

Spojna sredstva i veze u drvenim konstrukcijama

DEO 1.

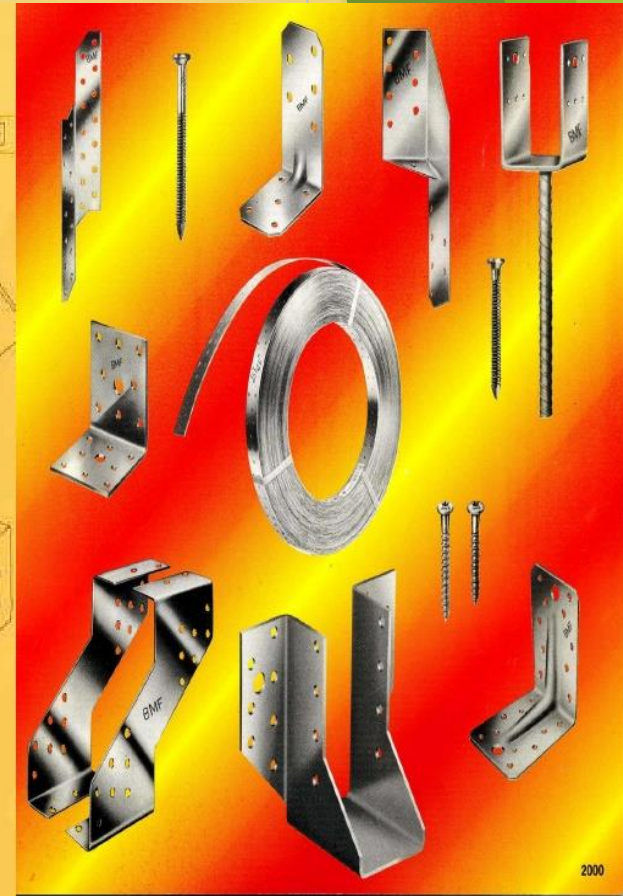
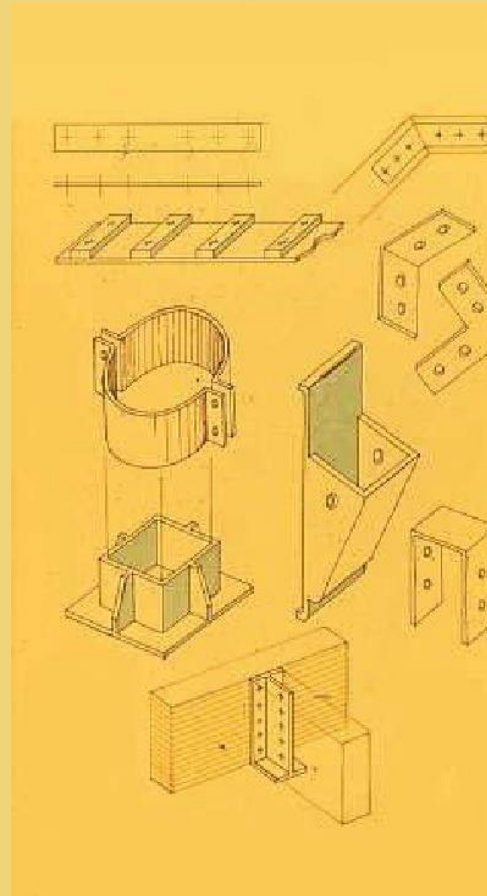
8.-15. april 2020.

SPOJNA SREDSTVA I VEZE

Spojna sredstva u drvenim konstrukcijama, imaju zadatak da spoje dva ili više elementa od drveta ili proizvoda na bazi drveta, kao i drveta i elemenata od drugih materijala, u jednu konstruktivnu celinu.

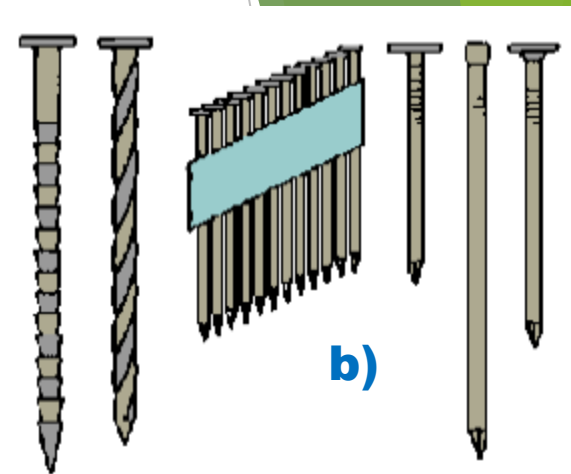
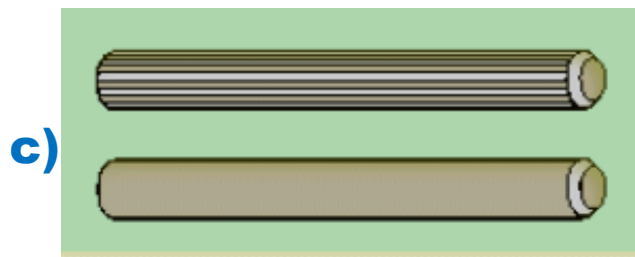
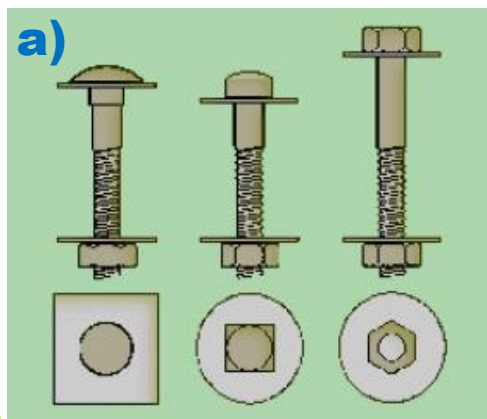
Najčešće korišćena **spojna sredstva u drvenim konstrukcijama** su:

- **zavrtnji,**
- **trnovi,**
- **ekseri,**
- **zavrtnji za drvo bez navrtke,**
- **razne vrste moždanika,**
- **klanfe (pijavice),**
- **drvene čivije,**
- **lepkovi**



Mehanička štapasta spojna sredstva u drvenim konstrukcijama

- a) zavrtnji,
- b) ekseri,
- c) štapasti moždanici, ili trnovi,
- c') štapovi sa navojnicama zalepljeni za drvo,
- d) zavrtnji za drvo bez navrtke.



Podela spojnih sredstava u zavisnosti od materijala

- ▶ čelik, (hladno oblikovane čelične trake, kovano liveno gvožđe)
- ▶ legure, (legure aluminijuma, livene legure čelika)
- ▶ drvo,
- ▶ polimeri,
- ▶ lepak.

