

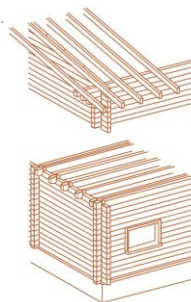
Podela objekata od drveta

- ▶ Podela na osnovu načina konstruisanja zidova
- ▶ Podela na osnovu načina prenosa opterećenja

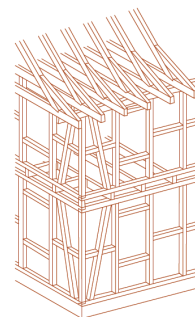


Podela na osnovu načina konstruisanja zidova

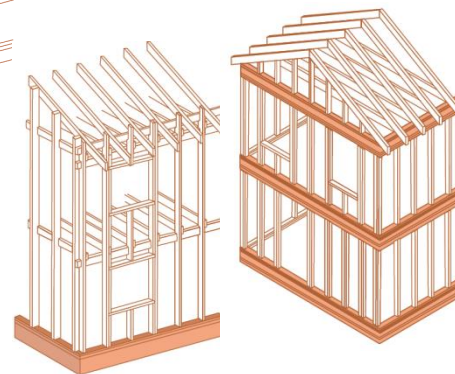
- ▶ Brvnare, talpare



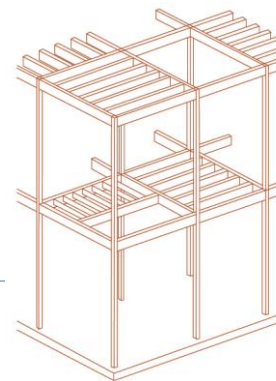
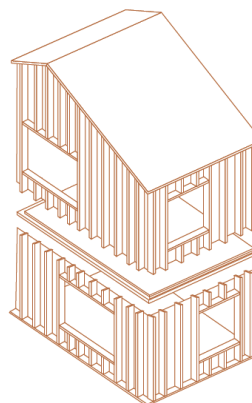
- ▶ Stari (tradicionalni) bondruk sistem



- ▶ Novi bondruk (skeletni) sistem



- ▶ Lagani skeletni sistem



Podela prema rasporedu nosivih elemenata i veza u čvorovima

- ▶ Sistem 1 - tradicionalni bondruk sistem
- ▶ Sistem 2 - tradicionalni bondruk sistem (višeetažni objekti)
- ▶ Sistem 3 – savremeni bondruk sistem
- ▶ Sistem 4 - Lagani skeletni sistem (bez platforme)

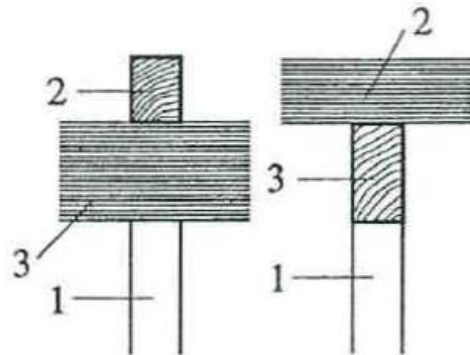
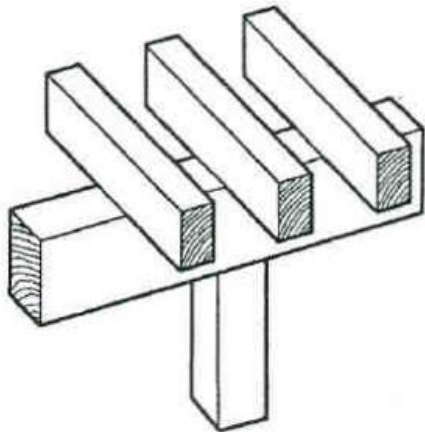


