

### AUGSTĀKĀ IZTURĪBA

Lieliska izturība pret tērauda lūšanu un stiepi ( $f_{y,k} = 1000 \text{ N/mm}^2$ ). Ļoti augsta griezes izturība  $f_{tor,k}$  drošākai skrūvēšanai.

### LIETOŠANA STRUKTŪRIEKĀRTĀS

Apstiprināta lietošanai strukturālos mezglos ar spiedienu jebkurā virzienā attiecībā pret šķiedru ( $\alpha = 0^\circ - 90^\circ$ ). Asimetriska "lietussarga" vītne, kas palīdz labāk ieurbties koksnē.

### ELASTĪGUMS

Saliekšanās leņķis ir par  $20^\circ$  platāks, salīdzinot ar standartu, kas sertificēts saskaņā ar ETA-11/0030. SEISMIC-REV cikliskās pārbaudes saskaņā ar EN 12512. Seismiskā veiktspēja pārbaudīta saskaņā ar EN 14592.

### CHROMIUM VI FREE

Sešvērtīgā hroma pilnīga neesamība. Atbilstība visstingrākajiem ķīmisko vielu regulēšanas noteikumiem (SVHC). Pieejama REACH informācija.

## ĪPAŠĪBAS

|          |                                   |
|----------|-----------------------------------|
| FOKUSS   | ļoti visaptverošs klāsts          |
| GALVA    | noslēpta, ar izciļņiem zem galvas |
| DIAMETRS | no 3,5 līdz 12,0 mm               |
| GARUMS   | no 30 līdz 600 mm                 |



## MATERIĀLS

Oglekļa tērauds ar galvanisko cinka pārklājumu.

## LIETOŠANAS JOMA

- koksnes paneļi
  - masīvkoks
  - laminēta koksne
  - CLT, LVL
  - augsta blīvuma koksne
- Servisa kategorijas 1 un 2.

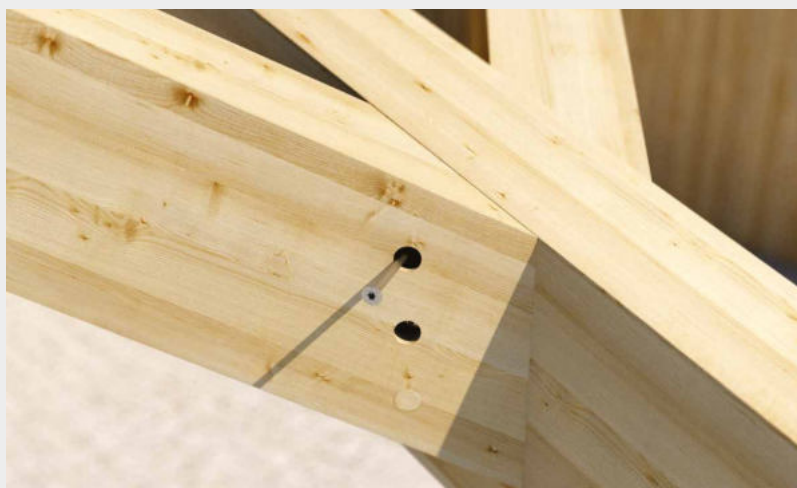


## CLT

Vērtības pārbaudītas, sertificētas un aprēķinātas arī CLT. Aprēķinu tabulas un dimensionēšanas programmatūra (MyProject) CLT pieejami kataloga veidā un tiešsaistē.

## LVL

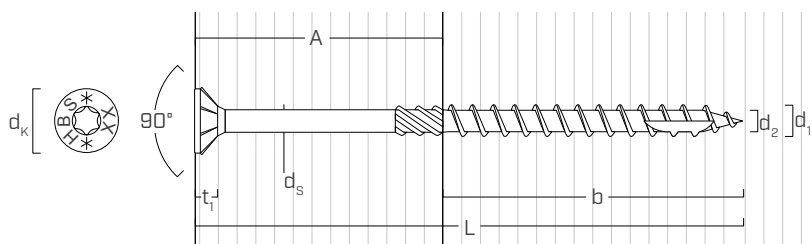
Vērtības pārbaudītas, sertificētas un aprēķinātas arī CLT un augsta blīvuma koksnei, piemēram, LVL mikro lamelārai koksnei.



^  
Sijas un spāres savienojums ar HBS skrūvēm 8 mm diametrā.

^  
Sienas stiprinājumi CLT ar HBS skrūvēm 6 mm diametrā.

## ■ ĢEOMETRIJA UN MEHĀNISKĀS ĪPAŠĪBAS



| Nominālais diametrs                                                    | $d_1$        | [mm]                 | 3,5  | 4    | 4,5  | 5     | 6     | 8     | 10    | 12    |
|------------------------------------------------------------------------|--------------|----------------------|------|------|------|-------|-------|-------|-------|-------|
| Galvas diametrs                                                        | $d_k$        | [mm]                 | 7,00 | 8,00 | 9,00 | 10,00 | 12,00 | 14,50 | 18,25 | 20,75 |
| Kodola diametrs                                                        | $d_2$        | [mm]                 | 2,25 | 2,55 | 2,80 | 3,40  | 3,95  | 5,40  | 6,40  | 6,80  |
| Kāta diametrs                                                          | $d_s$        | [mm]                 | 2,45 | 2,75 | 3,15 | 3,65  | 4,30  | 5,80  | 7,00  | 8,00  |
| Galvas biezums                                                         | $t_1$        | [mm]                 | 2,20 | 2,80 | 2,80 | 3,10  | 4,50  | 4,50  | 5,80  | 7,20  |
| Priekšurbuma diametrs <sup>(1)</sup>                                   | $d_v$        | [mm]                 | 2,0  | 2,5  | 2,5  | 3,0   | 4,0   | 5,0   | 6,0   | 7,0   |
| Raksturīgs stiepes moments                                             | $M_{y,k}$    | [Nm]                 | 2,1  | 3,0  | 4,1  | 5,4   | 9,5   | 20,1  | 35,8  | 48,0  |
| Izturības pret vītnes izraušanos raksturīgais parametrs <sup>(2)</sup> | $f_{ax,k}$   | [N/mm <sup>2</sup> ] | 11,7 | 11,7 | 11,7 | 11,7  | 11,7  | 11,7  | 11,7  | 11,7  |
| Saistītais blīvums                                                     | $\rho_a$     | [kg/m <sup>3</sup> ] | 350  | 350  | 350  | 350   | 350   | 350   | 350   | 350   |
| Izturības pret vītnes izraušanos raksturīgais parametrs <sup>(3)</sup> | $f_{ax,k}$   | [N/mm <sup>2</sup> ] | 15,0 | 15,0 | 15,0 | 15,0  | 15,0  | 15,0  | 15,0  | 15,0  |
| Saistītais blīvums                                                     | $\rho_a$     | [kg/m <sup>3</sup> ] | 500  | 500  | 500  | 500   | 500   | 500   | 500   | 500   |
| Galvas ierbšanas raksturīgais parametrs <sup>(2)</sup>                 | $f_{head,k}$ | [N/mm <sup>2</sup> ] | 10,5 | 10,5 | 10,5 | 10,5  | 10,5  | 10,5  | 10,5  | 10,5  |
| Saistītais blīvums                                                     | $\rho_a$     | [kg/m <sup>3</sup> ] | 350  | 350  | 350  | 350   | 350   | 350   | 350   | 350   |
| Galvas ierbšanas raksturīgais parametrs <sup>(3)</sup>                 | $f_{head,k}$ | [N/mm <sup>2</sup> ] | 20,0 | 20,0 | 20,0 | 20,0  | 20,0  | 20,0  | 20,0  | 20,0  |
| Saistītais blīvums                                                     | $\rho_a$     | [kg/m <sup>3</sup> ] | 500  | 500  | 500  | 500   | 500   | 500   | 500   | 500   |
| Vilces raksturīgā izturība                                             | $f_{tens,k}$ | [kN]                 | 3,8  | 5,0  | 6,4  | 7,9   | 11,3  | 20,1  | 31,4  | 33,9  |

<sup>(1)</sup> Izmēģinājuma caurums derīgs skujkoku koksnei (softwood).

<sup>(2)</sup> Derīgs skujkoku koksnei (softwood) – maksimālais blīvums 440 kg/m<sup>3</sup>.

<sup>(3)</sup> Derīgs skujkoku koksnes (softwood) LVL – maksimālais blīvums 550 kg/m<sup>3</sup>.

Informāciju par lietojumu ar dažādiem materiāliem vai ar lielu blīvumu skatiet ETA-11/0030.



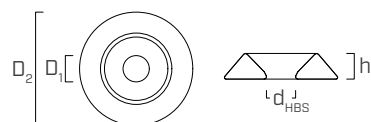
## KODI UN IZMĒRI

| d <sub>1</sub><br>[mm] | KODS    | L<br>[mm] | b<br>[mm] | A<br>[mm] | gab. |
|------------------------|---------|-----------|-----------|-----------|------|
| 3,5<br>TX 15           | HBS3540 | 40        | 18        | 22        | 500  |
|                        | HBS3545 | 45        | 24        | 21        | 400  |
|                        | HBS3550 | 50        | 24        | 26        | 400  |
| 4<br>TX 20             | HBS430  | 30        | 18        | 12        | 500  |
|                        | HBS435  | 35        | 18        | 17        | 500  |
|                        | HBS440  | 40        | 24        | 16        | 500  |
|                        | HBS445  | 45        | 30        | 15        | 400  |
|                        | HBS450  | 50        | 30        | 20        | 400  |
|                        | HBS460  | 60        | 35        | 25        | 200  |
|                        | HBS470  | 70        | 40        | 30        | 200  |
|                        | HBS480  | 80        | 40        | 40        | 200  |
| 4,5<br>TX 20           | HBS4540 | 40        | 24        | 16        | 400  |
|                        | HBS4545 | 45        | 30        | 15        | 400  |
|                        | HBS4550 | 50        | 30        | 20        | 200  |
|                        | HBS4560 | 60        | 35        | 25        | 200  |
|                        | HBS4570 | 70        | 40        | 30        | 200  |
|                        | HBS4580 | 80        | 40        | 40        | 200  |
| 5<br>TX 25             | HBS540  | 40        | 24        | 16        | 200  |
|                        | HBS545  | 45        | 24        | 21        | 200  |
|                        | HBS550  | 50        | 24        | 26        | 200  |
|                        | HBS560  | 60        | 30        | 30        | 200  |
|                        | HBS570  | 70        | 35        | 35        | 100  |
|                        | HBS580  | 80        | 40        | 40        | 100  |
|                        | HBS590  | 90        | 45        | 45        | 100  |
|                        | HBS5100 | 100       | 50        | 50        | 100  |
| 6<br>TX 30             | HBS5120 | 120       | 60        | 60        | 100  |
|                        | HBS640  | 40        | 35        | 8         | 100  |
|                        | HBS650  | 50        | 35        | 15        | 100  |
|                        | HBS660  | 60        | 30        | 30        | 100  |
|                        | HBS670  | 70        | 40        | 30        | 100  |
|                        | HBS680  | 80        | 40        | 40        | 100  |
|                        | HBS690  | 90        | 50        | 40        | 100  |
|                        | HBS6100 | 100       | 50        | 50        | 100  |
|                        | HBS6110 | 110       | 60        | 50        | 100  |
|                        | HBS6120 | 120       | 60        | 60        | 100  |
|                        | HBS6130 | 130       | 60        | 70        | 100  |
|                        | HBS6140 | 140       | 75        | 65        | 100  |
|                        | HBS6150 | 150       | 75        | 75        | 100  |
|                        | HBS6160 | 160       | 75        | 85        | 100  |
|                        | HBS6180 | 180       | 75        | 105       | 100  |
|                        | HBS6200 | 200       | 75        | 125       | 100  |
|                        | HBS6220 | 220       | 75        | 145       | 100  |
|                        | HBS6240 | 240       | 75        | 165       | 100  |
|                        | HBS6260 | 260       | 75        | 185       | 100  |
|                        | HBS6280 | 280       | 75        | 205       | 100  |
|                        | HBS6300 | 300       | 75        | 225       | 100  |

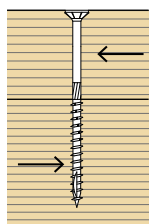
| d <sub>1</sub><br>[mm] | KODS     | L<br>[mm] | b<br>[mm] | A<br>[mm] | gab. |
|------------------------|----------|-----------|-----------|-----------|------|
| 8<br>TX 40             | HBS880   | 80        | 52        | 28        | 100  |
|                        | HBS8100  | 100       | 52        | 48        | 100  |
|                        | HBS8120  | 120       | 60        | 60        | 100  |
|                        | HBS8140  | 140       | 60        | 80        | 100  |
|                        | HBS8160  | 160       | 80        | 80        | 100  |
|                        | HBS8180  | 180       | 80        | 100       | 100  |
|                        | HBS8200  | 200       | 80        | 120       | 100  |
|                        | HBS8220  | 220       | 80        | 140       | 100  |
|                        | HBS8240  | 240       | 80        | 160       | 100  |
|                        | HBS8260  | 260       | 80        | 180       | 100  |
|                        | HBS8280  | 280       | 80        | 200       | 100  |
|                        | HBS8300  | 300       | 100       | 200       | 100  |
|                        | HBS8320  | 320       | 100       | 220       | 100  |
|                        | HBS8340  | 340       | 100       | 240       | 100  |
|                        | HBS8360  | 360       | 100       | 260       | 100  |
|                        | HBS8380  | 380       | 100       | 280       | 100  |
|                        | HBS8400  | 400       | 100       | 300       | 100  |
| 10<br>TX 40            | HBS8440  | 440       | 100       | 340       | 100  |
|                        | HBS8480  | 480       | 100       | 380       | 100  |
|                        | HBS8520  | 520       | 100       | 420       | 100  |
|                        | HBS1080  | 80        | 52        | 28        | 50   |
|                        | HBS10100 | 100       | 52        | 48        | 50   |
|                        | HBS10120 | 120       | 60        | 60        | 50   |
|                        | HBS10140 | 140       | 60        | 80        | 50   |
|                        | HBS10160 | 160       | 80        | 80        | 50   |
|                        | HBS10180 | 180       | 80        | 100       | 50   |
|                        | HBS10200 | 200       | 80        | 120       | 50   |
|                        | HBS10220 | 220       | 80        | 140       | 50   |
|                        | HBS10240 | 240       | 80        | 160       | 50   |
|                        | HBS10260 | 260       | 80        | 180       | 50   |
|                        | HBS10280 | 280       | 80        | 200       | 50   |
|                        | HBS10300 | 300       | 100       | 200       | 50   |
|                        | HBS10320 | 320       | 100       | 220       | 50   |
|                        | HBS10340 | 340       | 100       | 240       | 50   |
| 12<br>TX 50            | HBS10360 | 360       | 100       | 260       | 50   |
|                        | HBS10380 | 380       | 100       | 280       | 50   |
|                        | HBS10400 | 400       | 100       | 300       | 50   |
|                        | HBS12120 | 120       | 80        | 40        | 25   |
|                        | HBS12160 | 160       | 80        | 80        | 25   |
|                        | HBS12200 | 200       | 80        | 120       | 25   |
|                        | HBS12240 | 240       | 80        | 160       | 25   |
|                        | HBS12280 | 280       | 80        | 200       | 25   |
|                        | HBS12320 | 320       | 120       | 200       | 25   |
|                        | HBS12360 | 360       | 120       | 240       | 25   |
|                        | HBS12400 | 400       | 120       | 280       | 25   |
|                        | HBS12440 | 440       | 120       | 320       | 25   |
|                        | HBS12480 | 480       | 120       | 360       | 25   |
|                        | HBS12520 | 520       | 120       | 400       | 25   |
|                        | HBS12560 | 560       | 120       | 440       | 25   |
|                        | HBS12600 | 600       | 120       | 480       | 25   |