PODELA PREMA OBLIKU

- paralelopipedne, kvadratne i kružne nazubljene i ravne ploče,
- kružni prstenovi,
- valjkasti oblici, spiralni, rebrasti, štapasti oblici, profilisani elementi

Prema mestu ugrađivanja

- na licu mesta, na gradilištu ili
- u proizvodnoj hali

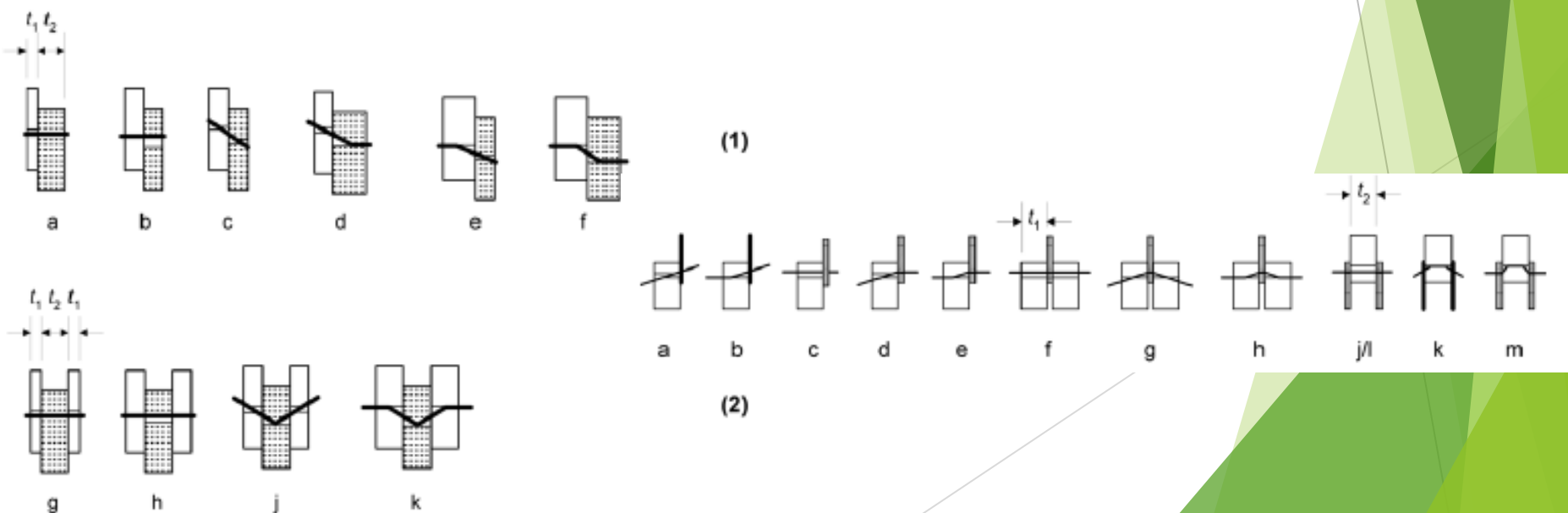


Prema načinu prenošenja sile razlikujemo:

- ▶ direkno preko kontakne površine drvo-drvo, drvo-beton,
- ▶ drvo-drugi materijali,
- ▶ preko spojnih ravni posredstvom spojnih sredstava,
- ▶ tarni spojevi i
- ▶ kombinovano.

Prema broju spojnih ravni

U vezama se najčešće sile prenose preko spojnih sredstava i spojne ravni, pa prema broju spojnih ravni razlikujemo: **jednosečne**, **dvosečne** i **višesečne**

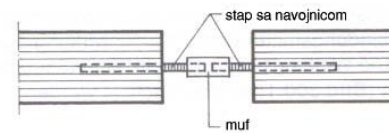
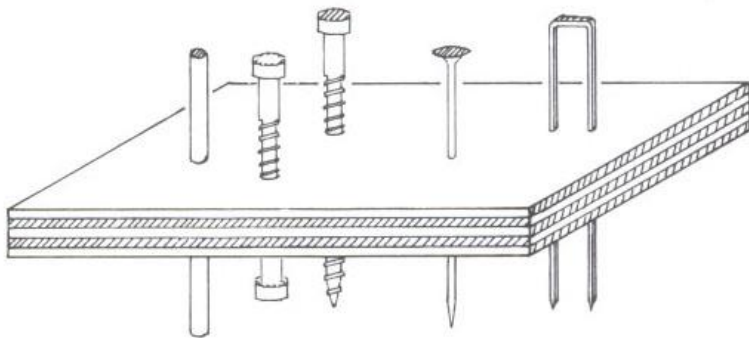


Veze sa mehaničkim spojnim sredstvima

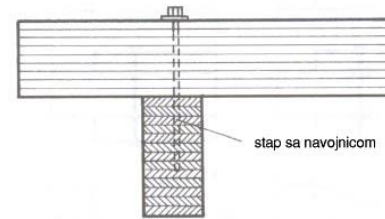
► sile se prenose preko spojnih sredstava a dele se na:

► **veze sa štapastim spojnim sredstvima:**

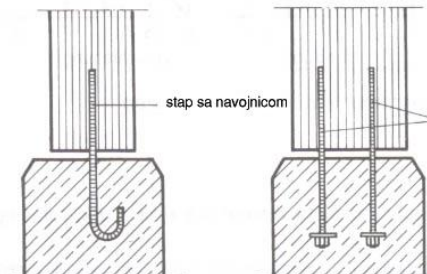
- zavrtnji,
- ekseri,
- štapasti moždanici, ili trnovi,
- štapovi sa navojnicama zalepljeni za drvo,
- zavrtnji za drvo bez navrtke,
- U- spone, T- spone i
- pijavice



spoj sa mufom



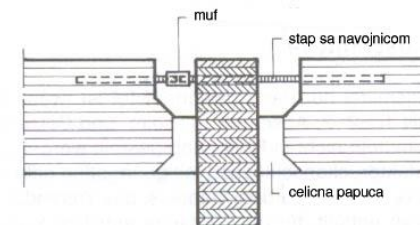
osiguranje od odizanja



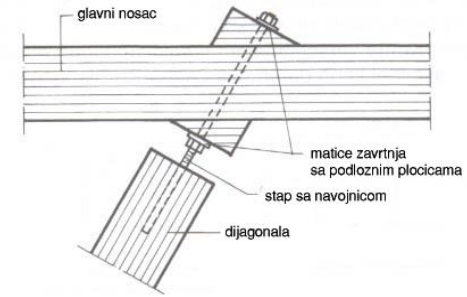
ojacanje oslonackog preseka

zglobna veza

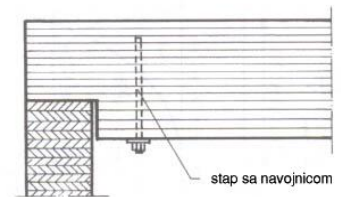
veza ukljestenjem



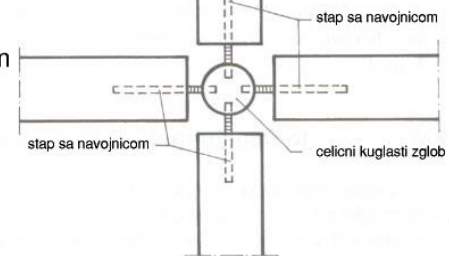
kruti spoj greda



veza za ukručenje glavnog nosaca



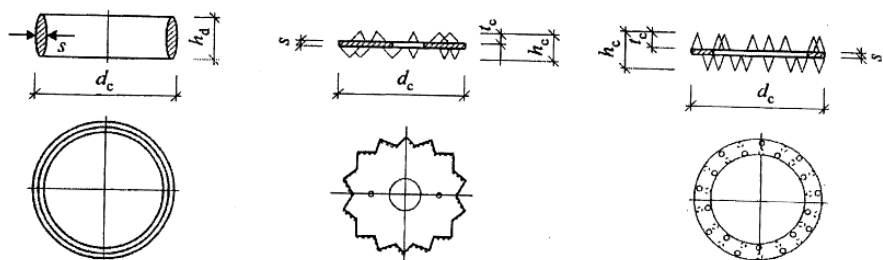
stap sa navojnicom



cvor prostorne konstrukcije

Veze sa ostalim spojnim sredstvima

- ▶ moždanici,
- ▶ konektor ploče, perforirane sa i bez zubaca,
- ▶ čelični limovi, trake i ploče,
- ▶ čelični profilisani elementi,
- ▶ spojna sredstva za vezu i sprezanje drveta sa betonom,
- ▶ sajle ,
- ▶ ankeri i
- ▶ specijalna patentirana spojna sredstva.