Konstruisanje kuća od drveta

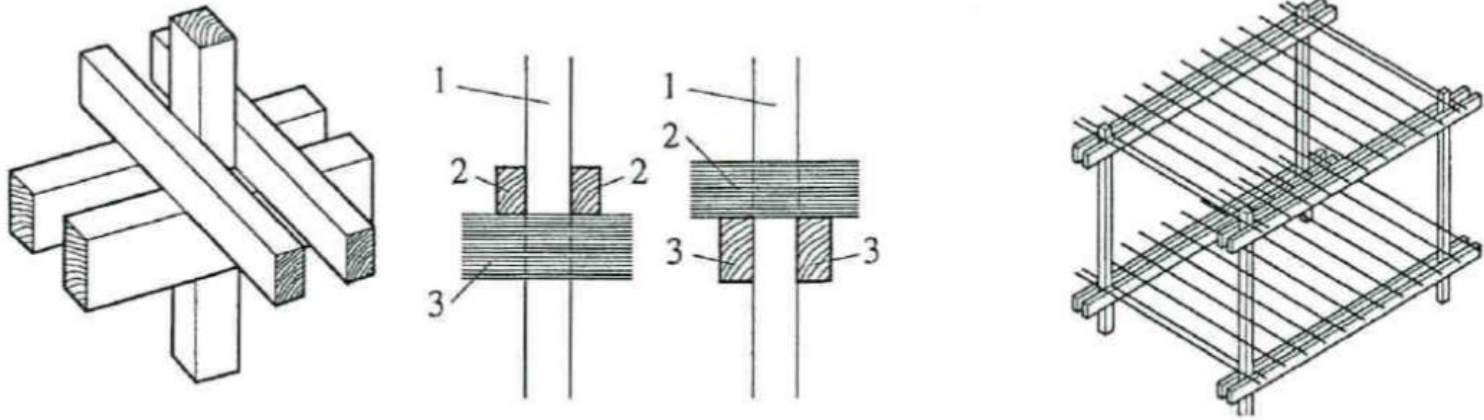


bondruk sistemi

Sistem 1



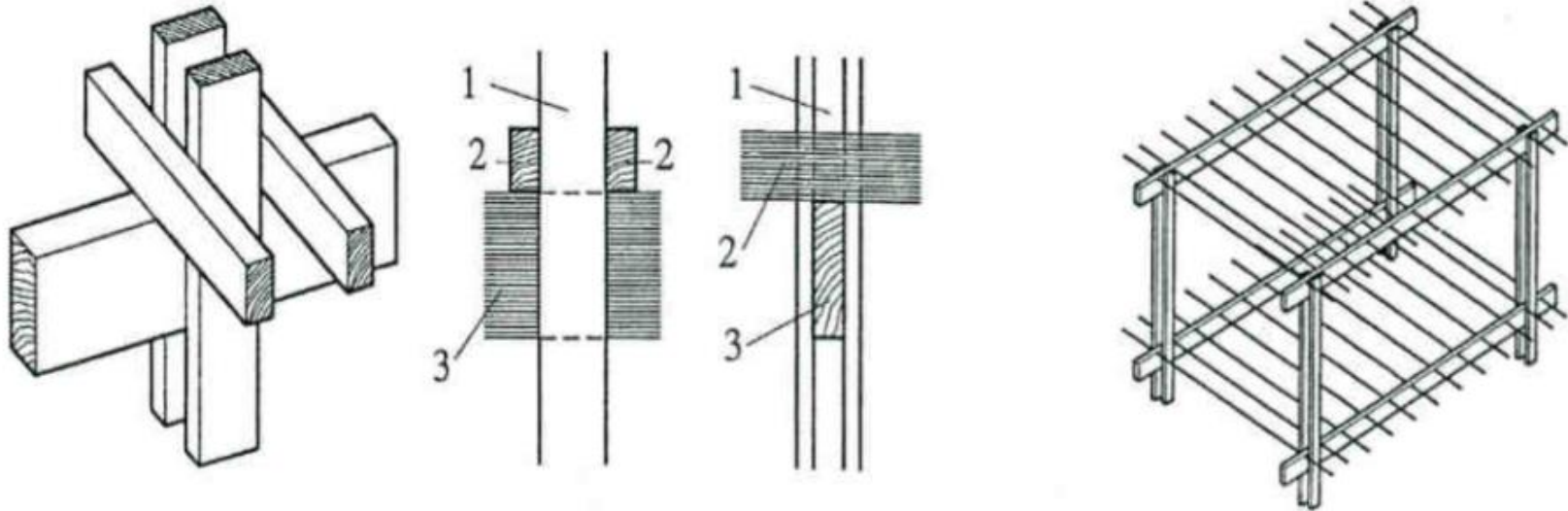
Sistem 2



- ✓ Tavanična rebra, sekundarni sistem konstrukcije se oslanjaju na sistem podvlaka što čini ukupnu debljinu međuspratne konstrukcije velikom
- ✓ Veze unutrašnjih nosivih pregradnih zidova sa fasadnim zidovima su složene, zbog potrebe za zatvaranjem međuprostora udovjenih podvlaka koje mimoilaze stub
- ✓ istaknute delove fasadnih podvlaka treba izbegavatu zbog uticaja atmosferilija, što je nepovoljno sa stanovišta trajnosti ugrađenog drveta, ili ih dodatno zaštititi.
- ✓ Sistem je nepovoljan sa aspekta fizike zgrade i današnjih visokih zahteva koji se odnose na sprečavanje energetskih gubitaka u međusobnim vezama, na debljinu termo-izolacije i potrebnu otpornost na delovanje vetra.



Sistem 3

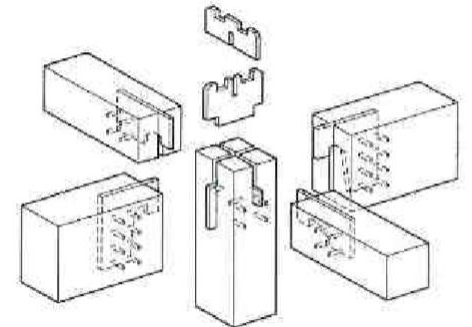
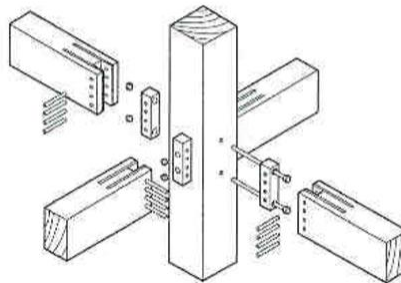
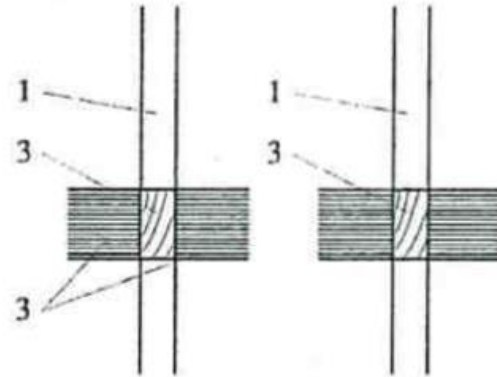
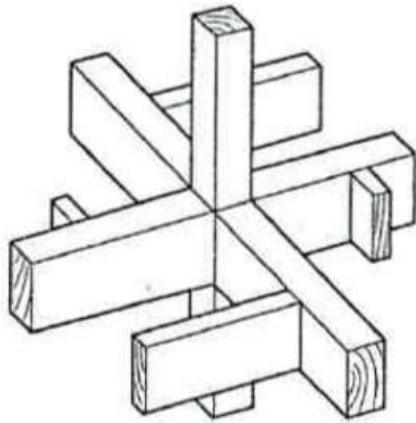


Nedostaci sistema:

- ✓ Male dimenzije poprečnih preseka štapova dvodelnog stuba mogu predstavljati problem u analizi protivpožarne otpornosti, koja je često merodavna za određivanje potrebnih dimenzija poprečnog preseka elemenata stuba.
- ✓ Kao i kod Sistema 2 javlja se problem povezivanja unutrašnjih nosivih pregradnih zidova sa fasadnim zidovima.



Sistem 4

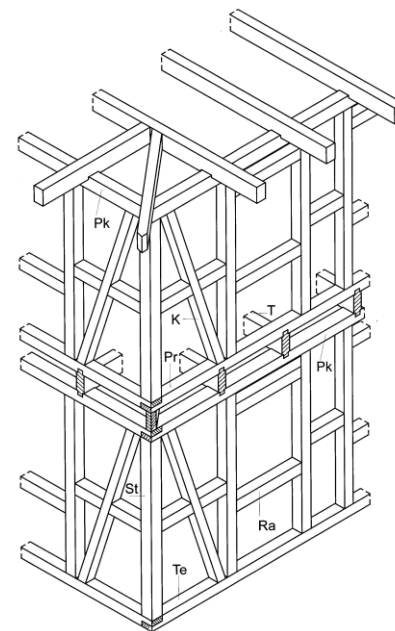


Konstruisanje kuća od drveta



Tradicionalni
bondruk sistem

materijali



Masivno i KVH drvo



70

92

115

140

180

202

Duo i trio grede



88

113

134

165

180

202

240

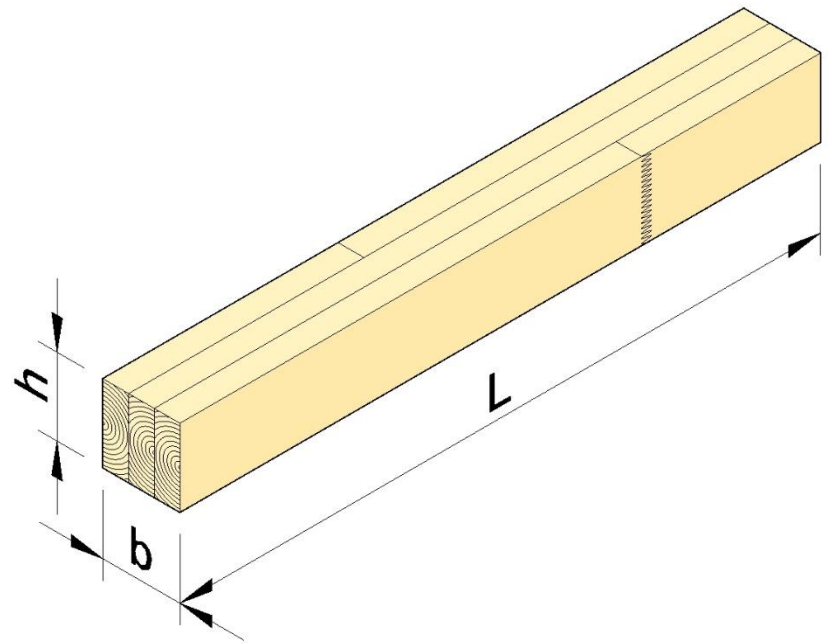
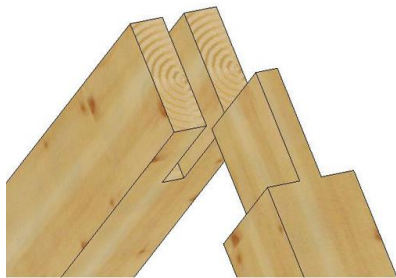
272



