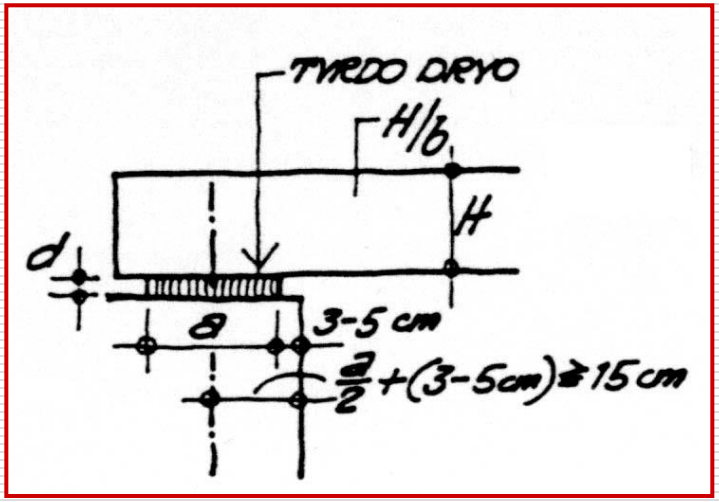
Osnove oblikovanja

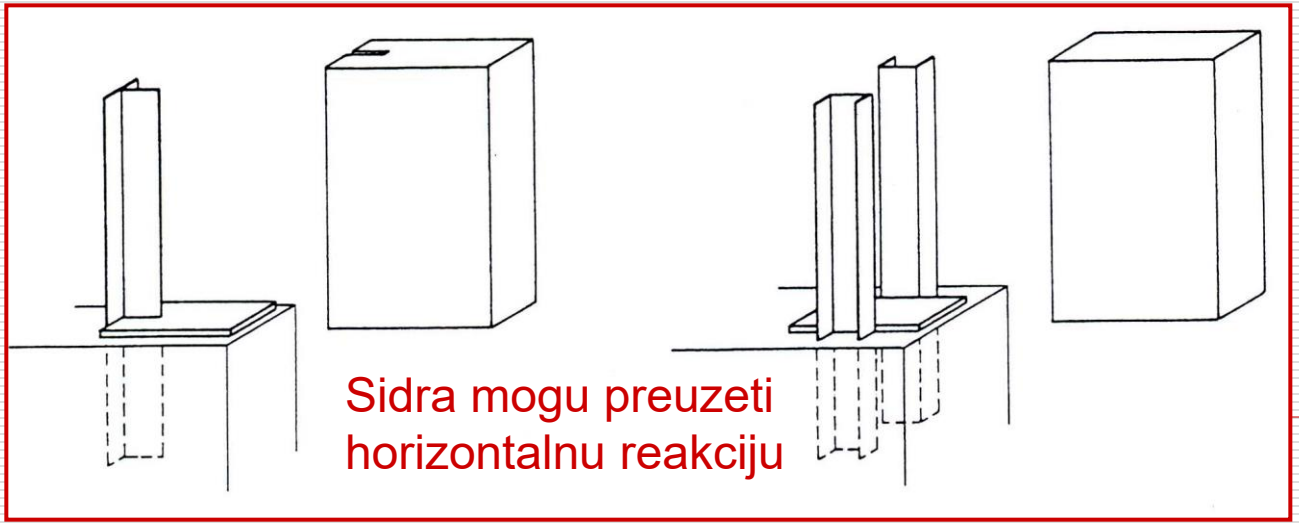
ležajeva greda i stupova

Oslanjanje drvenih greda malog i srednjeg raspona na armiranobetonsku potkonstrukciju



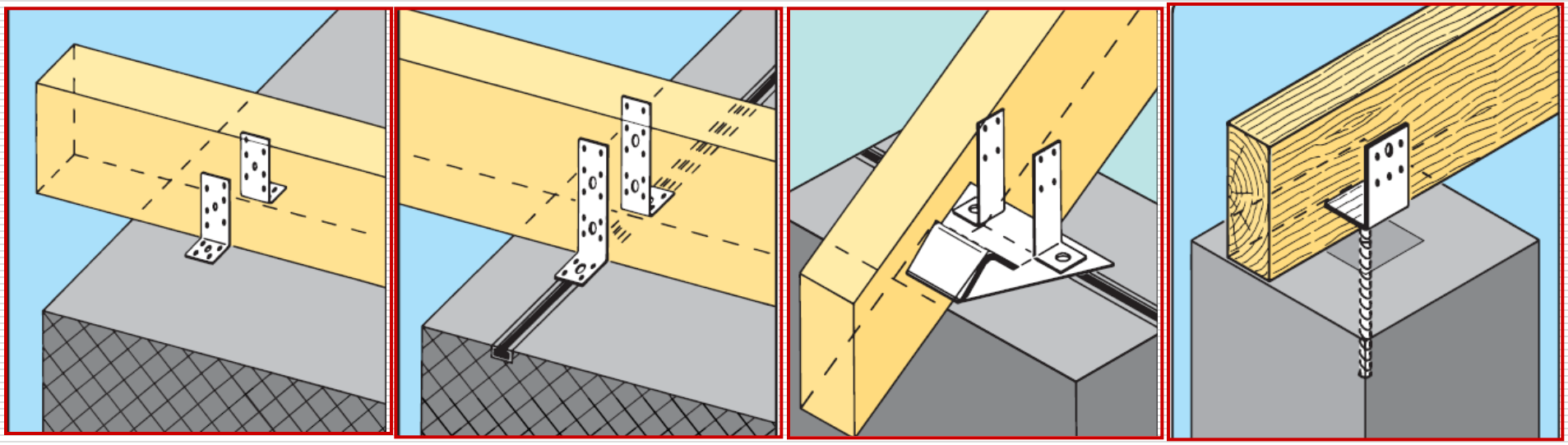
Jednostavni ležaj nalijeganjem greda malih do srednjih raspona na:

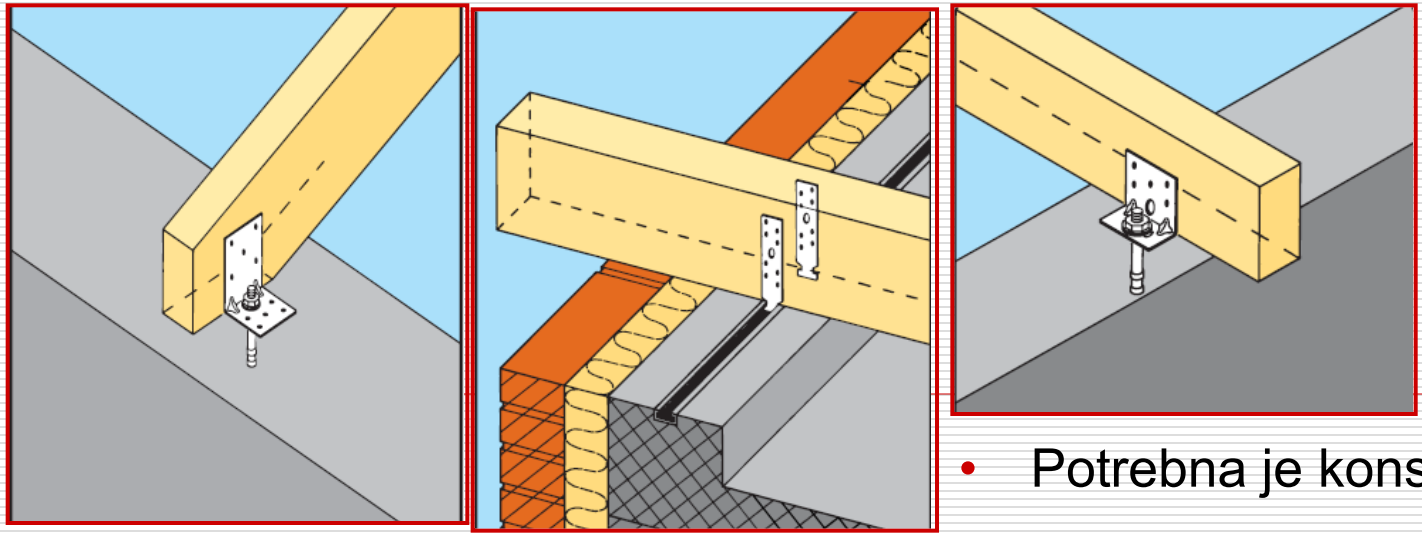
- Kladicu / podložnu gredu (tvrdo drvo)
  - osiguranje kutnicima i sidrenim vijcima ili U-profilima sidara
- Čeličnu podložnu ploču



- osiguranje U-profilima sidara ili T-profilima

Oslanjanje drvenih greda malog raspona na armiranobetonsku potkonstrukciju

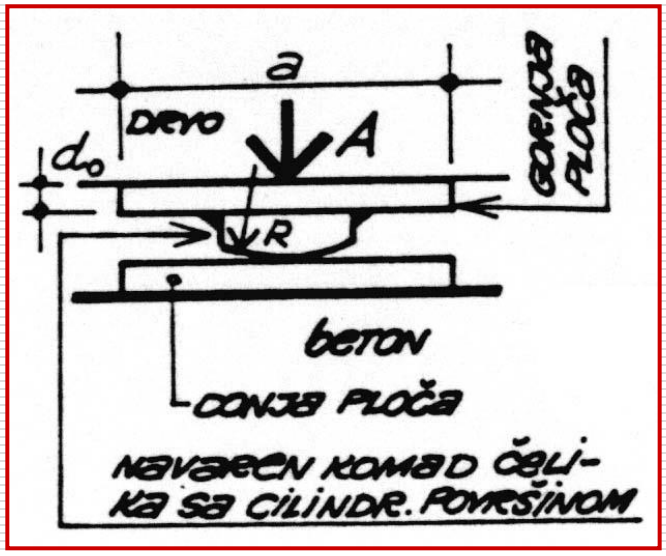




Tipski spojni pribor od tanjih limova – čavlani spojevi

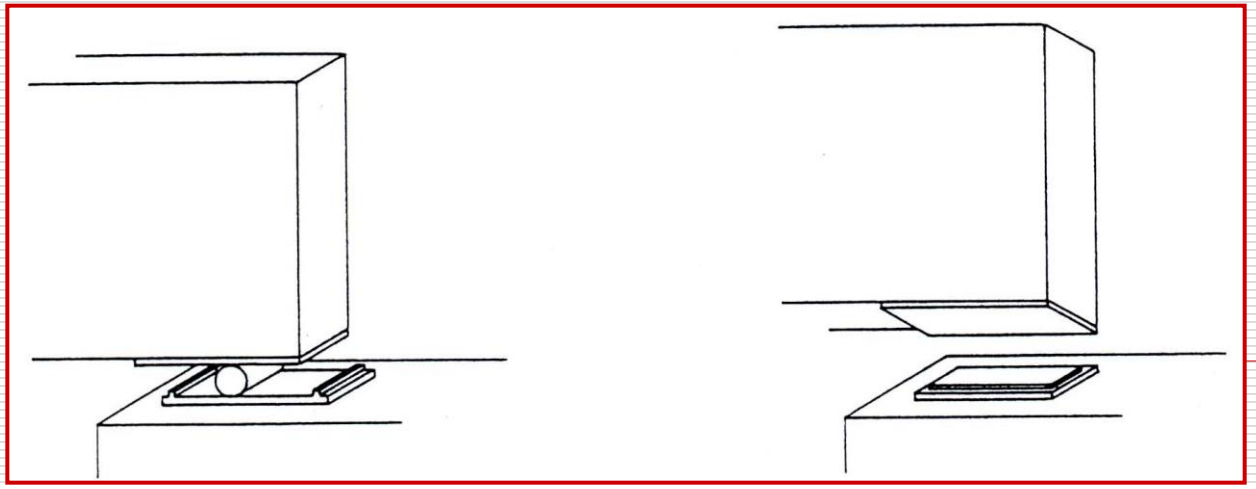
- Potrebna je konstruktivna zaštita

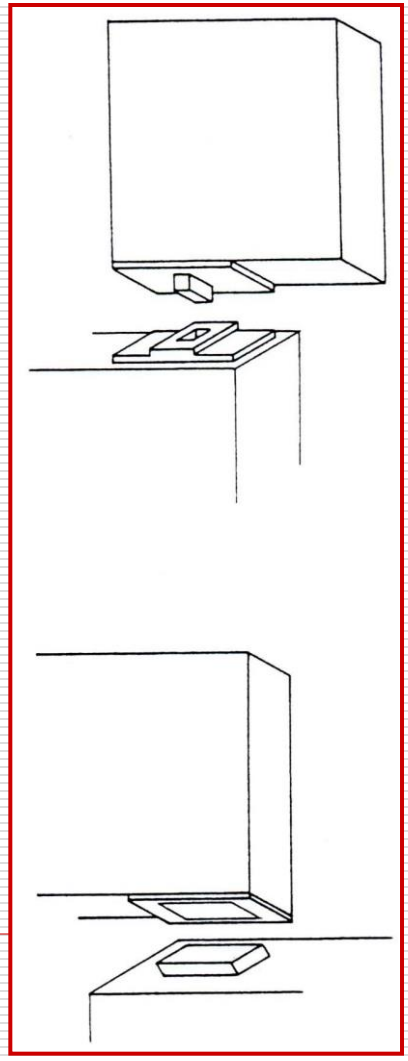
Oslanjanje drvenih greda srednjeg i većeg raspona na armiranobetonsku potkonstrukciju



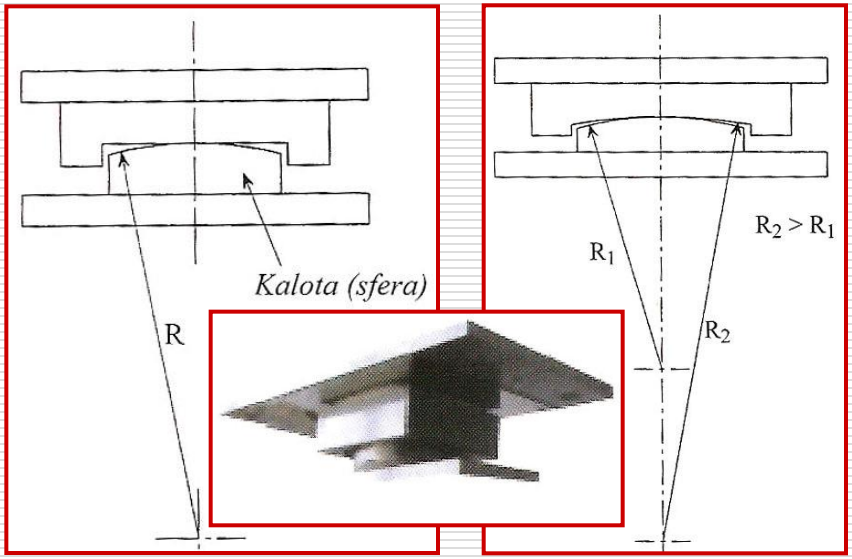
Ležajevi greda srednjih i većih raspona

- Linijski ili točkasti ležaj (s gornjom i donjom čeličnom pločom)
- Neoprenski ležaj





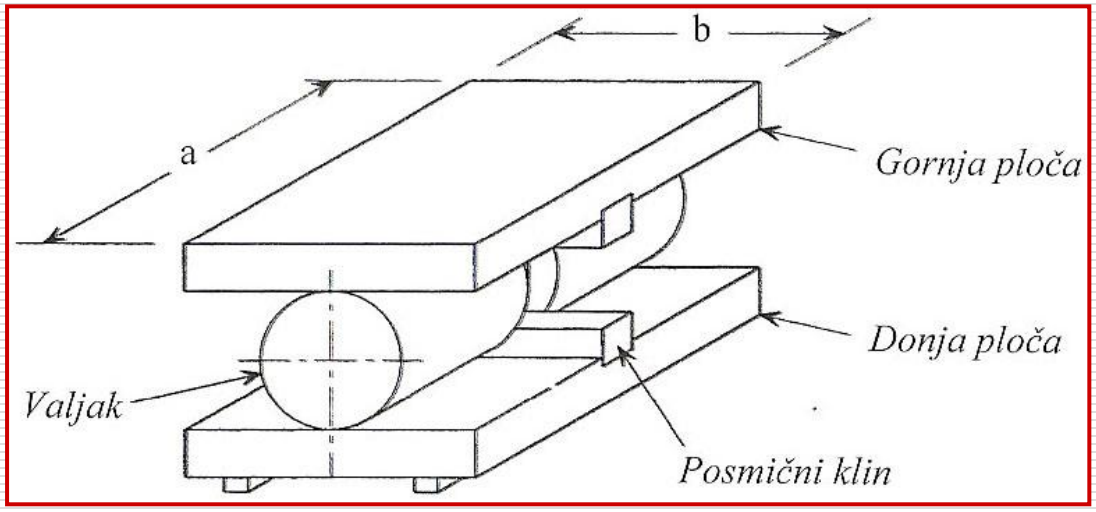
Oslanjanje drvenih greda srednjeg i većeg raspona na armiranobetonsku potkonstrukciju

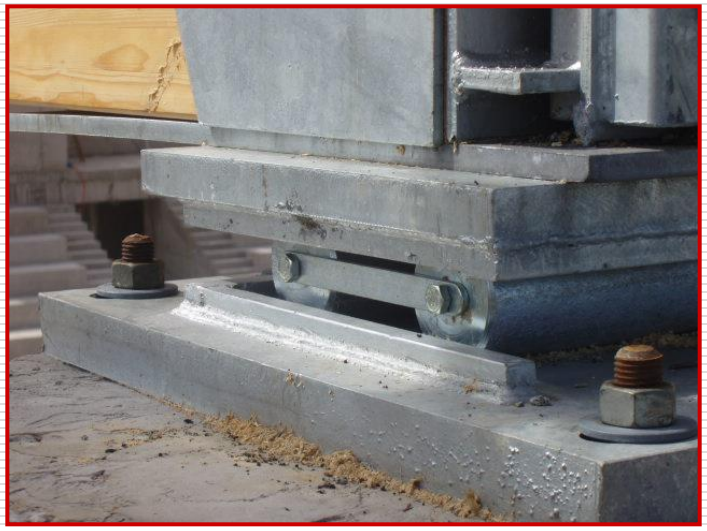


Linijski zaokretni ležaj

Točkasto zaokretni ležajevi s kontaktom ravnina / sfera i sfera / sfera

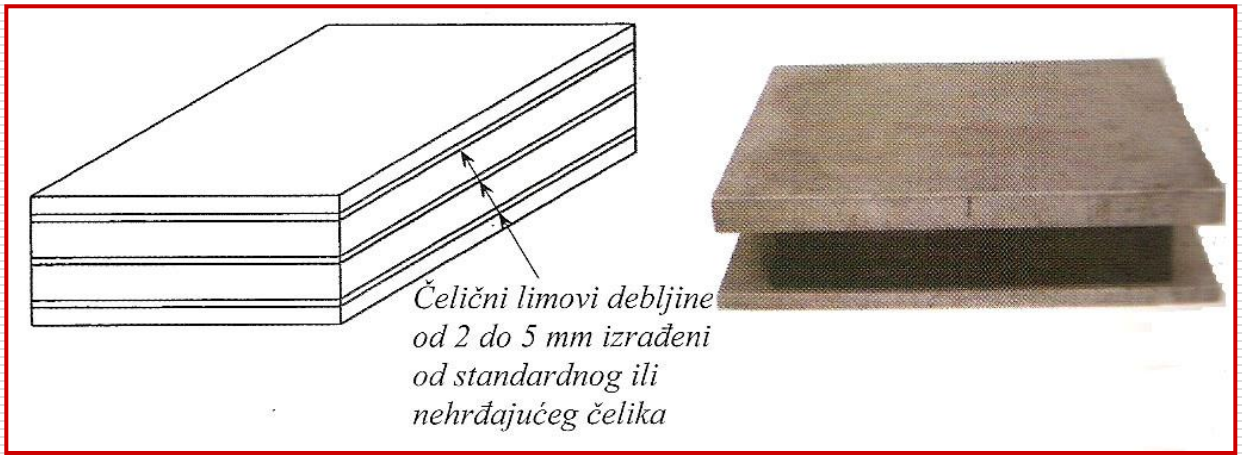
Oslanjanje drvenih greda srednjeg i većeg raspona na armiranobetonsku potkonstrukciju