Tip A

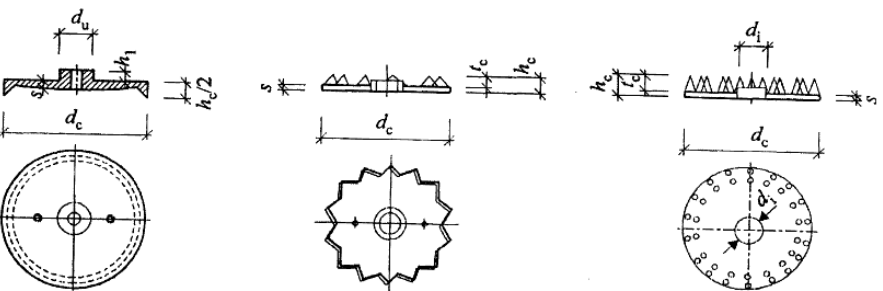
Dvostrani umetnuto – utisnuti tip moždanika

Tip C

Dvostrani utisnuti moždanik

Tip D

Dvostrani utisnuti moždanik



Tip A

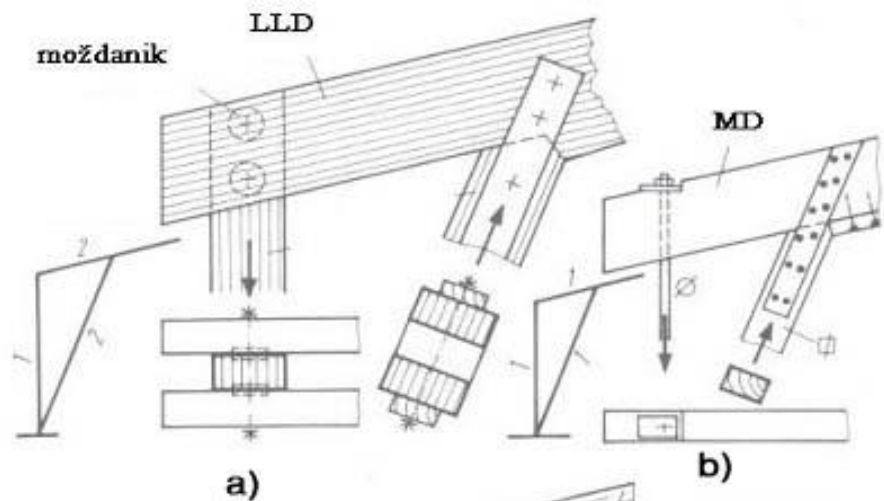
Jednostrani umetnuto – utisnuti tip moždanika

Tip C

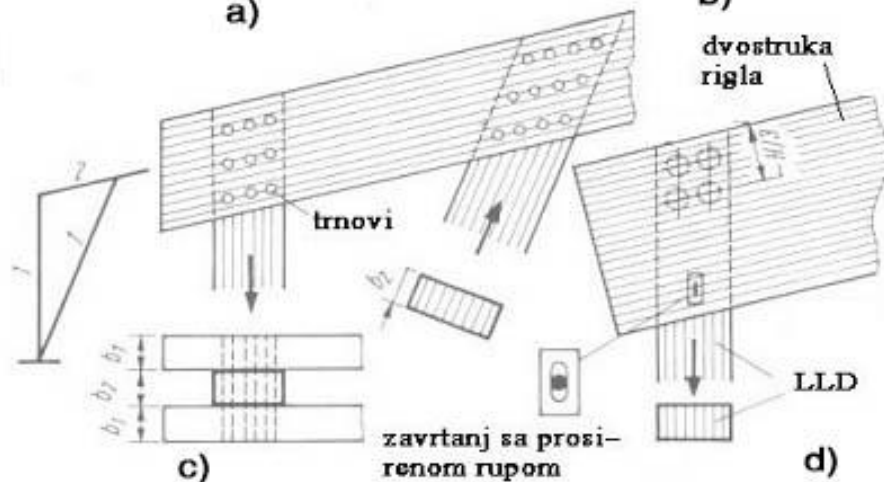
Jednostrani utisnuti moždanik

Tip D

Jednostrani utisnuti moždanik



a)

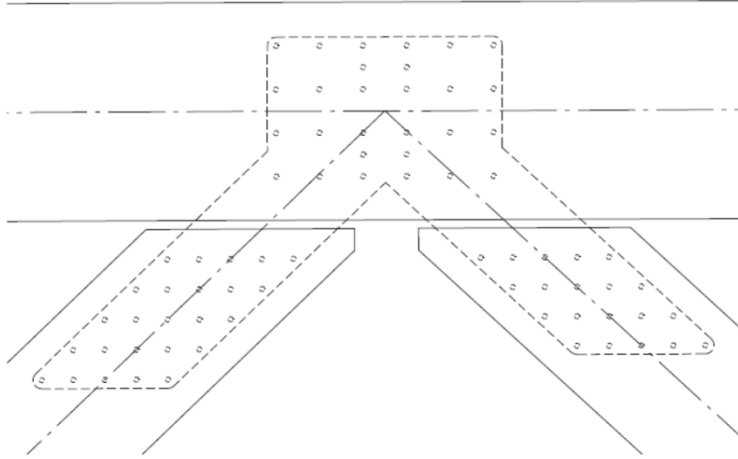
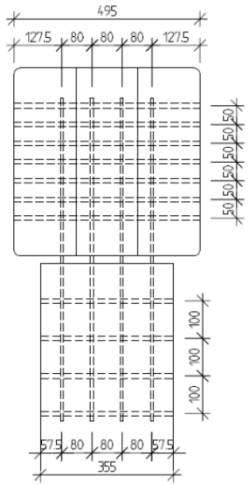


c)

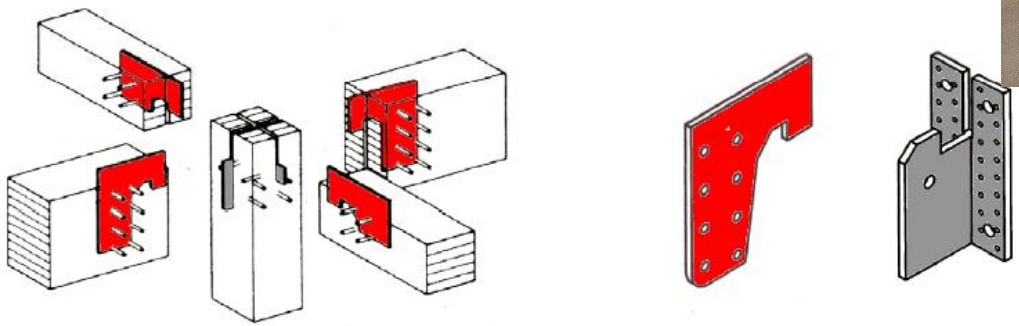
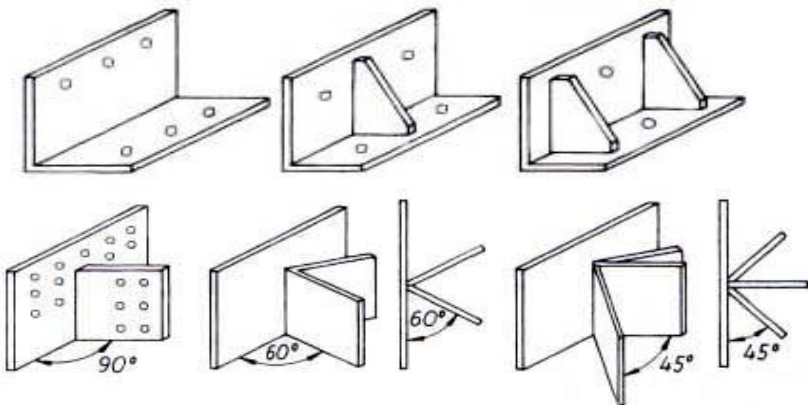
zavrtanj sa proširenom rupom

d)