Osnovni materijal

Stari (tradicionalni) bondruk sistem

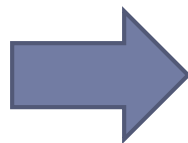
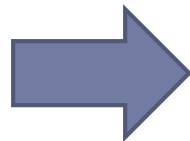
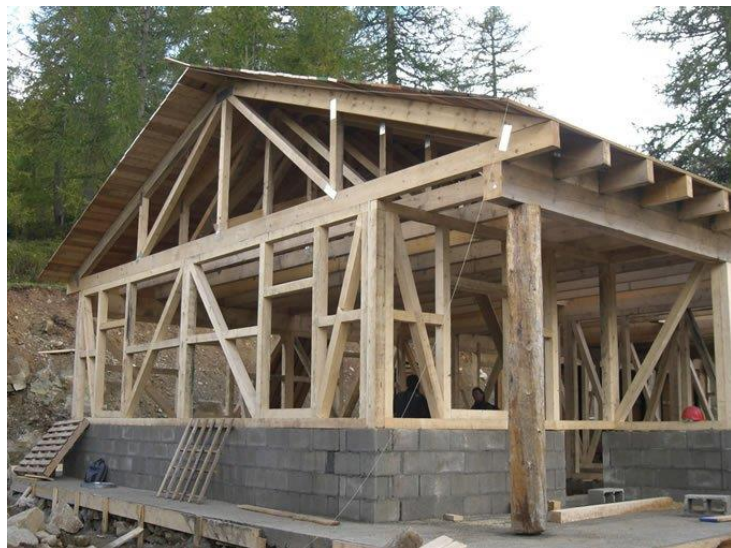
- ▶ Grede 10x10, 10x12, 12x14
- ▶ Rastojanje 120cm
- ▶ El.veze: tesarske veze



konstrukcija

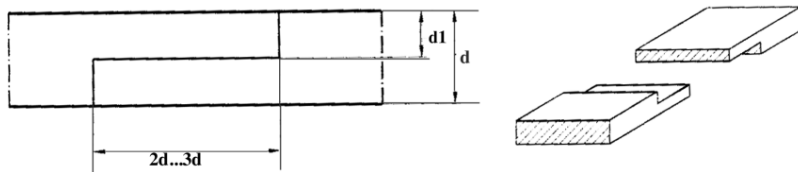


konstrukcija



Elementi veze

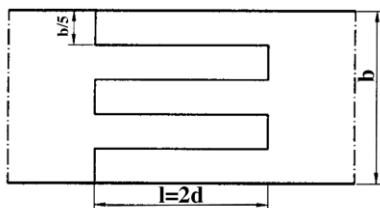
► Tesarske veze



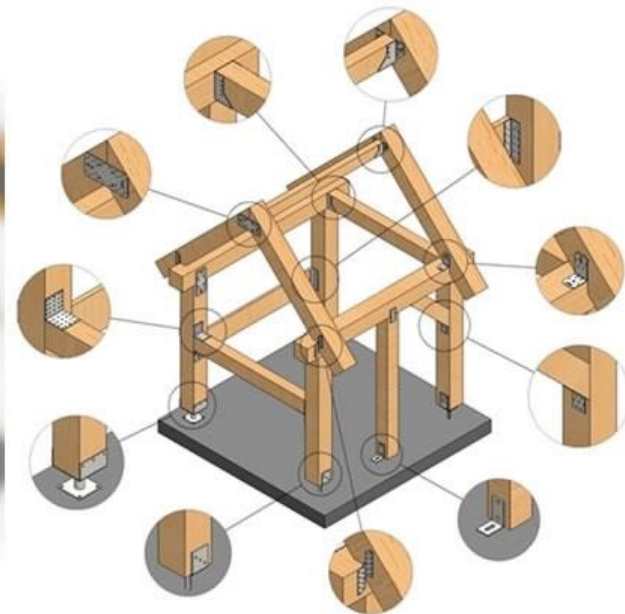
Spoj na ravni bočni preklop
i ravni sudar



Spoj na bočni čep i
prorez(jednostruki)

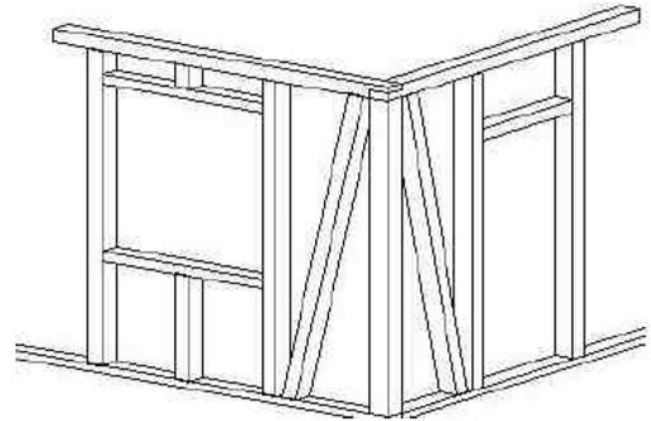


Stranični spoj na dvostruki čep
i prorez

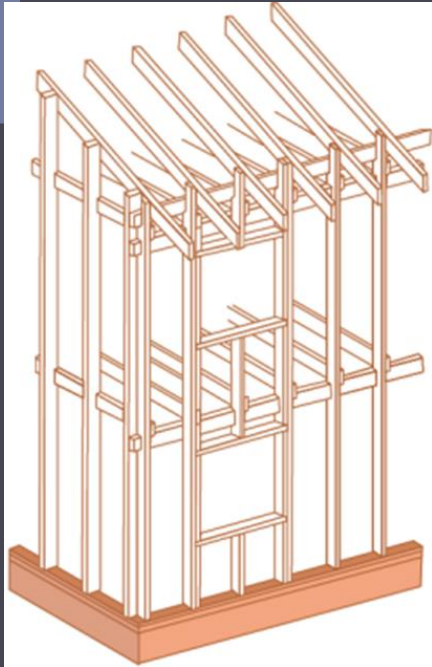


► Prednosti sistema

- ✓ slobodna organizacija (u arhitektonskom smislu); nosivi skelet se oblaže sa obe strane ili ostaje vidljiv samo sa jedne strane,
- ✓ moguće je izvesti jednoetažne i višeetažne zgrade,
- ✓ fiksni raspored elemenata konstrukcije važi za sve spratove,
- ✓ izgradnja konstrukcije sprat po sprat,