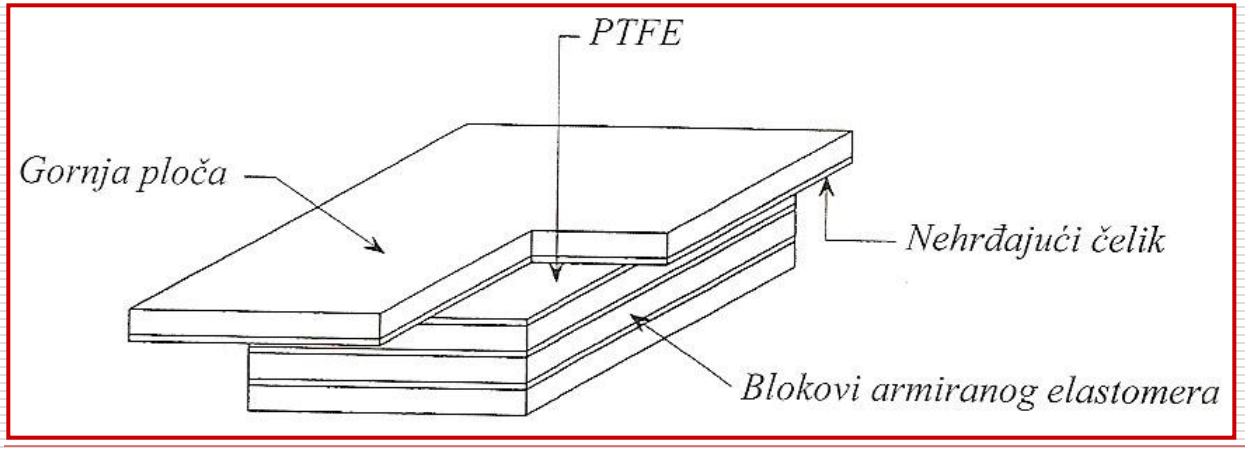


Linijski kotrljajući ležaj – pokretni ležaj

Oslanjanje drvenih greda srednjeg i većeg raspona na armiranobetonsku potkonstrukciju

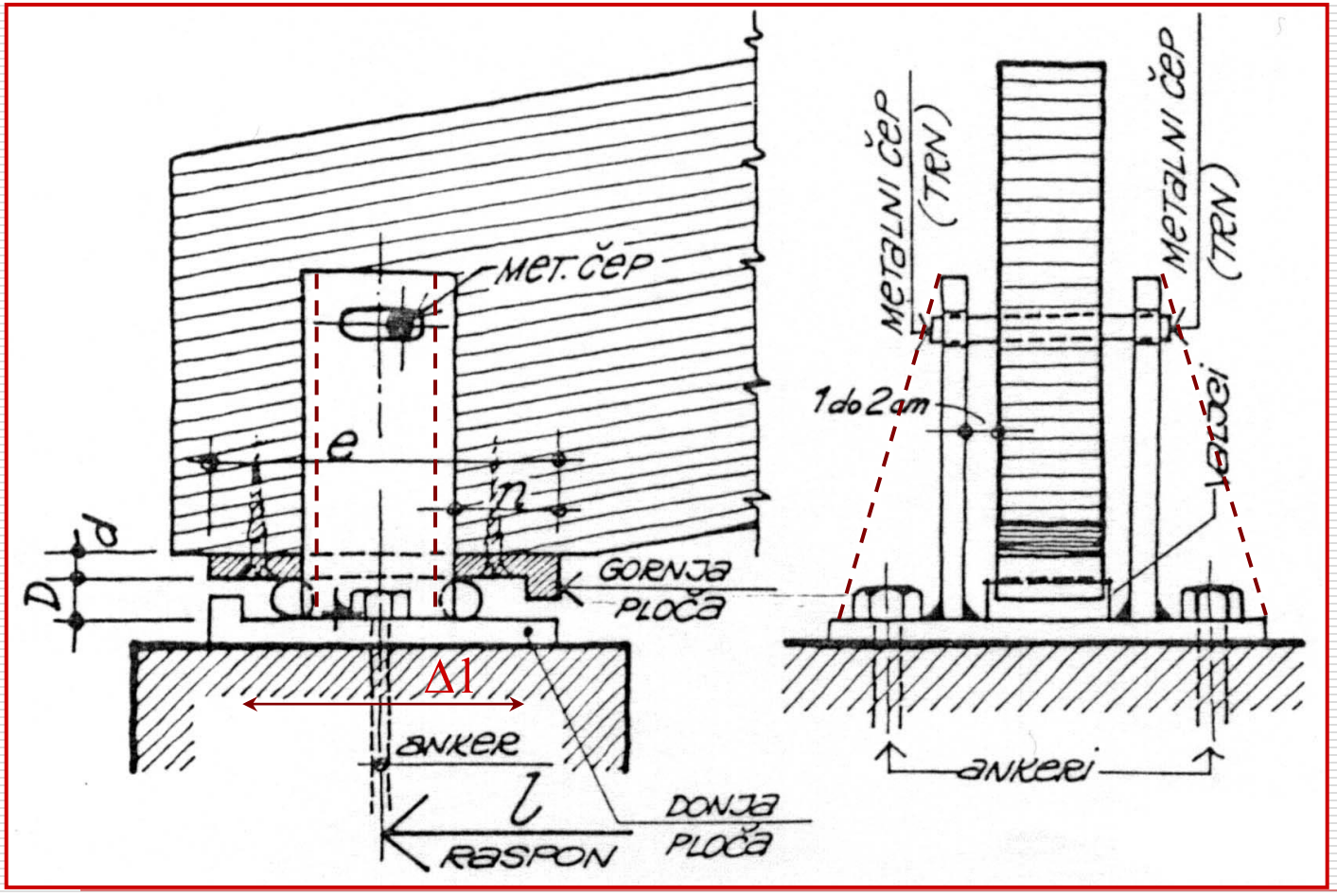


Nepokretni elastomerni ležaj



Pokretni elastomerni ležaj

Oslanjanje lijepljenih lameliranih greda velikog raspona na armiranobetonsku potkonstrukciju

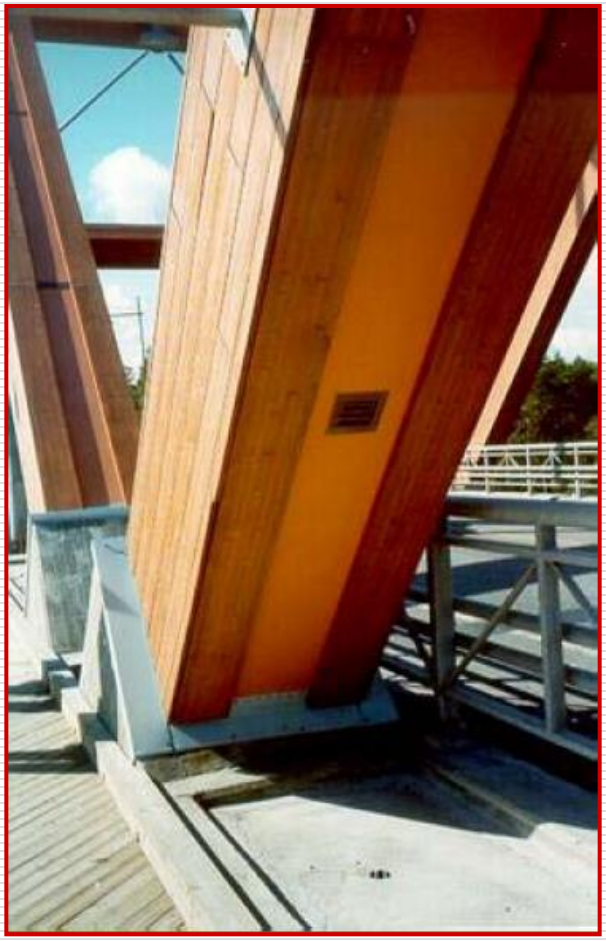


Konstrukcija pokretnog linijskog ležaja

"Zubi" zavareni na ležajne ploče omogućavaju proračunati horizontalni pomak

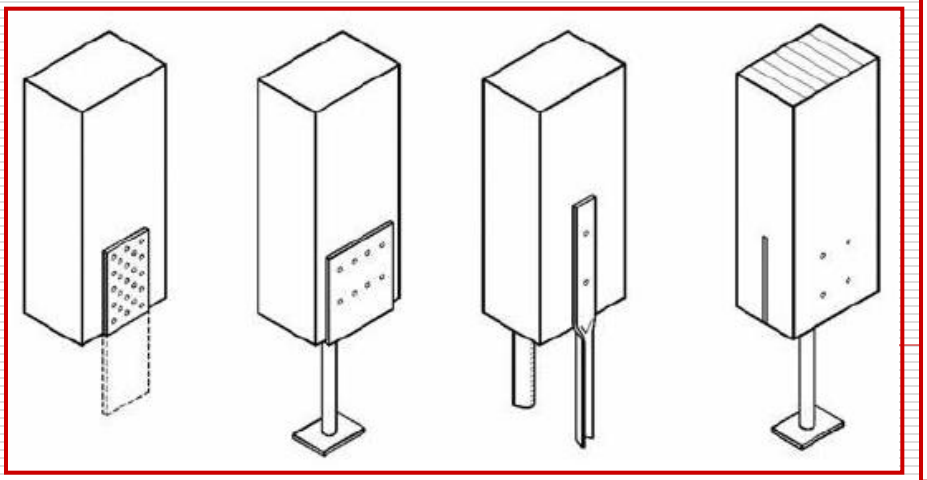
Oslanjanje drvenih stupova na temelj

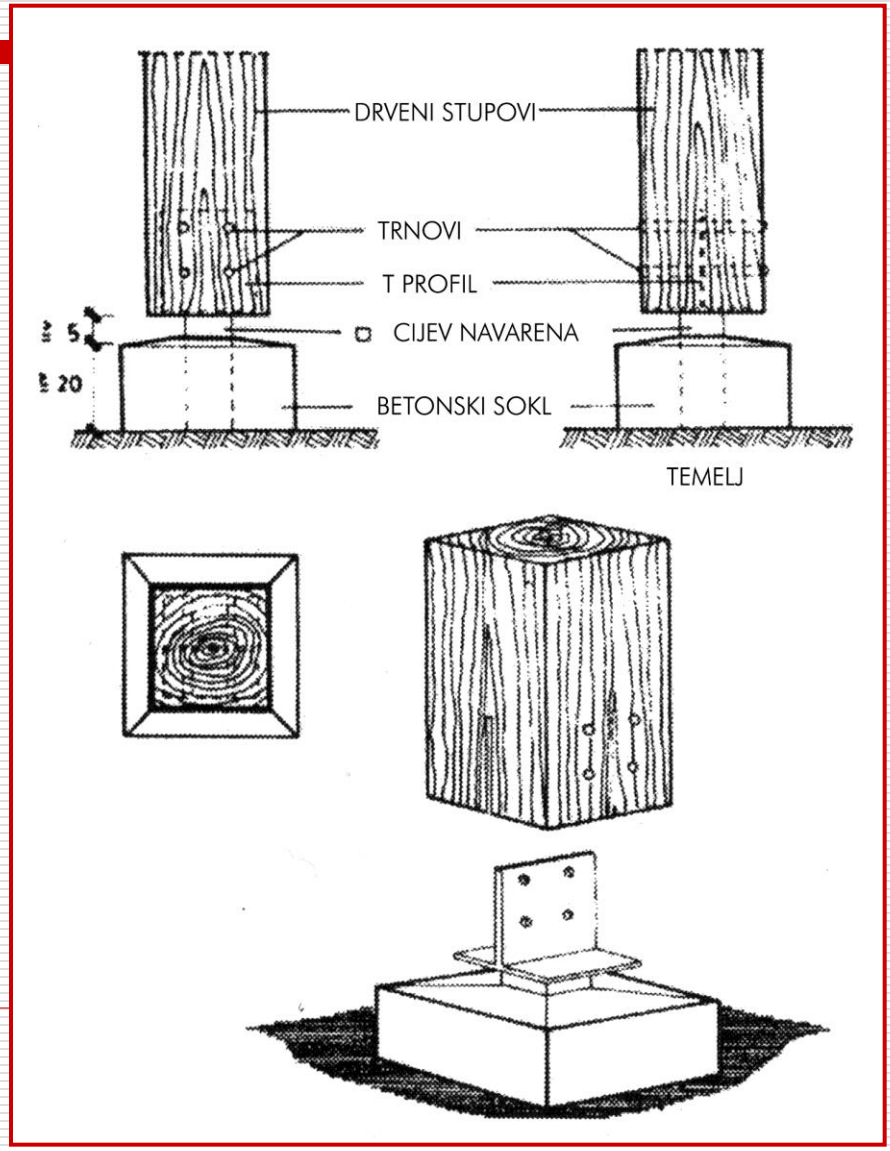
- Mjere konstruktivne i fizičke zaštite su obavezne.



Oslanjanje drvenih stupova sustava manjeg do srednjeg raspona

- Vertikalna reakcija prenosi se nalijeganjem (|| s vlaknima) na podložnu čeličnu ploču
- Spajala a vezu vertikalnog lima i stupa su konstruktivna –
  - treba ih proračunati u slučaju negativne reakcije.

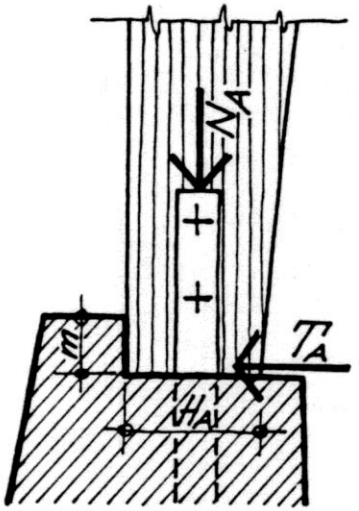


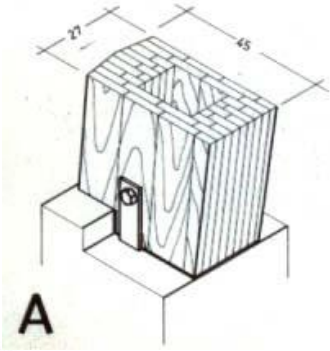


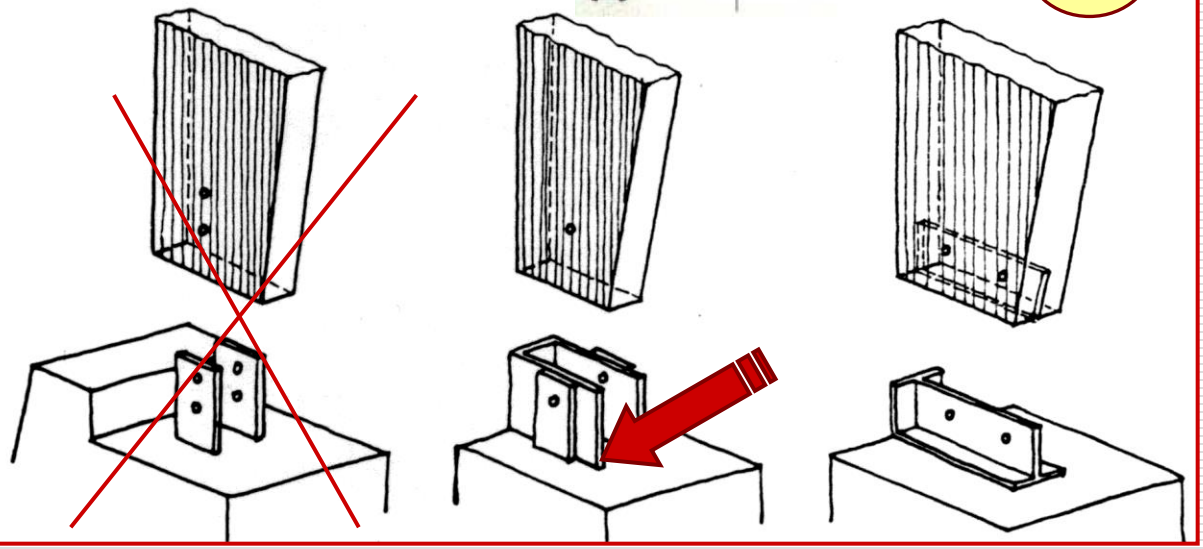
Oslanjanje drvenih stupova sustava manjeg do srednjeg raspona

- Vertikalna reakcija prenosi se nalijeganjem (|| s vlaknima) na podložnu čeličnu ploču
- Poprečnu silu prihvaća betonski "zub" ili čeona ploča ležaja (⊥ na vlakna / površina dodira)

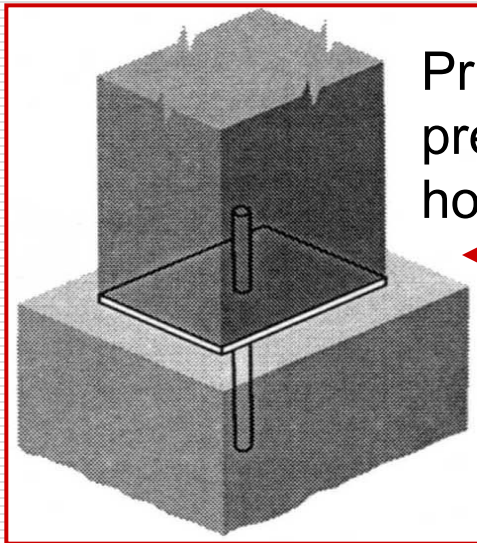
$$\sigma_{c,90,d} = \frac{T_{A,d} = Q_d}{m \cdot b} \le f_{c,90,d}$$



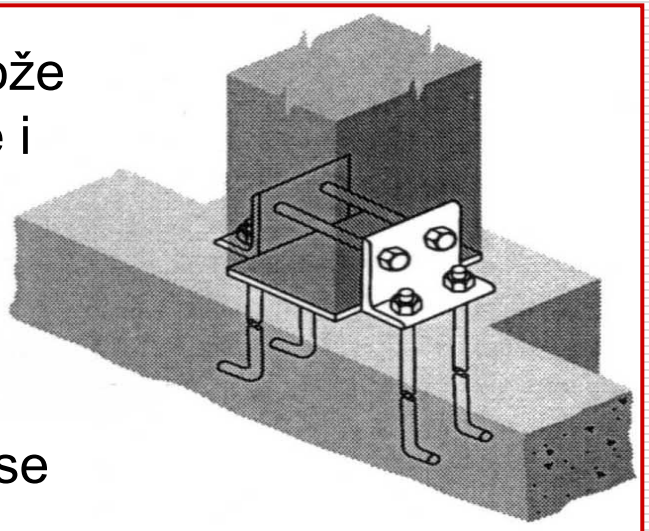




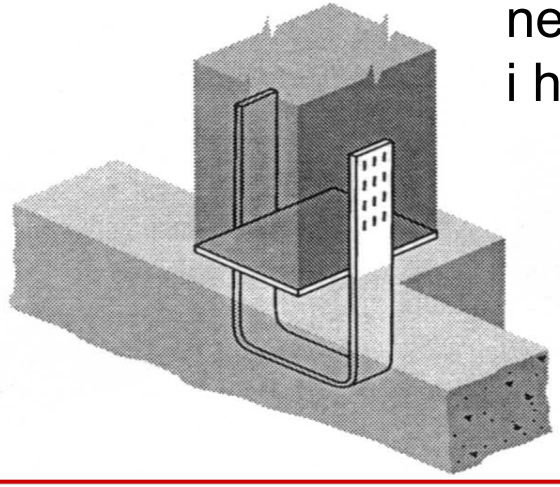
Oslanjanje drvenih stupova sustava manjeg do srednjeg raspona

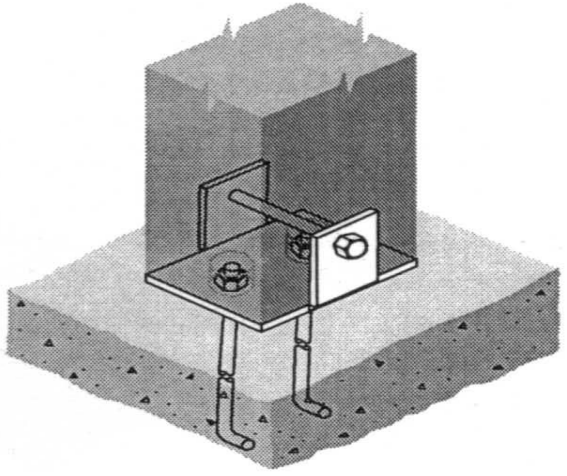


Priključak koji ne može preuzeti odižuće sile i horizontalne sile



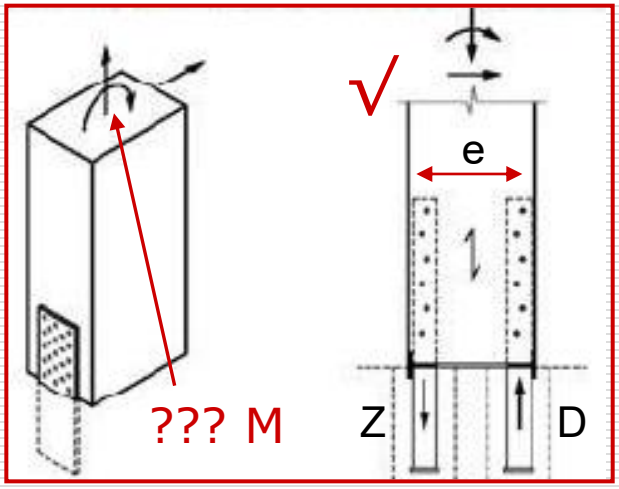
Priključci kojim se mogu prihvatiti negativne reakcije i horizontalne sile