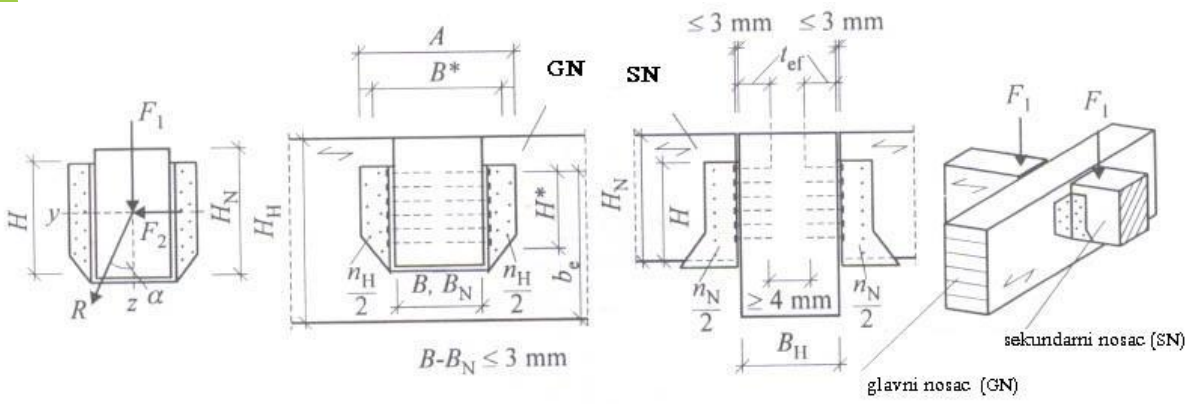
Veze sa tankim čeličnim limovima



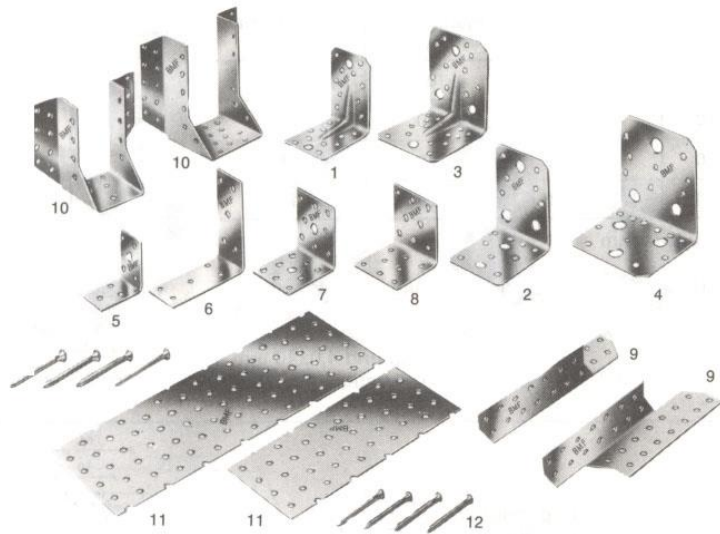
Profilisani konzolni čelični elementi



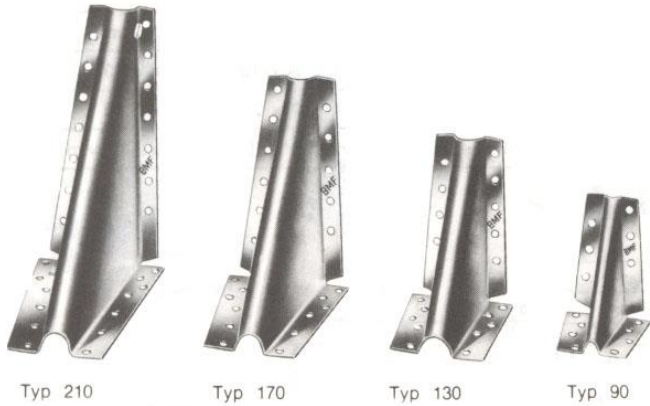
Profilisana čelična papuča



Tipizirani čelični elementi



BMF Passverbinder ET von BMF - SIMPSON

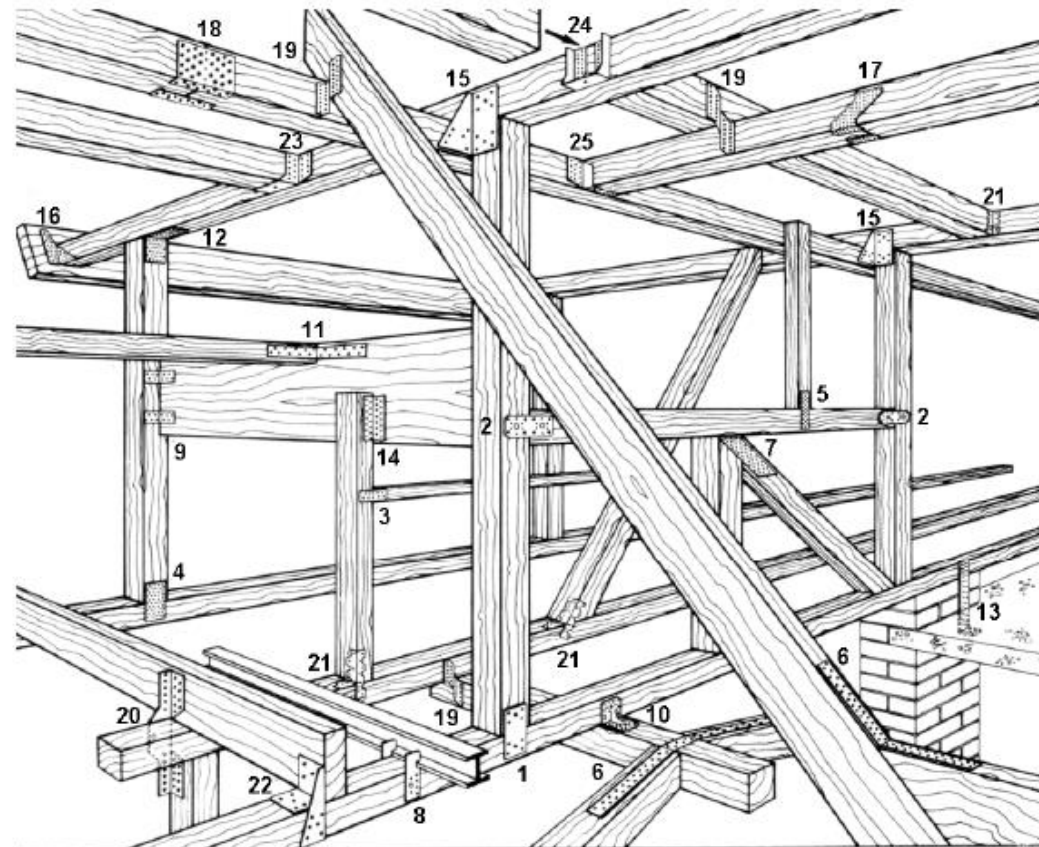
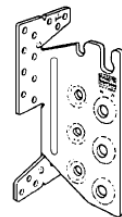
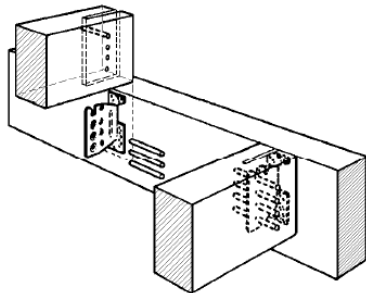