Konstruisanje kuća od drveta

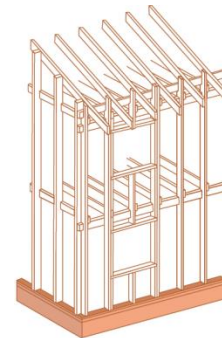


Savremeni
bonduk sistem

Podela Novog bondručnog (skeletnog) sistema gradnje na osnovu načina konstruisanja zidova

- ▶ **Novi bondručni (skeletni) sistem**

Braced frame construction system



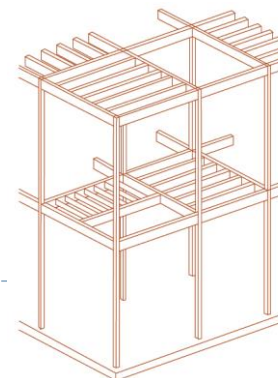
- ▶ **Lagani skeletni sistem na platformi**

Platform frame construction system



- ▶ **Lagani skeletni sistem (bez platforme)**

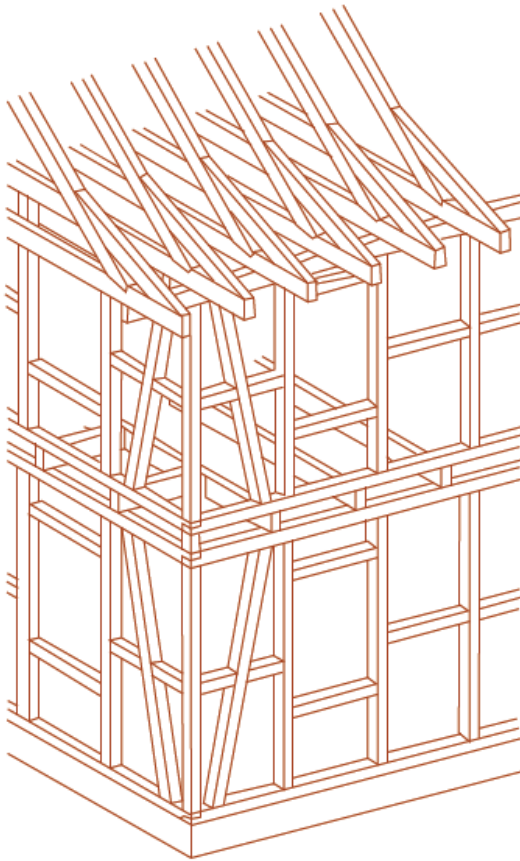
Baloon frame construction system



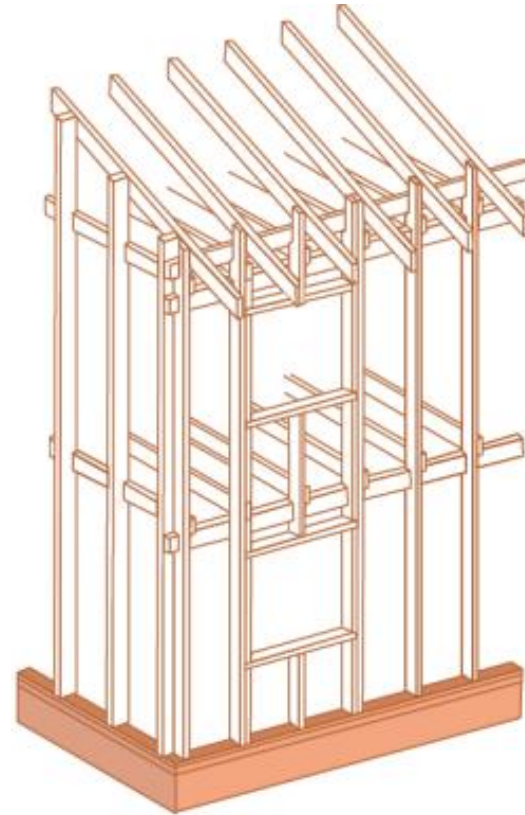
Novi bondručni (skeletni) sistem

Braced frame construction system

▶ tradicionalni



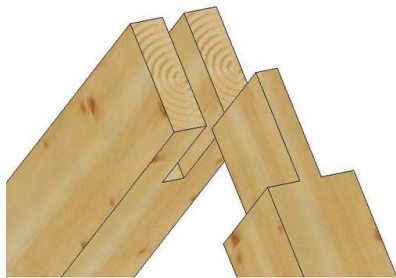
▶ Savremeni bondruk



Razlike u osnovnom materijalu

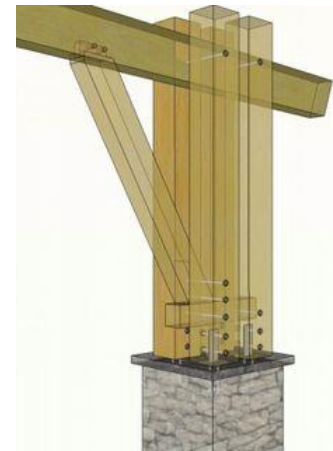
Stari (tradicionalni) bondruk sistem

- ▶ Grede 10x10, 10x12, 12x14
- ▶ Rastojanje 120cm
- ▶ El.veze: tesarske veze



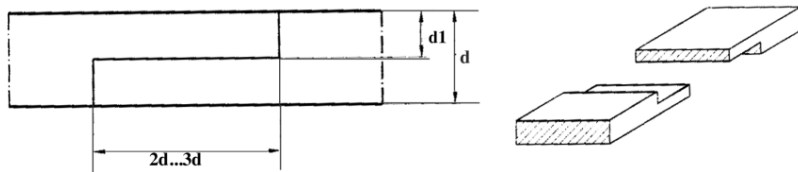
Novi bondruk (skeletni) sistem

- ▶ Grede 5x10, 5x15, 7,5x10, 7,5x15
- ▶ Rastojanje 40-60cm
- ▶ El.veze: ekseri, klamfe