## VIRPOTA PAPLĀKSNE HUS

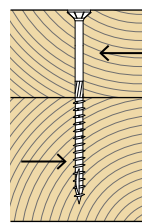
| d <sub>HBS</sub><br>[mm] | KODS  | D <sub>1</sub><br>[mm] | D <sub>2</sub><br>[mm] | h<br>[mm] | gab. |
|--------------------------|-------|------------------------|------------------------|-----------|------|
| 6                        | HUS6  | 7,5                    | 20,0                   | 4,50      | 100  |
| 8                        | HUS8  | 8,5                    | 25,0                   | 5,50      | 50   |
| 10                       | HUS10 | 10,8                   | 30,0                   | 6,50      | 50   |
| 12                       | HUS12 | 14,0                   | 37,0                   | 8,50      | 25   |



## MINIMĀLAIS ATTĀLUMS GARENISKI SASPIESTĀM SKRŪVĒM



Leņķis starp spēku un šķiedrām  $\alpha = 0^\circ$



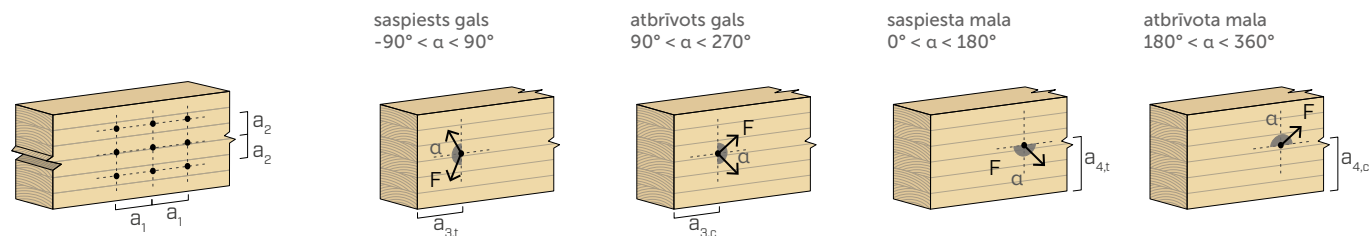
Leņķis starp spēku un šķiedrām  $\alpha = 90^\circ$

| SKRŪVES, KAS IEVIETOTAS AR PRIEKŠURBUMU |      |      |    |     |    |      |    |    |    |     | SKRŪVES, KAS IEVIETOTAS AR PRIEKŠURBUMU |     |     |    |    |     |    |    |    |    |    |
|-----------------------------------------|------|------|----|-----|----|------|----|----|----|-----|-----------------------------------------|-----|-----|----|----|-----|----|----|----|----|----|
| $d_1$                                   | [mm] | 3,5  | 4  | 4,5 | 5  | 6    | 8  | 10 | 12 |     | 3,5                                     | 4   | 4,5 | 5  | 6  | 8   | 10 | 12 |    |    |    |
| $a_1$                                   | [mm] | 5·d  | 18 | 20  | 23 | 5·d  | 25 | 30 | 40 | 50  | 60                                      | 4·d | 14  | 16 | 18 | 4·d | 20 | 24 | 32 | 40 | 48 |
| $a_2$                                   | [mm] | 3·d  | 11 | 12  | 14 | 3·d  | 15 | 18 | 24 | 30  | 36                                      | 4·d | 14  | 16 | 18 | 4·d | 20 | 24 | 32 | 40 | 48 |
| $a_{3,t}$                               | [mm] | 12·d | 42 | 48  | 54 | 12·d | 60 | 72 | 96 | 120 | 144                                     | 7·d | 25  | 28 | 32 | 7·d | 35 | 42 | 56 | 70 | 84 |
| $a_{3,c}$                               | [mm] | 7·d  | 25 | 28  | 32 | 7·d  | 35 | 42 | 56 | 70  | 84                                      | 7·d | 25  | 28 | 32 | 7·d | 35 | 42 | 56 | 70 | 84 |
| $a_{4,t}$                               | [mm] | 3·d  | 11 | 12  | 14 | 3·d  | 15 | 18 | 24 | 30  | 36                                      | 5·d | 18  | 20 | 23 | 7·d | 35 | 42 | 56 | 70 | 84 |
| $a_{4,c}$                               | [mm] | 3·d  | 11 | 12  | 14 | 3·d  | 15 | 18 | 24 | 30  | 36                                      | 3·d | 11  | 12 | 14 | 3·d | 15 | 18 | 24 | 30 | 36 |

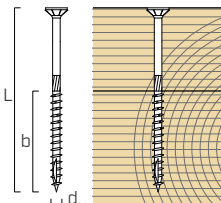
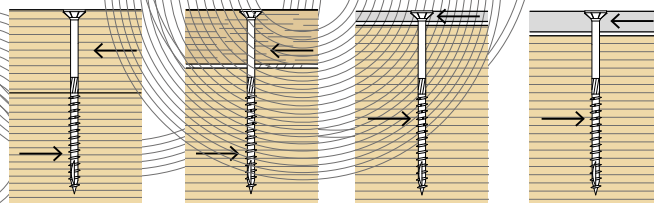
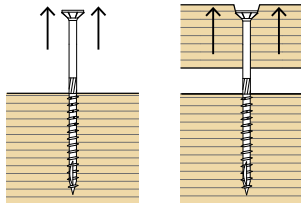
| SKRŪVES, KAS IEVIETOTAS BEZ PRIEKŠURBUMA |      |      |    |     |    |      |    |    |     |     | SKRŪVES, KAS IEVIETOTAS BEZ PRIEKŠURBUMA |      |     |    |    |      |    |    |    |     |     |
|------------------------------------------|------|------|----|-----|----|------|----|----|-----|-----|------------------------------------------|------|-----|----|----|------|----|----|----|-----|-----|
| $d_1$                                    | [mm] | 3,5  | 4  | 4,5 | 5  | 6    | 8  | 10 | 12  |     | 3,5                                      | 4    | 4,5 | 5  | 6  | 8    | 10 | 12 |    |     |     |
| $a_1$                                    | [mm] | 10·d | 35 | 40  | 45 | 12·d | 60 | 72 | 96  | 120 | 144                                      | 5·d  | 18  | 20 | 23 | 5·d  | 25 | 30 | 40 | 50  | 60  |
| $a_2$                                    | [mm] | 5·d  | 18 | 20  | 23 | 5·d  | 25 | 30 | 40  | 50  | 60                                       | 5·d  | 18  | 20 | 23 | 5·d  | 25 | 30 | 40 | 50  | 60  |
| $a_{3,t}$                                | [mm] | 15·d | 53 | 60  | 68 | 15·d | 75 | 90 | 120 | 150 | 180                                      | 10·d | 35  | 40 | 45 | 10·d | 50 | 60 | 80 | 100 | 120 |
| $a_{3,c}$                                | [mm] | 10·d | 35 | 40  | 45 | 10·d | 50 | 60 | 80  | 100 | 120                                      | 10·d | 35  | 40 | 45 | 10·d | 50 | 60 | 80 | 100 | 120 |
| $a_{4,t}$                                | [mm] | 5·d  | 18 | 20  | 23 | 5·d  | 25 | 30 | 40  | 50  | 60                                       | 7·d  | 25  | 28 | 32 | 10·d | 50 | 60 | 80 | 100 | 120 |
| $a_{4,c}$                                | [mm] | 5·d  | 18 | 20  | 23 | 5·d  | 25 | 30 | 40  | 50  | 60                                       | 5·d  | 18  | 20 | 23 | 5·d  | 25 | 30 | 40 | 50  | 60  |

$d$  = nominālais skrūves diametrs



### PIEZĪMES:

- Minimālie attālumus ir atbilstoši tiesību aktiem EN 1995:2014 sašķaņā ar ETA-11/0030, ņemot vērā koka elementu blīvumu  $\rho_k \leq 420 \text{ kg/m}^3$  un aprēķinu diametru, kas vienāds ar  $d$  = nominālo skrūves diametru.
- Tērauda un koka savienojumu gadījumā minimālo attālumus ( $a_1$ ,  $a_2$ ) var reizināt ar koeficientu 0,7.
- Paneļu un koka savienojumu gadījumā minimālo attālumus ( $a_1$ ,  $a_2$ ) var reizināt ar koeficientu 0,85.
- Savienojumu gadījumā ar Douglas egles (Pseudotsuga menziesii) elementiem atstarpes un minimālie attālumus paralēli šķiedrai ir jāreizina ar koeficientu 1,5.

| ģeometrija                                                                        |           |           |           | GRIEZUMS                                                                           |                             |                                           |                                           | VILCE                                                                               |                                |      |
|-----------------------------------------------------------------------------------|-----------|-----------|-----------|------------------------------------------------------------------------------------|-----------------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------|------|
|                                                                                   |           |           |           | koks-koks                                                                          | panelis-koks <sup>(1)</sup> | tērauds-plāna koka plāksne <sup>(2)</sup> | tērauds-bieza koka plāksne <sup>(3)</sup> | vītnes izraušana <sup>(4)</sup>                                                     | galvas iebūšana <sup>(5)</sup> |      |
|  |           |           |           |  |                             |                                           |                                           |  |                                |      |
| d <sub>1</sub><br>[mm]                                                            | L<br>[mm] | b<br>[mm] | A<br>[mm] | R <sub>V,k</sub><br>[kN]                                                           | R <sub>V,k</sub><br>[kN]    | R <sub>V,k</sub><br>[kN]                  | R <sub>V,k</sub><br>[kN]                  | R <sub>ax,k</sub><br>[kN]                                                           | R <sub>head,k</sub><br>[kN]    |      |
| 3,5                                                                               | 40        | 18        | 22        | 0,73                                                                               | S <sub>PAN</sub> = 12 mm    | 0,72                                      | S <sub>PLATE</sub> = 1,75 mm              | 1,12                                                                                | 0,80                           | 0,56 |
|                                                                                   | 45        | 24        | 21        | 0,79                                                                               |                             | 0,72                                      |                                           | 1,18                                                                                | 1,06                           | 0,56 |
|                                                                                   | 50        | 24        | 26        | 0,79                                                                               |                             | 0,72                                      |                                           | 1,18                                                                                | 1,06                           | 0,56 |
| 4                                                                                 | 30        | 18        | 12        | 0,72                                                                               | S <sub>PAN</sub> = 12 mm    | 0,76                                      | S <sub>PLATE</sub> = 2,0 mm               | 1,28                                                                                | 0,91                           | 0,73 |
|                                                                                   | 35        | 18        | 17        | 0,79                                                                               |                             | 0,84                                      |                                           | 1,38                                                                                | 0,91                           | 0,73 |
|                                                                                   | 40        | 24        | 16        | 0,83                                                                               |                             | 0,84                                      |                                           | 1,45                                                                                | 1,21                           | 0,73 |
|                                                                                   | 45        | 30        | 15        | 0,81                                                                               |                             | 0,84                                      |                                           | 1,53                                                                                | 1,52                           | 0,73 |
|                                                                                   | 50        | 30        | 20        | 0,91                                                                               |                             | 0,84                                      |                                           | 1,53                                                                                | 1,52                           | 0,73 |
|                                                                                   | 60        | 35        | 25        | 0,99                                                                               |                             | 0,84                                      |                                           | 1,59                                                                                | 1,77                           | 0,73 |
|                                                                                   | 70        | 40        | 30        | 0,99                                                                               |                             | 0,84                                      |                                           | 1,65                                                                                | 2,02                           | 0,73 |
| 4,5                                                                               | 40        | 24        | 16        | 0,98                                                                               | S <sub>PAN</sub> = 12 mm    | 1,06                                      | S <sub>PLATE</sub> = 2,25 mm              | 1,74                                                                                | 1,36                           | 0,92 |
|                                                                                   | 45        | 30        | 15        | 0,96                                                                               |                             | 1,06                                      |                                           | 1,83                                                                                | 1,70                           | 0,92 |
|                                                                                   | 50        | 30        | 20        | 1,06                                                                               |                             | 1,06                                      |                                           | 1,83                                                                                | 1,70                           | 0,92 |
|                                                                                   | 60        | 35        | 25        | 1,18                                                                               |                             | 1,06                                      |                                           | 1,90                                                                                | 1,99                           | 0,92 |
|                                                                                   | 70        | 40        | 30        | 1,22                                                                               |                             | 1,06                                      |                                           | 1,97                                                                                | 2,27                           | 0,92 |
|                                                                                   | 80        | 40        | 40        | 1,22                                                                               |                             | 1,06                                      |                                           | 1,97                                                                                | 2,27                           | 0,92 |
| 5                                                                                 | 40        | 24        | 16        | 1,12                                                                               | S <sub>PAN</sub> = 12 mm    | 1,16                                      | S <sub>PLATE</sub> = 2,5 mm               | 2,00                                                                                | 1,52                           | 1,13 |
|                                                                                   | 45        | 24        | 21        | 1,19                                                                               |                             | 1,20                                      |                                           | 2,05                                                                                | 1,52                           | 1,13 |
|                                                                                   | 50        | 24        | 26        | 1,29                                                                               |                             | 1,20                                      |                                           | 2,05                                                                                | 1,52                           | 1,13 |
|                                                                                   | 60        | 30        | 30        | 1,46                                                                               |                             | 1,20                                      |                                           | 2,14                                                                                | 1,89                           | 1,13 |
|                                                                                   | 70        | 35        | 35        | 1,46                                                                               |                             | 1,20                                      |                                           | 2,22                                                                                | 2,21                           | 1,13 |
|                                                                                   | 80        | 40        | 40        | 1,46                                                                               |                             | 1,20                                      |                                           | 2,30                                                                                | 2,53                           | 1,13 |
|                                                                                   | 90        | 45        | 45        | 1,46                                                                               |                             | 1,20                                      |                                           | 2,38                                                                                | 2,84                           | 1,13 |
|                                                                                   | 100       | 50        | 50        | 1,46                                                                               |                             | 1,20                                      |                                           | 2,46                                                                                | 3,16                           | 1,13 |
|                                                                                   | 120       | 60        | 60        | 1,46                                                                               |                             | 1,20                                      |                                           | 2,62                                                                                | 3,79                           | 1,13 |

#### PIEZĪMES:

- (1) Griezuma raksturīgo izturību novērtē, ņemot vērā OSB3 vai OSB4 plātni saskaņā ar EN 300 vai skaidu plātņi saskaņā ar EN 312 ar blīvumu S<sub>PAN</sub>.
- (2) Griezuma raksturīgo izturību novērtē, ņemot vērā plāno plāksni (S<sub>PLATE</sub> ≤ 0,5 d<sub>1</sub>).
- (3) Griezuma raksturīgo izturību novērtē, ņemot vērā biezo plāksni (S<sub>PLATE</sub> ≥ d<sub>1</sub>).
- (4) Aksālā pretestība pret vītnes izraušanu tika novērtēta, ņemot vērā 90° leņķi starp šķiedrām un savienotāju un ieskrūvēšanas garumu, kas vienāds ar b.