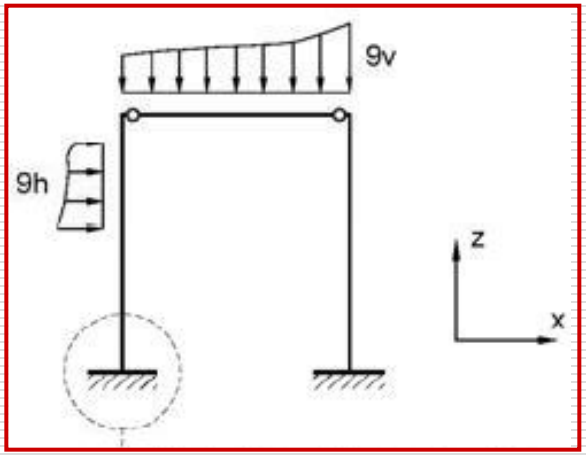




Upeti oslonci drvenih stupova

- Načela prijenosa momenta savijanja – spreg sila Z (vlačna) i D (tlačna) / razmak težišta spajala određuje krak sila, e:

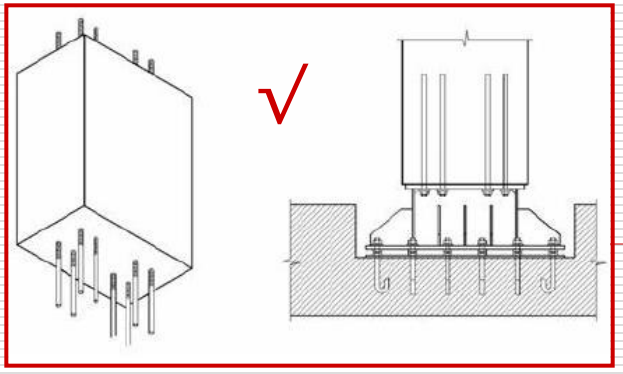




$$M_{y,d} = Z_d \cdot e = D_d \cdot e$$

- Vlačnu silu Z prihvaćaju spajala

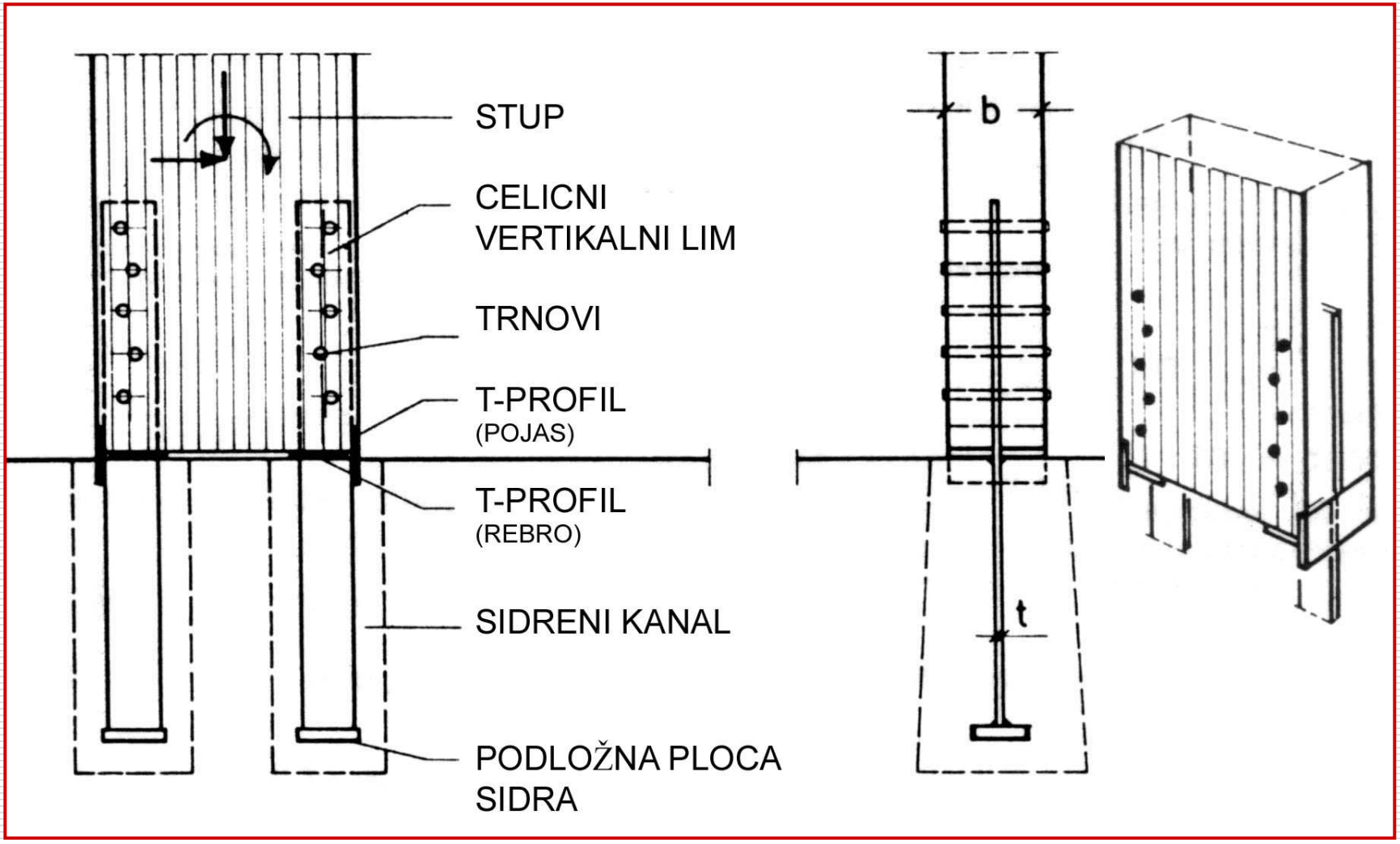
$$Z_d \leq \sum F_{v,R_d}(i)$$



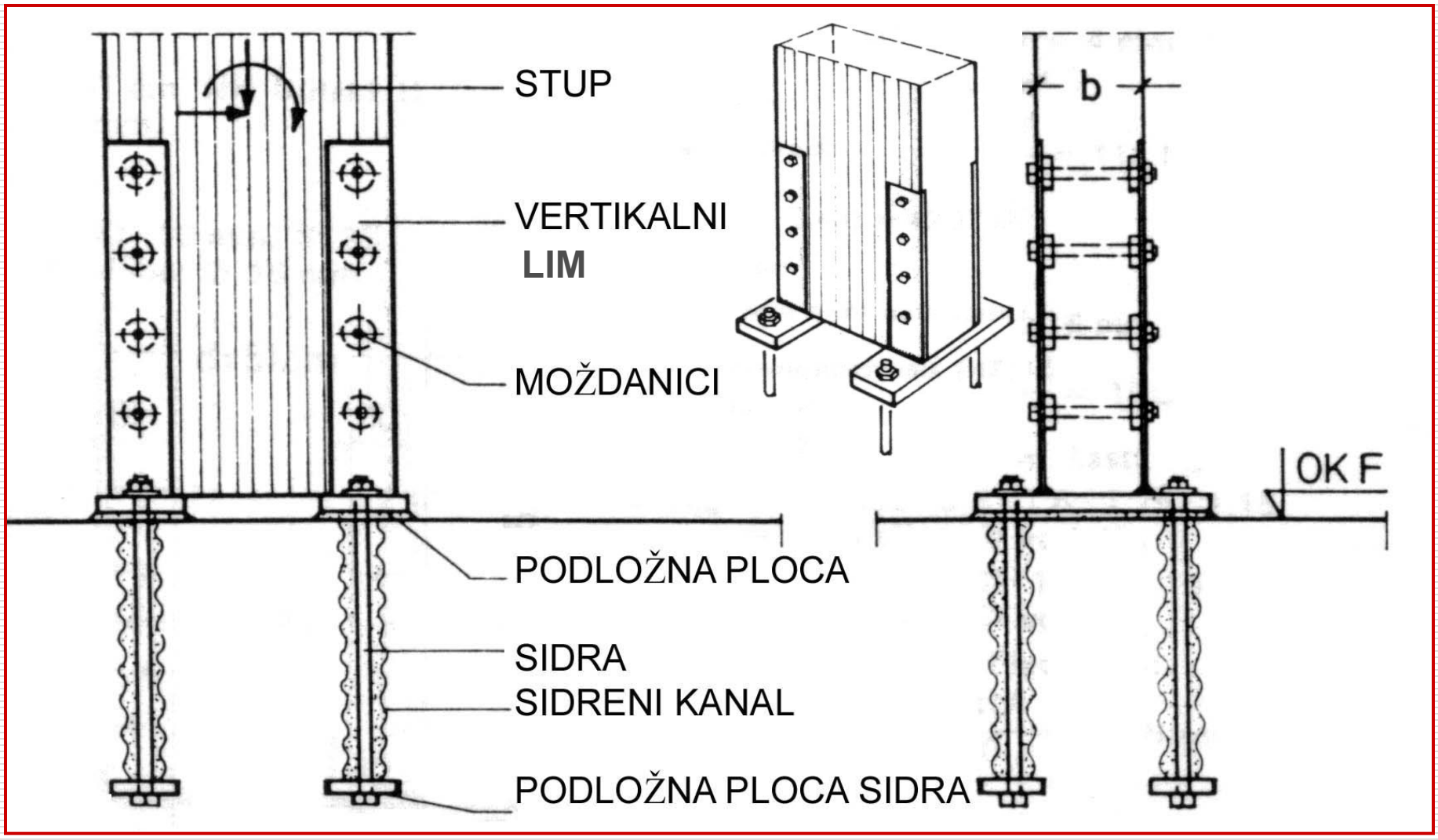
- Tlačna sila D prenosi se nalijeganjem presjeka stupa na podložnu ploču čeličnog profila (tlakom || s vlaknima).

- Inovativni sustavi – šipke s navojem

Upeti oslonci drvenih stupova

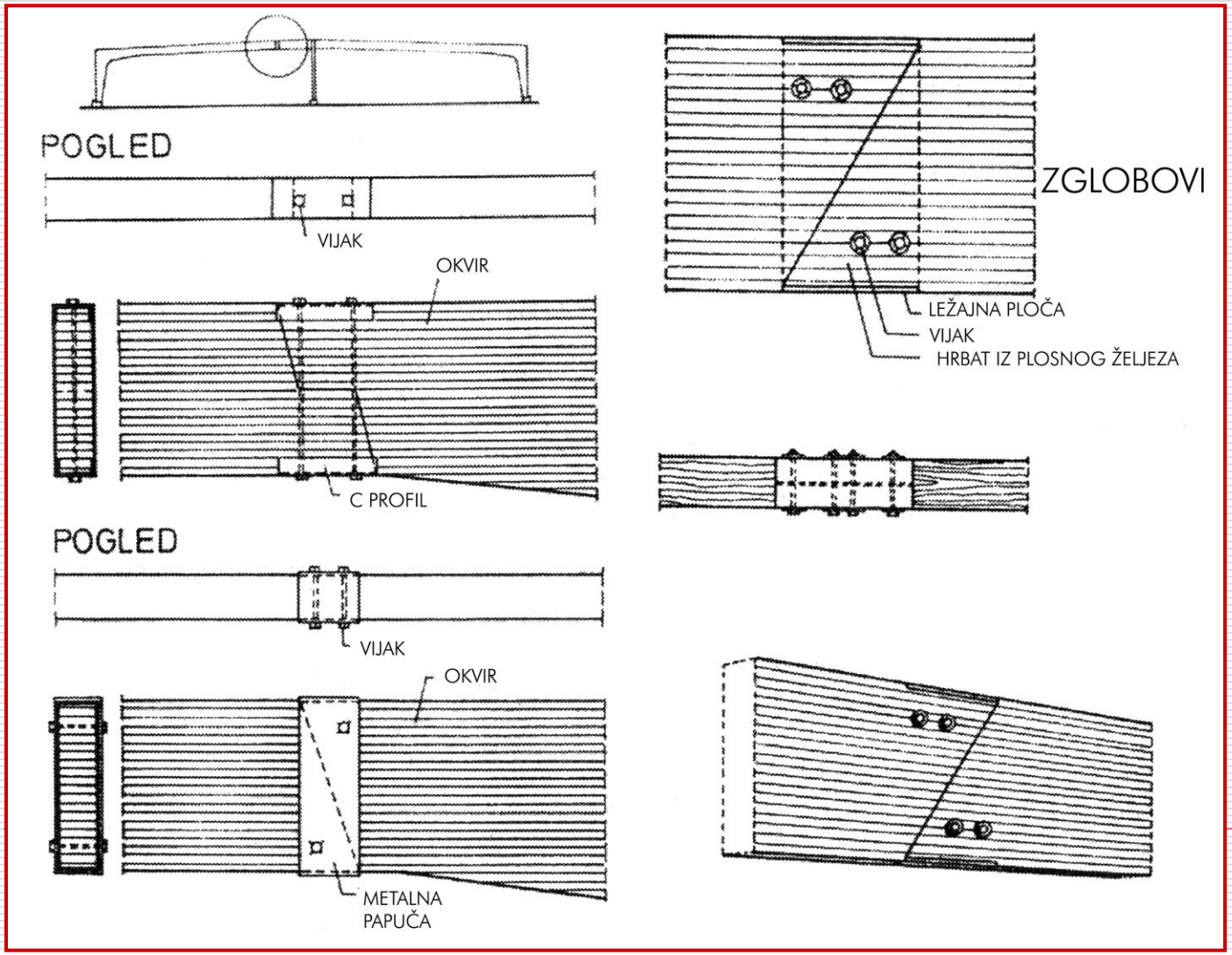


Upeti oslonci drvenih stupova

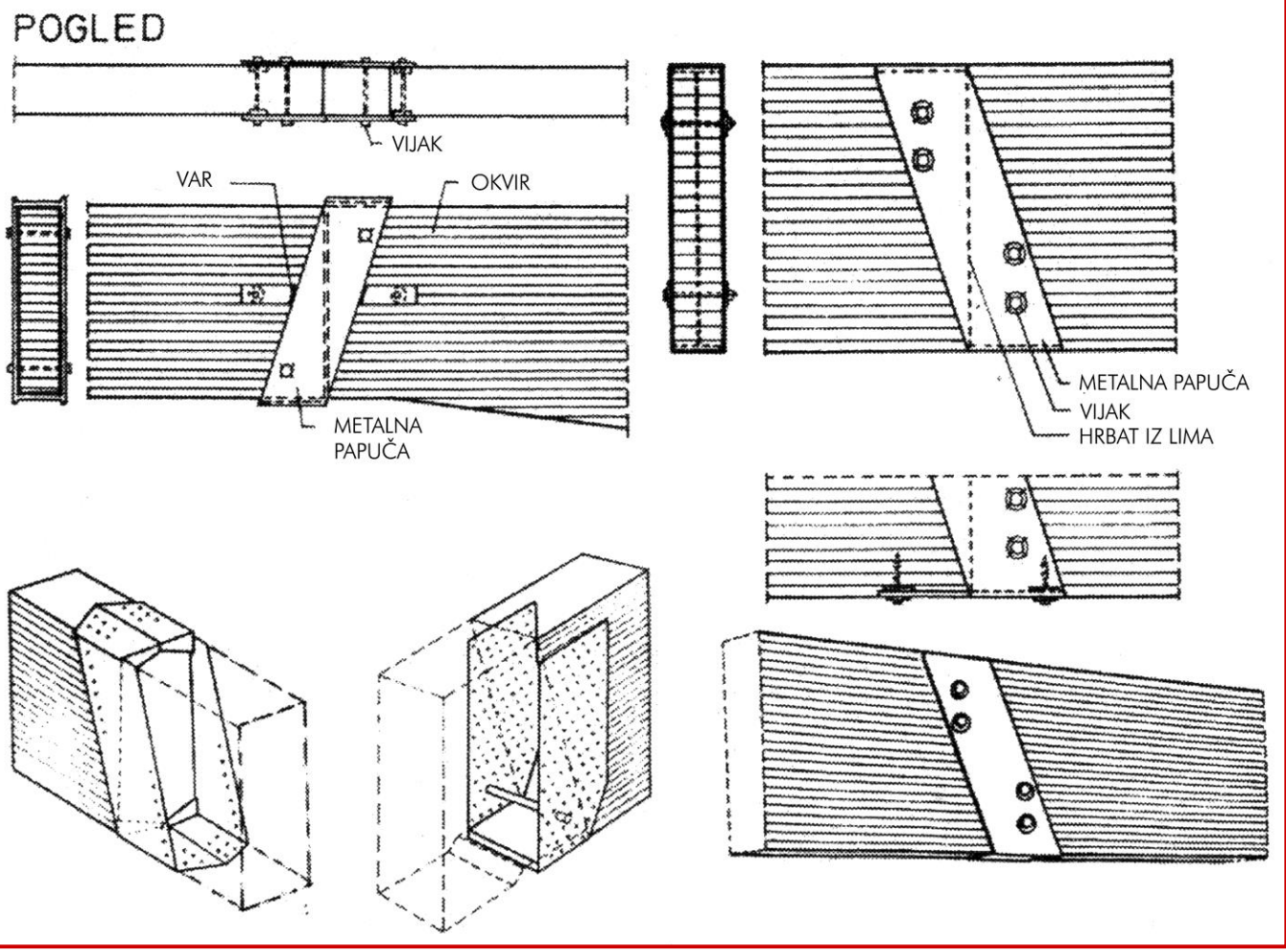


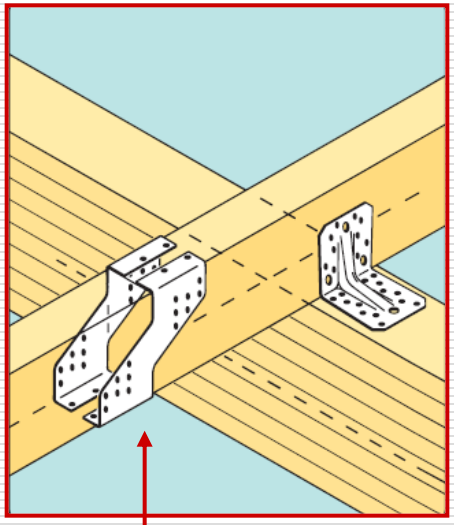
Oblikovanje Gerberovog zgloba

Gerberov zglob u veznim i okvirnim sustavima



Gerberov zglob u veznim i okvirnim sustavima

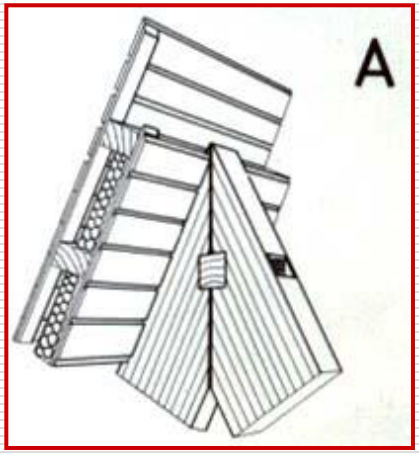


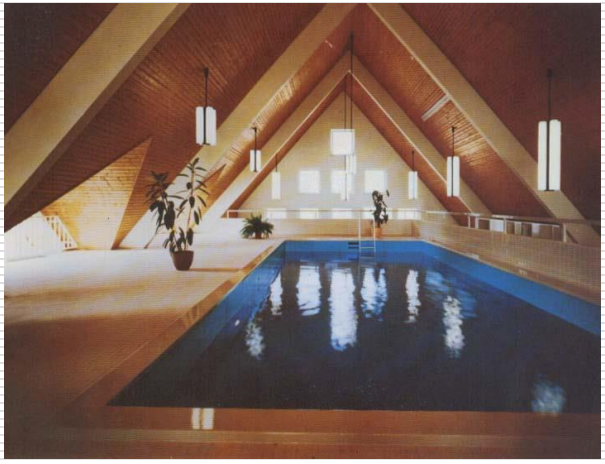


Tipsko rješenje za grede manjeg raspona

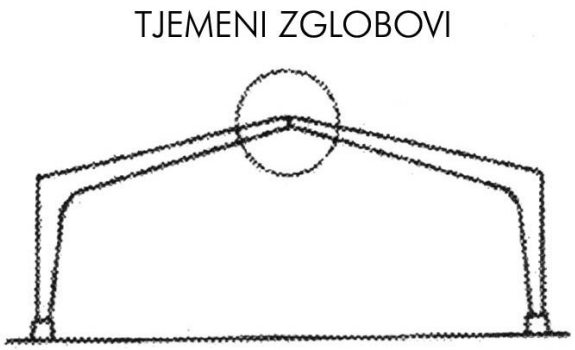
Osnove oblikovanja ležajeva i priključaka u sustavima okvira