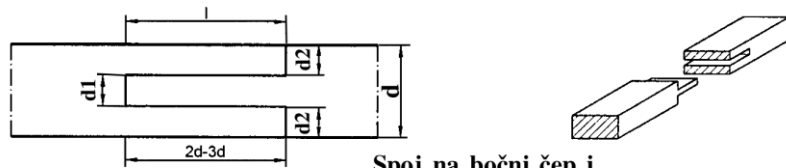


Elementi veze

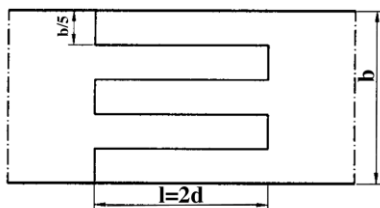
► Tesarske veze



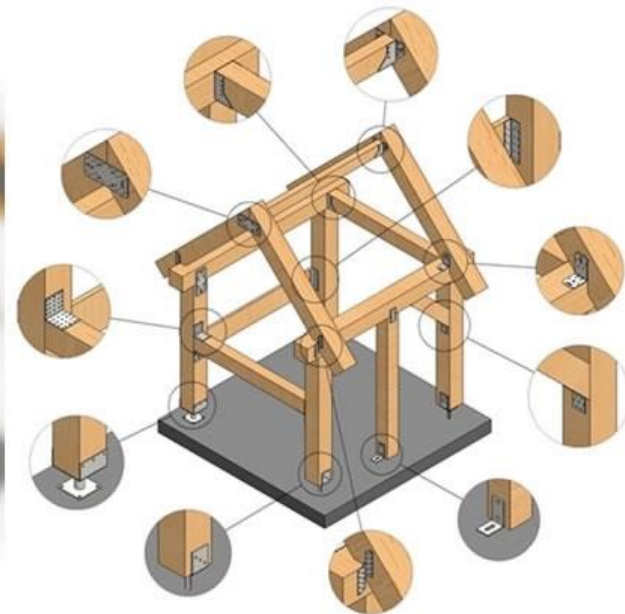
Spoj na ravni bočni preklop
i ravni sudar



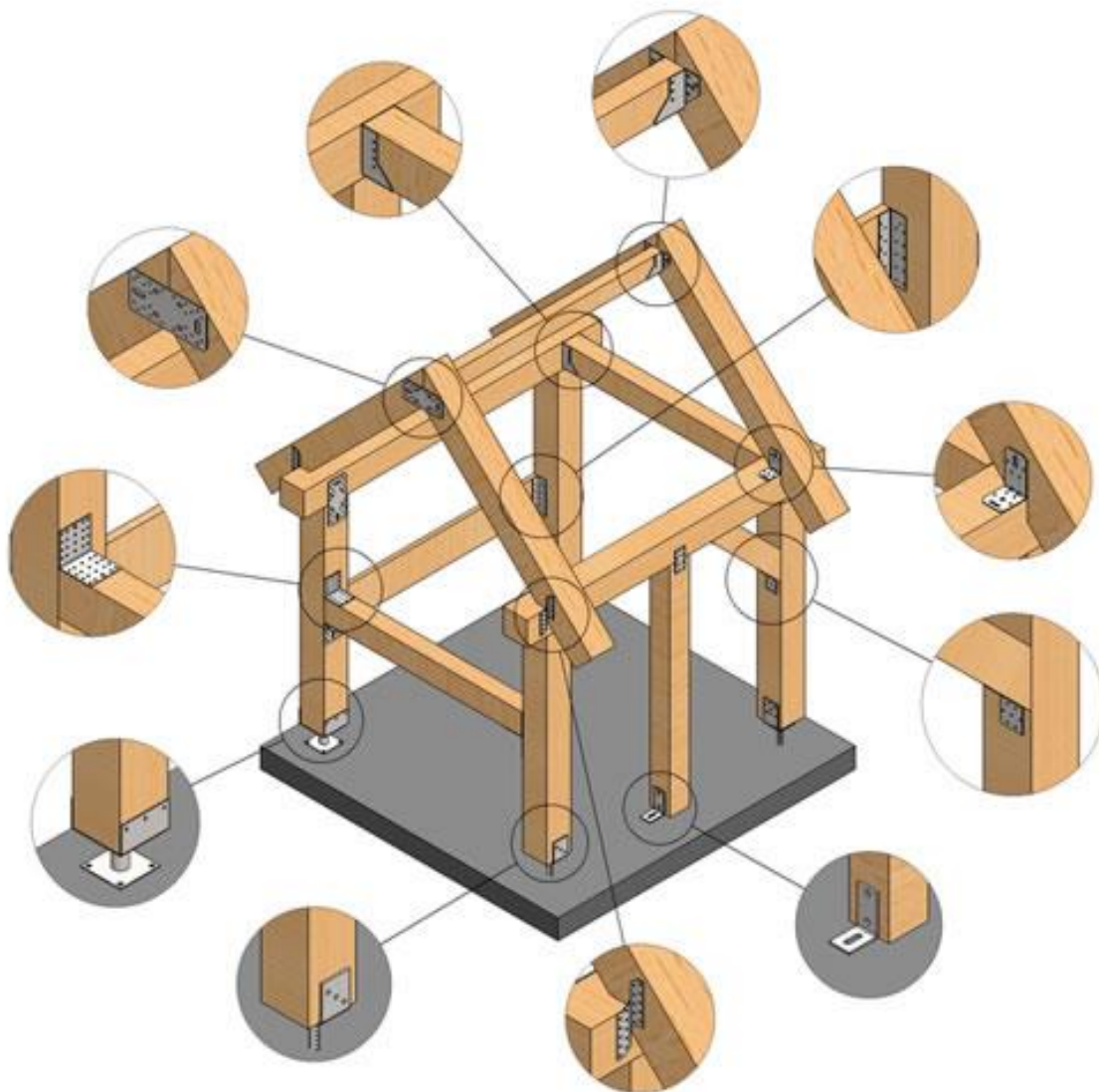
Spoj na bočni čep i
prorez(jednostruki)



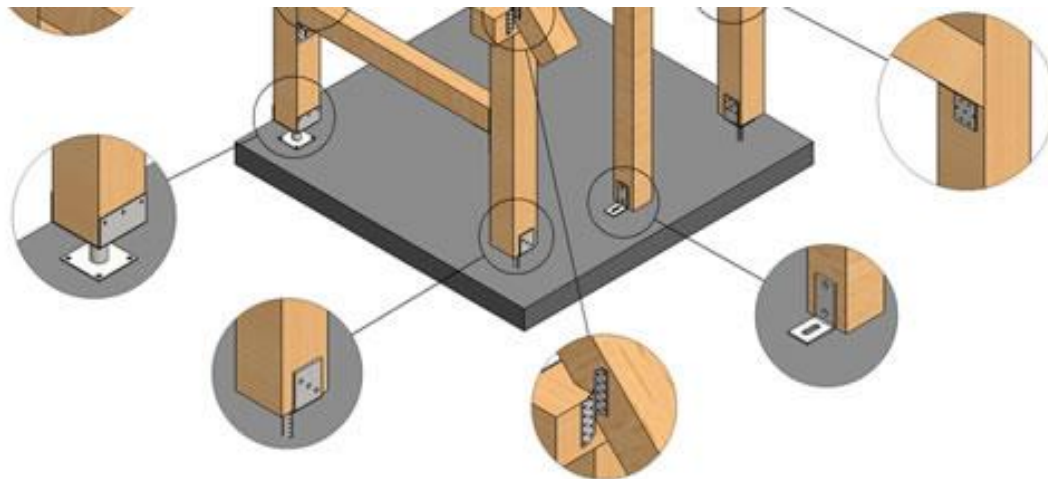
Stranični spoj na dvostruki čep
i prorez