- (5) Aksālā pretestība pret galvas iebūšanu ar un bez paplāksnes tika novērtēta uz koka elementa.
- Tērauda un koka savienojumu gadījumā tērauda stiepes izturība parasti ir saistoša attiecībā uz galvas izraušanu vai iebūšanu.

| ģeometrija     |      |      |      | koks-koks        |                  | koks-koks<br>ar paplāksni | tērauds-plāna<br>koka plāksne <sup>(2)</sup> | tērauds-bieza<br>koka plāksne <sup>(3)</sup> | VILCE                              |                                    |                                                 |
|----------------|------|------|------|------------------|------------------|---------------------------|----------------------------------------------|----------------------------------------------|------------------------------------|------------------------------------|-------------------------------------------------|
|                |      |      |      |                  |                  |                           |                                              |                                              | vītnes<br>izraušana <sup>(4)</sup> | galvas<br>ieurbšana <sup>(5)</sup> | galvas ieurbšana<br>ar paplāksni <sup>(5)</sup> |
| d <sub>1</sub> | L    | b    | A    | R <sub>V,k</sub> | R <sub>V,k</sub> | R <sub>V,k</sub>          | R <sub>V,k</sub>                             | R <sub>ax,k</sub>                            | R <sub>head,k</sub>                | R <sub>head,k</sub>                |                                                 |
| [mm]           | [mm] | [mm] | [mm] | [kN]             | [kN]             | [kN]                      | [kN]                                         | [kN]                                         | [kN]                               | [kN]                               |                                                 |
| 6              | 40   | 35   | 8    | 0,89             | 0,89             | S <sub>PLATE</sub> = 3 mm | 1,64                                         | 2,60                                         | 2,65                               | 1,63                               | 4,53                                            |
|                | 50   | 35   | 15   | 1,53             | 1,66             |                           | 2,08                                         | 2,98                                         | 2,65                               | 1,63                               | 4,53                                            |
|                | 60   | 30   | 30   | 1,78             | 1,94             |                           | 2,24                                         | 2,93                                         | 2,27                               | 1,63                               | 4,53                                            |
|                | 70   | 40   | 30   | 1,88             | 2,23             |                           | 2,43                                         | 3,12                                         | 3,03                               | 1,63                               | 4,53                                            |
|                | 80   | 40   | 40   | 2,08             | 2,43             |                           | 2,43                                         | 3,12                                         | 3,03                               | 1,63                               | 4,53                                            |
|                | 90   | 50   | 40   | 2,08             | 2,61             |                           | 2,61                                         | 3,31                                         | 3,79                               | 1,63                               | 4,53                                            |
|                | 100  | 50   | 50   | 2,08             | 2,61             |                           | 2,61                                         | 3,31                                         | 3,79                               | 1,63                               | 4,53                                            |
|                | 110  | 60   | 50   | 2,08             | 2,80             |                           | 2,80                                         | 3,49                                         | 4,55                               | 1,63                               | 4,53                                            |
|                | 120  | 60   | 60   | 2,08             | 2,80             |                           | 2,80                                         | 3,49                                         | 4,55                               | 1,63                               | 4,53                                            |
|                | 130  | 60   | 70   | 2,08             | 2,80             |                           | 2,80                                         | 3,49                                         | 4,55                               | 1,63                               | 4,53                                            |
|                | 140  | 75   | 65   | 2,08             | 2,80             |                           | 3,09                                         | 3,78                                         | 5,68                               | 1,63                               | 4,53                                            |
|                | 150  | 75   | 75   | 2,08             | 2,80             |                           | 3,09                                         | 3,78                                         | 5,68                               | 1,63                               | 4,53                                            |
|                | 160  | 75   | 85   | 2,08             | 2,80             |                           | 3,09                                         | 3,78                                         | 5,68                               | 1,63                               | 4,53                                            |
|                | 180  | 75   | 105  | 2,08             | 2,80             |                           | 3,09                                         | 3,78                                         | 5,68                               | 1,63                               | 4,53                                            |
|                | 200  | 75   | 125  | 2,08             | 2,80             |                           | 3,09                                         | 3,78                                         | 5,68                               | 1,63                               | 4,53                                            |
|                | 220  | 75   | 145  | 2,08             | 2,80             |                           | 3,09                                         | 3,78                                         | 5,68                               | 1,63                               | 4,53                                            |
|                | 240  | 75   | 165  | 2,08             | 2,80             |                           | 3,09                                         | 3,78                                         | 5,68                               | 1,63                               | 4,53                                            |
|                | 260  | 75   | 185  | 2,08             | 2,80             |                           | 3,09                                         | 3,78                                         | 5,68                               | 1,63                               | 4,53                                            |
| 8              | 280  | 75   | 205  | 2,08             | 2,80             |                           | 3,09                                         | 3,78                                         | 5,68                               | 1,63                               | 4,53                                            |
|                | 300  | 75   | 225  | 2,08             | 2,80             |                           | 3,09                                         | 3,78                                         | 5,68                               | 1,63                               | 4,53                                            |
|                | 80   | 52   | 28   | 2,59             | 3,31             | S <sub>PLATE</sub> = 4 mm | 4,00                                         | 5,11                                         | 5,25                               | 2,38                               | 7,08                                            |
|                | 100  | 52   | 48   | 3,28             | 4,00             |                           | 4,00                                         | 5,11                                         | 5,25                               | 2,38                               | 7,08                                            |
|                | 120  | 60   | 60   | 3,28             | 4,20             |                           | 4,20                                         | 5,31                                         | 6,06                               | 2,38                               | 7,08                                            |
|                | 140  | 60   | 80   | 3,28             | 4,20             |                           | 4,20                                         | 5,31                                         | 6,06                               | 2,38                               | 7,08                                            |
|                | 160  | 80   | 80   | 3,28             | 4,45             |                           | 4,70                                         | 5,81                                         | 8,08                               | 2,38                               | 7,08                                            |
|                | 180  | 80   | 100  | 3,28             | 4,45             |                           | 4,70                                         | 5,81                                         | 8,08                               | 2,38                               | 7,08                                            |
|                | 200  | 80   | 120  | 3,28             | 4,45             |                           | 4,70                                         | 5,81                                         | 8,08                               | 2,38                               | 7,08                                            |
|                | 220  | 80   | 140  | 3,28             | 4,45             |                           | 4,70                                         | 5,81                                         | 8,08                               | 2,38                               | 7,08                                            |
|                | 240  | 80   | 160  | 3,28             | 4,45             |                           | 4,70                                         | 5,81                                         | 8,08                               | 2,38                               | 7,08                                            |
|                | 260  | 80   | 180  | 3,28             | 4,45             |                           | 4,70                                         | 5,81                                         | 8,08                               | 2,38                               | 7,08                                            |
|                | 280  | 80   | 200  | 3,28             | 4,45             |                           | 4,70                                         | 5,81                                         | 8,08                               | 2,38                               | 7,08                                            |
|                | 300  | 100  | 200  | 3,28             | 4,45             |                           | 5,21                                         | 6,32                                         | 10,10                              | 2,38                               | 7,08                                            |
|                | 320  | 100  | 220  | 3,28             | 4,45             |                           | 5,21                                         | 6,32                                         | 10,10                              | 2,38                               | 7,08                                            |
|                | 340  | 100  | 240  | 3,28             | 4,45             |                           | 5,21                                         | 6,32                                         | 10,10                              | 2,38                               | 7,08                                            |
|                | 360  | 100  | 260  | 3,28             | 4,45             |                           | 5,21                                         | 6,32                                         | 10,10                              | 2,38                               | 7,08                                            |
|                | 380  | 100  | 280  | 3,28             | 4,45             |                           | 5,21                                         | 6,32                                         | 10,10                              | 2,38                               | 7,08                                            |
|                | 400  | 100  | 300  | 3,28             | 4,45             |                           | 5,21                                         | 6,32                                         | 10,10                              | 2,38                               | 7,08                                            |
| 10             | 440  | 100  | 340  | 3,28             | 4,45             |                           | 5,21                                         | 6,32                                         | 10,10                              | 2,38                               | 7,08                                            |
|                | 480  | 100  | 380  | 3,28             | 4,45             |                           | 5,21                                         | 6,32                                         | 10,10                              | 2,38                               | 7,08                                            |
|                | 520  | 100  | 420  | 3,28             | 4,45             |                           | 5,21                                         | 6,32                                         | 10,10                              | 2,38                               | 7,08                                            |
|                | 80   | 52   | 28   | 3,63             | 4,33             | S <sub>PLATE</sub> = 5 mm | 4,75                                         | 6,94                                         | 6,57                               | 3,77                               | 10,20                                           |
|                | 100  | 52   | 48   | 4,22             | 4,92             |                           | 5,51                                         | 7,12                                         | 6,57                               | 3,77                               | 10,20                                           |
|                | 120  | 60   | 60   | 4,81             | 5,76             |                           | 5,76                                         | 7,37                                         | 7,58                               | 3,77                               | 10,20                                           |
|                | 140  | 60   | 80   | 4,81             | 5,76             |                           | 5,76                                         | 7,37                                         | 7,58                               | 3,77                               | 10,20                                           |
|                | 160  | 80   | 80   | 4,81             | 6,40             |                           | 6,40                                         | 8,00                                         | 10,10                              | 3,77                               | 10,20                                           |
|                | 180  | 80   | 100  | 4,81             | 6,40             |                           | 6,40                                         | 8,00                                         | 10,10                              | 3,77                               | 10,20                                           |
|                | 200  | 80   | 120  | 4,81             | 6,40             |                           | 6,40                                         | 8,00                                         | 10,10                              | 3,77                               | 10,20                                           |
|                | 220  | 80   | 140  | 4,81             | 6,40             |                           | 6,40                                         | 8,00                                         | 10,10                              | 3,77                               | 10,20                                           |
|                | 240  | 80   | 160  | 4,81             | 6,40             |                           | 6,40                                         | 8,00                                         | 10,10                              | 3,77                               | 10,20                                           |
|                | 260  | 80   | 180  | 4,81             | 6,40             |                           | 6,40                                         | 8,00                                         | 10,10                              | 3,77                               | 10,20                                           |
|                | 280  | 80   | 200  | 4,81             | 6,40             |                           | 6,40                                         | 8,00                                         | 10,10                              | 3,77                               | 10,20                                           |
|                | 300  | 100  | 200  | 4,81             | 6,42             |                           | 7,03                                         | 8,63                                         | 12,63                              | 3,77                               | 10,20                                           |
|                | 320  | 100  | 220  | 4,81             | 6,42             |                           | 7,03                                         | 8,63                                         | 12,63                              | 3,77                               | 10,20                                           |
|                | 340  | 100  | 240  | 4,81             | 6,42             |                           | 7,03                                         | 8,63                                         | 12,63                              | 3,77                               | 10,20                                           |
|                | 360  | 100  | 260  | 4,81             | 6,42             |                           | 7,03                                         | 8,63                                         | 12,63                              | 3,77                               | 10,20                                           |
|                | 380  | 100  | 280  | 4,81             | 6,42             |                           | 7,03                                         | 8,63                                         | 12,63                              | 3,77                               | 10,20                                           |
|                | 400  | 100  | 300  | 4,81             | 6,42             |                           | 7,03                                         | 8,63                                         | 12,63                              | 3,77                               | 10,20                                           |

|               |           |           |           | GRIEZUMS          |                        |                                           |                                           | VILCE                           |                                 |                                              |
|---------------|-----------|-----------|-----------|-------------------|------------------------|-------------------------------------------|-------------------------------------------|---------------------------------|---------------------------------|----------------------------------------------|
| ģeometrija    |           |           |           | koks-koks         | koks-koks ar paplāksni | tērauds-plāna koka plāksne <sup>(2)</sup> | tērauds-bieza koka plāksne <sup>(3)</sup> | vītnes izraušana <sup>(4)</sup> | galvas ieurbšana <sup>(5)</sup> | galvas ieurbšana ar paplāksni <sup>(5)</sup> |
|               |           |           |           |                   |                        |                                           |                                           |                                 |                                 |                                              |
| $d_1$<br>[mm] | L<br>[mm] | b<br>[mm] | A<br>[mm] | $R_{v,k}$<br>[kN] | $R_{v,k}$<br>[kN]      | $R_{v,k}$<br>[kN]                         | $R_{v,k}$<br>[kN]                         | $R_{ax,k}$<br>[kN]              | $R_{head,k}$<br>[kN]            | $R_{head,k}$<br>[kN]                         |
| 12            | 120       | 80        | 40        | 4,87              | 6,68                   | 7,81                                      | 9,79                                      | 12,12                           | 4,88                            | 15,51                                        |
|               | 160       | 80        | 80        | 6,00              | 7,81                   | 7,81                                      | 9,79                                      | 12,12                           | 4,88                            | 15,51                                        |
|               | 200       | 80        | 120       | 6,00              | 7,81                   | 7,81                                      | 9,79                                      | 12,12                           | 4,88                            | 15,51                                        |
|               | 240       | 80        | 160       | 6,00              | 7,81                   | 7,81                                      | 9,79                                      | 12,12                           | 4,88                            | 15,51                                        |
|               | 280       | 80        | 200       | 6,00              | 7,81                   | 7,81                                      | 9,79                                      | 12,12                           | 4,88                            | 15,51                                        |
|               | 320       | 120       | 200       | 6,00              | 8,66                   | 9,32                                      | 11,30                                     | 18,18                           | 4,88                            | 15,51                                        |
|               | 360       | 120       | 240       | 6,00              | 8,66                   | 9,32                                      | 11,30                                     | 18,18                           | 4,88                            | 15,51                                        |
|               | 400       | 120       | 280       | 6,00              | 8,66                   | 9,32                                      | 11,30                                     | 18,18                           | 4,88                            | 15,51                                        |
|               | 440       | 120       | 320       | 6,00              | 8,66                   | 9,32                                      | 11,30                                     | 18,18                           | 4,88                            | 15,51                                        |
|               | 480       | 120       | 360       | 6,00              | 8,66                   | 9,32                                      | 11,30                                     | 18,18                           | 4,88                            | 15,51                                        |
|               | 520       | 120       | 400       | 6,00              | 8,66                   | 9,32                                      | 11,30                                     | 18,18                           | 4,88                            | 15,51                                        |
|               | 560       | 120       | 440       | 6,00              | 8,66                   | 9,32                                      | 11,30                                     | 18,18                           | 4,88                            | 15,51                                        |
|               | 600       | 120       | 480       | 6,00              | 8,66                   | 9,32                                      | 11,30                                     | 18,18                           | 4,88                            | 15,51                                        |

