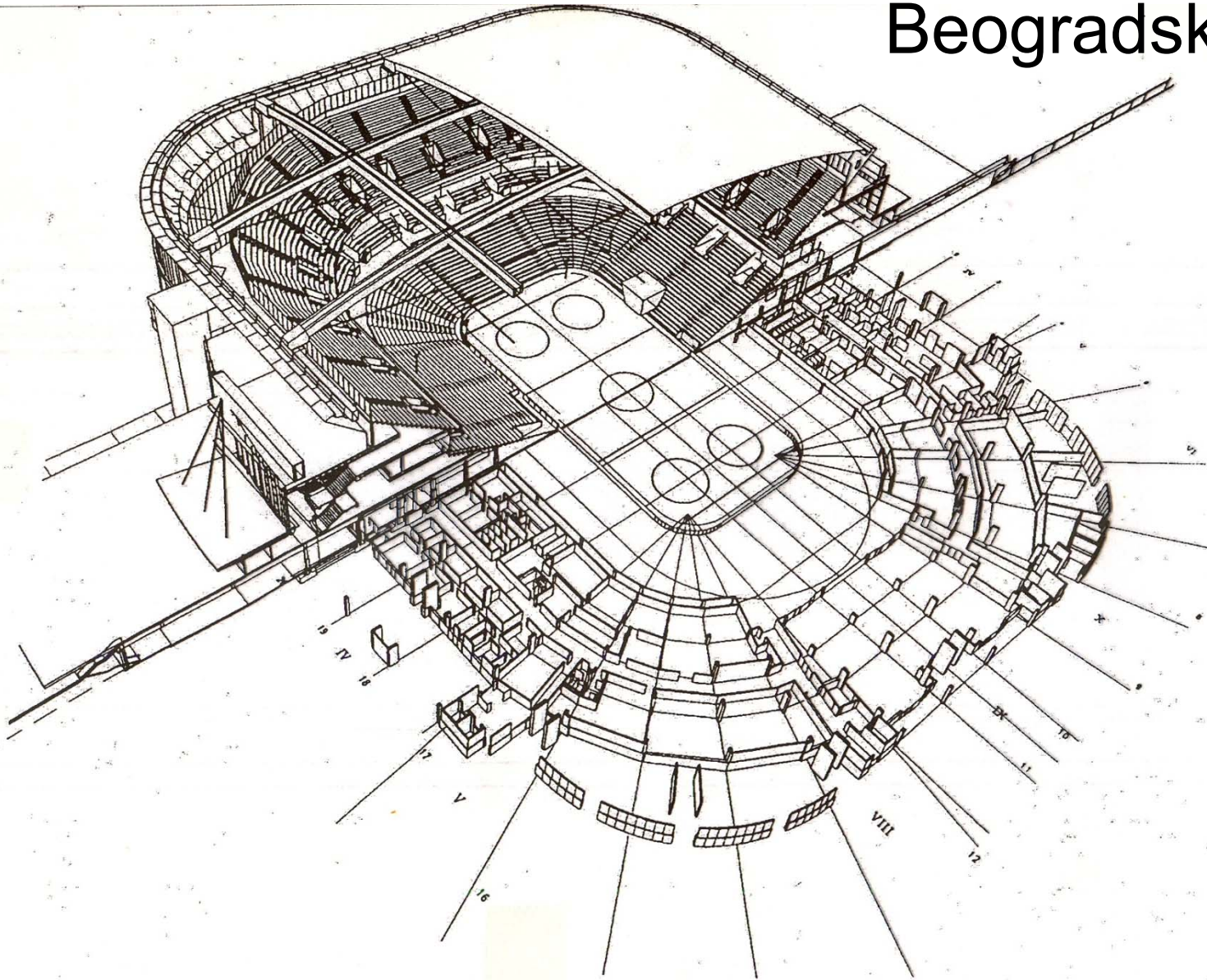
Dijagram interakcije GN