Elementi veze



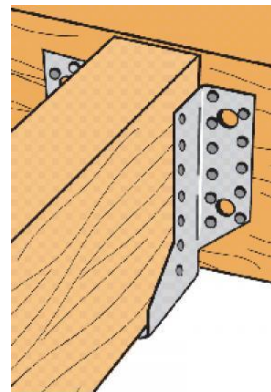
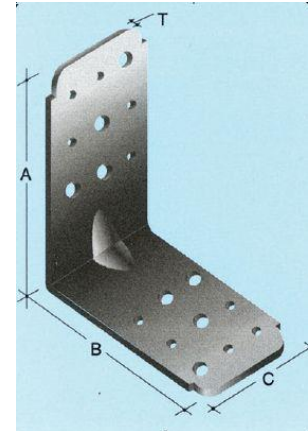
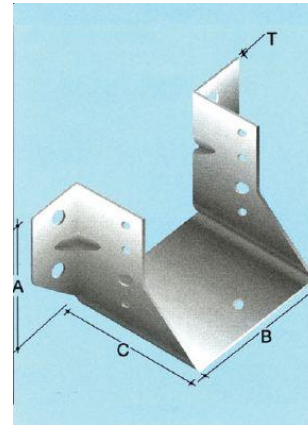
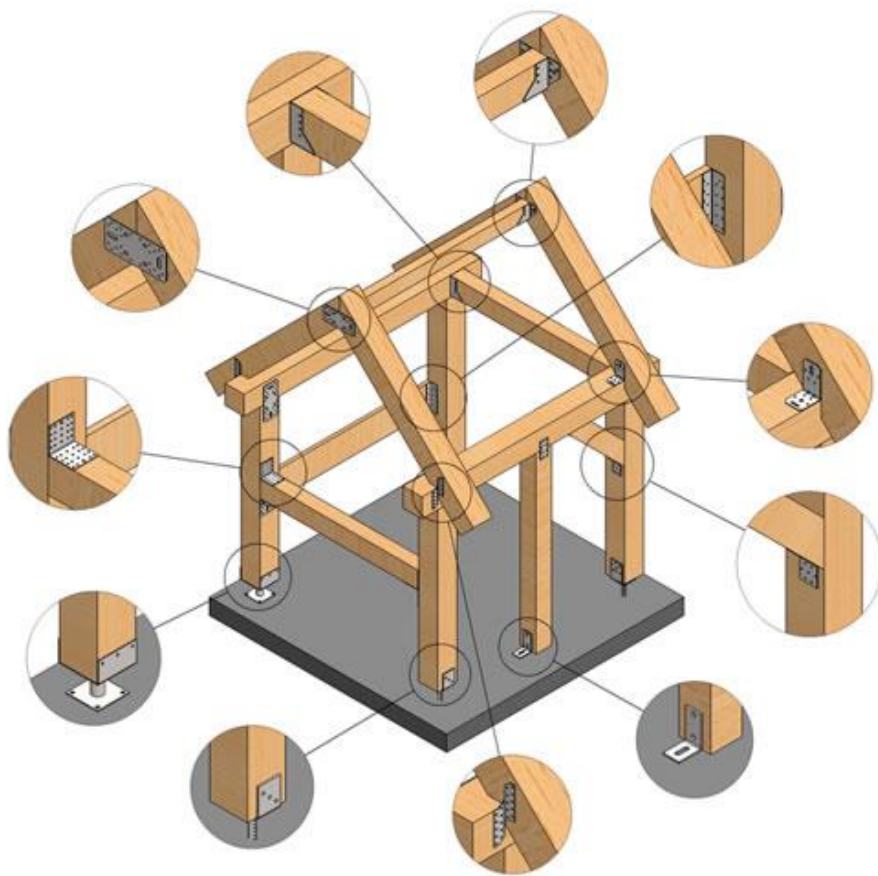
Elementi veze za spajanje vertikalnih greda sa podom



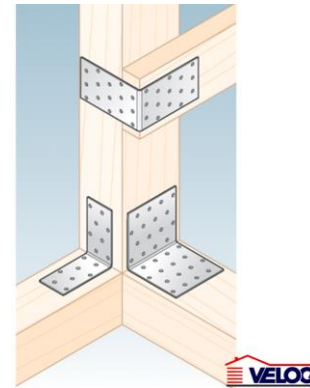
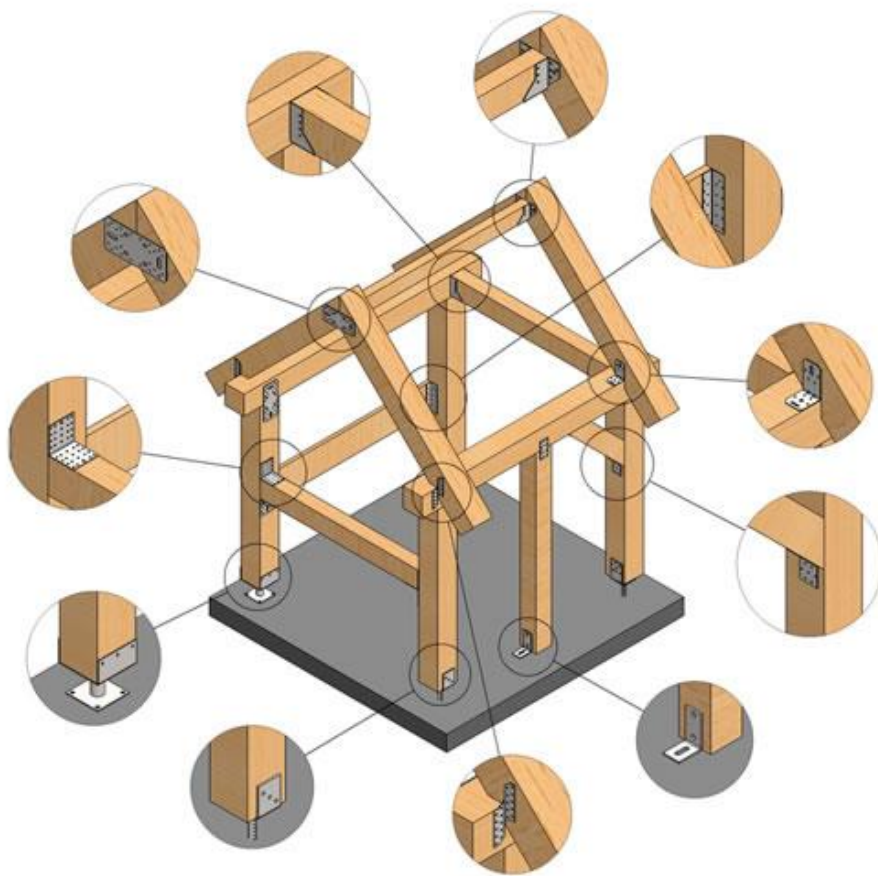
Elementi veze za spajanje vertikalnih greda sa podom