#### PIEZĪMES:

- (1) Griezuma raksturīgo izturību novērtē, ņemot vērā OSB3 vai OSB4 plātni saskaņā ar EN 300 vai skaidu plātņi saskaņā ar EN 312 ar blīvumu  $S_{PAN}$ .
- (2) Griezuma raksturīgo izturību novērtē, ņemot vērā plāno plāksni ( $S_{PLATE} \leq 0,5 d_1$ ).
- (3) Griezuma raksturīgo izturību novērtē, ņemot vērā biezo plāksni ( $S_{PLATE} \geq d_1$ ).
- (4) Akslālā pretestība pret vītnes izraušanos tika novērtēta, ņemot vērā 90° leņķi starp šķiedrām un savienotāju un ieskrūvēšanas garumu, kas vienāds ar b.
- (5) Akslālā pretestība pret galvas ieurbšanu ar un bez paplāksnes tika novērtēta uz koka elementa.

Tērauda un koka savienojumu gadījumā tērauda stiepes izturība parasti ir saistoša attiecībā uz galvas izraušanu vai ieurbšanu.

#### VISPĀRĪGI PRINCIPI:

- Raksturīgās vērtības atbilst EN 1995:2014 saskaņā ar ETA-11/0030.
- Projekta vērtības no raksturīgajām vērtībām tiek iegūtas šādi:

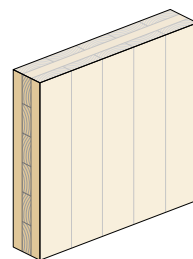
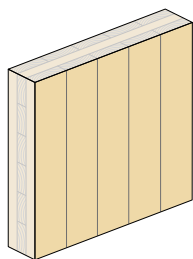
$$R_d = \frac{R_k \cdot k_{mod}}{\gamma_M}$$

Koeficienti  $\gamma_M$  un  $k_{mod}$  jāpieņem atbilstoši spēkā esošajiem tiesību aktiem, ko izmanto aprēķinos.

- Attiecībā uz mehāniskās izturības vērtībām un skrūvju ģeometriju tika sniegta atsauce uz to, kas norādīts ETA-11/0030.
- Aprēķinu posmā tika ņemts vērā koka elementu blīvums, kas vienāds ar  $\rho_k = 385 \text{ kg/m}^3$ .
- Vērtības tika aprēķinātas, ņemot vērā vītņotās daļas pilnīgu ievietošanu koka elementā.
- Koka elementu, paneļu un tērauda plākšņu dimensionēšana un pārbaude jāveic atsevišķi.
- Griezuma raksturīgo izturību novērtē skrūvēm, kas ievietotas bez priekšurbuma; ja skrūves ir ievietotas ar priekšurbumu, iespējams iegūt augstākas pretestības vērtības.
- Dažādām aprēķinu konfigurācijām ir pieejama MyProject programmatūra ([www.rothoblaas.com](http://www.rothoblaas.com)).

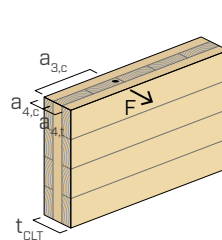
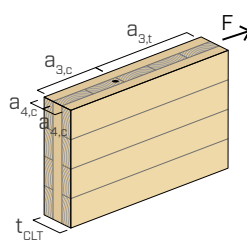
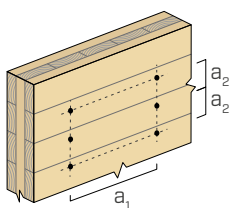
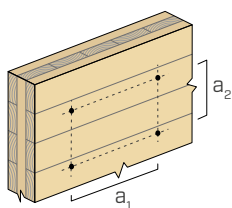
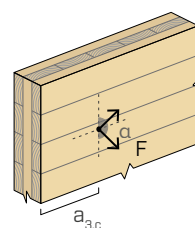
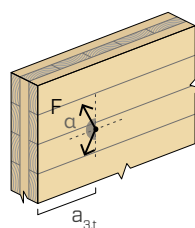
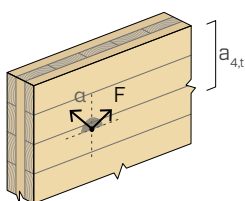
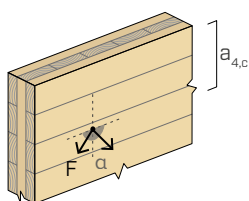


## ■ MINIMĀLAIS ATTĀLUMS GARENISKI SASPIESTĀM UN AKSIĀLI SLOGOTĀM SKRŪVĒM | CLT



|                  |      | SKRŪVES, KAS IEVIETOTAS BEZ PRIEKŠURBUMA |    |    |    |                            | SKRŪVES, KAS IEVIETOTAS BEZ PRIEKŠURBUMA |    |    |     |     |
|------------------|------|------------------------------------------|----|----|----|----------------------------|------------------------------------------|----|----|-----|-----|
|                  |      | lateral face <sup>(1)</sup>              |    |    |    | narrow face <sup>(2)</sup> |                                          |    |    |     |     |
| d <sub>1</sub>   | [mm] | 6                                        | 8  | 10 | 12 |                            | 6                                        | 8  | 10 | 12  |     |
| a <sub>1</sub>   | [mm] | 4·d                                      | 24 | 32 | 40 | 48                         | 10·d                                     | 60 | 80 | 100 | 120 |
| a <sub>2</sub>   | [mm] | 2,5·d                                    | 15 | 20 | 25 | 30                         | 4·d                                      | 24 | 32 | 40  | 48  |
| a <sub>3,t</sub> | [mm] | 6·d                                      | 36 | 48 | 60 | 72                         | 12·d                                     | 72 | 96 | 120 | 144 |
| a <sub>3,c</sub> | [mm] | 6·d                                      | 36 | 48 | 60 | 72                         | 7·d                                      | 42 | 56 | 70  | 84  |
| a <sub>4,t</sub> | [mm] | 6·d                                      | 36 | 48 | 60 | 72                         | 6·d                                      | 36 | 48 | 60  | 72  |
| a <sub>4,c</sub> | [mm] | 2,5·d                                    | 15 | 20 | 25 | 30                         | 3·d                                      | 18 | 24 | 30  | 36  |

d = nominālais skrūves diametrs



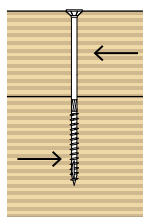
### PIEZĪMES:

Minimālie attāļumi atbilst ETA-11/0030 un ir uzskatāmi par derīgiem, ja CLT paneļu tehniskajos dokumentos nav noteikts citādi.

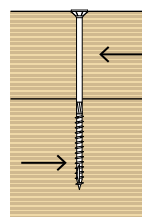
<sup>(1)</sup> CLT minimālais biezums  $t_{min} = 10 \cdot d$

<sup>(2)</sup> CLT minimālais biezums  $t_{min} = 10 \cdot d$  un minimālais skrūves iebīšanas dziļums  $t_{pen} = 10 \cdot d$

## ■ MINIMĀLAIS ATTĀLUMS GARENISKI SASPIESTĀM SKRŪVĒM | LVL



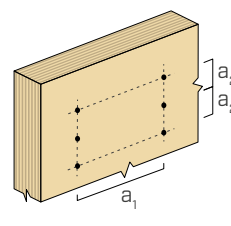
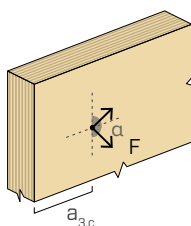
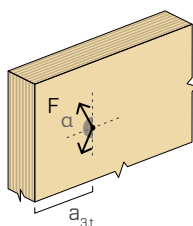
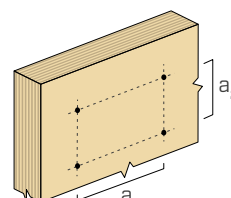
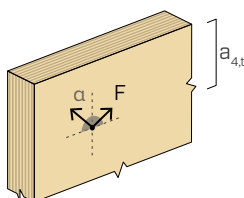
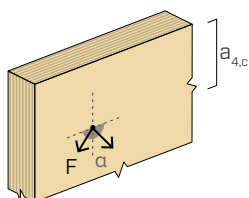
Leņķis starp spēku un šķiedrām  $\alpha = 0^\circ$



Leņķis starp spēku un šķiedrām  $\alpha = 90^\circ$

|           |      | SKRŪVES, KAS IEVIETOTAS BEZ PRIEKŠURBUMA |    |    |     |     | SKRŪVES, KAS IEVIETOTAS BEZ PRIEKŠURBUMA |    |    |    |     |
|-----------|------|------------------------------------------|----|----|-----|-----|------------------------------------------|----|----|----|-----|
| $d_1$     | [mm] |                                          | 5  | 6  | 8   | 10  |                                          | 5  | 6  | 8  | 10  |
| $a_1$     | [mm] | 12·d                                     | 60 | 72 | 96  | 120 | 5·d                                      | 25 | 30 | 40 | 50  |
| $a_2$     | [mm] | 5·d                                      | 25 | 30 | 40  | 50  | 5·d                                      | 25 | 30 | 40 | 50  |
| $a_{3,t}$ | [mm] | 15·d                                     | 75 | 90 | 120 | 150 | 10·d                                     | 50 | 60 | 80 | 100 |
| $a_{3,c}$ | [mm] | 10·d                                     | 50 | 60 | 80  | 100 | 10·d                                     | 50 | 60 | 80 | 100 |
| $a_{4,t}$ | [mm] | 5·d                                      | 25 | 30 | 40  | 50  | 10·d                                     | 50 | 60 | 80 | 100 |
| $a_{4,c}$ | [mm] | 5·d                                      | 25 | 30 | 40  | 50  | 5·d                                      | 25 | 30 | 40 | 50  |

d = nominālais skrūves diametrs



### PIEZĪMES:

- Minimālie attālumi atbilst ETA-11/0030 un ir uzskatāmi par derīgiem, ja LVL paneļu tehniskajos dokumentos nav noteikts citādi.
- Minimālie attālumi ir spēkā, lietojot skujkoku koksnes (softwood) LVL gan ar paralēlu, gan šķērsenisku finieri.
- Minimālie attālumi bez priekšurbuma ir spēkā LVL elementu minimālajam biezumam  $t_{\min}$ :

$$t_1 \geq 8,4 \cdot d - 9$$

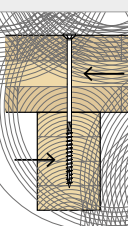
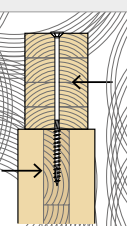
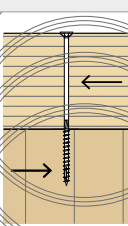
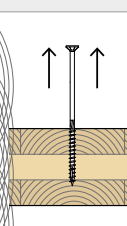
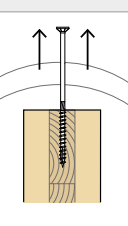
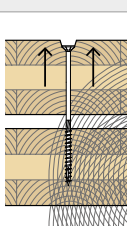
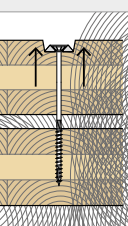
$$t_2 \geq \begin{cases} 11,4 \cdot d \\ 75 \end{cases}$$

kur:

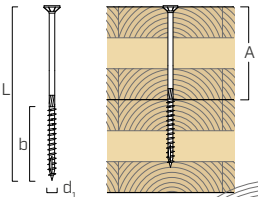
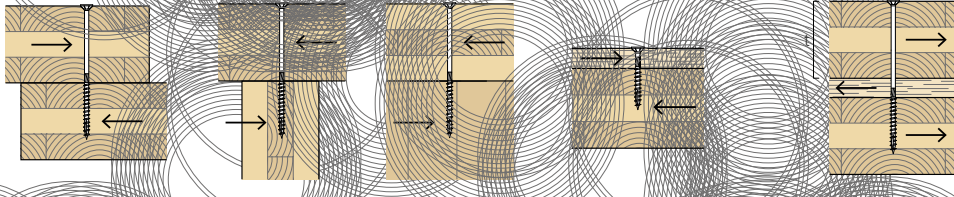
$t_1$  ir LVL elementa biezums mm savienojumā ar 2 koka elementiem. Savienojumu gadījumos ar 3 vai vairākiem elementiem  $t_1$  apzīmē vistuvāk ārmai novietotā LVL biezumu;

$t_2$  ir centrālā elementa biezums mm savienojumā ar 3 vai vairākiem elementiem.