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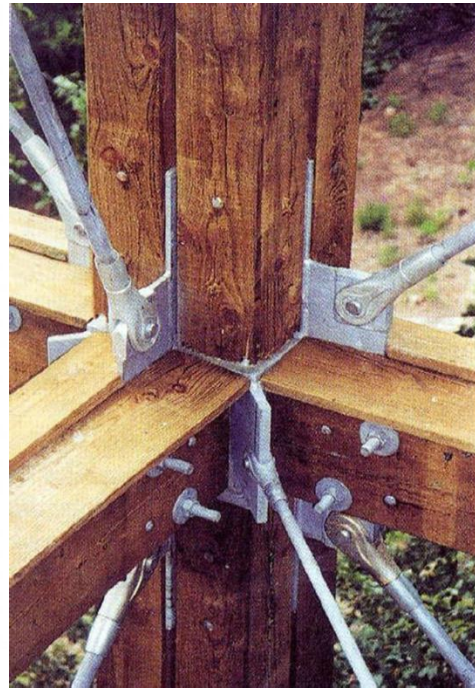
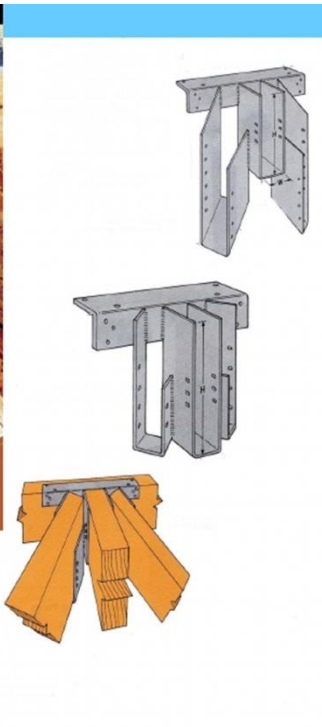
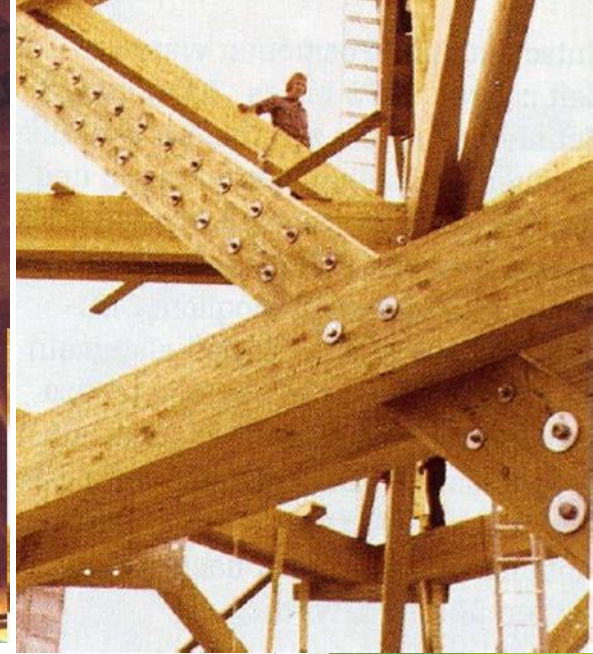
Typ 170

Typ 130

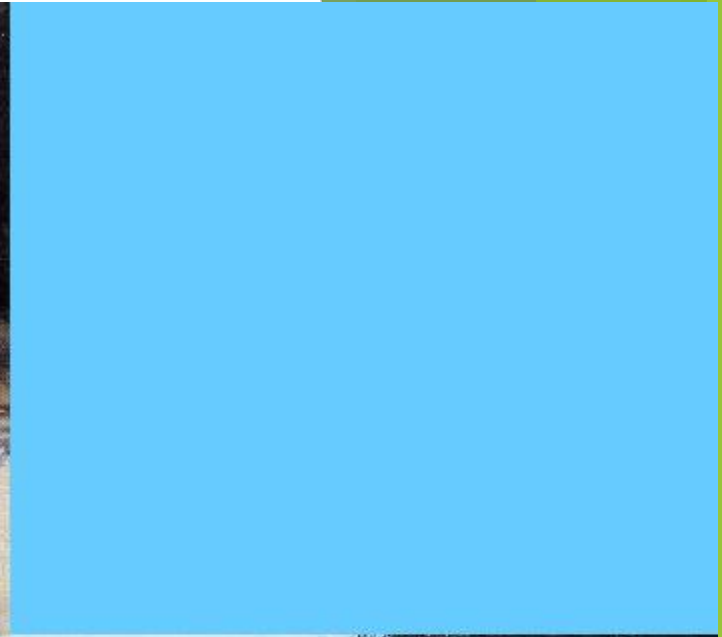
Typ 90



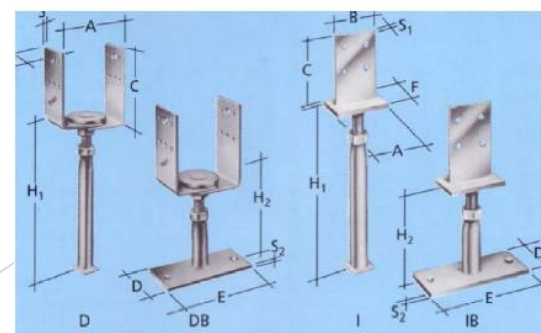
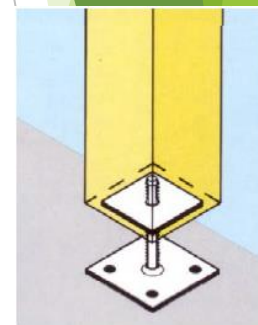
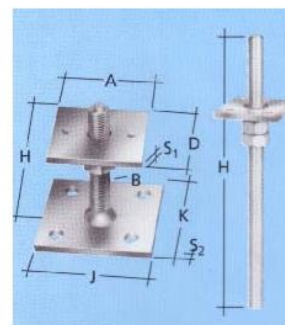
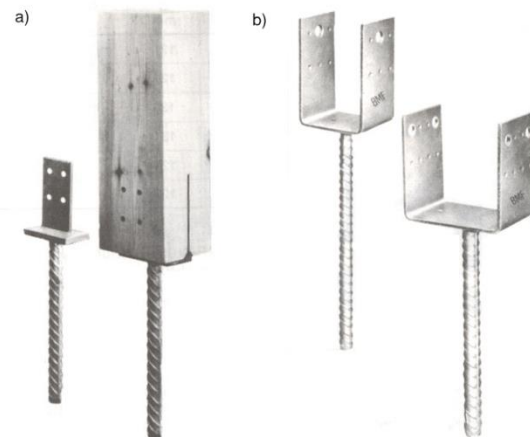
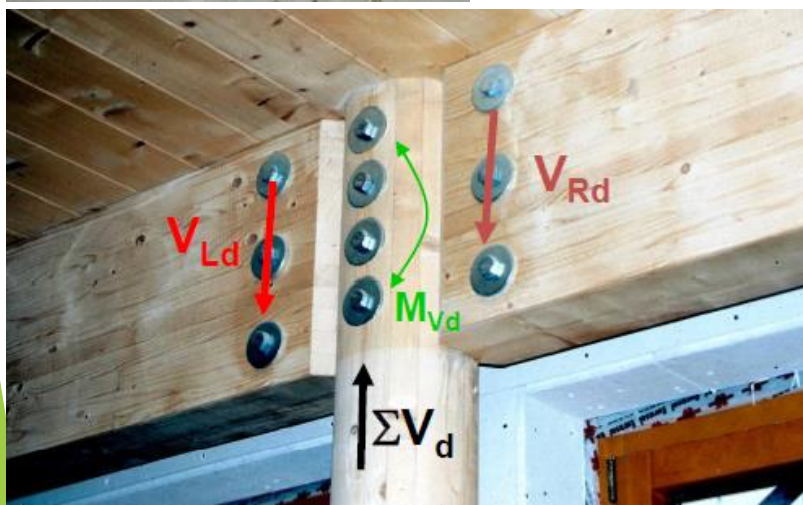
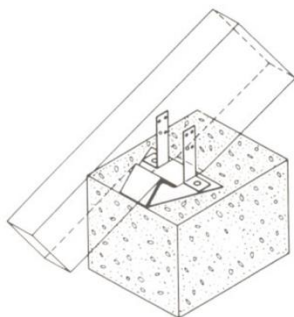
Primer 2