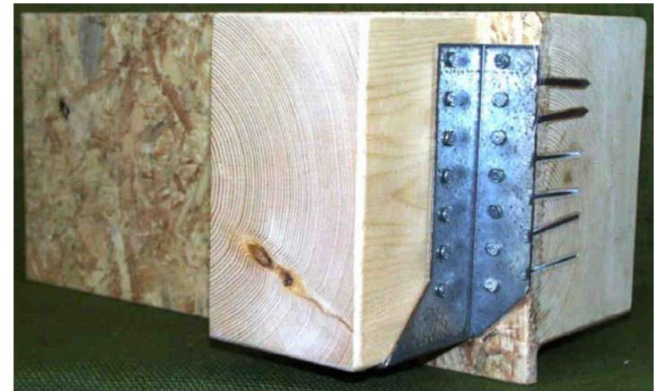
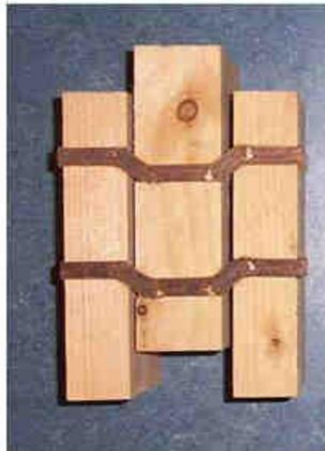
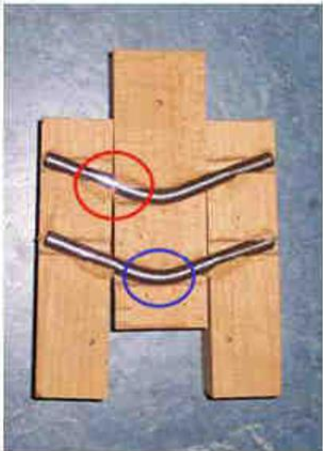


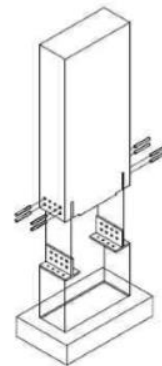
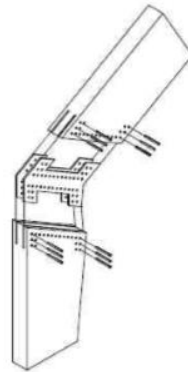
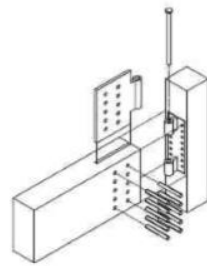
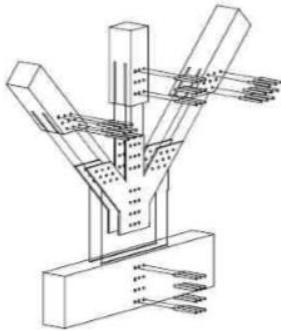
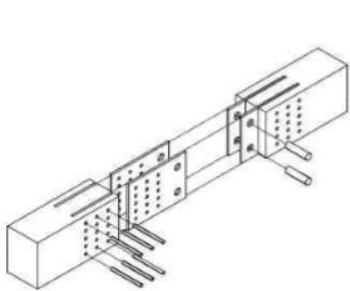
Elementi veze za spajanje vertikalnih i horizontalnih greda



Elementi veze za spajanje vertikalnih i horizontalnih greda

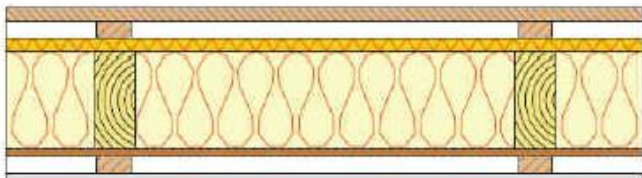






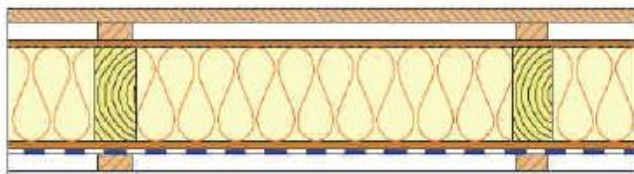
Izolacija

Zid tipa 1 (paropropustan)



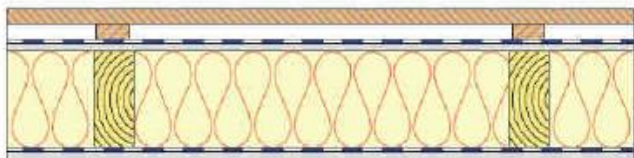
| | |
|-------------------------------------------|--------------|
| Fasadni element | 20 mm |
| Letva | 30 mm |
| (razmak za provetranje) | |
| Okvirna konstrukcija | 140 mm |
| Bitumenizirana ploča od drvnih vlakana | 25 mm |
| Termoizolacija | |
| OSB ploča | 15 mm |
| Letve (instalacije) | 30 mm |
| Gips kartonska ploča | <u>15 mm</u> |

Zid tipa 2 (paronepropustan)



| | |
|---------------------------------------------|--------------|
| Fasadna obloga | 20 mm |
| Letva | 30 mm |
| (razmak za provetranje) | |
| OSB ploča | 15 mm |
| Termička izolacija od mineralnih vlakana | |
| OSB, parna brana | 15 mm |
| Letve (instalacije) | 30 mm |
| Gips kartonska ploča | <u>15 mm</u> |
| | 265 mm |

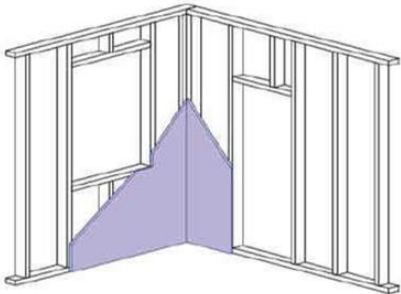
Zid tipa 3 (paronepropustan)



| | |
|------------------------------------------|--------------|
| Fasadna obloga | 20 mm |
| Letva | 30 mm |
| (razmak za provetranje) | |
| Parna brana | |
| Gips kartonska ploča | 15 mm |
| Okvirna konstrukcija | 140 mm |
| Termo izolacija od mineralnih vlakana | |
| Parna brana | |
| Gips kartonska ploča | <u>15 mm</u> |
| | 220 mm |