| ģeometrija             |           |           |           | GRIEZUMS <sup>(1)</sup>   |                                         |                                              |                                                    |
|------------------------|-----------|-----------|-----------|---------------------------|-----------------------------------------|----------------------------------------------|----------------------------------------------------|
|                        |           |           |           | CLT - CLT<br>lateral face | CLT - CLT<br>lateral face - narrow face | panelis - CLT <sup>(2)</sup><br>lateral face | CLT - panelis - CLT <sup>(2)</sup><br>lateral face |
|                        |           |           |           |                           |                                         |                                              |                                                    |
| d <sub>1</sub><br>[mm] | L<br>[mm] | b<br>[mm] | A<br>[mm] | R <sub>V,k</sub><br>[kN]  | R <sub>V,k</sub><br>[kN]                | R <sub>V,k</sub><br>[kN]                     | t<br>[mm]<br>R <sub>V,k</sub><br>[kN]              |
| 6                      | 40        | 35        | 8         | 0,80                      | -                                       | 1,30                                         | -                                                  |
|                        | 50        | 35        | 15        | 1,44                      | -                                       | 1,53                                         | -                                                  |
|                        | 60        | 30        | 30        | 1,63                      | -                                       | 1,53                                         | -                                                  |
|                        | 70        | 40        | 30        | 1,74                      | -                                       | 1,53                                         | 30                                                 |
|                        | 80        | 40        | 40        | 1,97                      | -                                       | 1,53                                         | 35                                                 |
|                        | 90        | 50        | 40        | 1,97                      | -                                       | 1,53                                         | 40                                                 |
|                        | 100       | 50        | 50        | 1,97                      | -                                       | 1,53                                         | 45                                                 |
|                        | 110       | 60        | 50        | 1,97                      | -                                       | 1,53                                         | 50                                                 |
|                        | 120       | 60        | 60        | 1,97                      | -                                       | 1,53                                         | 55                                                 |
|                        | 130       | 60        | 70        | 1,97                      | -                                       | 1,53                                         | 60                                                 |
|                        | 140       | 75        | 65        | 1,97                      | -                                       | 1,53                                         | 65                                                 |
|                        | 150       | 75        | 75        | 1,97                      | -                                       | 1,53                                         | 70                                                 |
|                        | 160       | 75        | 85        | 1,97                      | -                                       | 1,53                                         | 75                                                 |
|                        | 180       | 75        | 105       | 1,97                      | -                                       | 1,53                                         | 85                                                 |
|                        | 200       | 75        | 125       | 1,97                      | -                                       | 1,53                                         | 95                                                 |
|                        | 220       | 75        | 145       | 1,97                      | -                                       | 1,53                                         | 105                                                |
|                        | 240       | 75        | 165       | 1,97                      | -                                       | 1,53                                         | 115                                                |
|                        | 260       | 75        | 185       | 1,97                      | -                                       | 1,53                                         | 125                                                |
|                        | 280       | 75        | 205       | 1,97                      | -                                       | 1,53                                         | 135                                                |
|                        | 300       | 75        | 225       | 1,97                      | -                                       | 1,53                                         | 145                                                |
| 8                      | 80        | 52        | 28        | 2,42                      | 1,84                                    | 2,30                                         | -                                                  |
|                        | 100       | 52        | 48        | 3,04                      | 2,13                                    | 2,30                                         | 40                                                 |
|                        | 120       | 60        | 60        | 3,11                      | 2,26                                    | 2,30                                         | 50                                                 |
|                        | 140       | 60        | 80        | 3,11                      | 2,26                                    | 2,30                                         | 60                                                 |
|                        | 160       | 80        | 80        | 3,11                      | 2,58                                    | 2,30                                         | 70                                                 |
|                        | 180       | 80        | 100       | 3,11                      | 2,58                                    | 2,30                                         | 80                                                 |
|                        | 200       | 80        | 120       | 3,11                      | 2,58                                    | 2,30                                         | 90                                                 |
|                        | 220       | 80        | 140       | 3,11                      | 2,58                                    | 2,30                                         | 100                                                |
|                        | 240       | 80        | 160       | 3,11                      | 2,58                                    | 2,30                                         | 110                                                |
|                        | 260       | 80        | 180       | 3,11                      | 2,58                                    | 2,30                                         | 120                                                |
|                        | 280       | 80        | 200       | 3,11                      | 2,58                                    | 2,30                                         | 130                                                |
|                        | 300       | 100       | 200       | 3,11                      | 2,58                                    | 2,30                                         | 140                                                |
|                        | 320       | 100       | 220       | 3,11                      | 2,58                                    | 2,30                                         | 150                                                |
|                        | 340       | 100       | 240       | 3,11                      | 2,58                                    | 2,30                                         | 160                                                |
|                        | 360       | 100       | 260       | 3,11                      | 2,58                                    | 2,30                                         | 170                                                |
|                        | 380       | 100       | 280       | 3,11                      | 2,58                                    | 2,30                                         | 180                                                |
|                        | 400       | 100       | 300       | 3,11                      | 2,58                                    | 2,30                                         | 190                                                |
|                        | 440       | 100       | 340       | 3,11                      | 2,58                                    | 2,30                                         | 210                                                |
|                        | 480       | 100       | 380       | 3,11                      | 2,58                                    | 2,30                                         | 230                                                |
|                        | 520       | 100       | 420       | 3,11                      | 2,58                                    | 2,30                                         | 250                                                |

| GRIEZUMS <sup>(1)</sup>                                                           |                                                                                   |                                                                                   | VILCE                                                                             |                                                                                    |                                                                                     |                                                                                     |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| CLT - koks<br>lateral face                                                        | koks - CLT<br>narrow face                                                         |                                                                                   | vītne izraušana<br>lateral face <sup>(3)</sup>                                    | vītne izraušana<br>narrow face <sup>(4)</sup>                                      | galvas<br>ieurbšana <sup>(5)</sup>                                                  | galvas ieurbšana<br>ar paplāksni <sup>(5)</sup>                                     |
|  |  |  |  |  |  |  |
| $R_{V,k}$<br>[kN]                                                                 | $R_{V,k}$<br>[kN]                                                                 |                                                                                   | $R_{ax,k}$<br>[kN]                                                                | $R_{ax,k}$<br>[kN]                                                                 | $R_{head,k}$<br>[kN]                                                                | $R_{head,k}$<br>[kN]                                                                |
| 0,80                                                                              | -                                                                                 |                                                                                   | 2,46                                                                              | -                                                                                  | 1,51                                                                                | 4,20                                                                                |
| 1,47                                                                              | -                                                                                 |                                                                                   | 2,46                                                                              | -                                                                                  | 1,51                                                                                | 4,20                                                                                |
| 1,69                                                                              | -                                                                                 |                                                                                   | 2,11                                                                              | -                                                                                  | 1,51                                                                                | 4,20                                                                                |
| 1,82                                                                              | -                                                                                 |                                                                                   | 2,81                                                                              | -                                                                                  | 1,51                                                                                | 4,20                                                                                |
| 2,01                                                                              | -                                                                                 |                                                                                   | 2,81                                                                              | -                                                                                  | 1,51                                                                                | 4,20                                                                                |
| 2,01                                                                              | -                                                                                 |                                                                                   | 3,51                                                                              | -                                                                                  | 1,51                                                                                | 4,20                                                                                |
| 2,01                                                                              | -                                                                                 |                                                                                   | 3,51                                                                              | -                                                                                  | 1,51                                                                                | 4,20                                                                                |
| 2,01                                                                              | -                                                                                 |                                                                                   | 4,21                                                                              | -                                                                                  | 1,51                                                                                | 4,20                                                                                |
| 2,01                                                                              | -                                                                                 |                                                                                   | 4,21                                                                              | -                                                                                  | 1,51                                                                                | 4,20                                                                                |
| 2,01                                                                              | -                                                                                 |                                                                                   | 4,21                                                                              | -                                                                                  | 1,51                                                                                | 4,20                                                                                |
| 2,01                                                                              | -                                                                                 |                                                                                   | 4,21                                                                              | -                                                                                  | 1,51                                                                                | 4,20                                                                                |
| 2,01                                                                              | -                                                                                 |                                                                                   | 5,27                                                                              | -                                                                                  | 1,51                                                                                | 4,20                                                                                |
| 2,01                                                                              | -                                                                                 |                                                                                   | 5,27                                                                              | -                                                                                  | 1,51                                                                                | 4,20                                                                                |
| 2,01                                                                              | -                                                                                 |                                                                                   | 5,27                                                                              | -                                                                                  | 1,51                                                                                | 4,20                                                                                |
| 2,01                                                                              | -                                                                                 |                                                                                   | 5,27                                                                              | -                                                                                  | 1,51                                                                                | 4,20                                                                                |
| 2,01                                                                              | -                                                                                 |                                                                                   | 5,27                                                                              | -                                                                                  | 1,51                                                                                | 4,20                                                                                |
| 2,01                                                                              | -                                                                                 |                                                                                   | 5,27                                                                              | -                                                                                  | 1,51                                                                                | 4,20                                                                                |
| 2,01                                                                              | -                                                                                 |                                                                                   | 5,27                                                                              | -                                                                                  | 1,51                                                                                | 4,20                                                                                |
| 2,01                                                                              | -                                                                                 |                                                                                   | 5,27                                                                              | -                                                                                  | 1,51                                                                                | 4,20                                                                                |
| 2,01                                                                              | -                                                                                 |                                                                                   | 5,27                                                                              | -                                                                                  | 1,51                                                                                | 4,20                                                                                |
| 2,01                                                                              | -                                                                                 |                                                                                   | 5,27                                                                              | -                                                                                  | 1,51                                                                                | 4,20                                                                                |
| 2,51                                                                              | 2,19                                                                              |                                                                                   | 4,87                                                                              | 3,70                                                                               | 2,21                                                                                | 6,56                                                                                |
| 3,17                                                                              | 2,19                                                                              |                                                                                   | 4,87                                                                              | 3,70                                                                               | 2,21                                                                                | 6,56                                                                                |
| 3,17                                                                              | 2,32                                                                              |                                                                                   | 5,62                                                                              | 4,21                                                                               | 2,21                                                                                | 6,56                                                                                |
| 3,17                                                                              | 2,32                                                                              |                                                                                   | 5,62                                                                              | 4,21                                                                               | 2,21                                                                                | 6,56                                                                                |
| 3,17                                                                              | 2,66                                                                              |                                                                                   | 7,49                                                                              | 5,45                                                                               | 2,21                                                                                | 6,56                                                                                |
| 3,17                                                                              | 2,66                                                                              |                                                                                   | 7,49                                                                              | 5,45                                                                               | 2,21                                                                                | 6,56                                                                                |
| 3,17                                                                              | 2,66                                                                              |                                                                                   | 7,49                                                                              | 5,45                                                                               | 2,21                                                                                | 6,56                                                                                |
| 3,17                                                                              | 2,66                                                                              |                                                                                   | 7,49                                                                              | 5,45                                                                               | 2,21                                                                                | 6,56                                                                                |
| 3,17                                                                              | 2,66                                                                              |                                                                                   | 7,49                                                                              | 5,45                                                                               | 2,21                                                                                | 6,56                                                                                |
| 3,17                                                                              | 2,66                                                                              |                                                                                   | 7,49                                                                              | 5,45                                                                               | 2,21                                                                                | 6,56                                                                                |
| 3,17                                                                              | 2,66                                                                              |                                                                                   | 7,49                                                                              | 5,45                                                                               | 2,21                                                                                | 6,56                                                                                |
| 3,17                                                                              | 2,66                                                                              |                                                                                   | 9,36                                                                              | 6,66                                                                               | 2,21                                                                                | 6,56                                                                                |
| 3,17                                                                              | 2,66                                                                              |                                                                                   | 9,36                                                                              | 6,66                                                                               | 2,21                                                                                | 6,56                                                                                |
| 3,17                                                                              | 2,66                                                                              |                                                                                   | 9,36                                                                              | 6,66                                                                               | 2,21                                                                                | 6,56                                                                                |
| 3,17                                                                              | 2,66                                                                              |                                                                                   | 9,36                                                                              | 6,66                                                                               | 2,21                                                                                | 6,56                                                                                |
| 3,17                                                                              | 2,66                                                                              |                                                                                   | 9,36                                                                              | 6,66                                                                               | 2,21                                                                                | 6,56                                                                                |
| 3,17                                                                              | 2,66                                                                              |                                                                                   | 9,36                                                                              | 6,66                                                                               | 2,21                                                                                | 6,56                                                                                |
| 3,17                                                                              | 2,66                                                                              |                                                                                   | 9,36                                                                              | 6,66                                                                               | 2,21                                                                                | 6,56                                                                                |
| 3,17                                                                              | 2,66                                                                              |                                                                                   | 9,36                                                                              | 6,66                                                                               | 2,21                                                                                | 6,56                                                                                |
| 3,17                                                                              | 2,66                                                                              |                                                                                   | 9,36                                                                              | 6,66                                                                               | 2,21                                                                                | 6,56                                                                                |
| 3,17                                                                              | 2,66                                                                              |                                                                                   | 9,36                                                                              | 6,66                                                                               | 2,21                                                                                | 6,56                                                                                |
| 3,17                                                                              | 2,66                                                                              |                                                                                   | 9,36                                                                              | 6,66                                                                               | 2,21                                                                                | 6,56                                                                                |

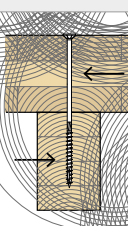
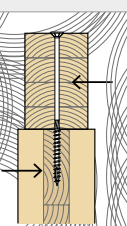
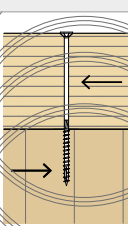
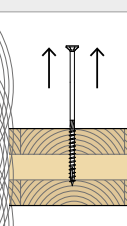
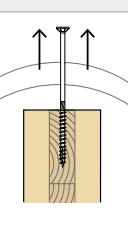
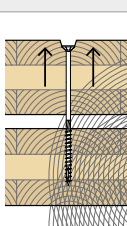
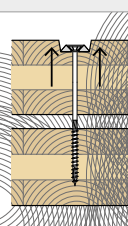