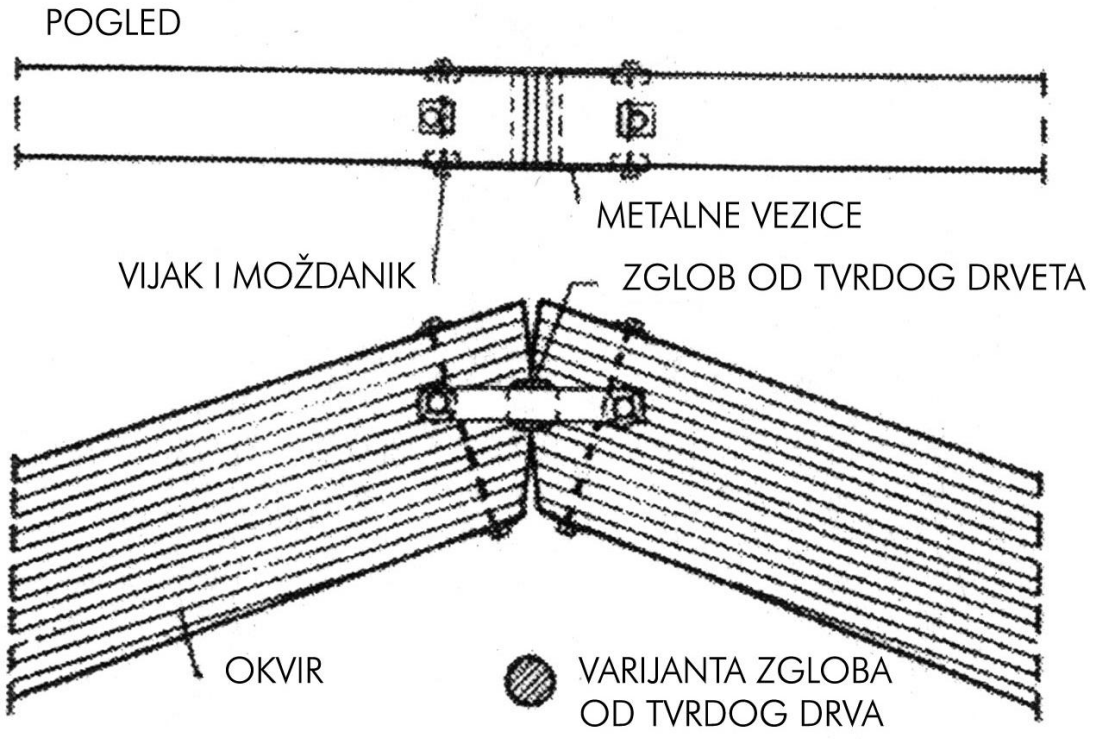
Konstrukcije zglobova u tjemenu okvira



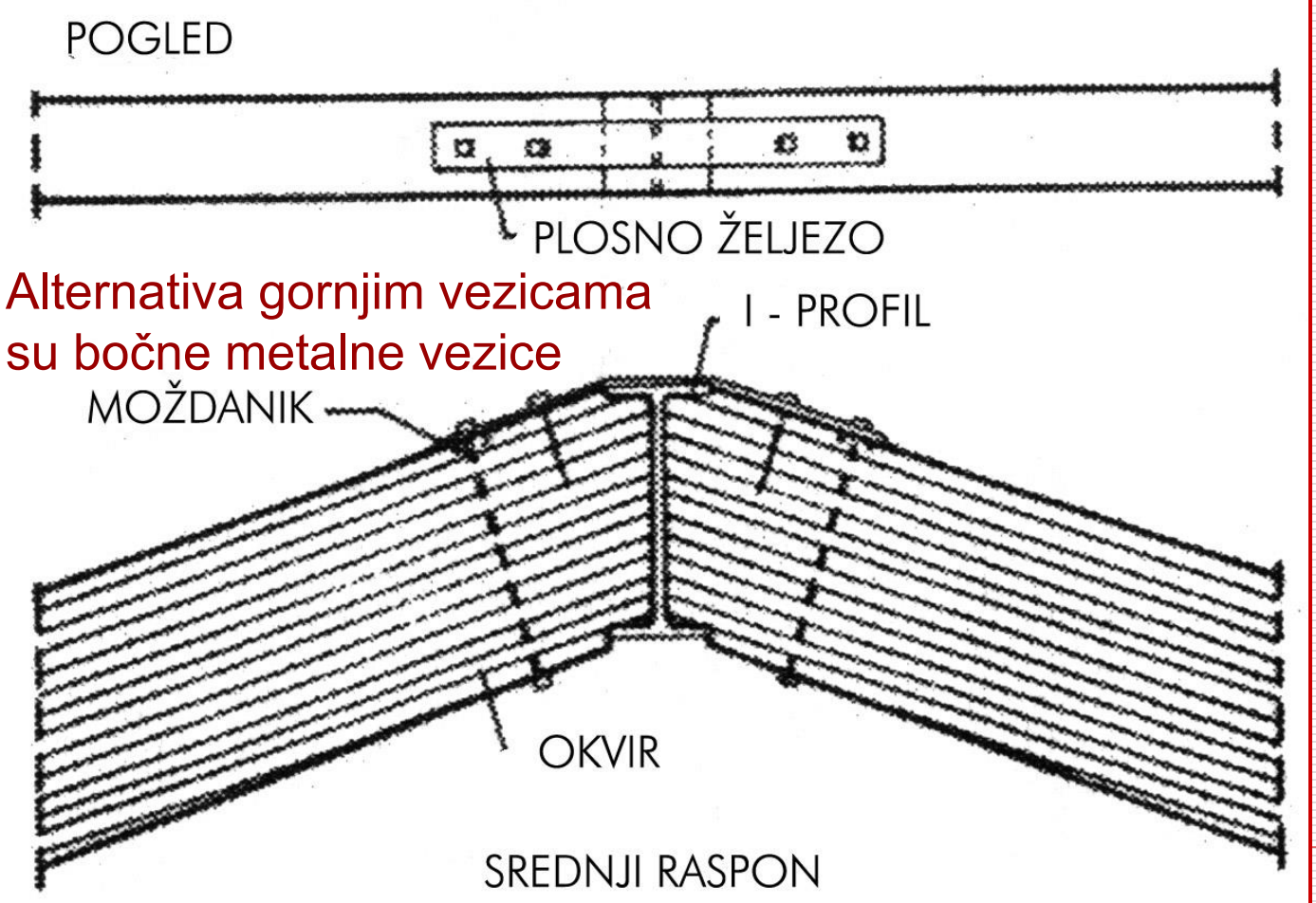


Zglobna veza greda i sljemenu za okvire manjih raspona



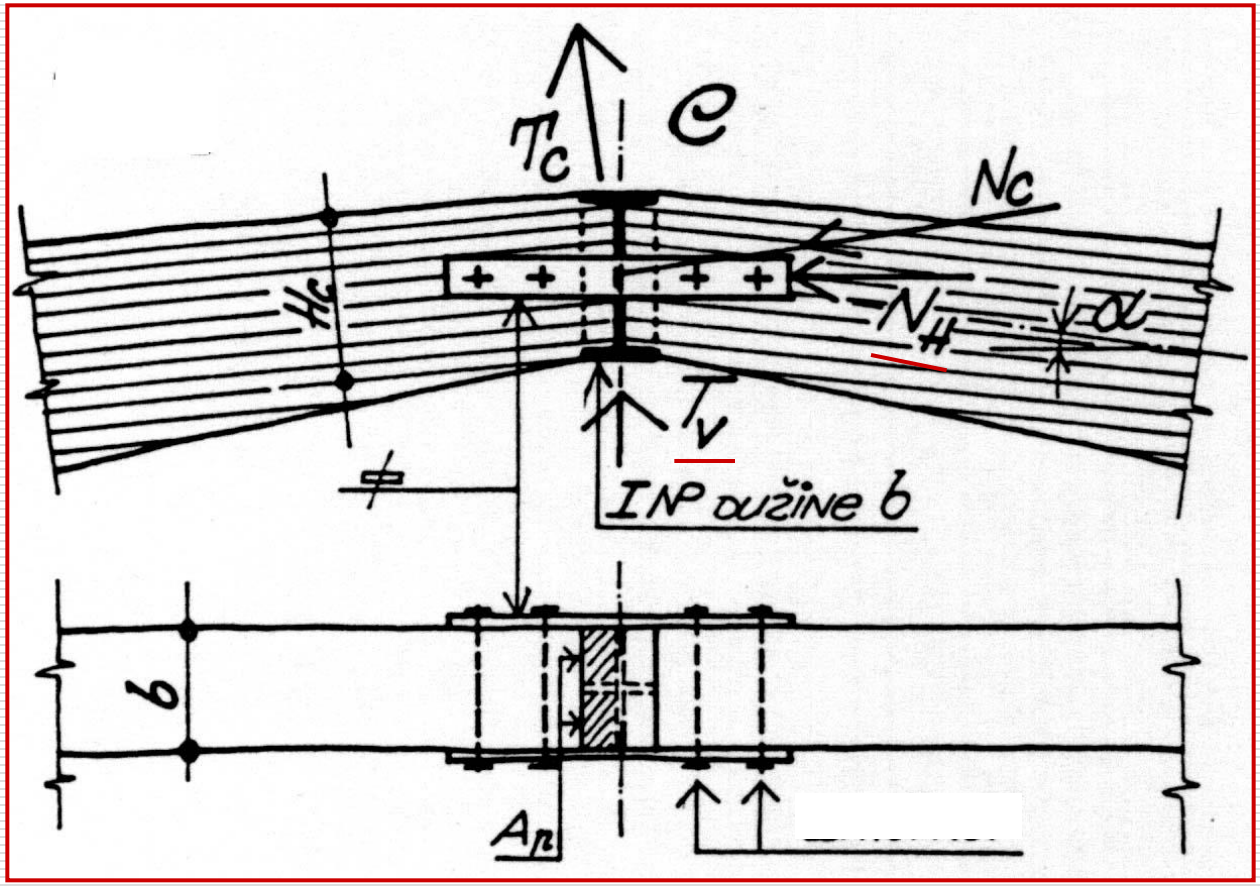


Konstrukcije zglobova u tjemenu okvirnih sustava



Zglobna veza greda i sljemenu za okvire srednjih raspona

Konstrukcije zglobova u tjemenu okvirnih sustava

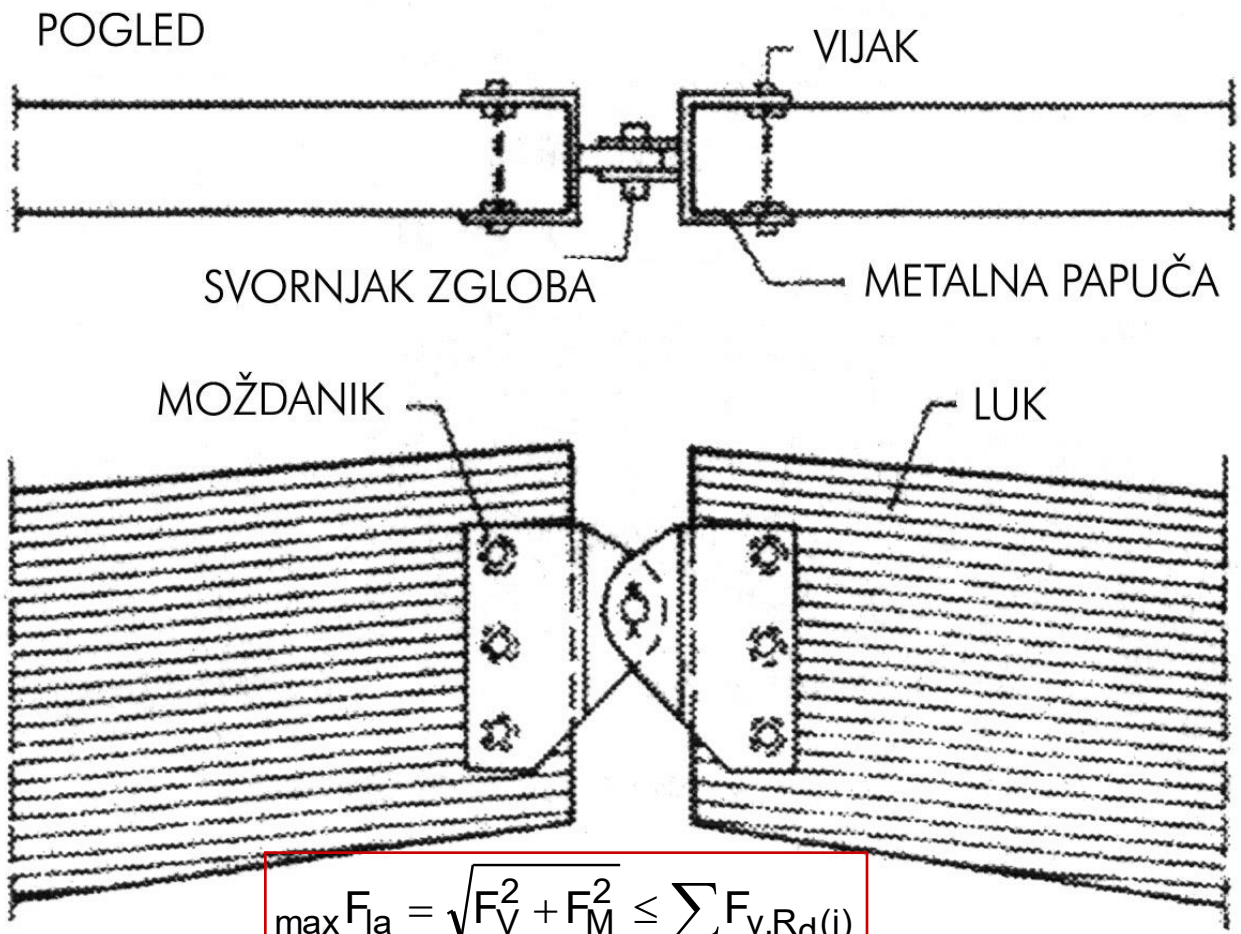


Vijci su konstruktivni ako je osna sila tlačna i ako zadovoljavaju provjere naprezanja na površinama dodira

Nosivi su ako ta provjera ne zadovoljava ili je osna sila vlačna

Zglobna veza greda i sljemenu okvira srednjih raspona

Konstrukcije zglobova u tjemenu lukova i okvira

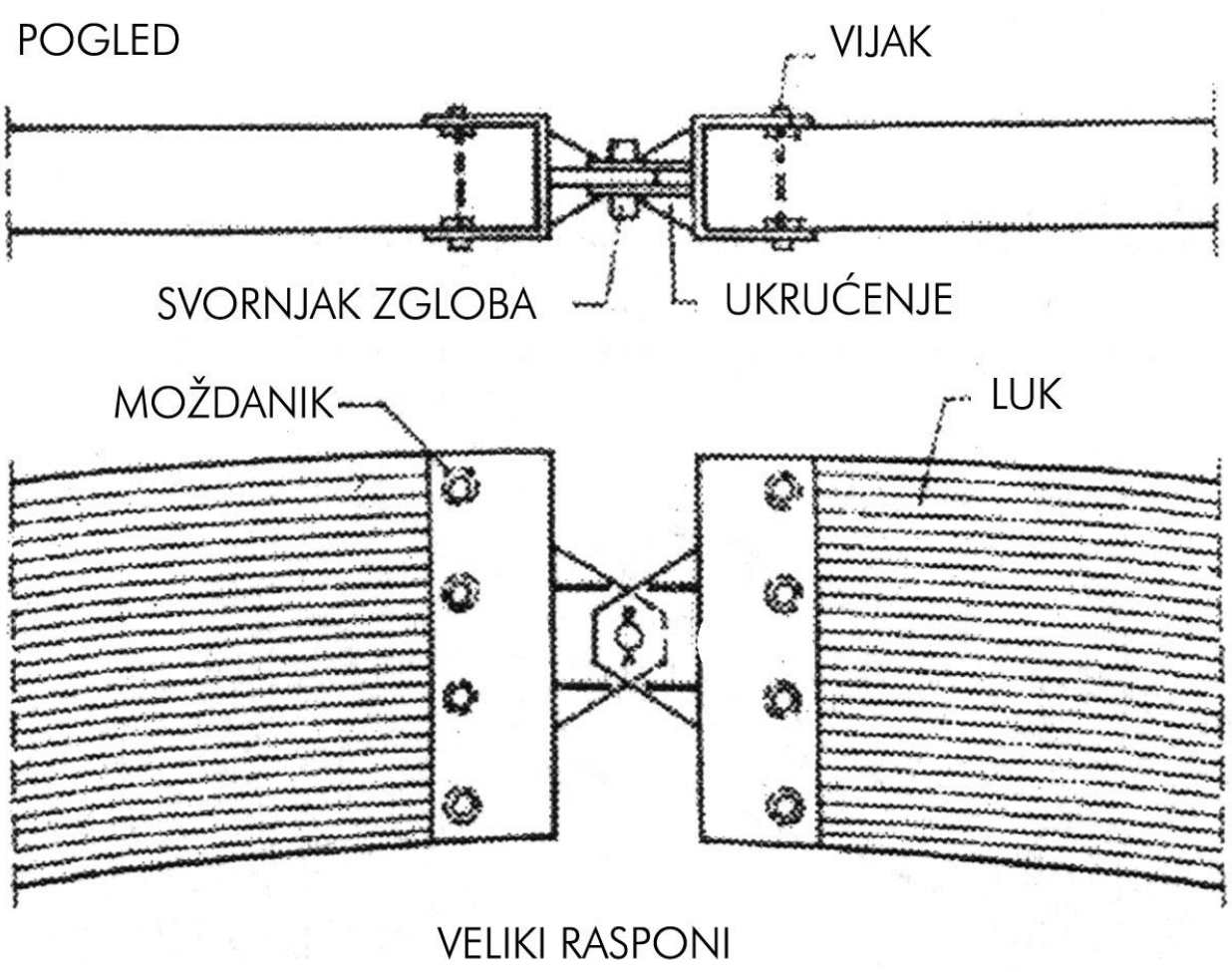


$$\max F_{Ia} = \sqrt{F_V^2 + F_M^2} \le \sum F_{v,R_d(i)}$$

Zglobna veza greda i sljemenu lukova i okvira većih raspona

Varijanta "bolzen" zgloba

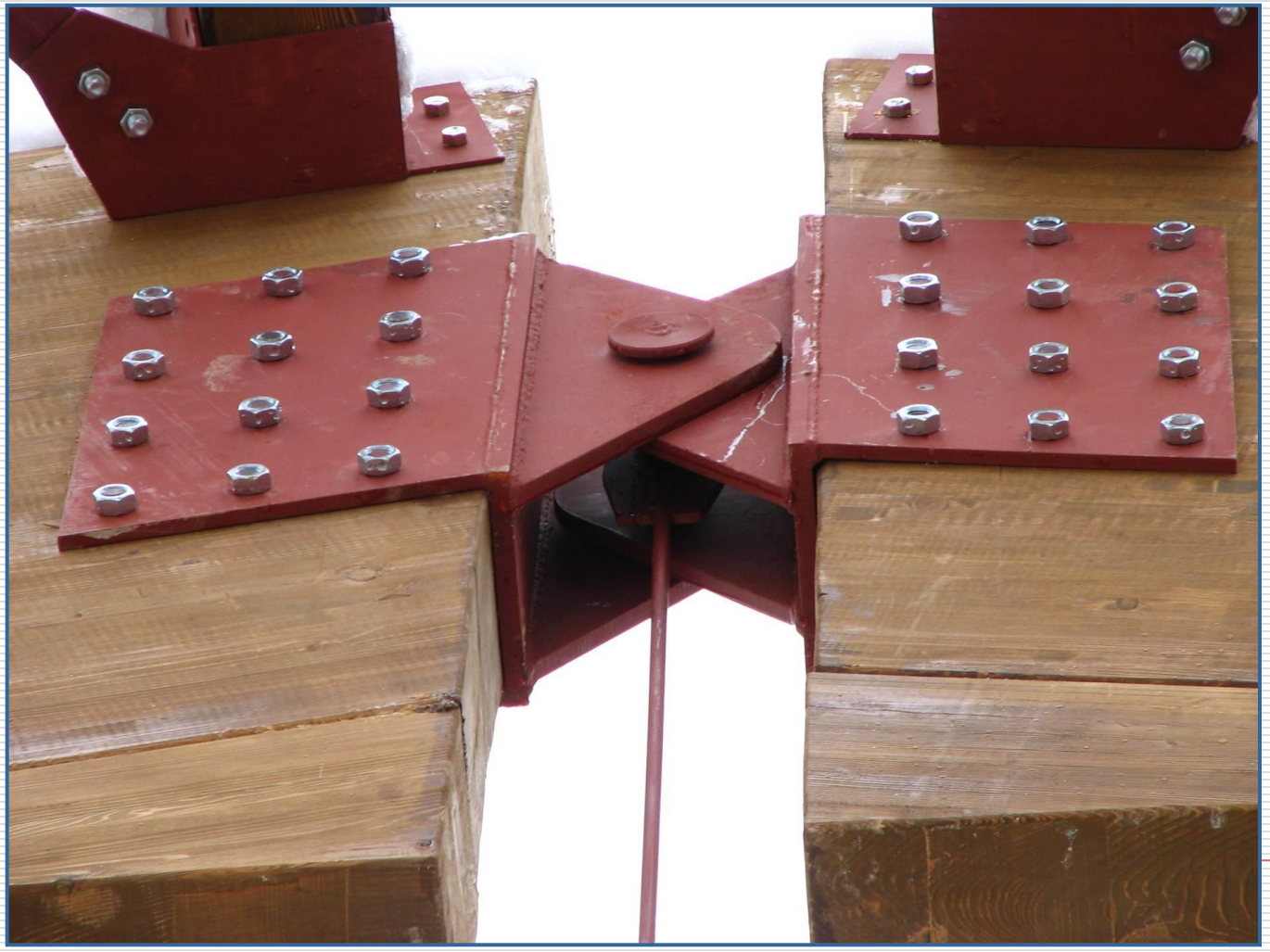
Konstrukcije zglobova u tjemenu lukova i okvira