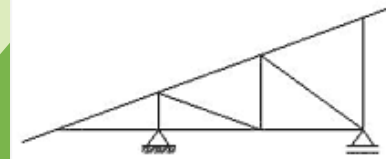
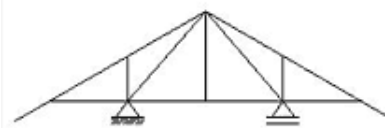
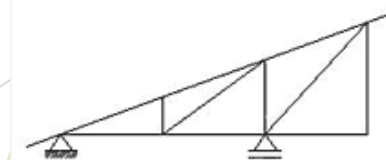
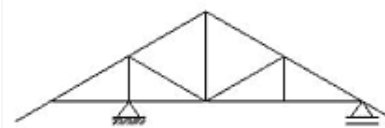
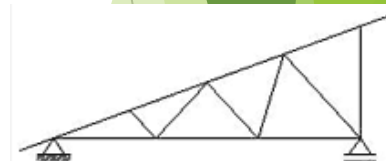
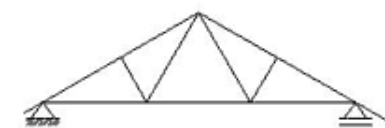
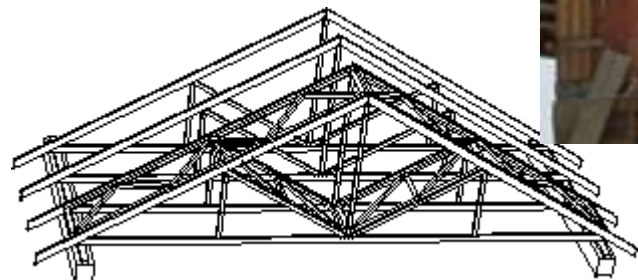
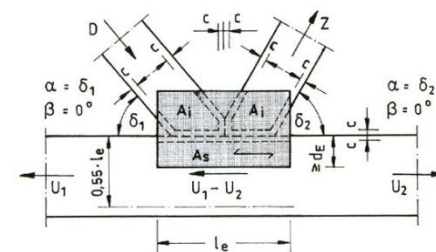
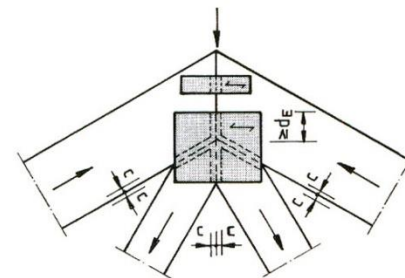
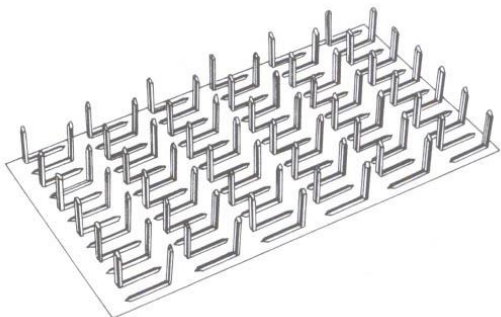
Primer 4