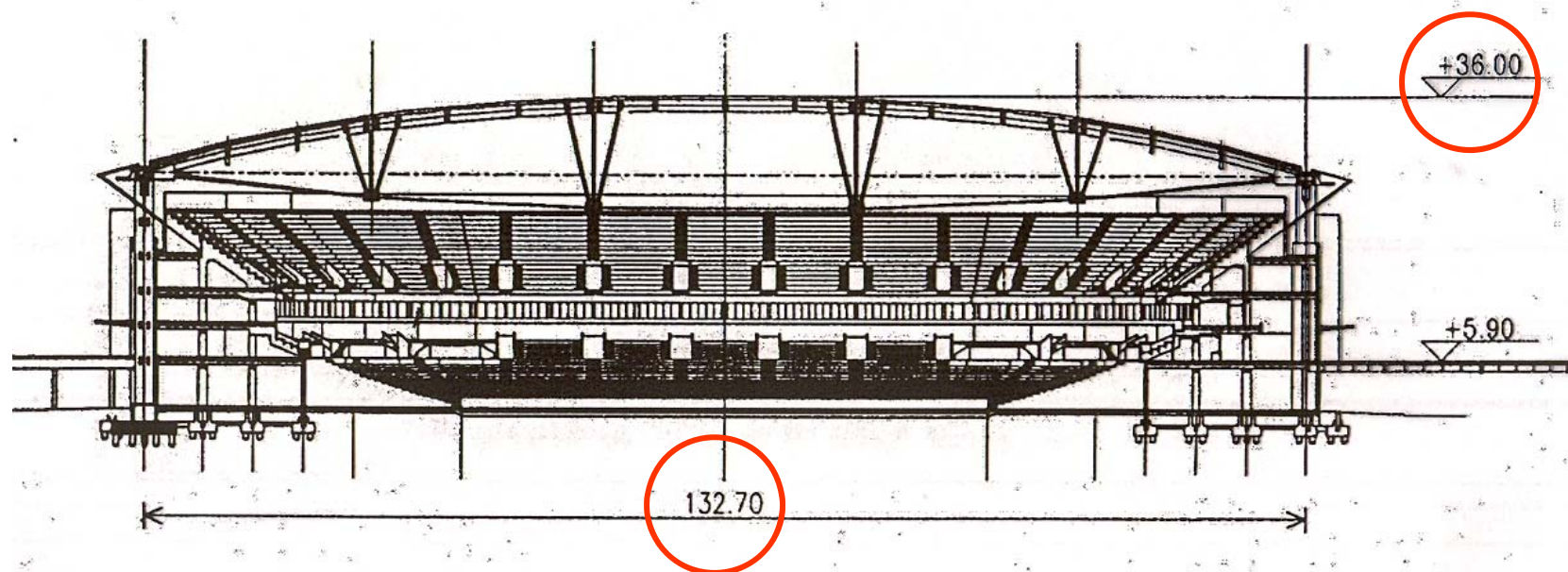
Završen hangar



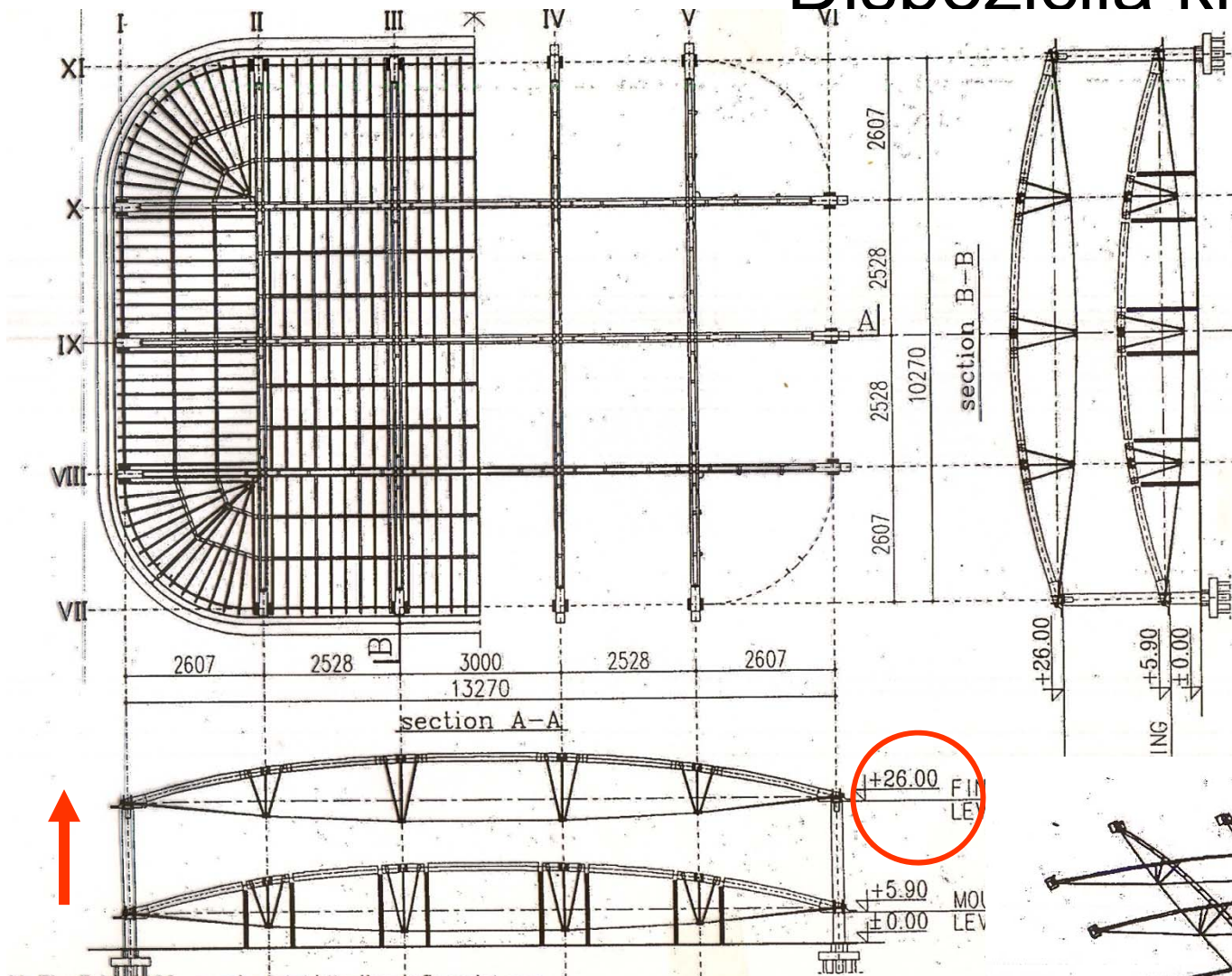