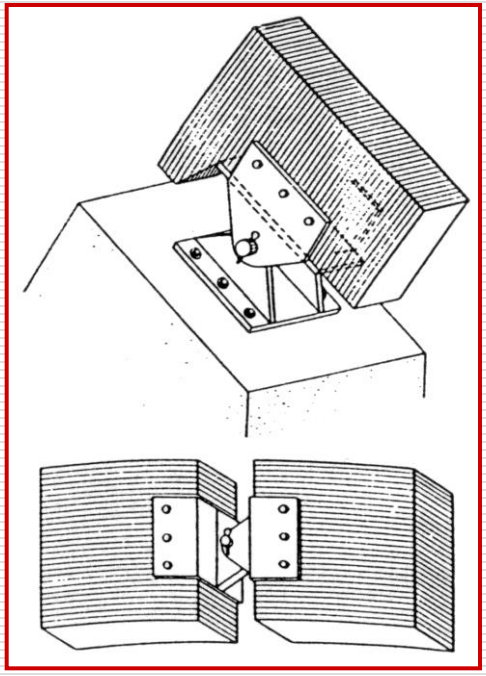
Zglobna veza greda i sljemenu lukova i okvira većih raspona

Varijanta “bolzen” zgloba

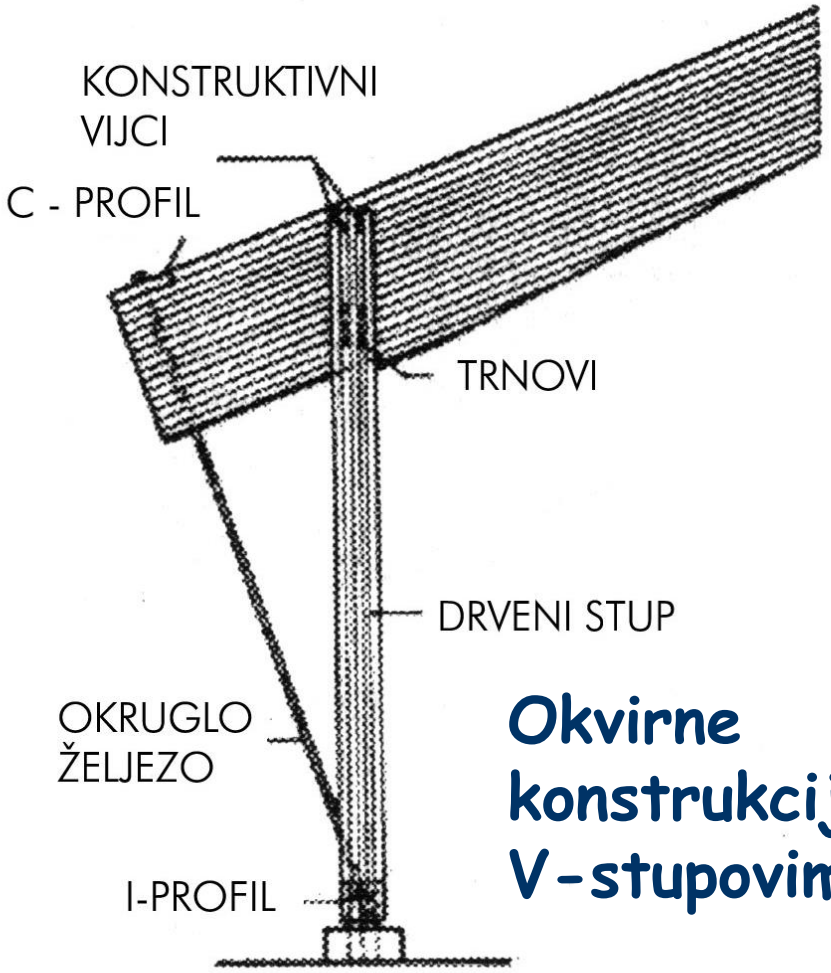
Konstrukcije zglobova u tjemenu lukova i okvira



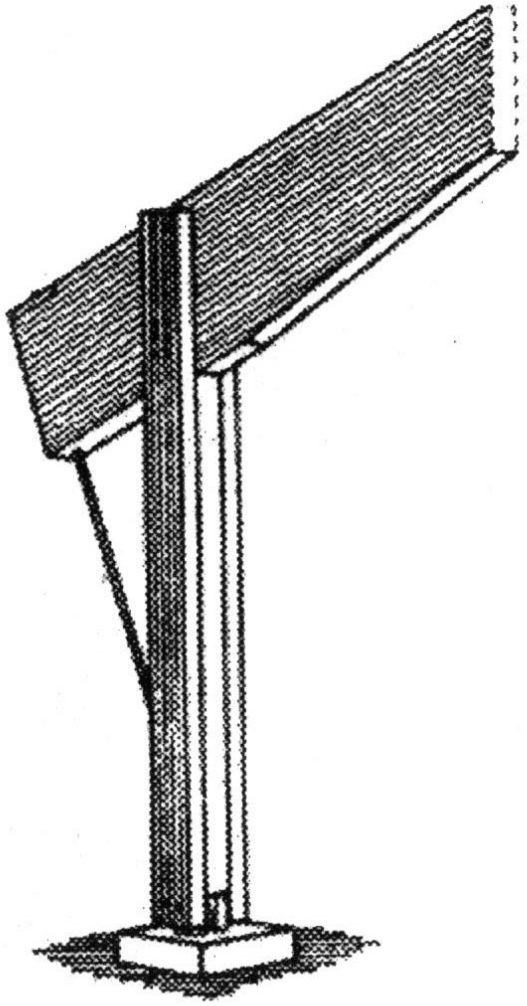
Varijanta
“bolzen” zgloba



MOGUĆE IZVEDBE STUPOVA



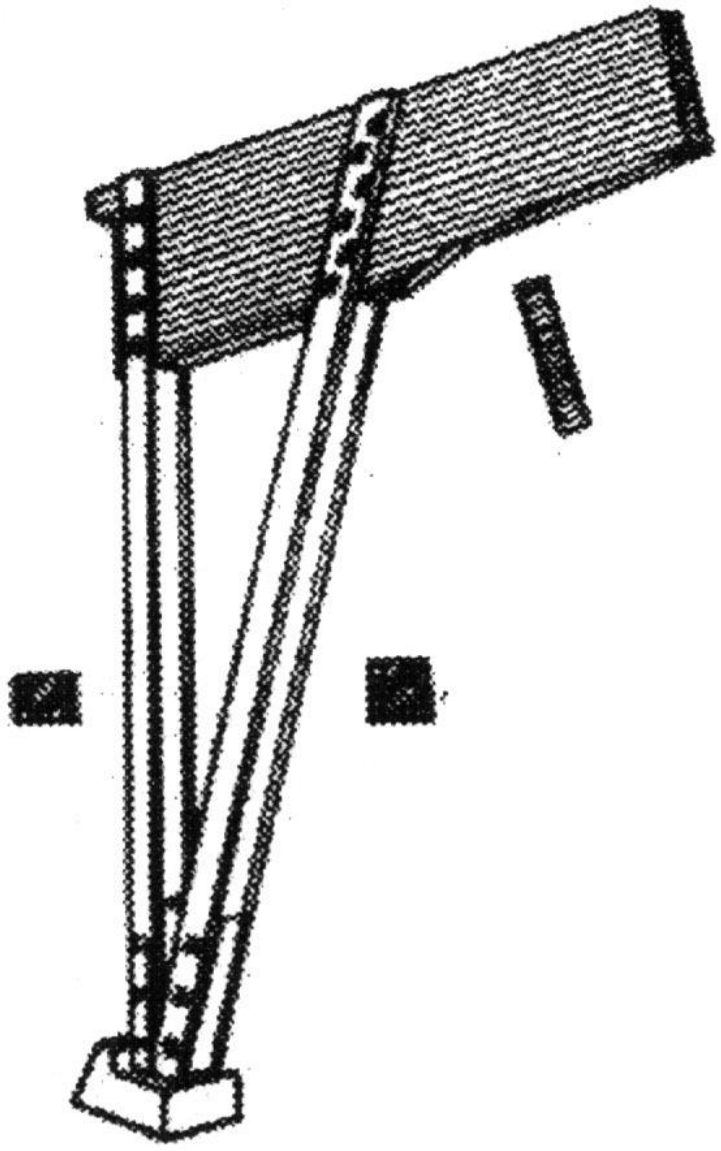
Okvirne konstrukcije sa V-stupovima

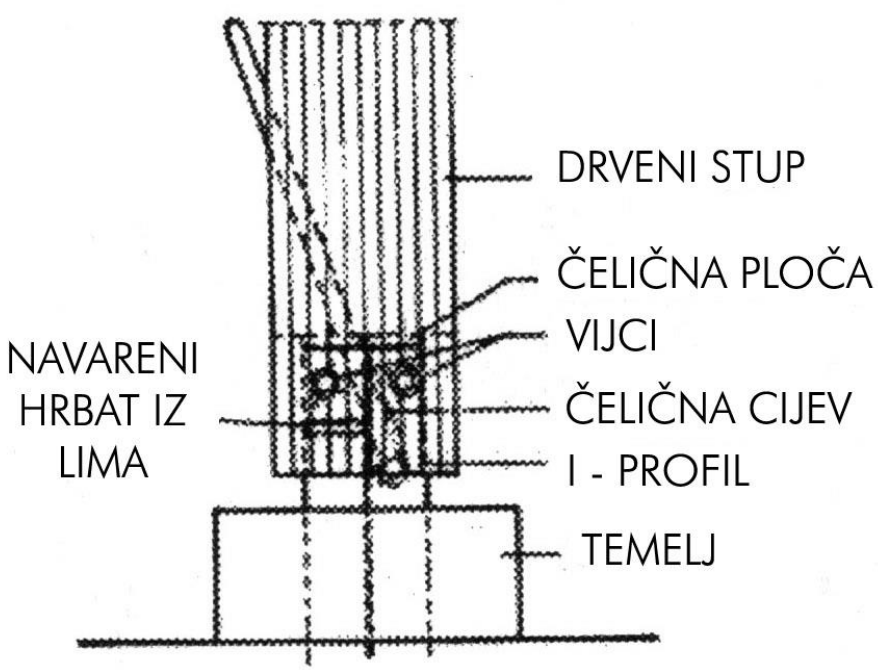


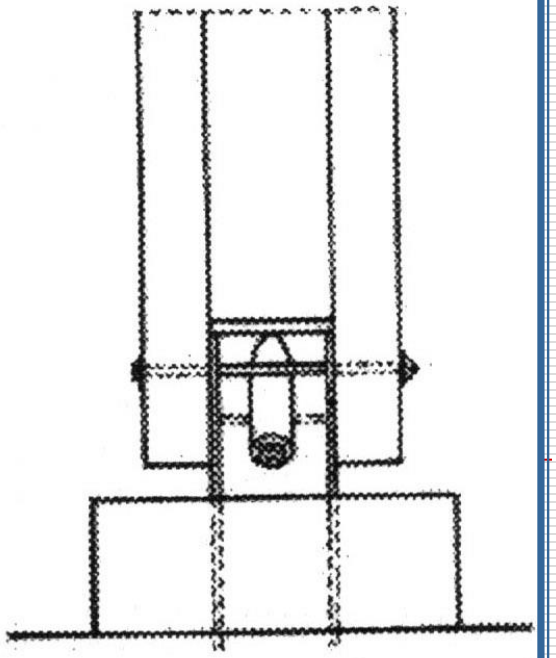
Metalna papuča navarena na čeličnu podložnu ploču

(naprezanja pod kutem !!!)

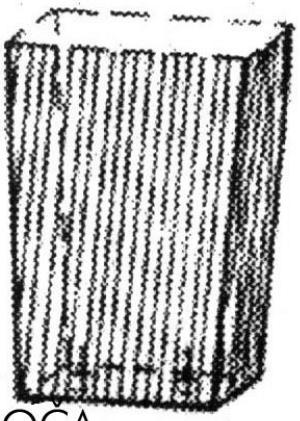
Drveni umetak između stupova



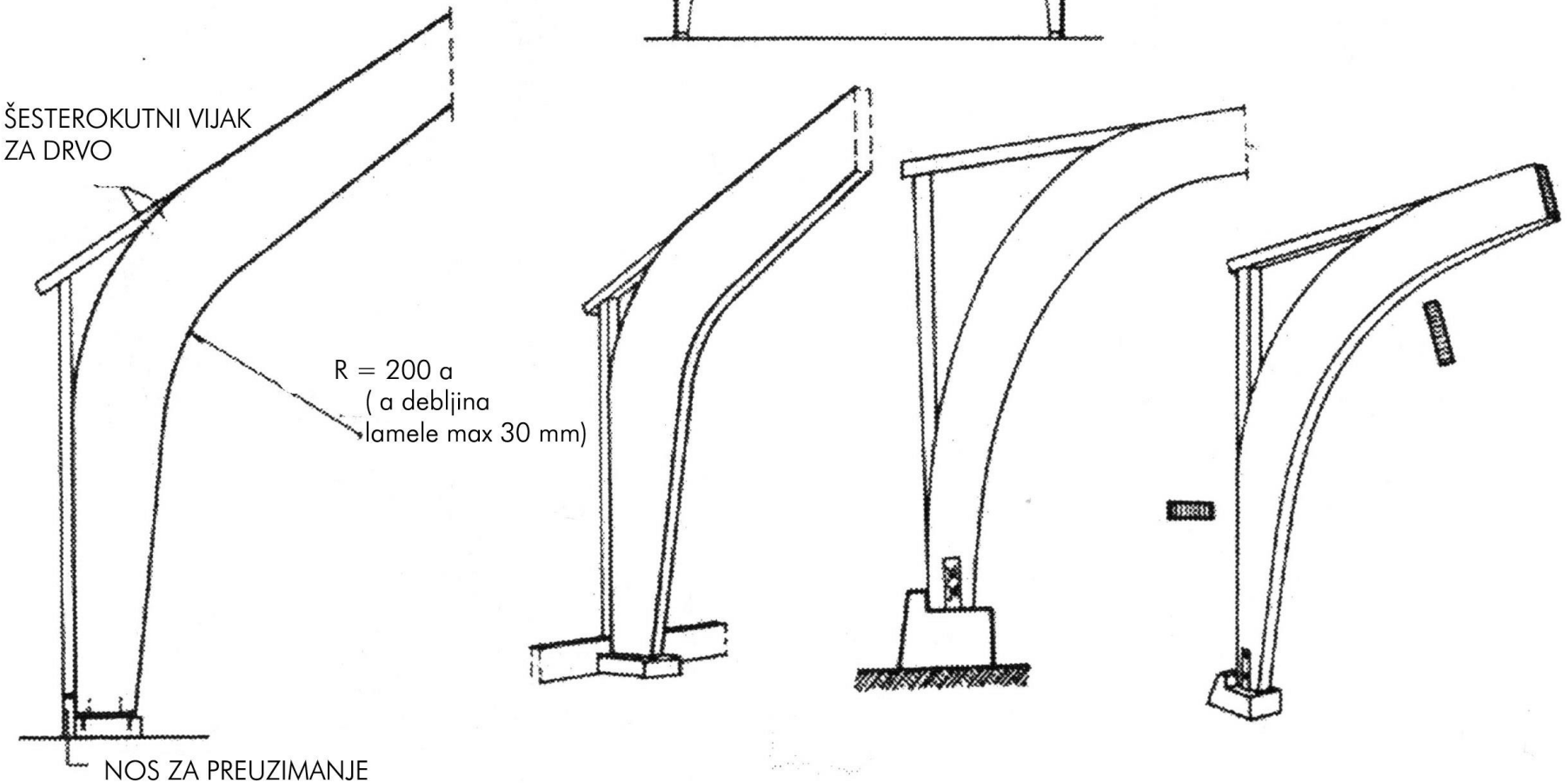


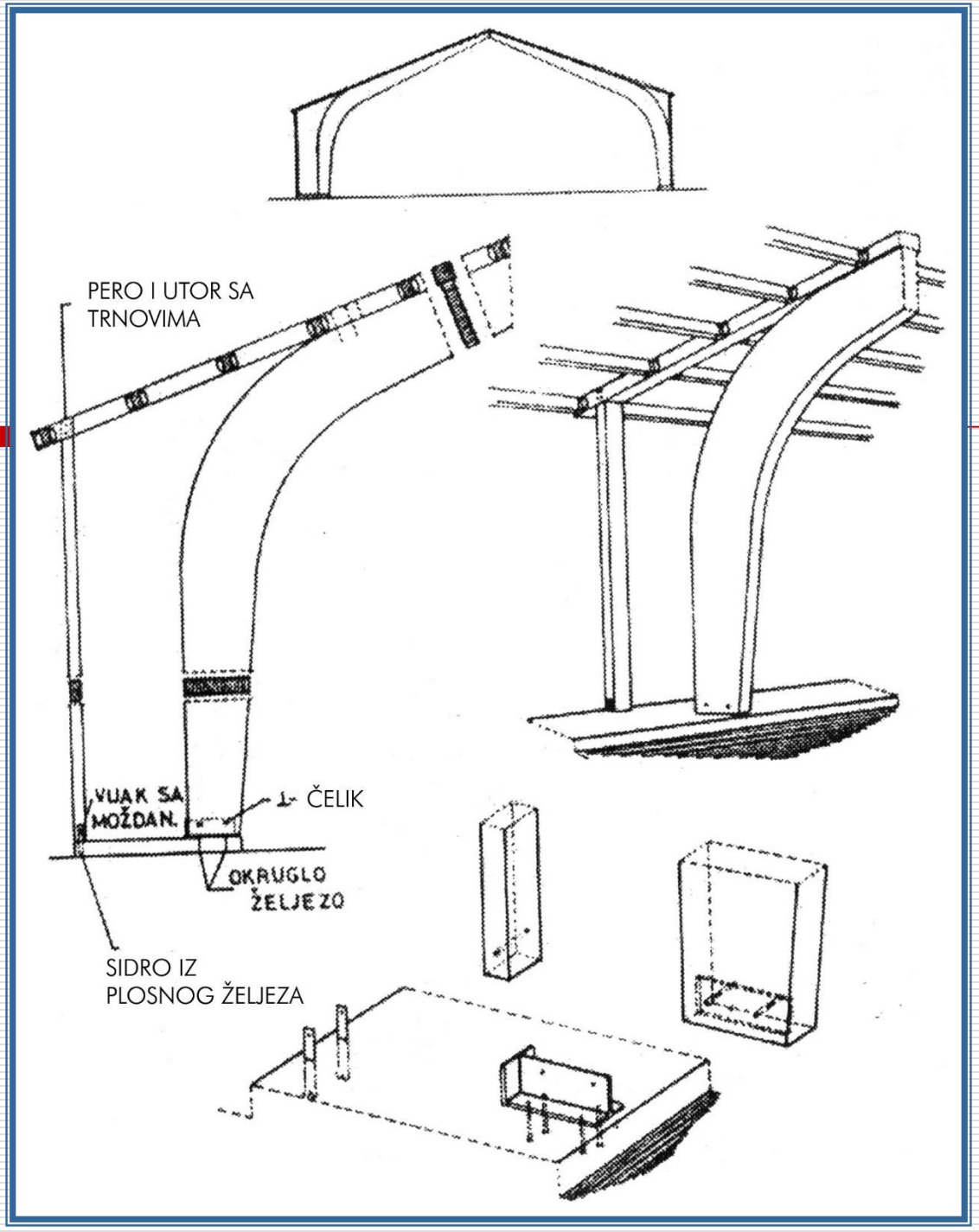


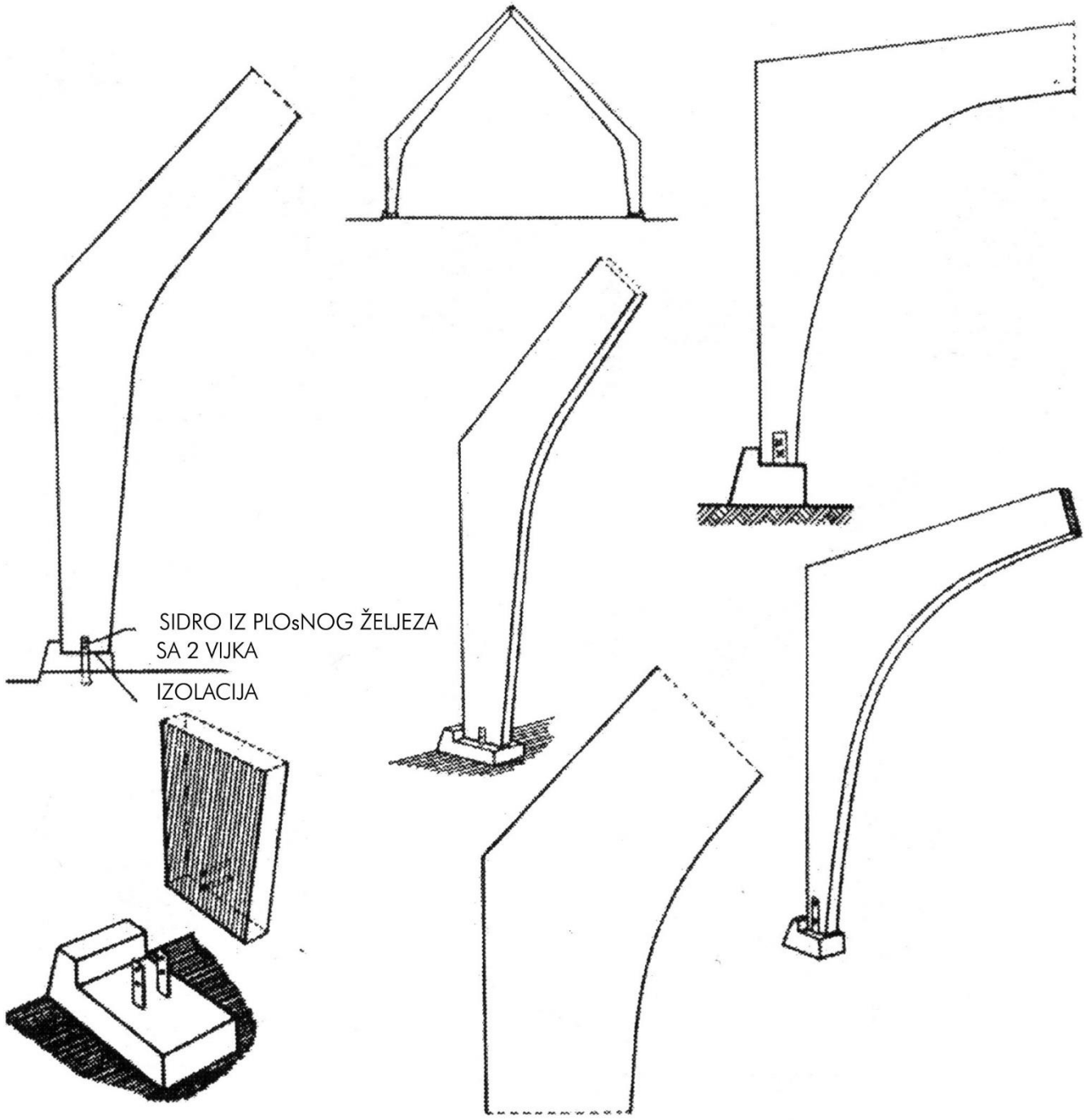
Slobodna rotacija (zglob) !!!