Patentirani elementi za vezu sa betonom



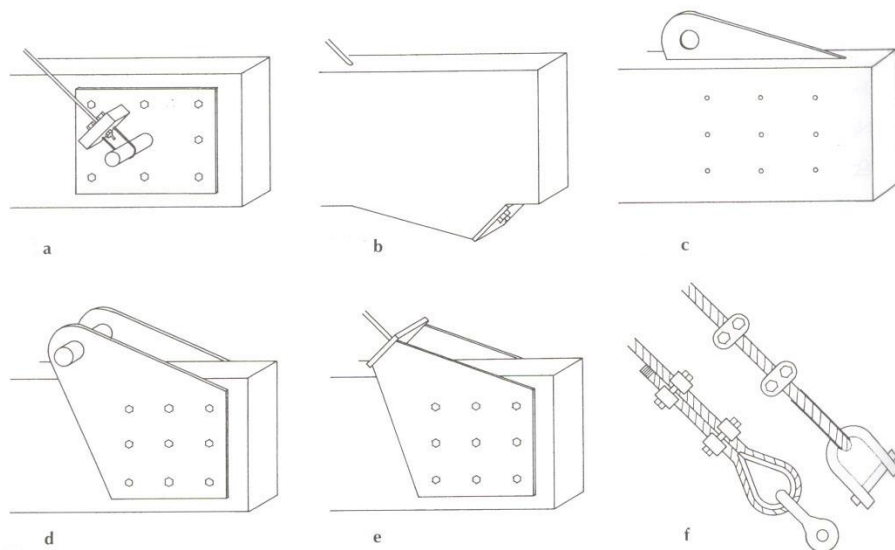
Metalne konektor ploče



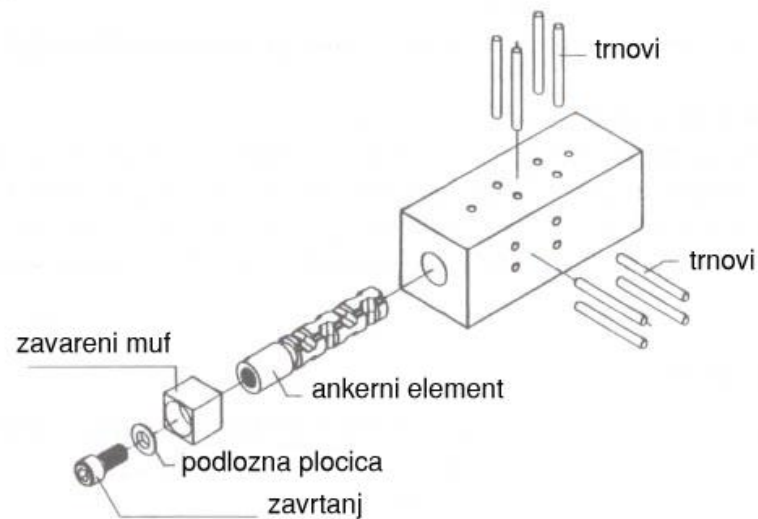
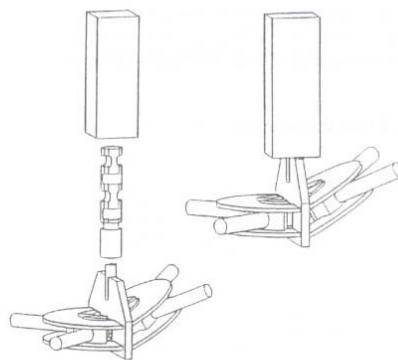
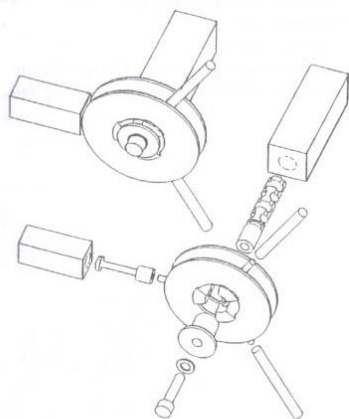
Metalne konektor ploče-primena



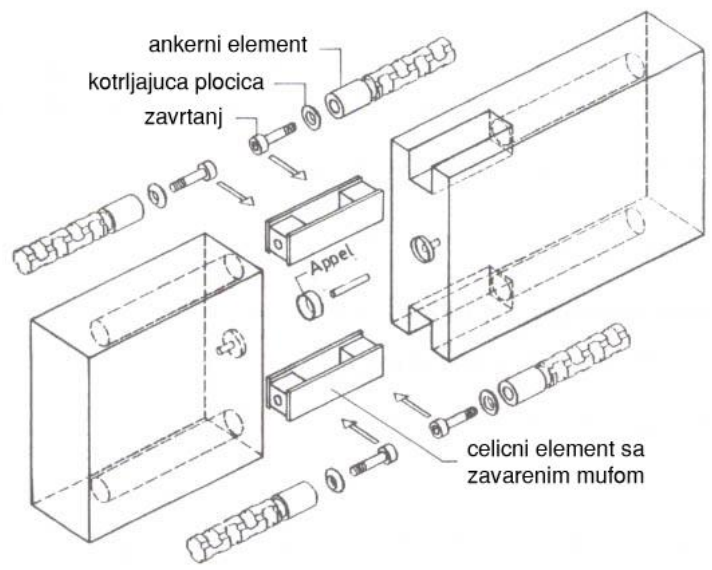
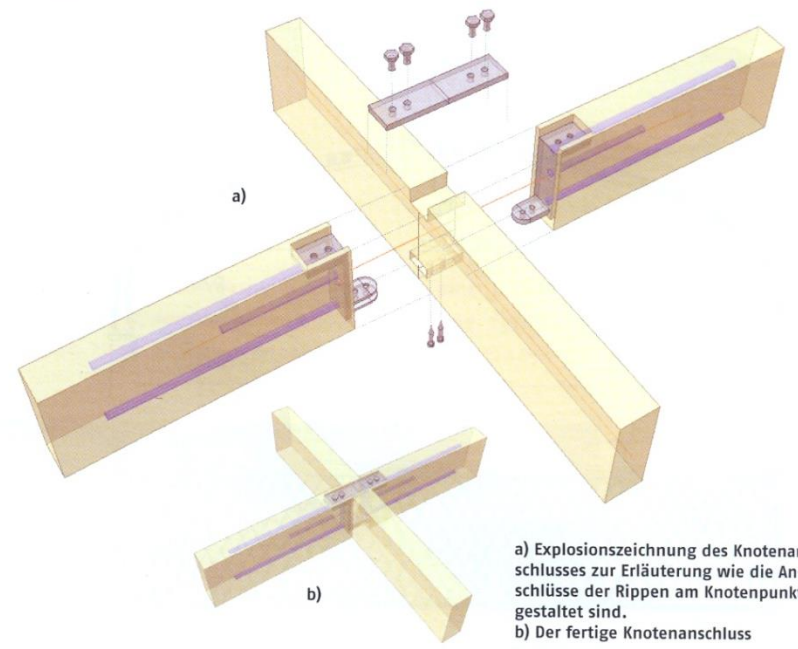
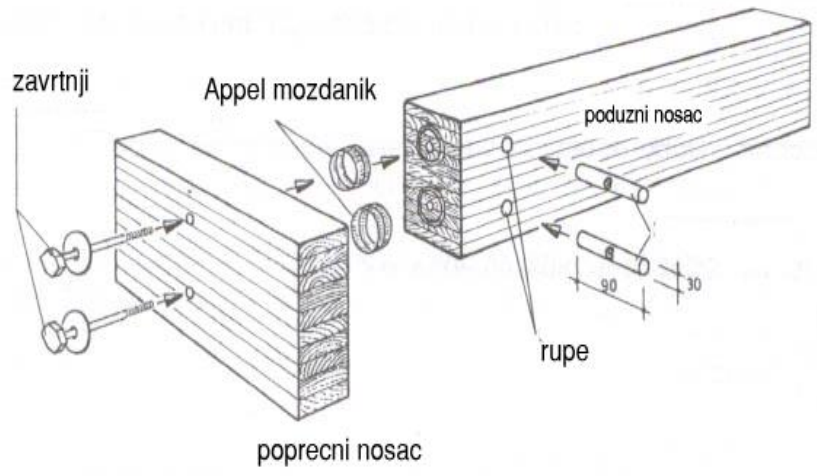
Konektor kose zatege viseće konstrukcije



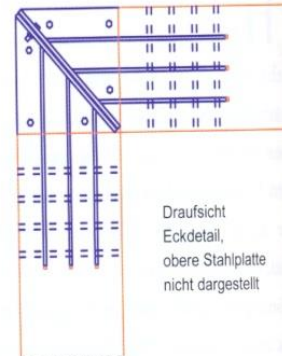
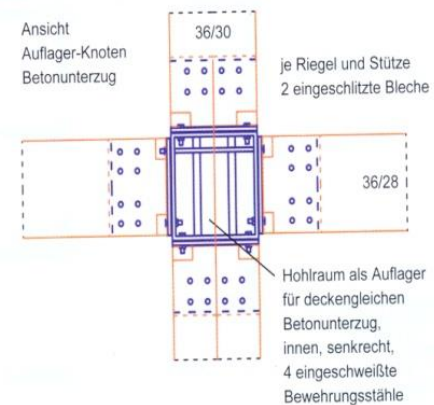
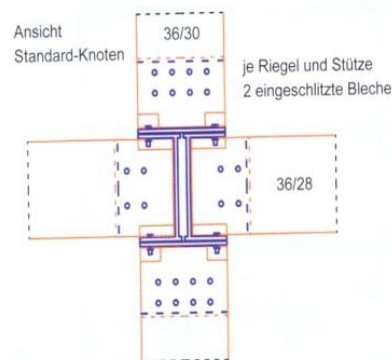
prostorni zglob