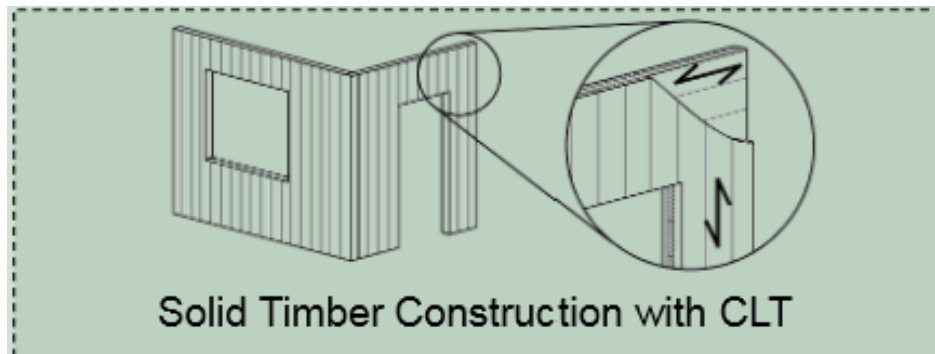
Lagani skeletni sistem

Platform frame construction system



Podela na osnovu načina konstruisanja zidova

▶ CLT



▶ Panelni sistem





„balloon frame“

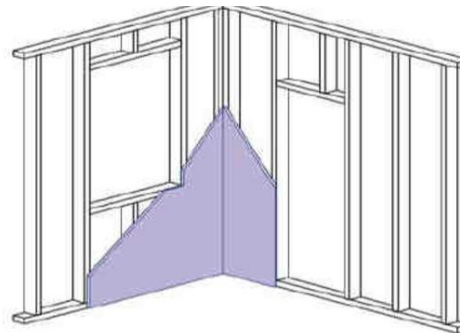


„platform frame“



Karakteristike sistema

- ✓ ograničen tehnički rastur dtvne građe, kao posledica sistemskog korišćenja standardnih dimenzija građe,
- ✓ raspored stubova uslovljen je dimenzijama pločstog materijala proizvedenog na bazi drveta (ili gipsanih ploča), a osnovni razmak stubova od 60 cm osigurava lokalno ukrućenje obložnih ploča i izbjegavanje rastur pločastog materijala, koji može nastati ukrajanjem.
- ✓ nema tesarskih spojeva,
- ✓ na gradilištu se postavljaju svi zidni elementi (prethodno su sastavljeni u radionici) imogu biti u sistemu sitnog i krupnog panela, u zavisnosti od dimenzija elemenata,
- ✓ hermetičnost tako formiranog zida je zagarnotavana i bez komplikovanih tehničkih rešenja,
- ✓ elementi za ukrućenje građevine su sami zidovi, koji zamenjuju poznate sisteme spregova za ukrućenje.

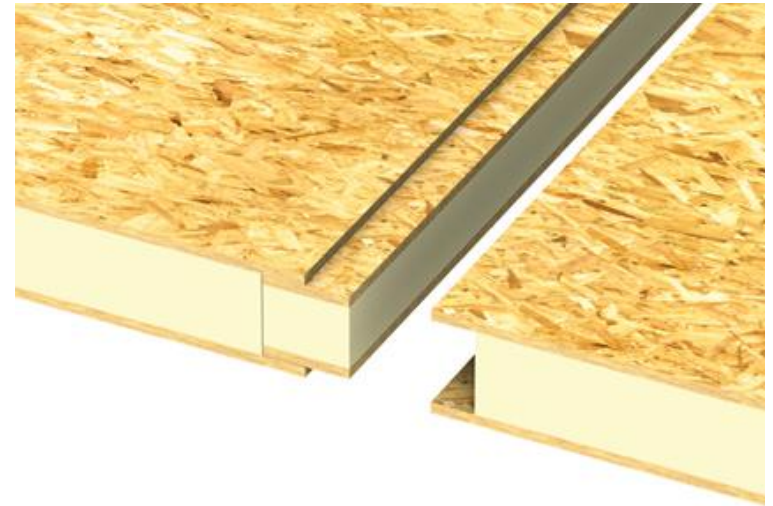


Elementi veze

<https://www.youtube.com/watch?v=egKyZ8yq8>

FQ







Lagani skeletni
sistem
(balon sistem)

Baloon frame
construction system



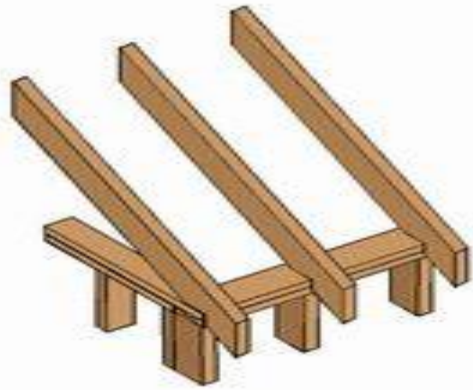
„balloon frame“



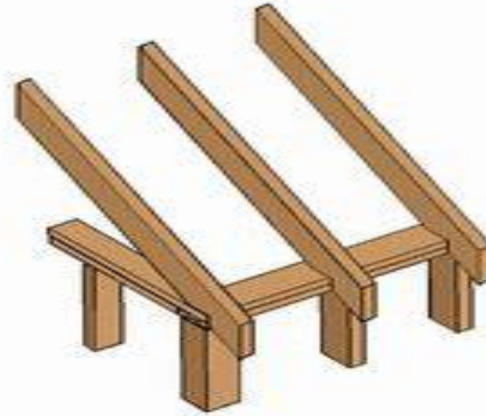
„platform frame“



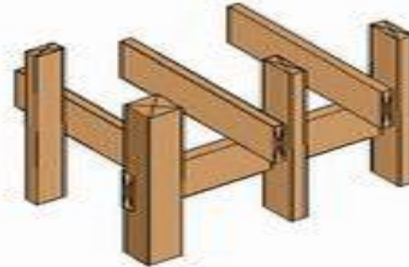
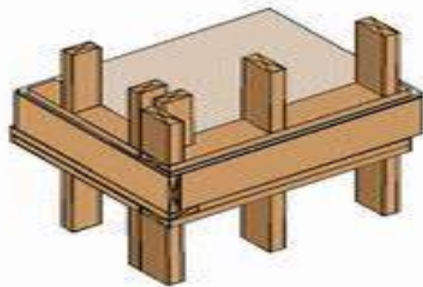
Platform versus balloon framing



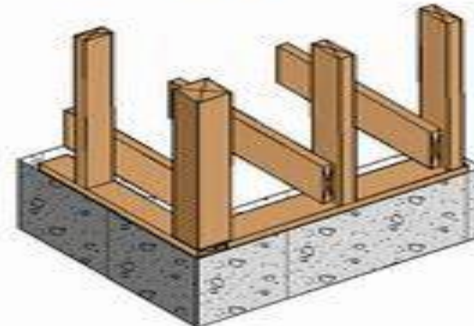
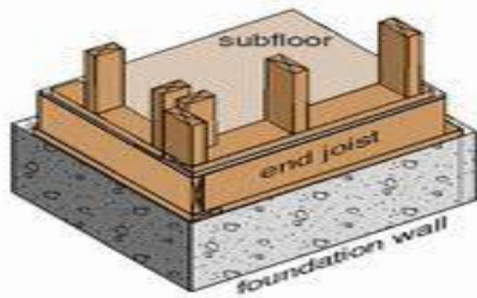
roof framing



second floor



first floor framing



platform framing

balloon framing

perspective view

FRAME TYPES

PLATFORM

BALLOON



ROOF FRAMING

SECOND FLOOR

FIRST FLOOR FRAMING