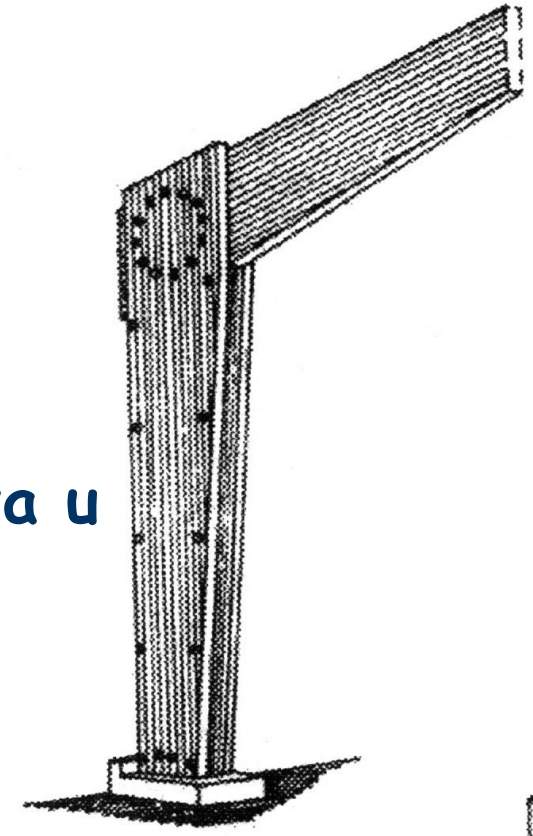
TROZGLOBNI OKVIR

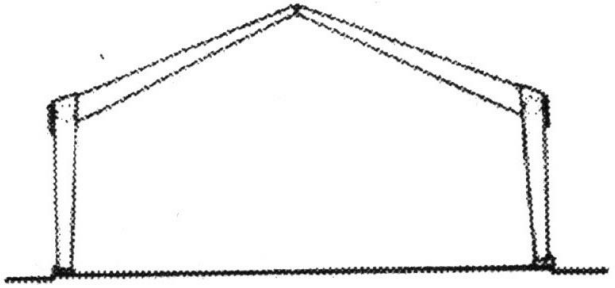


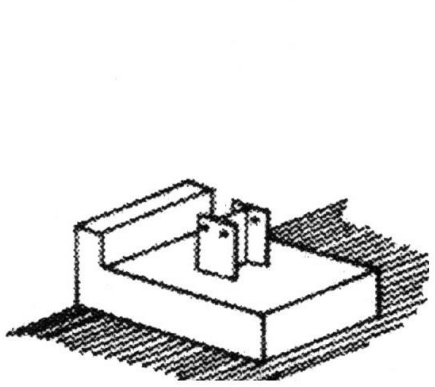

PERO I UTOR SA
TRNOVIMA
VIJAK SA
MOŽDAN.
ČELIK
OKRUGLO
ŽELJEZO
SIDRO IZ
PLOSNOG ŽELJEZA

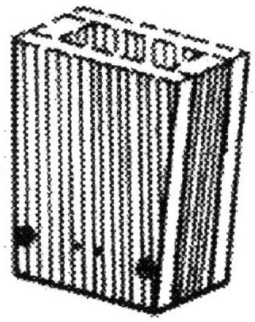

SIDRO IZ PLOsNOG ŽELJEZA
SA 2 VIJKA
IZOLACIJA

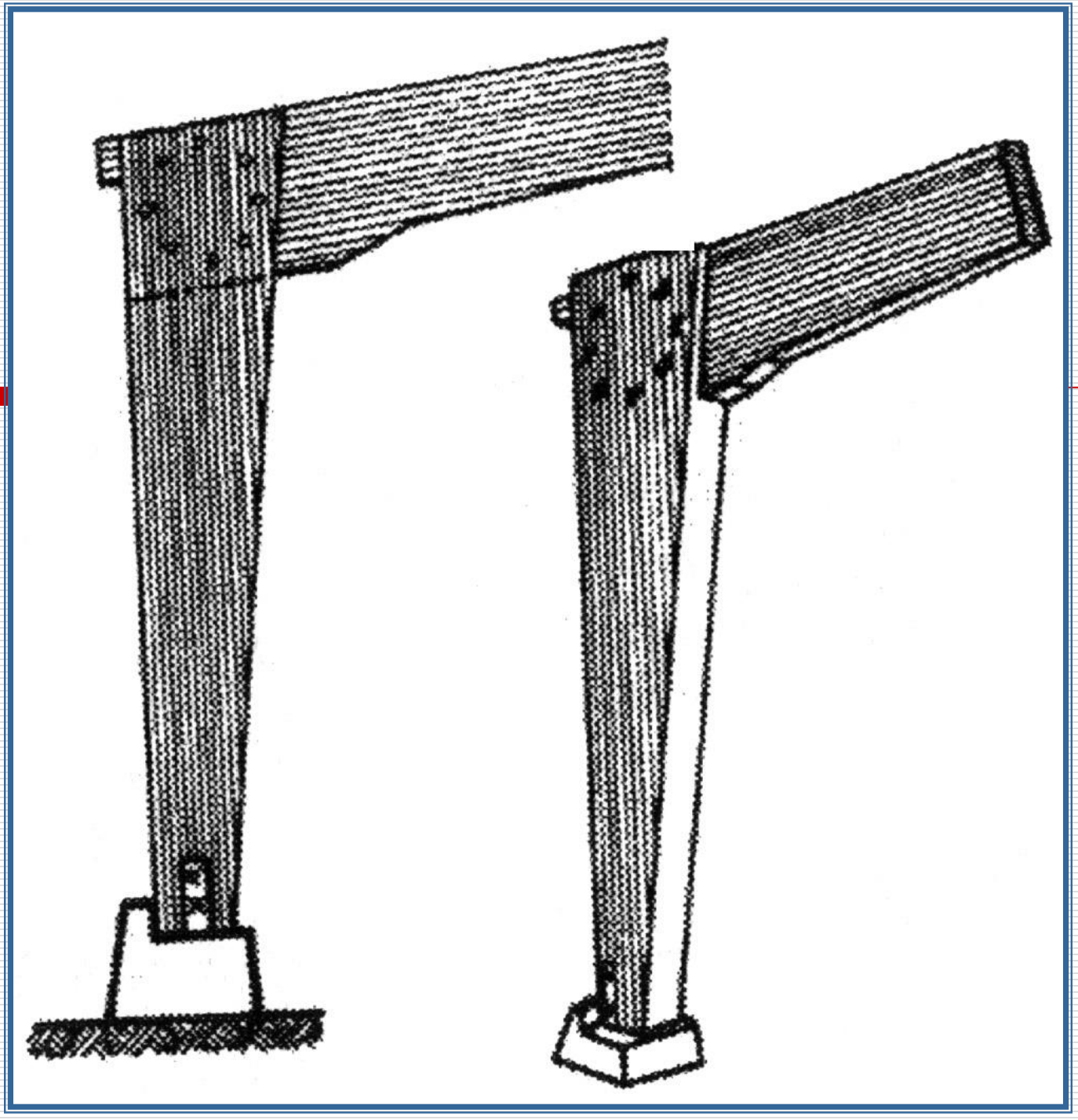
Montažna veza u kutu okvira

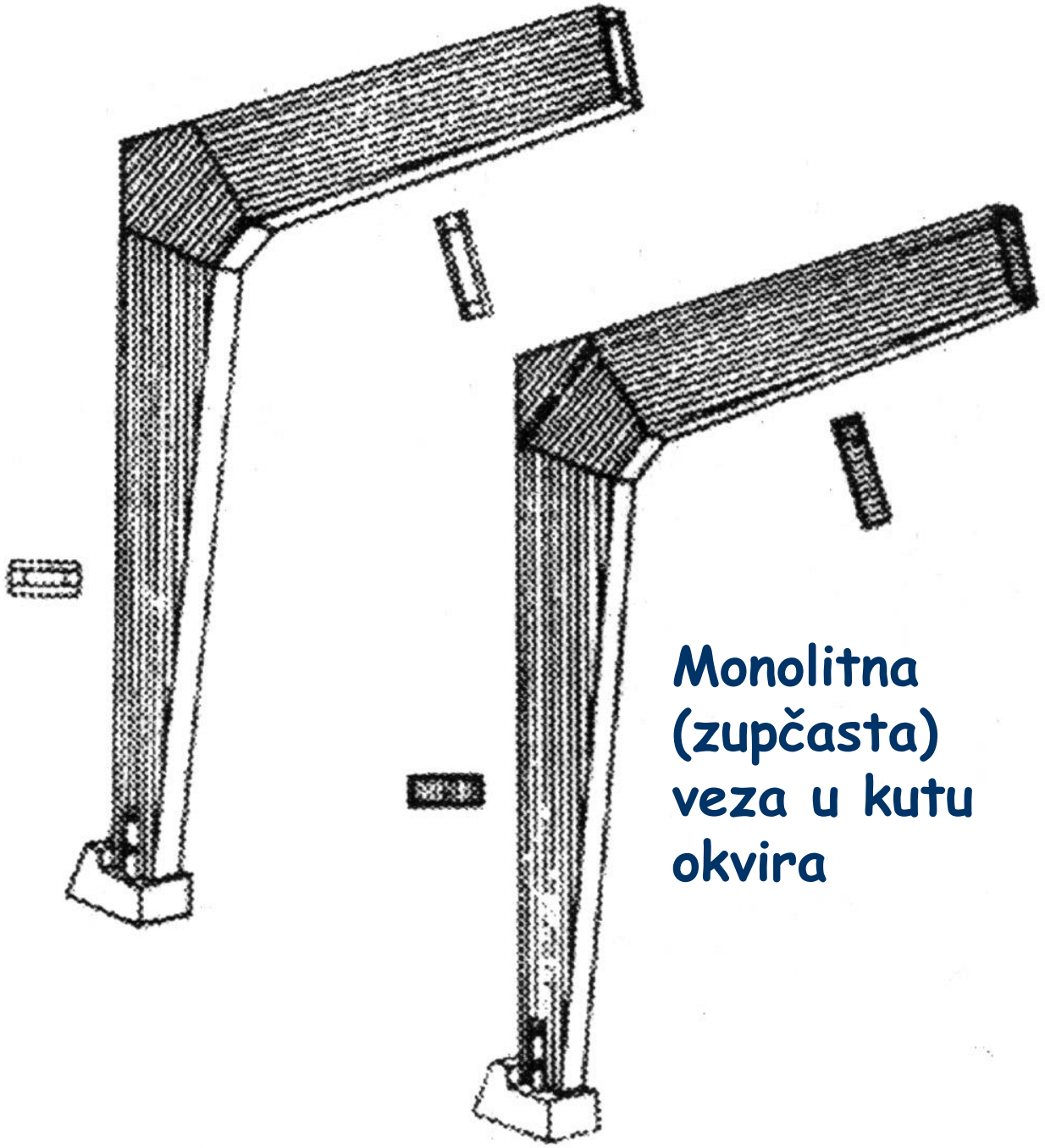




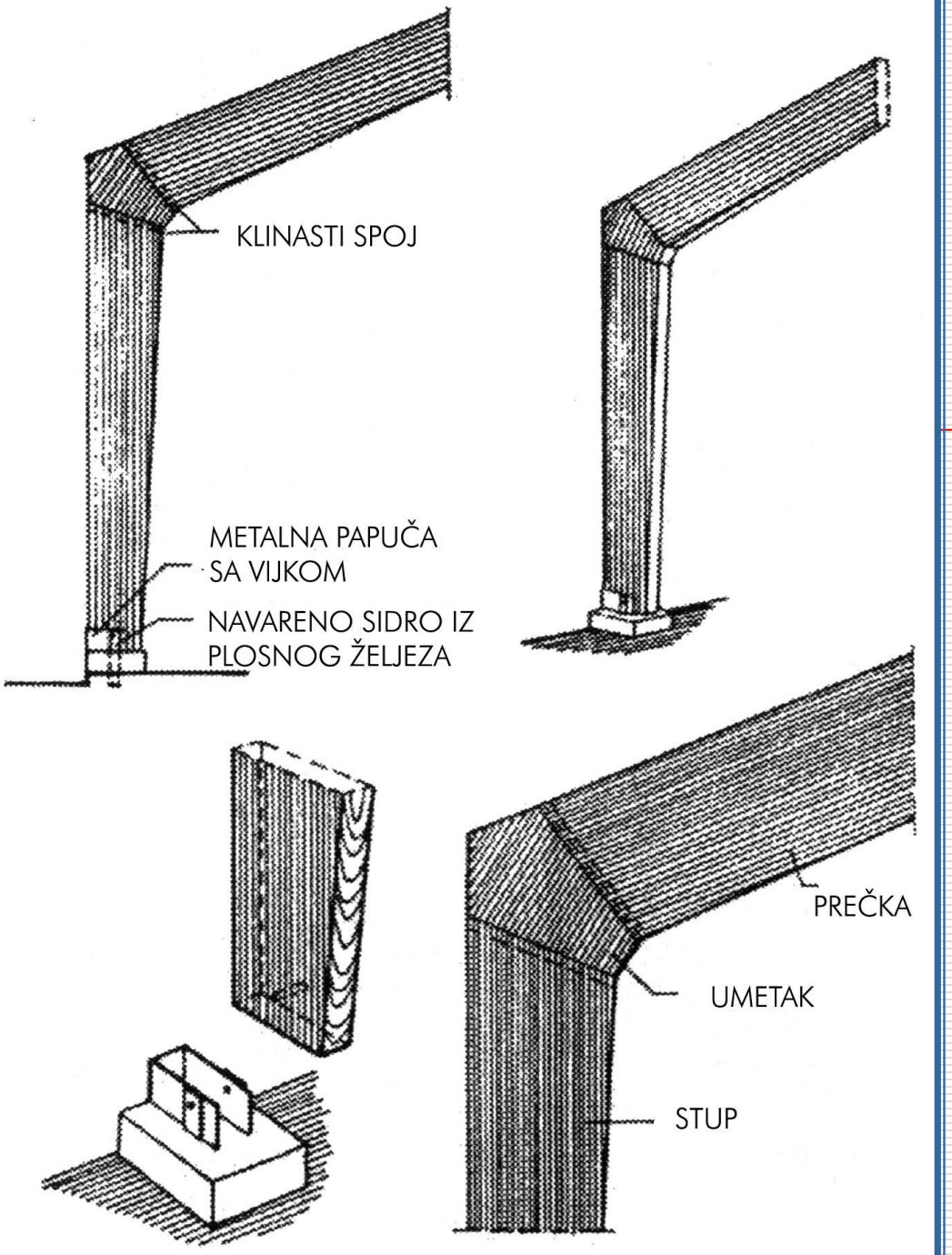




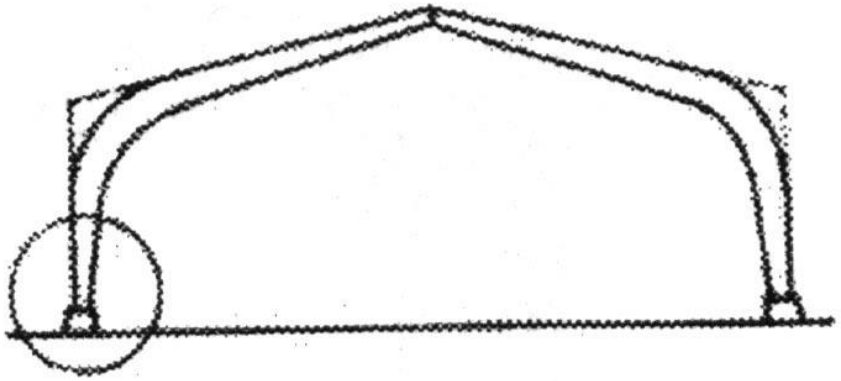


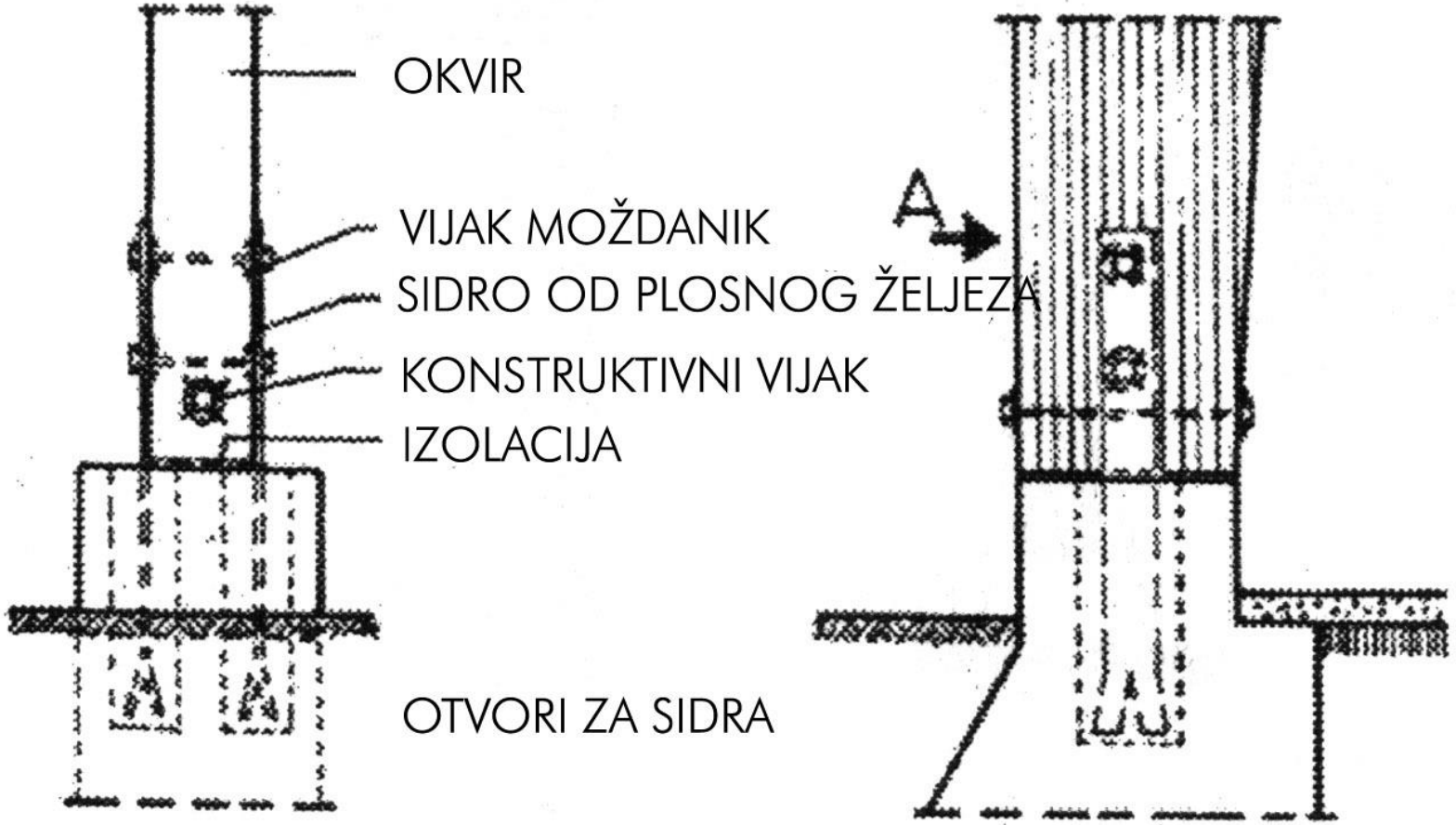