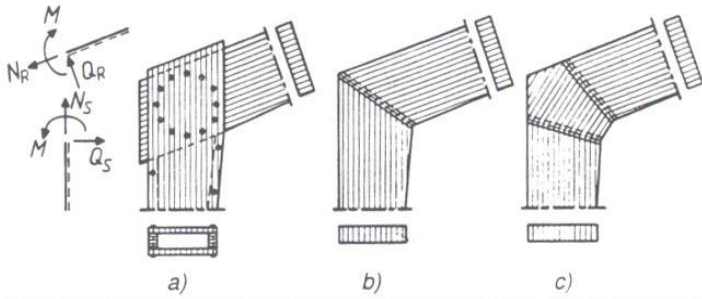
Posebno kreirane veze drvenih elemenata 1



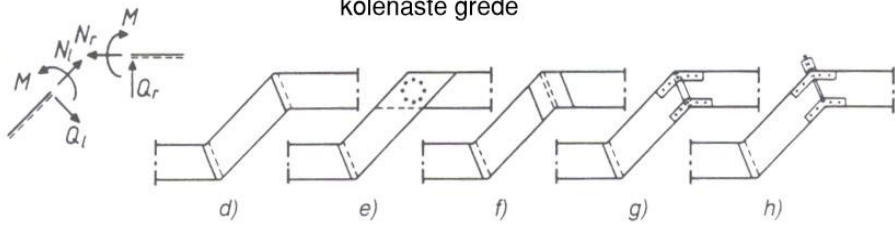
Posebno kreirane veze drvenih elementata-2



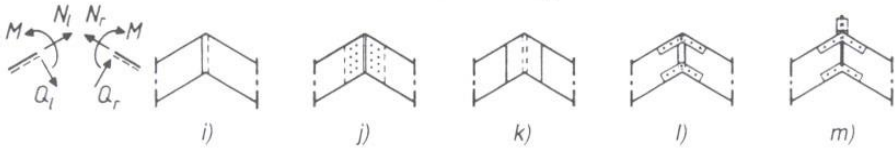
kruti ugao rama



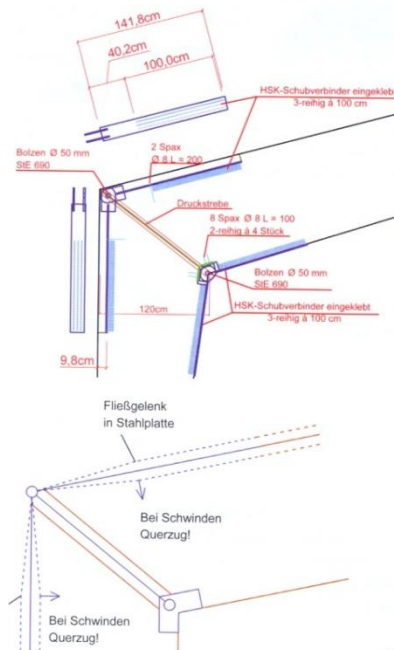
kolenaste grede



veza u slemenu kao kruti ugao



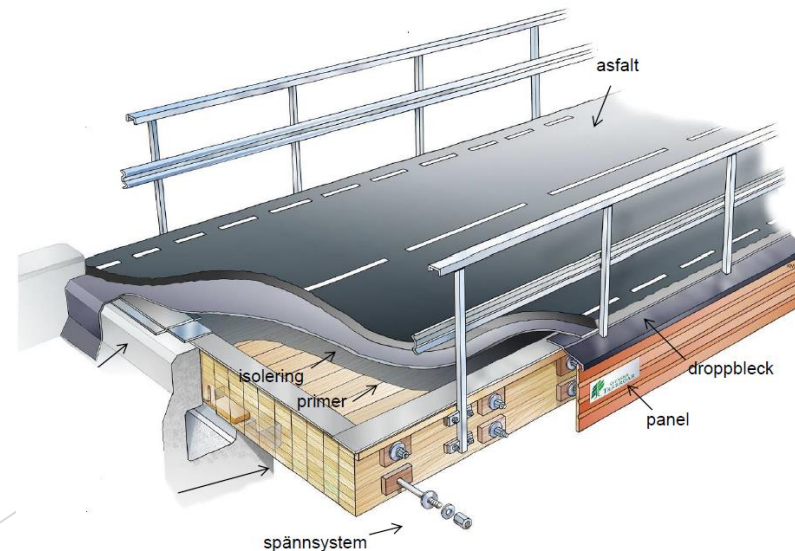
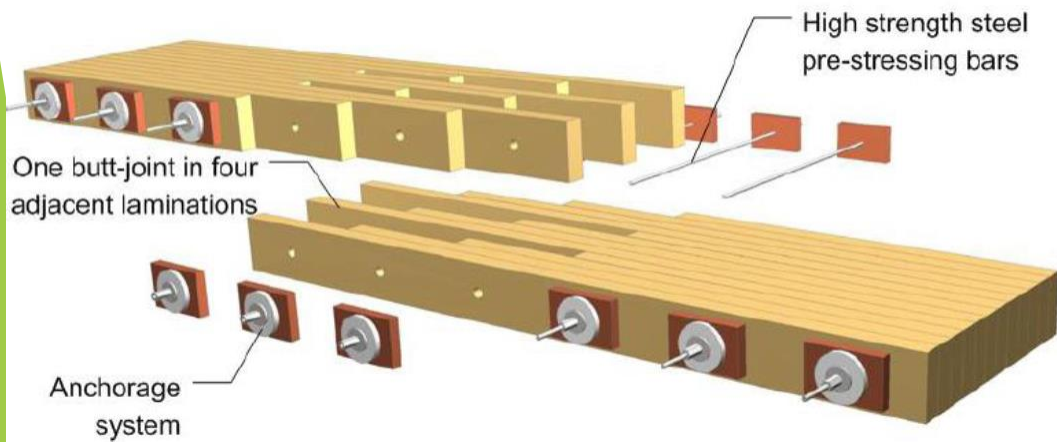
Posebno kreirane veze drvenih elemenata-3





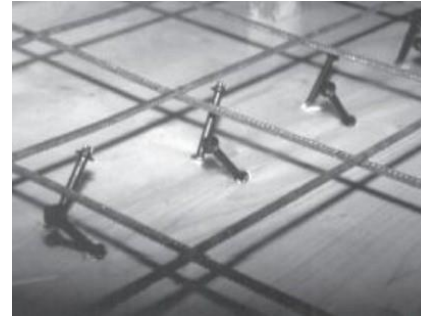
Primena štapastih spojnih sredstava u hibridnim drvenim konstrukcijama

Drveni mostovi od LLD prednapregnuti u poprečnom pravcu

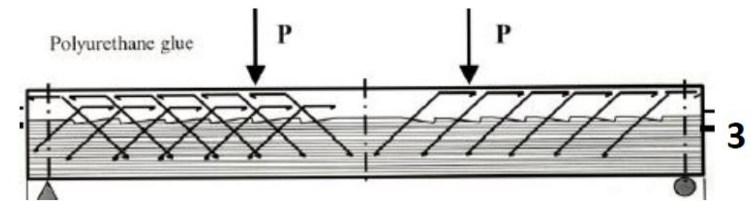


Primena štapastih spojnih sredstava u hibridnim drvenim konstrukcijama

Spregnuti konstrukcije mostova i MSK tipa drvo-beton



Spojni sistemi-moždanici



Vihantasalmi Bridge, Finska. Dužina $21+3 \times 42+21=168\text{m}$, širina $11+3=14\text{m}$, sagrađen 1999.



Primena štapastih spojnih sredstava u hibridnim drvenim konstrukcijama