|                                                                                   |           |           |           | GRIEZUMS <sup>(1)</sup>                                                            |                                         |                                              |                                                    |                          |  |  |  |
|-----------------------------------------------------------------------------------|-----------|-----------|-----------|------------------------------------------------------------------------------------|-----------------------------------------|----------------------------------------------|----------------------------------------------------|--------------------------|--|--|--|
| ģeometrija                                                                        |           |           |           | CLT - CLT<br>lateral face                                                          | CLT - CLT<br>lateral face - narrow face | panelis - CLT <sup>(2)</sup><br>lateral face | CLT - panelis - CLT <sup>(2)</sup><br>lateral face |                          |  |  |  |
|  |           |           |           |  |                                         |                                              |                                                    |                          |  |  |  |
| d <sub>1</sub><br>[mm]                                                            | L<br>[mm] | b<br>[mm] | A<br>[mm] | R <sub>V,k</sub><br>[kN]                                                           | R <sub>V,k</sub><br>[kN]                | R <sub>V,k</sub><br>[kN]                     | t<br>[mm]                                          | R <sub>V,k</sub><br>[kN] |  |  |  |
| 10                                                                                | 80        | 52        | 28        | 3,40                                                                               | 2,34                                    | 3,31                                         | -                                                  | -                        |  |  |  |
|                                                                                   | 100       | 52        | 48        | 3,86                                                                               | 2,91                                    | 3,31                                         | -                                                  | -                        |  |  |  |
|                                                                                   | 120       | 60        | 60        | 4,45                                                                               | 3,03                                    | 3,31                                         | 50                                                 | 3,89                     |  |  |  |
|                                                                                   | 140       | 60        | 80        | 4,49                                                                               | 3,03                                    | 3,31                                         | 60                                                 | 3,89                     |  |  |  |
|                                                                                   | 160       | 80        | 80        | 4,56                                                                               | 3,37                                    | 3,31                                         | 70                                                 | 3,89                     |  |  |  |
|                                                                                   | 180       | 80        | 100       | 4,56                                                                               | 3,37                                    | 3,31                                         | 80                                                 | 3,89                     |  |  |  |
|                                                                                   | 200       | 80        | 120       | 4,56                                                                               | 3,37                                    | 3,31                                         | 90                                                 | 3,89                     |  |  |  |
|                                                                                   | 220       | 80        | 140       | 4,56                                                                               | 3,37                                    | 3,31                                         | 100                                                | 3,89                     |  |  |  |
|                                                                                   | 240       | 80        | 160       | 4,56                                                                               | 3,37                                    | 3,31                                         | 110                                                | 3,89                     |  |  |  |
|                                                                                   | 260       | 80        | 180       | 4,56                                                                               | 3,37                                    | 3,31                                         | 120                                                | 3,89                     |  |  |  |
|                                                                                   | 280       | 80        | 200       | 4,56                                                                               | 3,37                                    | 3,31                                         | 130                                                | 3,89                     |  |  |  |
|                                                                                   | 300       | 100       | 200       | 4,56                                                                               | 3,76                                    | 3,31                                         | 140                                                | 3,89                     |  |  |  |
|                                                                                   | 320       | 100       | 220       | 4,56                                                                               | 3,76                                    | 3,31                                         | 150                                                | 3,89                     |  |  |  |
|                                                                                   | 340       | 100       | 240       | 4,56                                                                               | 3,76                                    | 3,31                                         | 160                                                | 3,89                     |  |  |  |
|                                                                                   | 360       | 100       | 260       | 4,56                                                                               | 3,76                                    | 3,31                                         | 170                                                | 3,89                     |  |  |  |
|                                                                                   | 380       | 100       | 280       | 4,56                                                                               | 3,76                                    | 3,31                                         | 180                                                | 3,89                     |  |  |  |
|                                                                                   | 400       | 100       | 300       | 4,56                                                                               | 3,76                                    | 3,31                                         | 190                                                | 3,89                     |  |  |  |
| 12                                                                                | 120       | 80        | 40        | 4,54                                                                               | 3,56                                    | -                                            | -                                                  | -                        |  |  |  |
|                                                                                   | 160       | 80        | 80        | 5,69                                                                               | 4,00                                    | -                                            | -                                                  | -                        |  |  |  |
|                                                                                   | 200       | 80        | 120       | 5,69                                                                               | 4,00                                    | -                                            | -                                                  | -                        |  |  |  |
|                                                                                   | 240       | 80        | 160       | 5,69                                                                               | 4,00                                    | -                                            | -                                                  | -                        |  |  |  |
|                                                                                   | 280       | 80        | 200       | 5,69                                                                               | 4,00                                    | -                                            | -                                                  | -                        |  |  |  |
|                                                                                   | 320       | 120       | 200       | 5,69                                                                               | 4,65                                    | -                                            | -                                                  | -                        |  |  |  |
|                                                                                   | 360       | 120       | 240       | 5,69                                                                               | 4,65                                    | -                                            | -                                                  | -                        |  |  |  |
|                                                                                   | 400       | 120       | 280       | 5,69                                                                               | 4,65                                    | -                                            | -                                                  | -                        |  |  |  |
|                                                                                   | 440       | 120       | 320       | 5,69                                                                               | 4,65                                    | -                                            | -                                                  | -                        |  |  |  |
|                                                                                   | 480       | 120       | 360       | 5,69                                                                               | 4,65                                    | -                                            | -                                                  | -                        |  |  |  |
|                                                                                   | 520       | 120       | 400       | 5,69                                                                               | 4,65                                    | -                                            | -                                                  | -                        |  |  |  |
|                                                                                   | 560       | 120       | 440       | 5,69                                                                               | 4,65                                    | -                                            | -                                                  | -                        |  |  |  |
|                                                                                   | 600       | 120       | 480       | 5,69                                                                               | 4,65                                    | -                                            | -                                                  | -                        |  |  |  |

#### PIEZĪMES:

- (1) Griezuma raksturīgā izturība nav atkarīga no CLT paneļu ārējā slāņa šķiedrojuma virziena.
- (2) Griezuma raksturīgo izturību novērtē, ņemot vērā OSB3 vai OSB4 plātni saskaņā ar EN 300 vai skaidu plātni saskaņā ar EN 312 ar blīvumu  $S_{PAN}$ .
- (3) Aksiālā pretestība pret vītnes izraušanos tika novērtēta, ņemot vērā 90° leņķi starp šķiedrām un savienotāju un ieskrūvēšanas garumu, kas vienāds ar b.

- (4) Aksiālā vītnes izraušanas pretestība ir spēkā minimālajam elementa biezumam  $t_{min} = 10 \cdot d$  un minimālajam skrūvju padziļinājuma  $t_{PEN} = 10 \cdot d$ .
- (5) Aksiālā pretestība pret galvas ieburšanu tika novērtēta uz koka elementa.

| GRIEZUMS <sup>(1)</sup>                                                           |                                                                                   |                                                                                   | VILCE                                                                             |                                                                                    |                                                                                     |                                                                                     |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| CLT - koks<br>lateral face                                                        | koks - CLT<br>narrow face                                                         |                                                                                   | vītnes izraušana<br>lateral face <sup>(3)</sup>                                   | vītnes izraušana<br>narrow face <sup>(4)</sup>                                     | galvas<br>ieurbšana <sup>(5)</sup>                                                  | galvas ieurbšana<br>ar paplāksni <sup>(5)</sup>                                     |
|  |  |  |  |  |  |  |
| $R_{V,k}$<br>[kN]                                                                 | $R_{V,k}$<br>[kN]                                                                 |                                                                                   | $R_{ax,k}$<br>[kN]                                                                | $R_{ax,k}$<br>[kN]                                                                 | $R_{head,k}$<br>[kN]                                                                | $R_{head,k}$<br>[kN]                                                                |
| 3,50                                                                              | 3,01                                                                              |                                                                                   | 6,08                                                                              | 4,42                                                                               | 3,50                                                                                | 9,45                                                                                |
| 4,02                                                                              | 3,01                                                                              |                                                                                   | 6,08                                                                              | 4,42                                                                               | 3,50                                                                                | 9,45                                                                                |
| 4,63                                                                              | 3,12                                                                              |                                                                                   | 7,02                                                                              | 5,03                                                                               | 3,50                                                                                | 9,45                                                                                |
| 4,65                                                                              | 3,12                                                                              |                                                                                   | 7,02                                                                              | 5,03                                                                               | 3,50                                                                                | 9,45                                                                                |
| 4,65                                                                              | 3,46                                                                              |                                                                                   | 9,36                                                                              | 6,51                                                                               | 3,50                                                                                | 9,45                                                                                |
| 4,65                                                                              | 3,46                                                                              |                                                                                   | 9,36                                                                              | 6,51                                                                               | 3,50                                                                                | 9,45                                                                                |
| 4,65                                                                              | 3,46                                                                              |                                                                                   | 9,36                                                                              | 6,51                                                                               | 3,50                                                                                | 9,45                                                                                |
| 4,65                                                                              | 3,46                                                                              |                                                                                   | 9,36                                                                              | 6,51                                                                               | 3,50                                                                                | 9,45                                                                                |
| 4,65                                                                              | 3,46                                                                              |                                                                                   | 9,36                                                                              | 6,51                                                                               | 3,50                                                                                | 9,45                                                                                |
| 4,65                                                                              | 3,46                                                                              |                                                                                   | 9,36                                                                              | 6,51                                                                               | 3,50                                                                                | 9,45                                                                                |
| 4,65                                                                              | 3,46                                                                              |                                                                                   | 9,36                                                                              | 6,51                                                                               | 3,50                                                                                | 9,45                                                                                |
| 4,65                                                                              | 3,86                                                                              |                                                                                   | 11,70                                                                             | 7,96                                                                               | 3,50                                                                                | 9,45                                                                                |
| 4,65                                                                              | 3,86                                                                              |                                                                                   | 11,70                                                                             | 7,96                                                                               | 3,50                                                                                | 9,45                                                                                |
| 4,65                                                                              | 3,86                                                                              |                                                                                   | 11,70                                                                             | 7,96                                                                               | 3,50                                                                                | 9,45                                                                                |
| 4,65                                                                              | 3,86                                                                              |                                                                                   | 11,70                                                                             | 7,96                                                                               | 3,50                                                                                | 9,45                                                                                |
| 4,65                                                                              | 3,86                                                                              |                                                                                   | 11,70                                                                             | 7,96                                                                               | 3,50                                                                                | 9,45                                                                                |
| 4,71                                                                              | 4,10                                                                              |                                                                                   | 11,23                                                                             | 7,54                                                                               | 4,52                                                                                | 14,37                                                                               |
| 5,79                                                                              | 4,11                                                                              |                                                                                   | 11,23                                                                             | 7,54                                                                               | 4,52                                                                                | 14,37                                                                               |
| 5,79                                                                              | 4,11                                                                              |                                                                                   | 11,23                                                                             | 7,54                                                                               | 4,52                                                                                | 14,37                                                                               |
| 5,79                                                                              | 4,11                                                                              |                                                                                   | 11,23                                                                             | 7,54                                                                               | 4,52                                                                                | 14,37                                                                               |
| 5,79                                                                              | 4,11                                                                              |                                                                                   | 11,23                                                                             | 7,54                                                                               | 4,52                                                                                | 14,37                                                                               |
| 5,79                                                                              | 4,78                                                                              |                                                                                   | 16,85                                                                             | 10,86                                                                              | 4,52                                                                                | 14,37                                                                               |
| 5,79                                                                              | 4,78                                                                              |                                                                                   | 16,85                                                                             | 10,86                                                                              | 4,52                                                                                | 14,37                                                                               |
| 5,79                                                                              | 4,78                                                                              |                                                                                   | 16,85                                                                             | 10,86                                                                              | 4,52                                                                                | 14,37                                                                               |
| 5,79                                                                              | 4,78                                                                              |                                                                                   | 16,85                                                                             | 10,86                                                                              | 4,52                                                                                | 14,37                                                                               |
| 5,79                                                                              | 4,78                                                                              |                                                                                   | 16,85                                                                             | 10,86                                                                              | 4,52                                                                                | 14,37                                                                               |
| 5,79                                                                              | 4,78                                                                              |                                                                                   | 16,85                                                                             | 10,86                                                                              | 4,52                                                                                | 14,37                                                                               |
| 5,79                                                                              | 4,78                                                                              |                                                                                   | 16,85                                                                             | 10,86                                                                              | 4,52                                                                                | 14,37                                                                               |
| 5,79                                                                              | 4,78                                                                              |                                                                                   | 16,85                                                                             | 10,86                                                                              | 4,52                                                                                | 14,37                                                                               |
| 5,79                                                                              | 4,78                                                                              |                                                                                   | 16,85                                                                             | 10,86                                                                              | 4,52                                                                                | 14,37                                                                               |
| 5,79                                                                              | 4,78                                                                              |                                                                                   | 16,85                                                                             | 10,86                                                                              | 4,52                                                                                | 14,37                                                                               |

#### VISPĀRĪGI PRINCIPI:

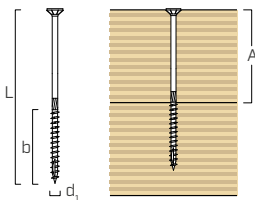
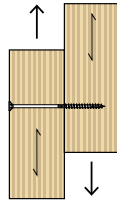
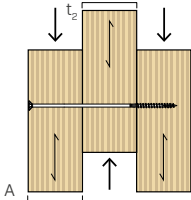
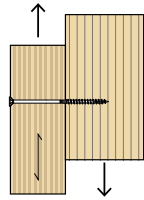
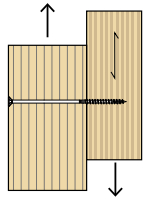
- Raksturīgās vērtības atbilst standartam EN 1995:2014 un nacionālajai specifikācijai ŅORM EN 1995 - Annex K pielikumam saskaņā ar ETA-11/0030.
- Projekta vērtības no raksturīgajām vērtībām tiek iegūtas šādi:

$$R_d = \frac{R_k \cdot k_{mod}}{\gamma_M}$$

Koeficienti  $\gamma_M$  un  $k_{mod}$  jāpieņem atbilstoši spēkā esošajiem tiesību aktiem, ko izmanto aprēķinos.

- Attiecībā uz mehāniskās izturības vērtībām un skrūvju ģeometriju tika sniegta atsauce uz to, kas norādīts ETA-11/0030.
- Aprēķinu posmā tika ņemts vērā blīvums, kas vienāds ar  $\rho_k = 350 \text{ kg/m}^3$  CLT elementiem un kas vienāds ar  $\rho_k = 385 \text{ kg/m}^3$  koka elementiem.