Monolitna (zupčasta) veza u kutu okvira

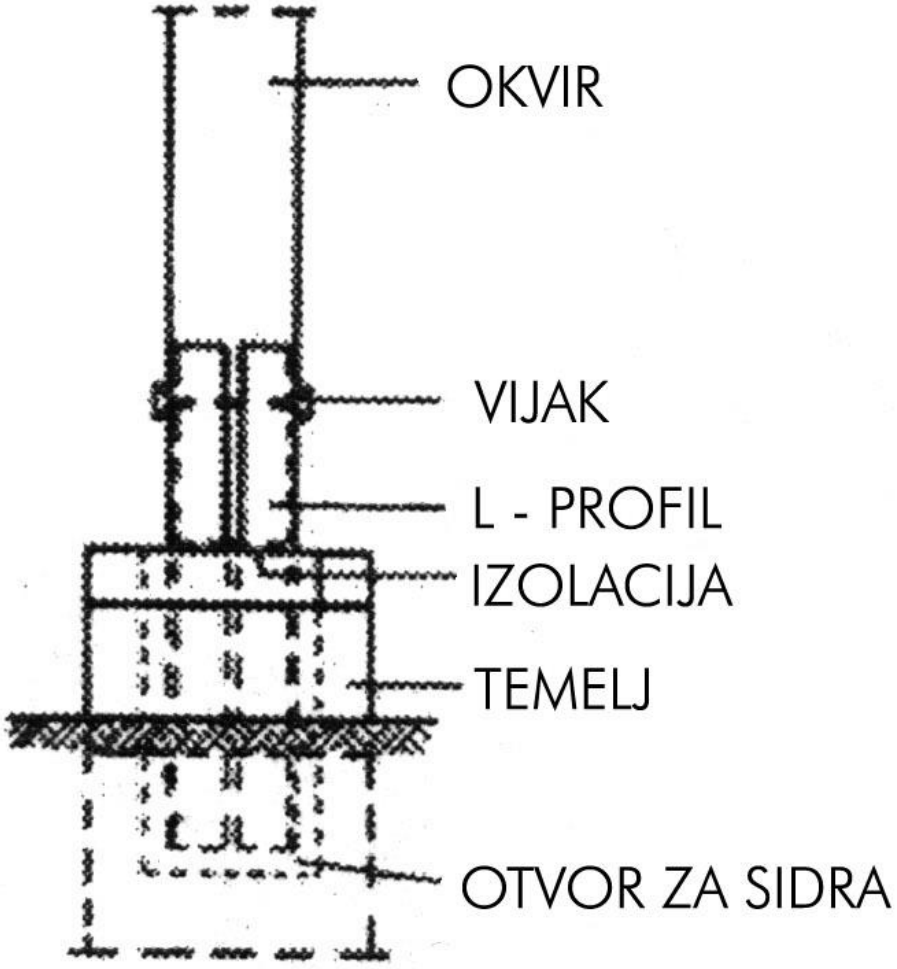

KLINASTI SPOJ
METALNA PAPUČA
SA VIJKOM
NAVARENO SIDRO IZ
PLOSNOG ŽELJEZA
PREČKA
UMETAK
STUP

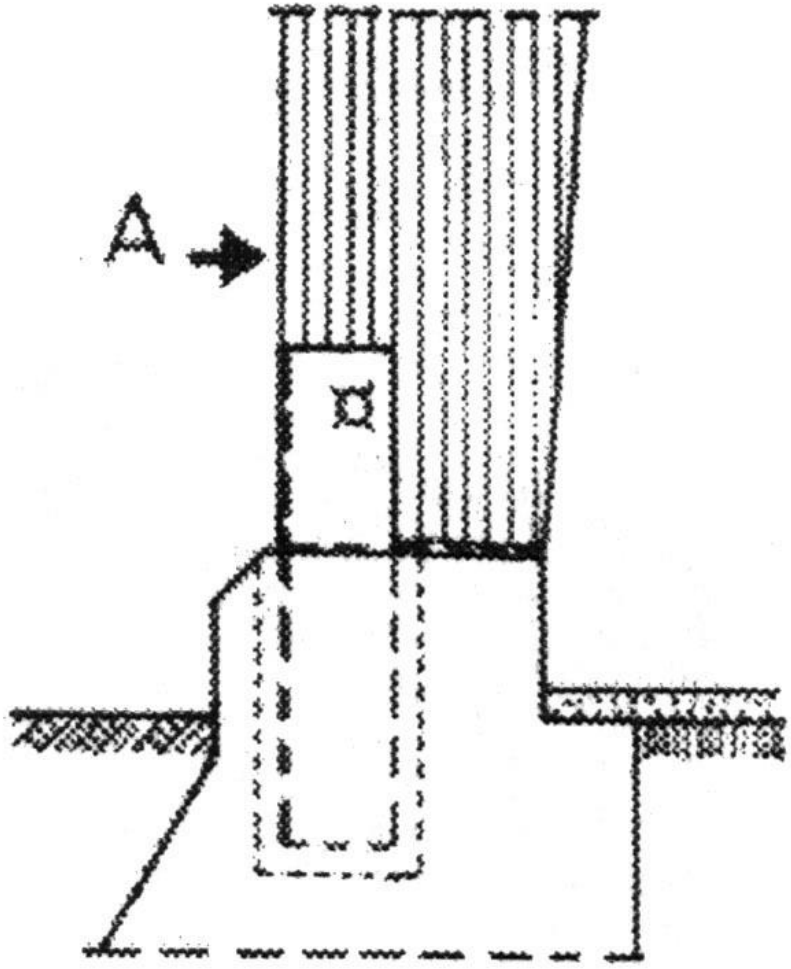
POGLED “A”

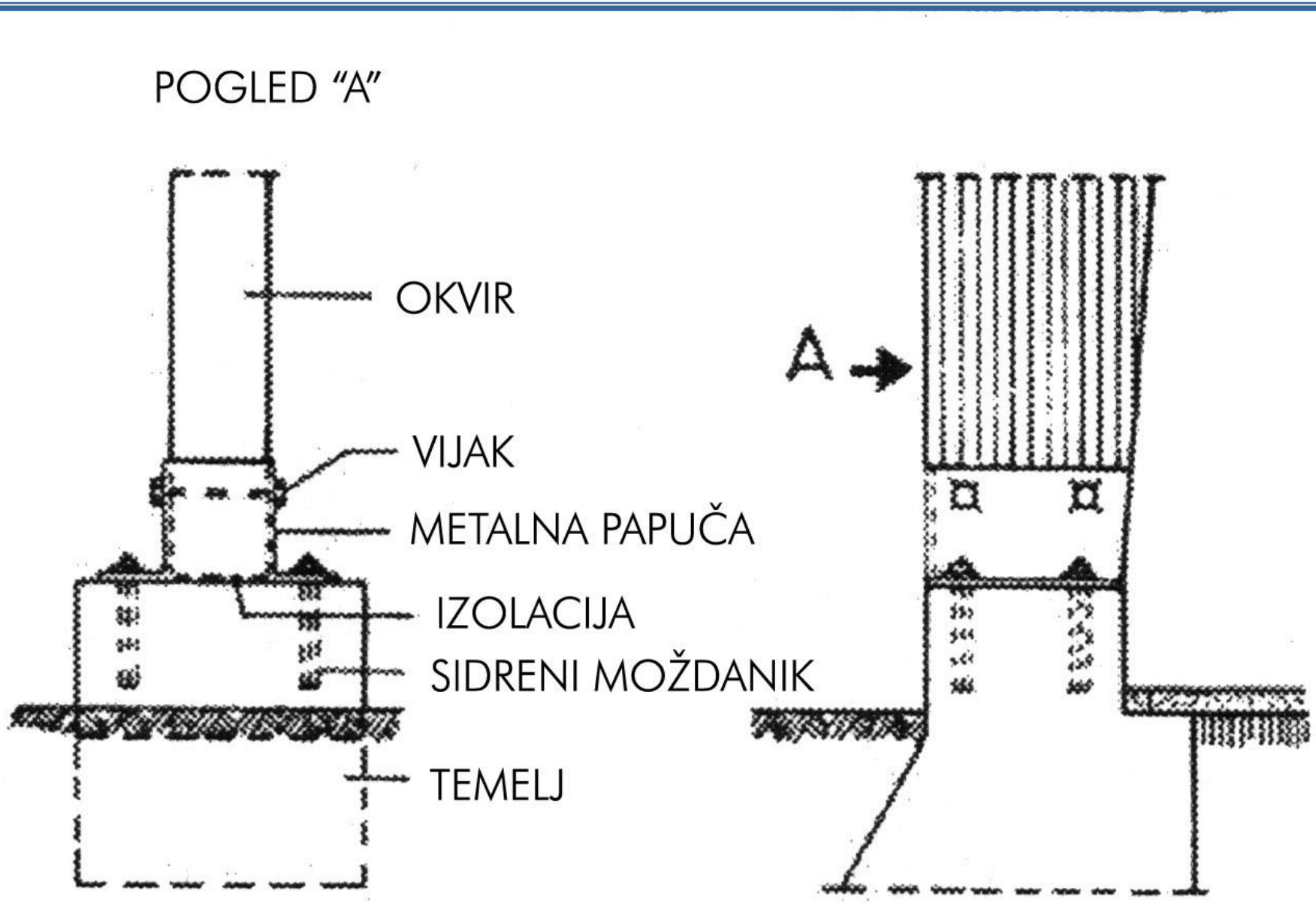



OKVIR
VIJAK MOŽDANIK
SIDRO OD PLOSNOG ŽELJEZA
KONSTRUKTIVNI VIJAK
IZOLACIJA
A
OTVORI ZA SIDRA

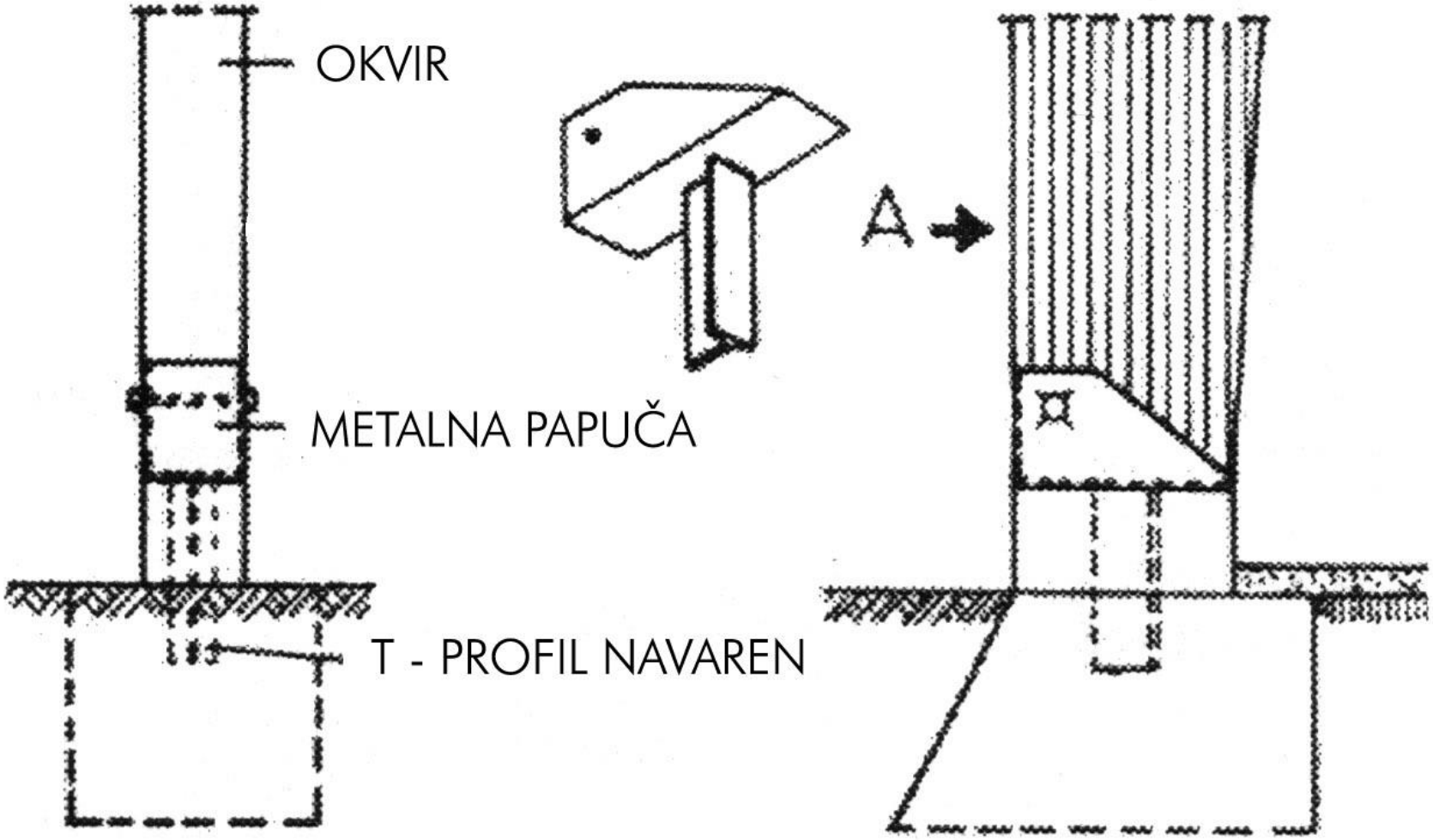
POGLED "A"



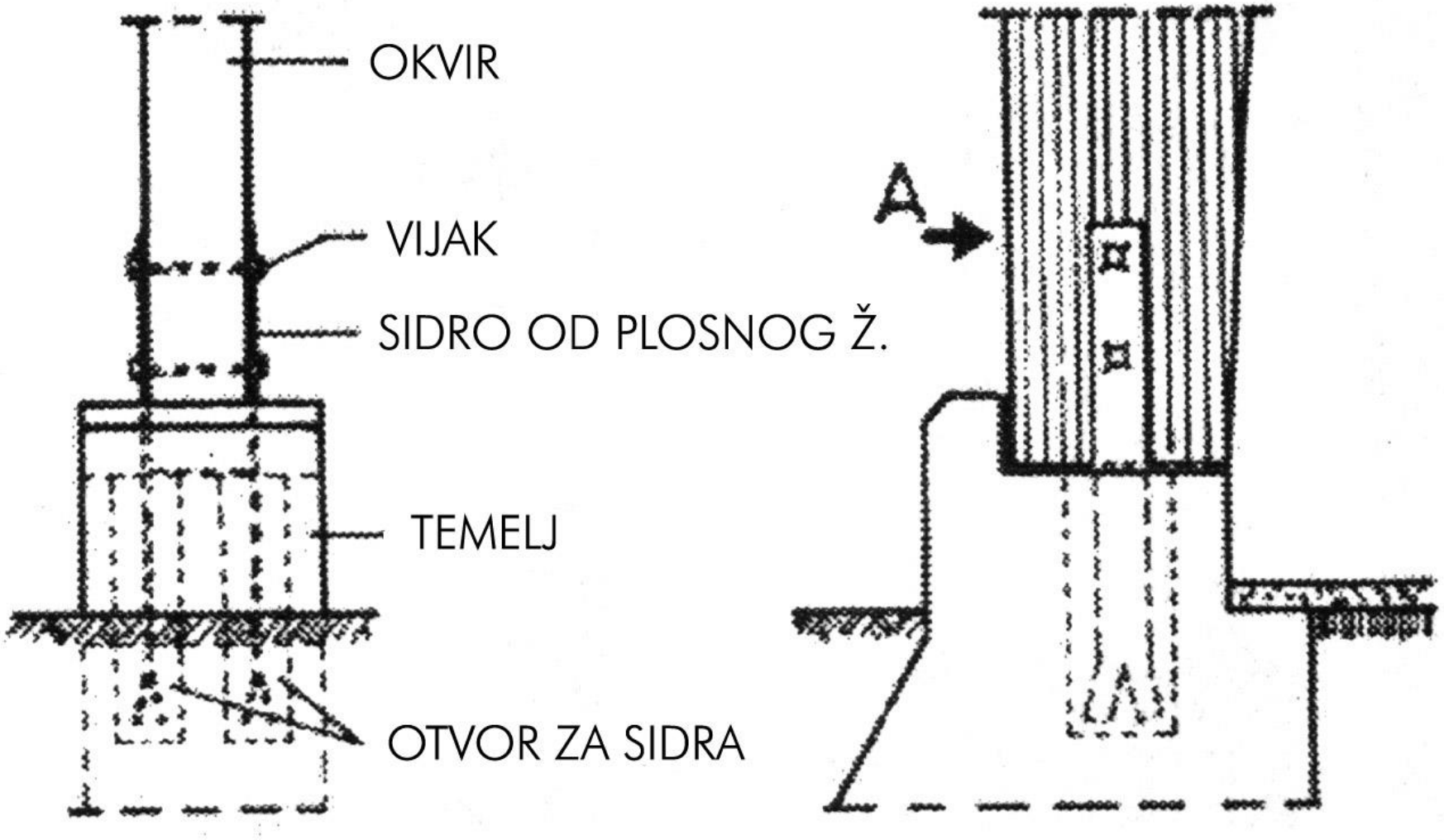



POGLED "A"
OKVIR
VIJAK
METALNA PAPUČA
IZOLACIJA
SIDRENI MOŽDANIK
TEMELJ
A

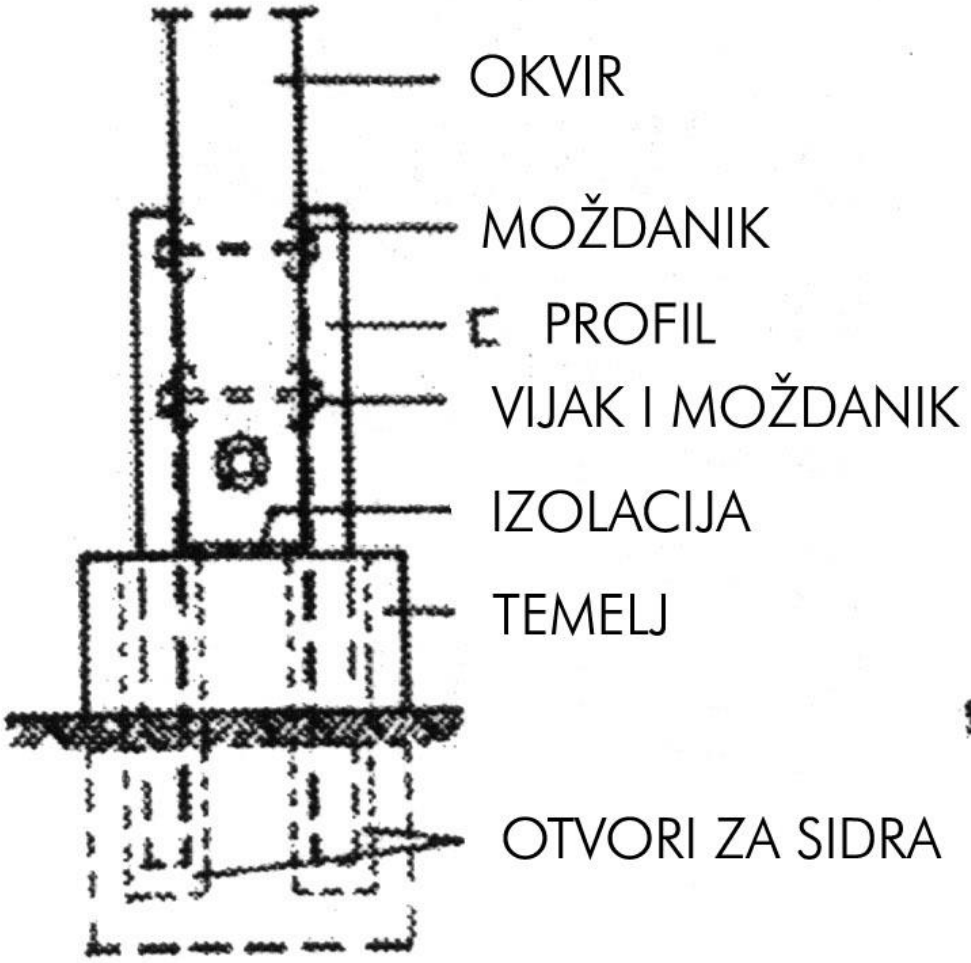
POGLED "A"