Beogradska Arena



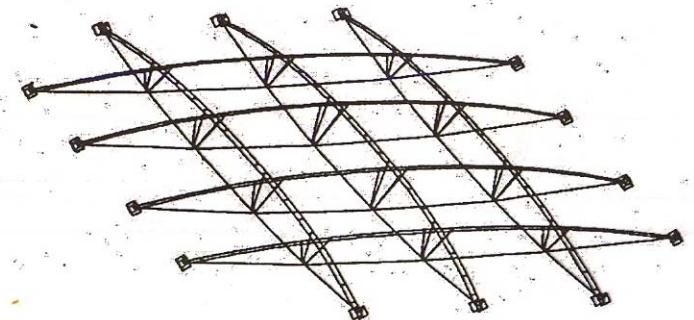
Podužni presek



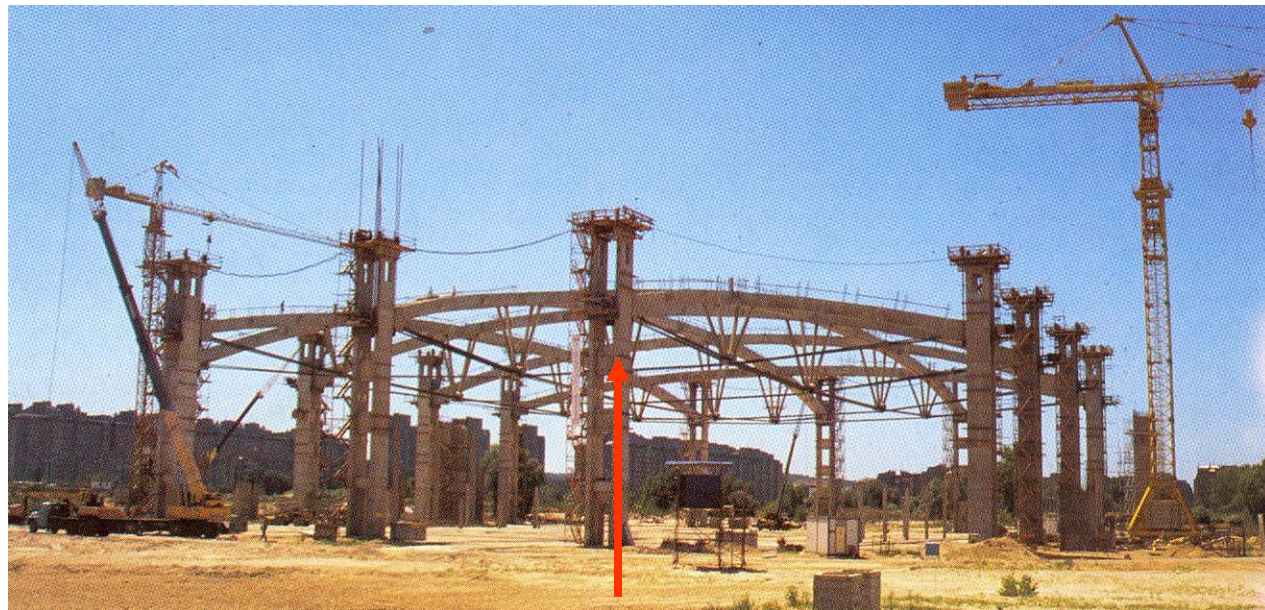
Dispoziciia krovne kon.