- Vērtības tika aprēķinātas, ņemot vērā vītņotās daļas pilnīgu ievietošanu koka elementā.
- Koka elementu un paneļu dimensionēšana un pārbaude jāveic atsevišķi.
- Griezuma raksturīgo izturību novērtē skrūvēm, kas ievietotas bez priekššurbuma; ja skrūves ir ievietotas ar priekššurbumu, iespējams iegūt augstākas pretestības vērtības.
- Bīdes pretestības raksturlielumi tiek aprēķināti, ņemot vērā minimālo stiprinājuma garumu  $4 d_1$ .
- Skrūves jānovieto, ievērojot minimālos attālumus.

|                                                                                   |           |           | GRIEZUMS                                                                          |                          |                                                                                   |                        |                          |                                                                                     |                          |                                                                                     |                          |  |
|-----------------------------------------------------------------------------------|-----------|-----------|-----------------------------------------------------------------------------------|--------------------------|-----------------------------------------------------------------------------------|------------------------|--------------------------|-------------------------------------------------------------------------------------|--------------------------|-------------------------------------------------------------------------------------|--------------------------|--|
| ģeometrija                                                                        |           |           | LVL - LVL                                                                         |                          | LVL - LVL - LVL                                                                   |                        |                          | LVL - koks                                                                          |                          | koks - LVL                                                                          |                          |  |
|  |           |           |  |                          |  |                        |                          |  |                          |  |                          |  |
| d <sub>1</sub><br>[mm]                                                            | L<br>[mm] | b<br>[mm] | A<br>[mm]                                                                         | R <sub>V,k</sub><br>[kN] | A<br>[mm]                                                                         | t <sub>2</sub><br>[mm] | R <sub>V,k</sub><br>[kN] | A<br>[mm]                                                                           | R <sub>V,k</sub><br>[kN] | A<br>[mm]                                                                           | R <sub>V,k</sub><br>[kN] |  |
| 5                                                                                 | 40        | 24        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | -                                                                                   | -                        |  |
|                                                                                   | 45        | 24        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | -                                                                                   | -                        |  |
|                                                                                   | 50        | 24        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | -                                                                                   | -                        |  |
|                                                                                   | 60        | 30        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | 27                                                                                  | 1,35                     |  |
|                                                                                   | 70        | 35        | 33                                                                                | 1,80                     | -                                                                                 | -                      | -                        | 33                                                                                  | 1,69                     | 35                                                                                  | 1,47                     |  |
|                                                                                   | 80        | 40        | 40                                                                                | 1,80                     | -                                                                                 | -                      | -                        | 40                                                                                  | 1,69                     | 40                                                                                  | 1,47                     |  |
|                                                                                   | 90        | 45        | 45                                                                                | 1,80                     | -                                                                                 | -                      | -                        | 45                                                                                  | 1,69                     | 45                                                                                  | 1,47                     |  |
|                                                                                   | 100       | 50        | 50                                                                                | 1,80                     | -                                                                                 | -                      | -                        | 50                                                                                  | 1,69                     | 50                                                                                  | 1,47                     |  |
|                                                                                   | 120       | 60        | 60                                                                                | 1,80                     | -                                                                                 | -                      | -                        | 60                                                                                  | 1,69                     | 70                                                                                  | 1,47                     |  |
| 6                                                                                 | 40        | 35        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | -                                                                                   | -                        |  |
|                                                                                   | 50        | 35        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | -                                                                                   | -                        |  |
|                                                                                   | 60        | 30        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | -                                                                                   | -                        |  |
|                                                                                   | 70        | 40        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | -                                                                                   | -                        |  |
|                                                                                   | 80        | 40        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | 35                                                                                  | 1,96                     |  |
|                                                                                   | 90        | 50        | 45                                                                                | 2,56                     | -                                                                                 | -                      | -                        | 45                                                                                  | 2,41                     | 40                                                                                  | 2,09                     |  |
|                                                                                   | 100       | 50        | 50                                                                                | 2,56                     | -                                                                                 | -                      | -                        | 50                                                                                  | 2,41                     | 50                                                                                  | 2,09                     |  |
|                                                                                   | 110       | 60        | 50                                                                                | 2,56                     | -                                                                                 | -                      | -                        | 50                                                                                  | 2,41                     | 50                                                                                  | 2,09                     |  |
|                                                                                   | 120       | 60        | 60                                                                                | 2,56                     | -                                                                                 | -                      | -                        | 60                                                                                  | 2,41                     | 60                                                                                  | 2,09                     |  |
|                                                                                   | 130       | 60        | 70                                                                                | 2,56                     | -                                                                                 | -                      | -                        | 70                                                                                  | 2,41                     | 70                                                                                  | 2,09                     |  |
|                                                                                   | 140       | 75        | 65                                                                                | 2,56                     | -                                                                                 | -                      | -                        | 65                                                                                  | 2,41                     | 65                                                                                  | 2,09                     |  |
|                                                                                   | 150       | 75        | 75                                                                                | 2,56                     | -                                                                                 | -                      | -                        | 75                                                                                  | 2,41                     | 75                                                                                  | 2,09                     |  |
|                                                                                   | 160       | 75        | 85                                                                                | 2,56                     | 45                                                                                | 70                     | 5,12                     | 85                                                                                  | 2,41                     | 85                                                                                  | 2,09                     |  |
|                                                                                   | 180       | 75        | 105                                                                               | 2,56                     | 55                                                                                | 75                     | 5,12                     | 105                                                                                 | 2,41                     | 105                                                                                 | 2,09                     |  |
|                                                                                   | 200       | 75        | 125                                                                               | 2,56                     | 60                                                                                | 85                     | 5,12                     | 125                                                                                 | 2,41                     | 125                                                                                 | 2,09                     |  |
|                                                                                   | 220       | 75        | 145                                                                               | 2,56                     | 70                                                                                | 85                     | 5,12                     | 145                                                                                 | 2,41                     | 145                                                                                 | 2,09                     |  |
|                                                                                   | 240       | 75        | 165                                                                               | 2,56                     | 75                                                                                | 95                     | 5,12                     | 165                                                                                 | 2,41                     | 165                                                                                 | 2,09                     |  |
|                                                                                   | 260       | 75        | 185                                                                               | 2,56                     | 75                                                                                | 115                    | 5,12                     | 185                                                                                 | 2,41                     | 185                                                                                 | 2,09                     |  |
|                                                                                   | 280       | 75        | 205                                                                               | 2,56                     | 75                                                                                | 135                    | 5,12                     | 205                                                                                 | 2,41                     | 205                                                                                 | 2,09                     |  |
|                                                                                   | 300       | 75        | 225                                                                               | 2,56                     | 75                                                                                | 155                    | 5,12                     | 225                                                                                 | 2,41                     | 225                                                                                 | 2,09                     |  |

**PIEZĪMES:**

(1) Aksālā pretestība pret vītnes izraušanos tika novērtēta, ņemot vērā 90 ° leņķi starp šķiedrām un savienotāju un ieskrūvēšanas garumu, kas vienāds ar b.

(2) Aksālā pretestība pret galvas ieburšanu ar un bez paplāksnes tika novērtēta uz LVL elementa.

VILCE

[illegible]

### VISPĀRĪGI PRINCIPI:

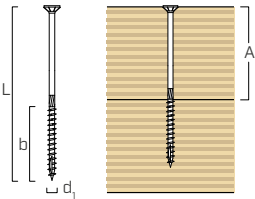
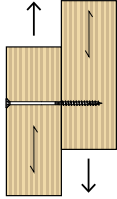
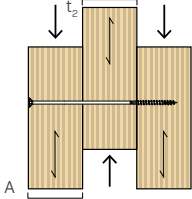
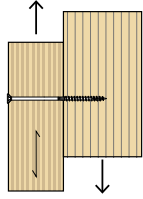
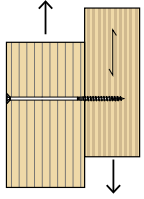
- Raksturīgās vērtības atbilst EN 1995:2014 saskaņā ar ETA-11/0030.
- Projekta vērtības no raksturīgajām vērtībām tiek iegūtas šādi:

$$R_d = \frac{R_k \cdot k_{mod}}{\gamma_M}$$

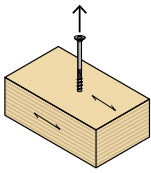
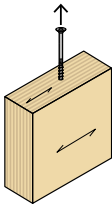
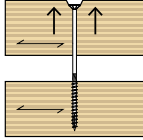
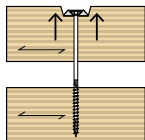
Koeficienti  $\gamma_M$  un  $k_{mod}$  jāpieņem atbilstoši spēkā esošajiem tiesību aktiem, ko izmanto aprēķinos.

- Attiecībā uz mehāniskās izturības vērtībām un skrūvju ģeometriju tika sniegta atsauce uz to, kas norādīts ETA-11/0030.

- Aprēķinu posmā tika ņemts vērā blīvums, kas vienāds ar  $\rho_k = 480 \text{ kg/m}^3$  skuļķoku koksnes (softwood) LVL elementiem un kas vienāds ar  $\rho_k = 350 \text{ kg/m}^3$  koka elementiem.
- Vērtības tika aprēķinātas, ņemot vērā vītņotās daļas pilnīgu ievietošanu koka elementā.
- Koka elementu, paneļu un tērauda plākšņu dimensionēšana un pārbaude jāveic atsevišķi.
- Griezuma raksturīgo izturību novērtē skrūvēm, kas ievietotas bez priekšurbuma; ja skrūves ir ievietotas ar priekšurbumu, iespējams iegūt augstākas pretestības vērtības.

|                                                                                   |           |           | GRIEZUMS                                                                          |                          |                                                                                   |                        |                          |                                                                                     |                          |                                                                                     |                          |
|-----------------------------------------------------------------------------------|-----------|-----------|-----------------------------------------------------------------------------------|--------------------------|-----------------------------------------------------------------------------------|------------------------|--------------------------|-------------------------------------------------------------------------------------|--------------------------|-------------------------------------------------------------------------------------|--------------------------|
| ģeometrija                                                                        |           |           | LVL - LVL                                                                         |                          | LVL - LVL - LVL                                                                   |                        |                          | LVL - koks                                                                          |                          | koks - LVL                                                                          |                          |
|  |           |           |  |                          |  |                        |                          |  |                          |  |                          |
| d <sub>1</sub><br>[mm]                                                            | L<br>[mm] | b<br>[mm] | A<br>[mm]                                                                         | R <sub>V,k</sub><br>[kN] | A<br>[mm]                                                                         | t <sub>2</sub><br>[mm] | R <sub>V,k</sub><br>[kN] | A<br>[mm]                                                                           | R <sub>V,k</sub><br>[kN] | A<br>[mm]                                                                           | R <sub>V,k</sub><br>[kN] |
| 8                                                                                 | 80        | 52        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | -                                                                                   | -                        |
|                                                                                   | 100       | 52        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | 40                                                                                  | 2,89                     |
|                                                                                   | 120       | 60        | 60                                                                                | 4,01                     | -                                                                                 | -                      | -                        | 60                                                                                  | 3,77                     | 60                                                                                  | 3,30                     |
|                                                                                   | 140       | 60        | 80                                                                                | 4,01                     | -                                                                                 | -                      | -                        | 80                                                                                  | 3,77                     | 80                                                                                  | 3,30                     |
|                                                                                   | 160       | 80        | 80                                                                                | 4,01                     | -                                                                                 | -                      | -                        | 80                                                                                  | 3,77                     | 80                                                                                  | 3,30                     |
|                                                                                   | 180       | 80        | 100                                                                               | 4,01                     | -                                                                                 | -                      | -                        | 100                                                                                 | 3,77                     | 100                                                                                 | 3,30                     |
|                                                                                   | 200       | 80        | 120                                                                               | 4,01                     | 65                                                                                | 75                     | 8,03                     | 120                                                                                 | 3,77                     | 120                                                                                 | 3,30                     |
|                                                                                   | 220       | 80        | 140                                                                               | 4,01                     | 75                                                                                | 75                     | 8,03                     | 140                                                                                 | 3,77                     | 140                                                                                 | 3,30                     |
|                                                                                   | 240       | 80        | 160                                                                               | 4,01                     | 80                                                                                | 85                     | 8,03                     | 160                                                                                 | 3,77                     | 160                                                                                 | 3,30                     |
|                                                                                   | 260       | 80        | 180                                                                               | 4,01                     | 80                                                                                | 105                    | 8,03                     | 180                                                                                 | 3,77                     | 180                                                                                 | 3,30                     |
|                                                                                   | 280       | 80        | 200                                                                               | 4,01                     | 80                                                                                | 125                    | 8,03                     | 200                                                                                 | 3,77                     | 200                                                                                 | 3,30                     |
|                                                                                   | 300       | 100       | 200                                                                               | 4,01                     | 100                                                                               | 105                    | 8,03                     | 200                                                                                 | 3,77                     | 200                                                                                 | 3,30                     |
|                                                                                   | 320       | 100       | 220                                                                               | 4,01                     | 100                                                                               | 125                    | 8,03                     | 220                                                                                 | 3,77                     | 220                                                                                 | 3,30                     |
|                                                                                   | 340       | 100       | 240                                                                               | 4,01                     | 100                                                                               | 145                    | 8,03                     | 240                                                                                 | 3,77                     | 240                                                                                 | 3,30                     |
|                                                                                   | 360       | 100       | 260                                                                               | 4,01                     | 100                                                                               | 165                    | 8,03                     | 260                                                                                 | 3,77                     | 260                                                                                 | 3,30                     |
|                                                                                   | 380       | 100       | 280                                                                               | 4,01                     | 100                                                                               | 185                    | 8,03                     | 280                                                                                 | 3,77                     | 280                                                                                 | 3,30                     |
|                                                                                   | 400       | 100       | 300                                                                               | 4,01                     | 120                                                                               | 165                    | 8,03                     | 300                                                                                 | 3,77                     | 300                                                                                 | 3,30                     |
|                                                                                   | 440       | 100       | 340                                                                               | 4,01                     | 120                                                                               | 205                    | 8,03                     | 340                                                                                 | 3,77                     | 340                                                                                 | 3,30                     |
|                                                                                   | 480       | 100       | 380                                                                               | 4,01                     | 120                                                                               | 245                    | 8,03                     | 380                                                                                 | 3,77                     | 380                                                                                 | 3,30                     |
|                                                                                   | 520       | 100       | 420                                                                               | 4,01                     | 120                                                                               | 285                    | 8,03                     | 420                                                                                 | 3,77                     | 420                                                                                 | 3,30                     |
| 10                                                                                | 80        | 52        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | -                                                                                   | -                        |
|                                                                                   | 100       | 52        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | -                                                                                   | -                        |
|                                                                                   | 120       | 60        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | 45                                                                                  | 4,08                     |
|                                                                                   | 140       | 60        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | 60                                                                                  | 4,69                     |
|                                                                                   | 160       | 80        | 75                                                                                | 5,93                     | -                                                                                 | -                      | -                        | 75                                                                                  | 5,58                     | 80                                                                                  | 4,84                     |
|                                                                                   | 180       | 80        | 100                                                                               | 5,93                     | -                                                                                 | -                      | -                        | 100                                                                                 | 5,58                     | 100                                                                                 | 4,84                     |
|                                                                                   | 200       | 80        | 120                                                                               | 5,93                     | -                                                                                 | -                      | -                        | 120                                                                                 | 5,58                     | 120                                                                                 | 4,84                     |
|                                                                                   | 220       | 80        | 140                                                                               | 5,93                     | -                                                                                 | -                      | -                        | 140                                                                                 | 5,58                     | 140                                                                                 | 4,84                     |
|                                                                                   | 240       | 80        | 160                                                                               | 5,93                     | 80                                                                                | 85                     | 11,87                    | 160                                                                                 | 5,58                     | 160                                                                                 | 4,84                     |
|                                                                                   | 260       | 80        | 180                                                                               | 5,93                     | 80                                                                                | 105                    | 11,87                    | 180                                                                                 | 5,58                     | 180                                                                                 | 4,84                     |
|                                                                                   | 280       | 80        | 200                                                                               | 5,93                     | 80                                                                                | 125                    | 11,87                    | 200                                                                                 | 5,58                     | 200                                                                                 | 4,84                     |
|                                                                                   | 300       | 100       | 200                                                                               | 5,93                     | 100                                                                               | 105                    | 11,87                    | 200                                                                                 | 5,58                     | 200                                                                                 | 4,84                     |
|                                                                                   | 320       | 100       | 220                                                                               | 5,93                     | 100                                                                               | 125                    | 11,87                    | 220                                                                                 | 5,58                     | 220                                                                                 | 4,84                     |
|                                                                                   | 340       | 100       | 240                                                                               | 5,93                     | 100                                                                               | 145                    | 11,87                    | 240                                                                                 | 5,58                     | 240                                                                                 | 4,84                     |
|                                                                                   | 360       | 100       | 260                                                                               | 5,93                     | 100                                                                               | 165                    | 11,87                    | 260                                                                                 | 5,58                     | 260                                                                                 | 4,84                     |
|                                                                                   | 380       | 100       | 280                                                                               | 5,93                     | 120                                                                               | 145                    | 11,87                    | 280                                                                                 | 5,58                     | 280                                                                                 | 4,84                     |
|                                                                                   | 400       | 100       | 300                                                                               | 5,93                     | 120                                                                               | 165                    | 11,87                    | 300                                                                                 | 5,58                     | 300                                                                                 | 4,84                     |