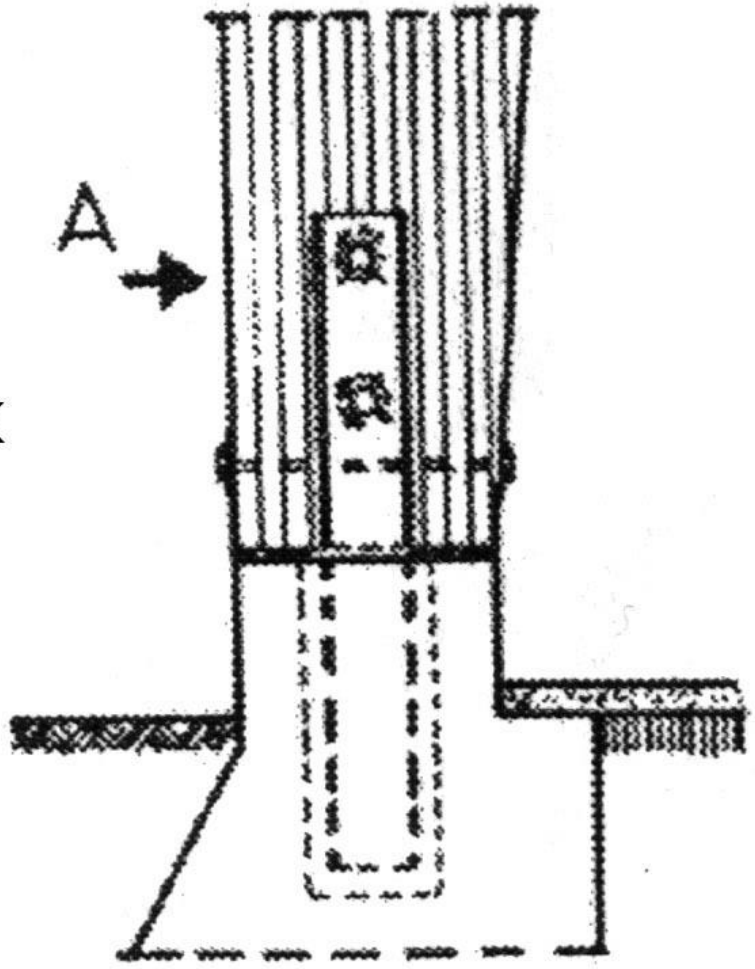


POGLED "A"



POGLED "A"

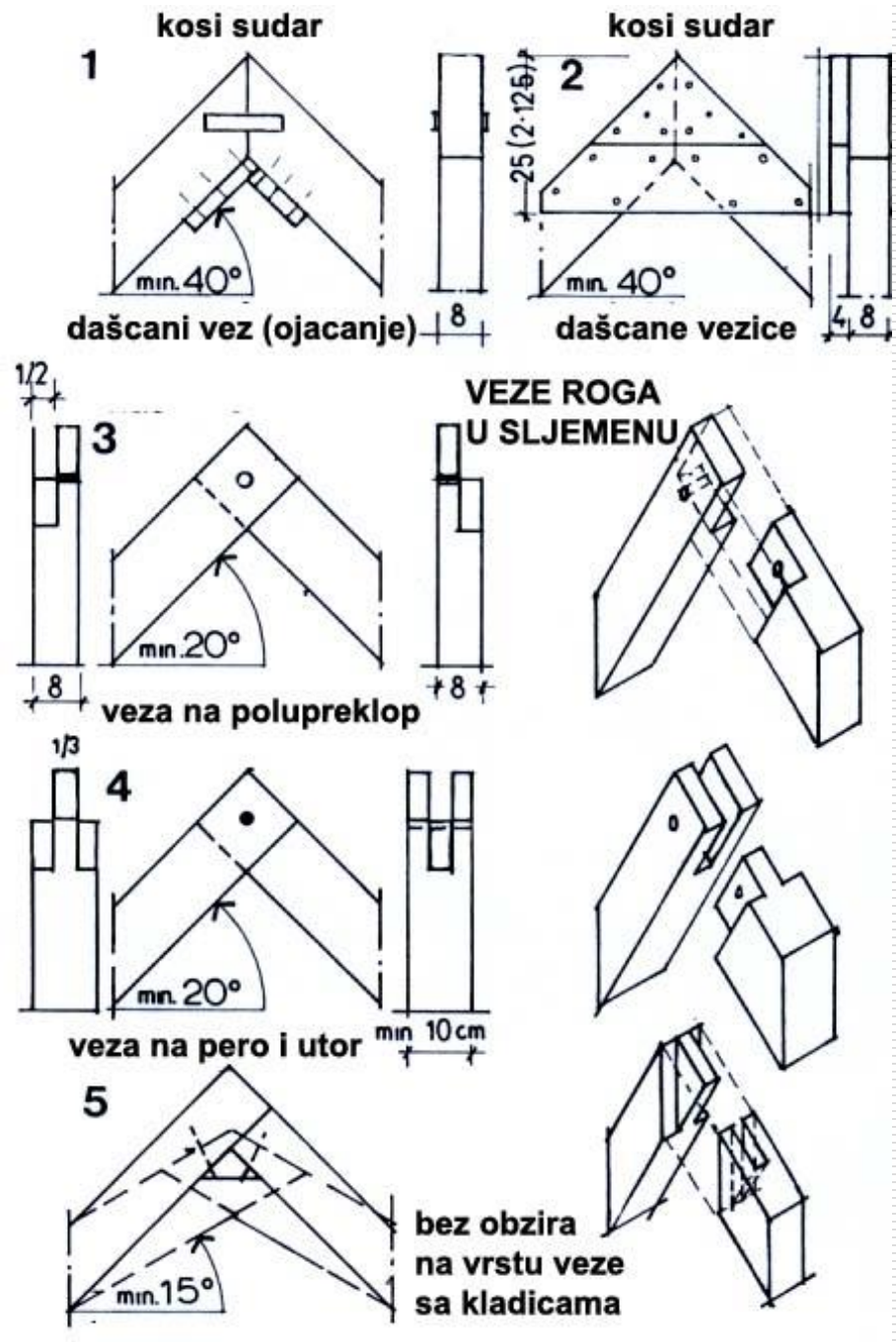

OKVIR
MOŽDANIK
PROFIL
VIJAK I MOŽDANIK
IZOLACIJA
TEMELJ
OTVORI ZA SIDRA


A

Osnove oblikovanja sljemena i ležaja u sustavima krovišta

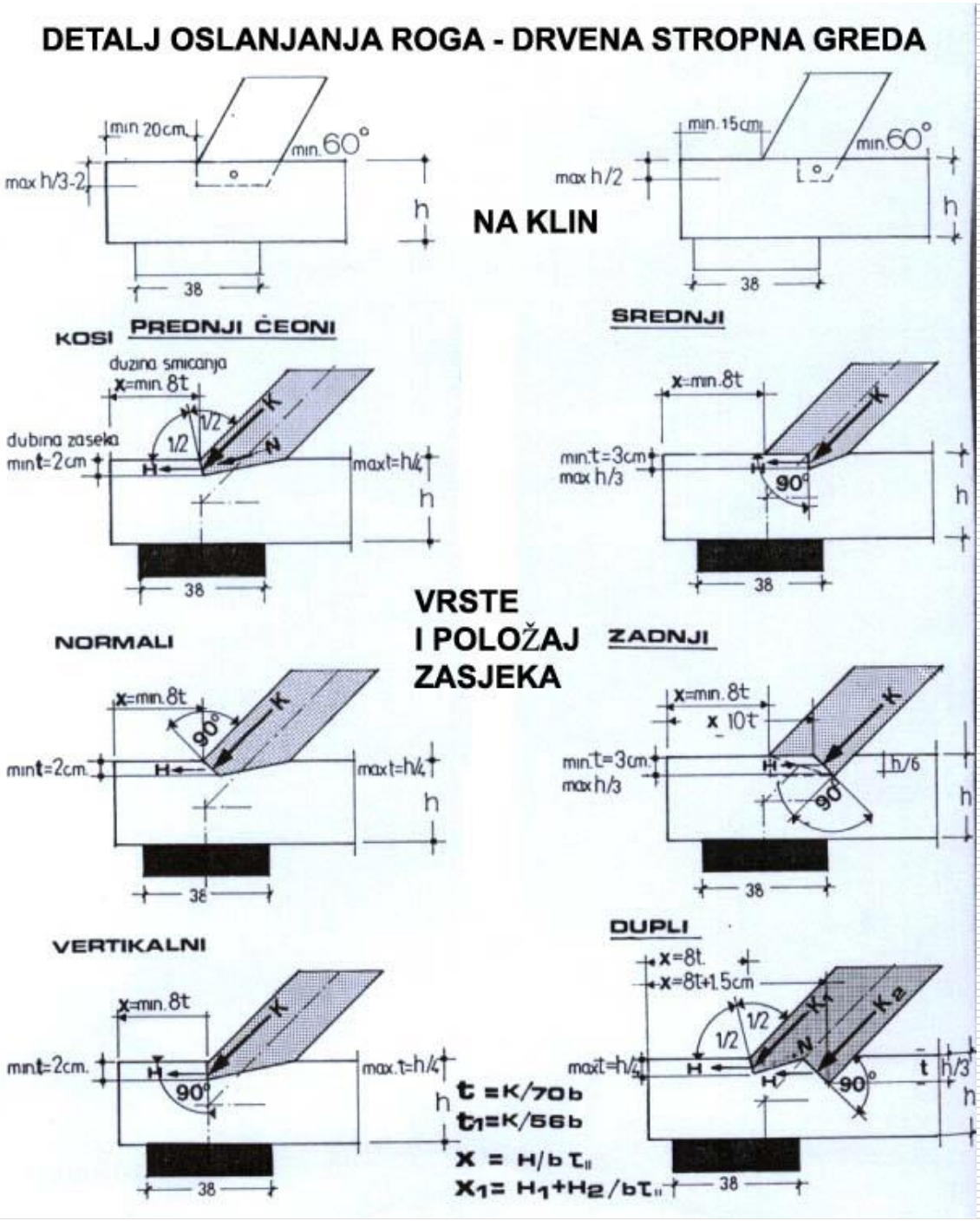
DETALJI VEZA NOSIVIH ELEMENATA

- Detalj veze rogova u sljemenu



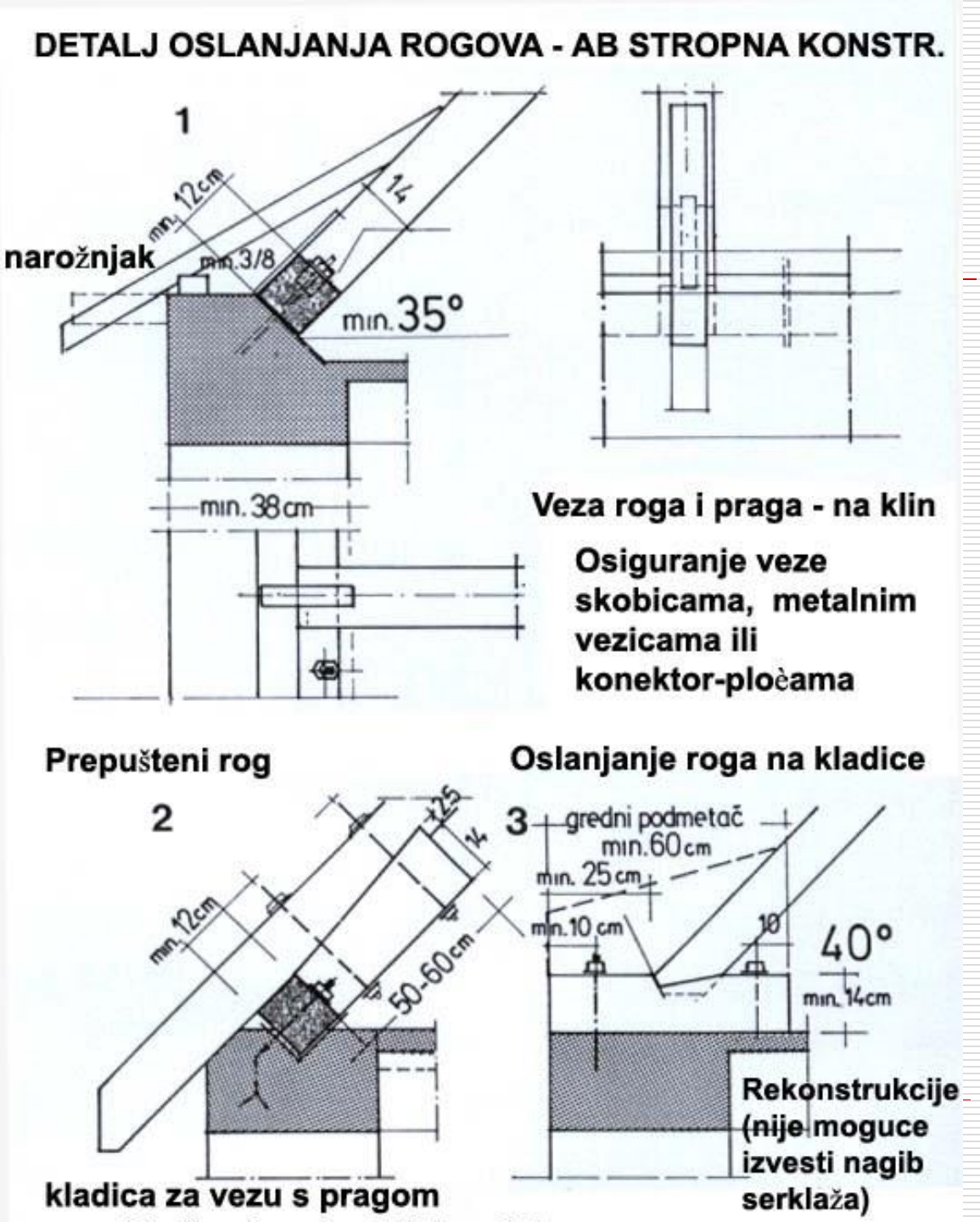
DETALJI VEZA NOSIVIH ELEMENATA

- Oslonac roga na drvenu veznu gredu



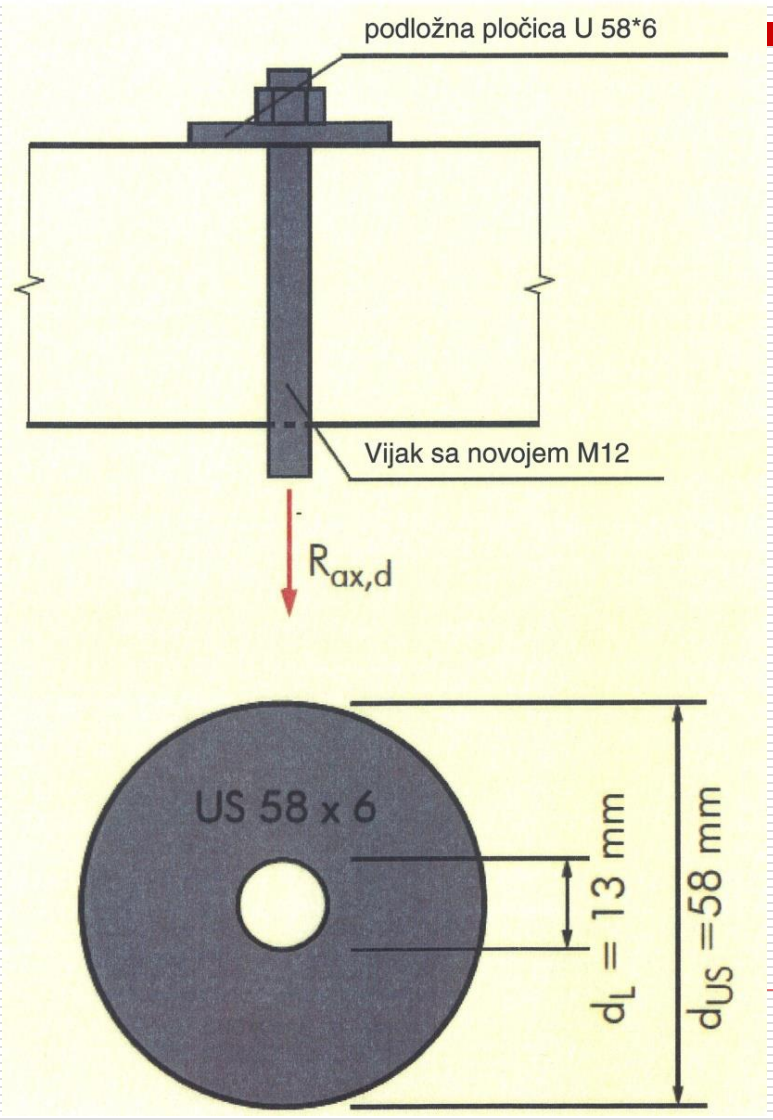
DETALJI VEZA NOSIVIH ELEMENATA

- Oslonac roga na arm.-betonsku stropnu konstr.



Primjer obješeni teret pomoću navijene šipke i podložne pločice

Primjer 4.4 Obješeni teret pomoću navijene šipke i podložnih pločica



Materijal:

Puno drvo C 24

Klasa vlage 1, klasa opterećenja (kratko), (k_{mod} = 0,9).

γ_M = 1,3

Navijena šipka M 12, čelik klase 4.6.

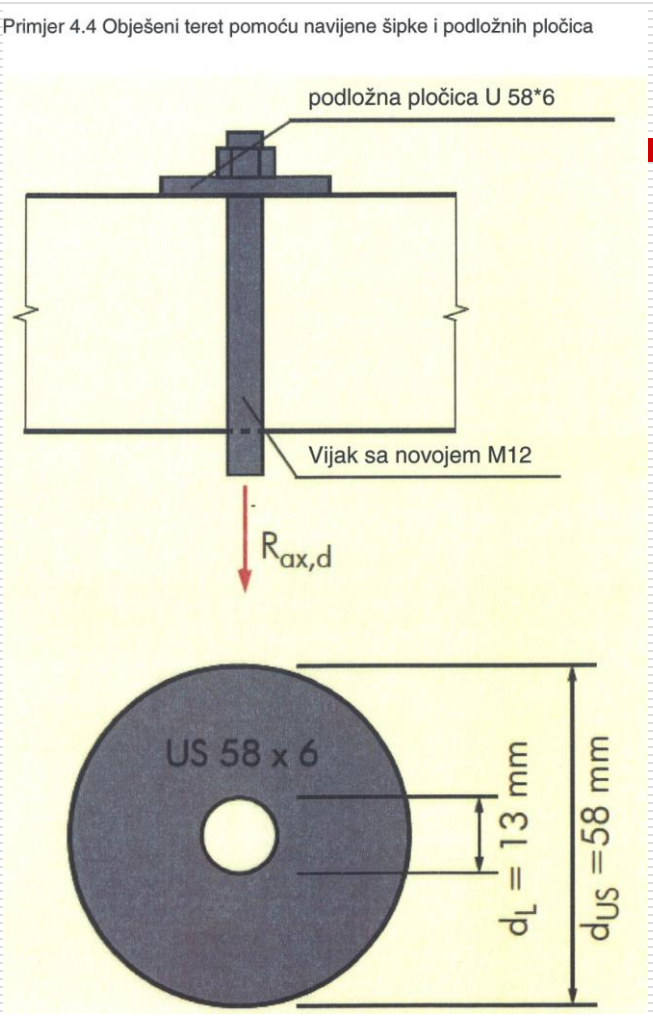
γ_M = 1,1

$f_{y,k}$=240 N/mm^2

Podložna pločica:

U 58 x 6 mm

i podložne pločice



Dokaz nosivosti:
Vlačna nosivost navijene šipke:

A_{ef} = 84,3 mm^2

$$R_{ax,d} = \frac{A_{ef} \cdot f_{y,k}}{\gamma_{st}} = \frac{84{,}3 \cdot 240}{1{,}25} = 16186\,N$$

Podložna pločica:

$A_{us} = \pi \cdot (58\text{-}13)^2 / 4 = 2509$ mm2

Ispod podložne pločice drveni elemenat je napregnut tlakom okomito na vlakna

$$f_{c,90,d} = \frac{f_{c,90,k} \cdot k_{\mathrm{mod}}}{\gamma_M} = \frac{2{,}5 \cdot 0{,}90}{1{,}30} = 1{,}73\,N/mm^2$$

$$k_{c,90,d} = k_{c,90} \cdot \left(\frac{150}{l}\right)^{0{,}25} = 1{,}80 \cdot \left(\frac{150}{58}\right)^{0{,}25} = 2{,}28$$

$R_{US,d} = A_{US} \cdot f_{c,90,d} \cdot k_{c,90} = 2509 \cdot 1{,}73 \cdot 2{,}28$ **= 9897 N – mjerodavna sila**