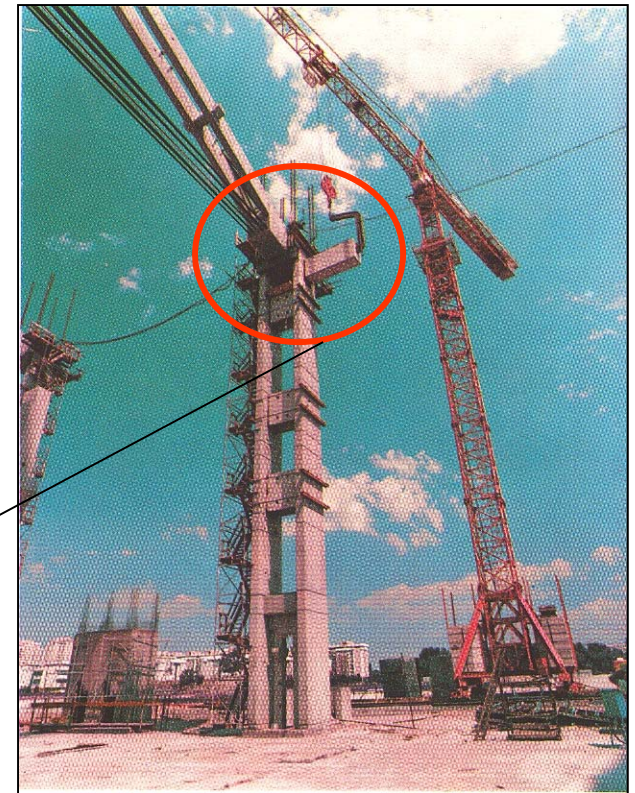
Proračunski model



Faze građenja



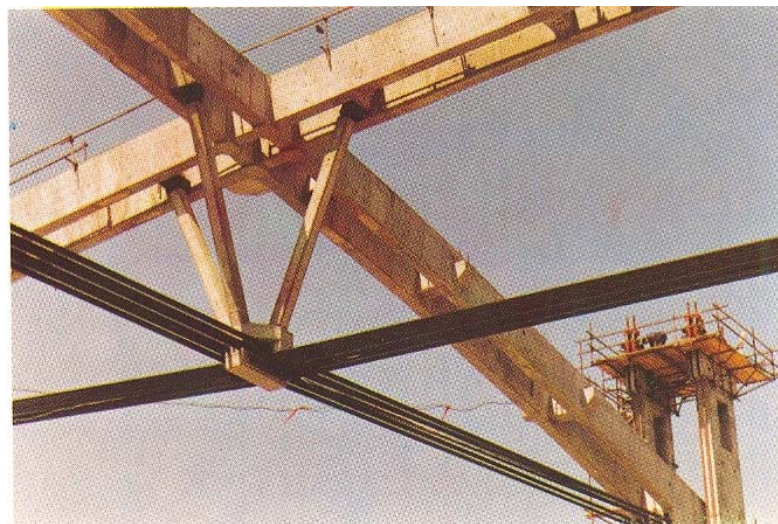
Montaža oslonačke grede



Montaža oslonačke grede - detalj

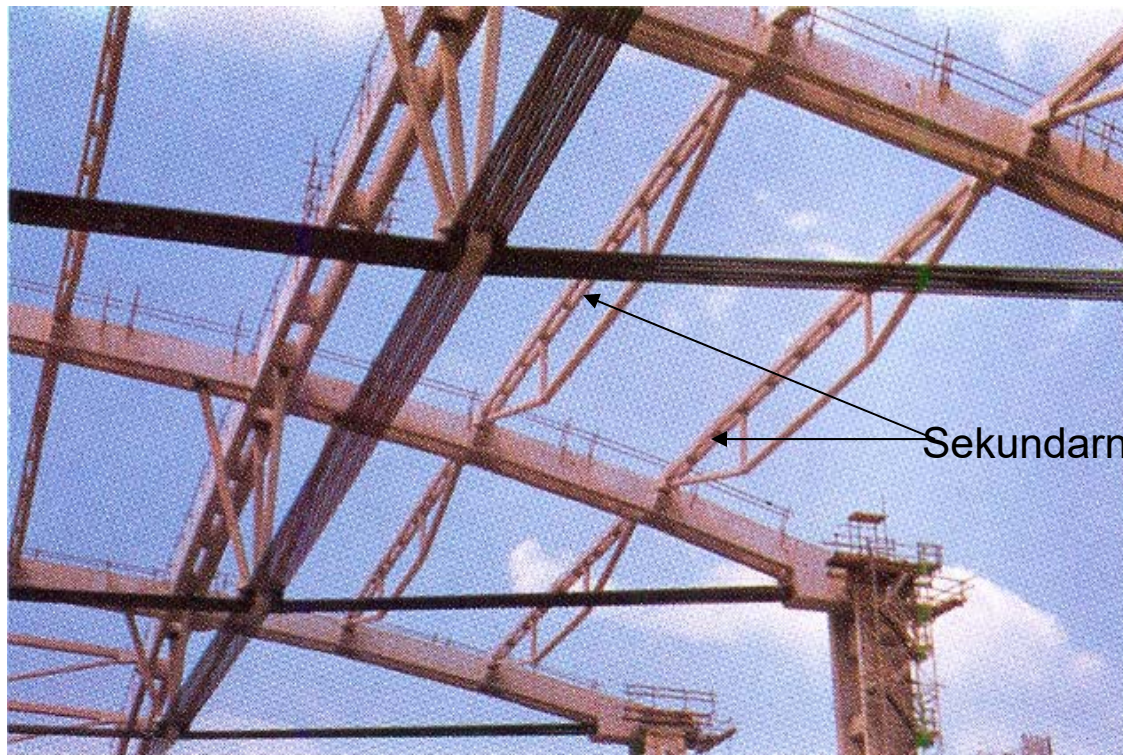


Sekundarni nosači



Montaža sek. nosača

Završena konstrukcija krova



Sekundarni nosači