| VILCE |                                                                                   |                                                                                   |                                                                                    |                                                                                     |
|-------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|       | vītnes izraušana<br>flat <sup>(1)</sup>                                           | vītnes izraušana<br>edge <sup>(1)</sup>                                           | galvas ievilkšana<br>flat <sup>(2)</sup>                                           | galvas ievilkšana<br>ar paplāksni<br>flat <sup>(2)</sup>                            |
|       |  |  |  |  |
|       | $R_{ax,k}$<br>[kN]                                                                | $R_{ax,k}$<br>[kN]                                                                | $R_{head,k}$<br>[kN]                                                               | $R_{head,k}$<br>[kN]                                                                |
|       | 6,04                                                                              | 4,03                                                                              | 4,07                                                                               | 12,10                                                                               |
|       | 6,04                                                                              | 4,03                                                                              | 4,07                                                                               | 12,10                                                                               |
|       | 6,97                                                                              | 4,65                                                                              | 4,07                                                                               | 12,10                                                                               |
|       | 6,97                                                                              | 4,65                                                                              | 4,07                                                                               | 12,10                                                                               |
|       | 9,29                                                                              | 6,19                                                                              | 4,07                                                                               | 12,10                                                                               |
|       | 9,29                                                                              | 6,19                                                                              | 4,07                                                                               | 12,10                                                                               |
|       | 9,29                                                                              | 6,19                                                                              | 4,07                                                                               | 12,10                                                                               |
|       | 9,29                                                                              | 6,19                                                                              | 4,07                                                                               | 12,10                                                                               |
|       | 9,29                                                                              | 6,19                                                                              | 4,07                                                                               | 12,10                                                                               |
|       | 9,29                                                                              | 6,19                                                                              | 4,07                                                                               | 12,10                                                                               |
|       | 9,29                                                                              | 6,19                                                                              | 4,07                                                                               | 12,10                                                                               |
|       | 11,61                                                                             | 7,74                                                                              | 4,07                                                                               | 12,10                                                                               |
|       | 11,61                                                                             | 7,74                                                                              | 4,07                                                                               | 12,10                                                                               |
|       | 11,61                                                                             | 7,74                                                                              | 4,07                                                                               | 12,10                                                                               |
|       | 11,61                                                                             | 7,74                                                                              | 4,07                                                                               | 12,10                                                                               |
|       | 11,61                                                                             | 7,74                                                                              | 4,07                                                                               | 12,10                                                                               |
|       | 11,61                                                                             | 7,74                                                                              | 4,07                                                                               | 12,10                                                                               |
|       | 11,61                                                                             | 7,74                                                                              | 4,07                                                                               | 12,10                                                                               |
|       | 11,61                                                                             | 7,74                                                                              | 4,07                                                                               | 12,10                                                                               |
|       | 11,61                                                                             | 7,74                                                                              | 4,07                                                                               | 12,10                                                                               |
|       | 7,55                                                                              | 5,03                                                                              | 6,45                                                                               | 17,42                                                                               |
|       | 7,55                                                                              | 5,03                                                                              | 6,45                                                                               | 17,42                                                                               |
|       | 8,71                                                                              | 5,81                                                                              | 6,45                                                                               | 17,42                                                                               |
|       | 8,71                                                                              | 5,81                                                                              | 6,45                                                                               | 17,42                                                                               |
|       | 11,61                                                                             | 7,74                                                                              | 6,45                                                                               | 17,42                                                                               |
|       | 11,61                                                                             | 7,74                                                                              | 6,45                                                                               | 17,42                                                                               |
|       | 11,61                                                                             | 7,74                                                                              | 6,45                                                                               | 17,42                                                                               |
|       | 11,61                                                                             | 7,74                                                                              | 6,45                                                                               | 17,42                                                                               |
|       | 11,61                                                                             | 7,74                                                                              | 6,45                                                                               | 17,42                                                                               |
|       | 11,61                                                                             | 7,74                                                                              | 6,45                                                                               | 17,42                                                                               |
|       | 11,61                                                                             | 7,74                                                                              | 6,45                                                                               | 17,42                                                                               |
|       | 14,52                                                                             | 9,68                                                                              | 6,45                                                                               | 17,42                                                                               |
|       | 14,52                                                                             | 9,68                                                                              | 6,45                                                                               | 17,42                                                                               |
|       | 14,52                                                                             | 9,68                                                                              | 6,45                                                                               | 17,42                                                                               |
|       | 14,52                                                                             | 9,68                                                                              | 6,45                                                                               | 17,42                                                                               |
|       | 14,52                                                                             | 9,68                                                                              | 6,45                                                                               | 17,42                                                                               |
|       | 14,52                                                                             | 9,68                                                                              | 6,45                                                                               | 17,42                                                                               |

# APRĒĶINU PIEMĒRI: SIJAS UN SPĀRES SAVIENOJUMS

## SAVIENOJUMS KOKS-KOKS/VIENKĀRŠS GRIEZUMS

| 1. ELEMENTS         | 1 |
|---------------------|---|
| B1 = 120 mm         |   |
| H1 = 160 mm         |   |
| 30% slīpums (16,7°) |   |
| GL24h koks          |   |



| 2. ELEMENTS         | 2 |
|---------------------|---|
| B2 = 160 mm         |   |
| H2 = 240 mm         |   |
| 21% slīpums (12,0°) |   |
| GL24h koks          |   |

| PROJEKTA DATI                |
|------------------------------|
| $F_{v,Rd} = 7,17 \text{ kN}$ |
| Servisa kategorija = 1       |
| Slodzes ilgums = īss         |

| SKRŪVES IZVĒLE     |
|--------------------|
| HBS = 10x180 mm    |
| Priekšurbums = nav |
| Paplāksne = nav    |

| SAVIENOJUMA ĢEOMETRIJA                                       |
|--------------------------------------------------------------|
| $t_1 = 60 \text{ mm}$                                        |
| $\alpha_1 = 73,3^\circ (90^\circ - 16,7^\circ)$              |
| $t_2 = 120 \text{ mm}$<br>(ieskrūvēšanas garums 2. elementā) |
| $\alpha_2 = 78,0^\circ (90^\circ - 12,0^\circ)$              |

## GRIEZUMA IZTURĪBAS APRĒĶINS (EN 1995:2014 e ETA-11/0030)

|                                    |                                                                                                                                     |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| $d_1 = 10,0 \text{ mm}$            | $M_{y,k} = 35,8 \text{ Nm}$                                                                                                         |
| $f_{h,1,k} = 15,82 \text{ N/mm}^2$ | $R_{ax,Rk} = \min \{ \text{izturība pret vītnes izraušanu; izturība pret galvas ievilkšanu} \} = \min \{ R_{ax,Rk}; R_{head,Rk} \}$ |
| $f_{h,2,k} = 15,82 \text{ N/mm}^2$ | $= 3,77 \text{ kN}$                                                                                                                 |
| $\beta = 1,00$                     | $R_{ax,Rk}/4 = 0,94 \text{ kN (stieples efekts)}$                                                                                   |

$$R_{v,Rk} = \min \left\{ \begin{array}{l} f_{h,1,k} t_1 d \\ f_{h,2,k} t_2 d \\ \frac{f_{h,1,k} t_1 d}{1 + \beta} \left[ \sqrt{\beta + 2\beta^2 \left[ 1 + \frac{t_2}{t_1} + \left( \frac{t_2}{t_1} \right)^2} \right] + \beta^3 \left( \frac{t_2}{t_1} \right)^2} - \beta \left( 1 + \frac{t_2}{t_1} \right) \right] + \frac{R_{ax,Rk}}{4} \\ 1,05 \frac{f_{h,1,k} t_1 d}{2 + \beta} \left[ \sqrt{2\beta (1 + \beta) + \frac{4\beta (2 + \beta) M_{y,Rk}}{f_{h,1,k} d t_1^2}} - \beta \right] + \frac{R_{ax,Rk}}{4} \\ 1,05 \frac{f_{h,1,k} t_2 d}{1 + 2\beta} \left[ \sqrt{2\beta^2 (1 + \beta) + \frac{4\beta (1 + 2\beta) M_{y,Rk}}{f_{h,1,k} d t_2^2}} - \beta \right] + \frac{R_{ax,Rk}}{4} \\ 1,15 \sqrt{\frac{2\beta}{(1 + \beta)}} \sqrt{2 M_{y,Rk} f_{h,1,k} d} + \frac{R_{ax,Rk}}{4} \end{array} \right.$$

(a) = 9,49 kN  
(b) = 18,99 kN  
(c) = 7,39 kN  
(d) = 4,87 kN  
(e) = 7,90 kN  
(f) = 4,81 kN

$R_{v,Rk} = 4,81 \text{ kN}$

$$R_d = \frac{R_k \cdot k_{mod}}{\gamma_M}$$

EN 1995:2014  
 $k_{mod} = 0,9$   
 $\gamma_M = 1,3$   
 $R_{v,Rd} = 3,33 \text{ kN}$   
 Minimālais skrūvju skaits  
 $F_{v,Rd}/R_{v,Rd} = 2,15$

Itālija - NTC 2018

$$k_{mod} = 0,9$$

$$\gamma_M = 1,5$$

$$R_{v,Rd} = 2,89 \text{ kN}$$

Minimālais skrūvju skaits  
 $F_{v,Rd}/R_{v,Rd} = 2,48$

Tiek norādītas 3 skrūves

$$n_{ef,GRIEZUMS} = 3 \text{ (šķiedrām perpendikulāras skrūves)}$$

$$n_{ef,VILCE} = \max(3^{0,9}; 0,9 \cdot 3) = 2,70$$

Pārreķinot griezumam izturību, par stieples efektu tiek uzskatīta atsevišķas skrūves stiepes izturība, kas vienāda ar:

$$R_{ax,Rk} = 3,77 \cdot 2,70/3 = 3,39 \text{ kN (galvas ievilkšana)}$$

$$R_{ax,Rk}/4 = 0,85 \text{ kN (stieples efekts)}$$

Atsevišķas skrūves griezumam izturība:

$$R_{v,Rk} = 4,72 \text{ kN}$$

$$R_{v,Rd} \geq F_{v,Rd}$$

EN 1995:2014  
 $R_{v,Rd} = 3,27 \text{ kN}$   
**Savienojuma griezumam izturība:**  
 $R_{v,Rd} = 3,27 \times 3 = 9,80 \text{ kN} > 7,17 \text{ kN OK}$

Itālija - NTC 2018

$$R_{v,Rd} = 2,83 \text{ kN}$$

**Savienojuma griezumam izturība:**  
 $R_{v,Rd} = 2,83 \times 3 = 8,49 \text{ kN} > 7,17 \text{ kN OK}$

## SAVIENOJUMS KOKS-KOKS/VIENKĀRŠS GRIEZUMS

### 1. ELEMENTS

1

B1 = 120 mm

H1 = 160 mm

30% slīpums (16,7°)

GL24h koks



### 2. ELEMENTS

2

B2 = 160 mm

H2 = 240 mm

21% slīpums (12,0°)

GL24h koks

### PROJEKTA DATI

$F_{v,Rd} = 7,17 \text{ kN}$

Servisa kategorija = 1

Slodzes ilgums = īss

### SKRŪVES IZVĒLE

HBS = 10x180 mm

Priekššurbums = nav

Paplāksne = nav

### SAVIENOJUMA ĢEOMETRIJA

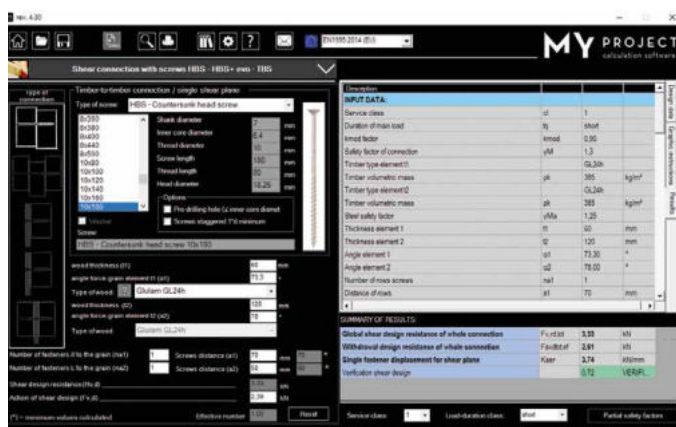
$t_1 = 60 \text{ mm}$

$\alpha_1 = 73,3^\circ (90^\circ - 16,7^\circ)$

$t_2 = 120 \text{ mm}$   
(ieskrūvēšanas garums 2. elementā)

$\alpha_2 = 78,0^\circ (90^\circ - 12,0^\circ)$

## GRIEZUMA IZTURĪBAS APRĒĶINS AR MYPROJECT PROGRAMMATŪRU [EN 1995:2014 un ETA-11/0030]



|                       |     |    |    |
|-----------------------|-----|----|----|
| Number of rows screws | na1 | 1  |    |
| Distance of rows      | a1  | 70 | mm |

| SUMMARY OF RESULTS:                                |                |      |          |
|----------------------------------------------------|----------------|------|----------|
| Global shear design resistance of whole connection | $F_{v,Rd,tot}$ | 3,33 | kN       |
| Withdrawal design resistance of whole connection   | $F_{ax,d,tot}$ | 2,61 | kN       |
| Single fastener displacement for shear plane       | $K_{ser}$      | 3,74 | kN/mm    |
| Verification shear design                          |                | 0,72 | VERIFIED |

## APRĒĶINA PĀRSKATS

