

POSITION 45: SCISSORS IMPORT

1. Input parameters

2. General statements

double shear plane connection, exact verification acc. to DIN EN 1995, 8.2.2
crossing angle $\delta = 36.9^\circ$

3. materials

3.1. outer timber members

NKL 1, glue laminated timber EC GL30h, $\rho_k = 430 \text{ kg/m}^3$, $t/b = 100.0/220.0 \text{ mm}$
angle between force and the grain direction $\alpha = 0.0^\circ$
bar continuous to the left and right

3.2. central timber member

NKL 1, glue laminated timber EC GL32c, $\rho_k = 400 \text{ kg/m}^3$, $t/b = 180.0/200.0 \text{ mm}$
bar continuous to the left and right

4. fasteners

bolt 8 mm, FK 5.8 as fitted bolt

washer $d = 28 \text{ mm}$

$F_{v,Rk}$ increased acc. to DIN EN 1995, 8.2.2(2) with washer $d = 28 \text{ mm}$

4.1. load combinations (design internal forces)

4.1.1. Lf1, KLED: free

Nr	bar	N_d kN	M_d kNm	V_d kN	k_{mod} -	γ -
1	outer t.memb. left	0.000	0.000	0.000	0.600	1.30
2	out. t. memb. right	-3.333	0.000	0.000	0.600	1.30
3	ctr. t.mem. left	-2.667	-2.000	-1.000	0.600	1.30
4	ctr. t.mem. right	0.000	2.000	1.000	0.600	1.30
5	$\Sigma H, \Sigma M, \Sigma V$	-0.002	0.000	0.001	---	---

4.1.2. 1.35*Lf1, KLED: free

Nr	bar	N_d kN	M_d kNm	V_d kN	k_{mod} -	γ -
1	outer t.memb. left	0.000	0.000	0.000	0.600	1.30
2	out. t. memb. right	-4.500	0.000	0.000	0.600	1.30
3	ctr. t.mem. left	-3.600	-2.700	-1.350	0.600	1.30
4	ctr. t.mem. right	0.000	2.700	1.350	0.600	1.30
5	$\Sigma H, \Sigma M, \Sigma V$	-0.001	0.000	0.002	---	---

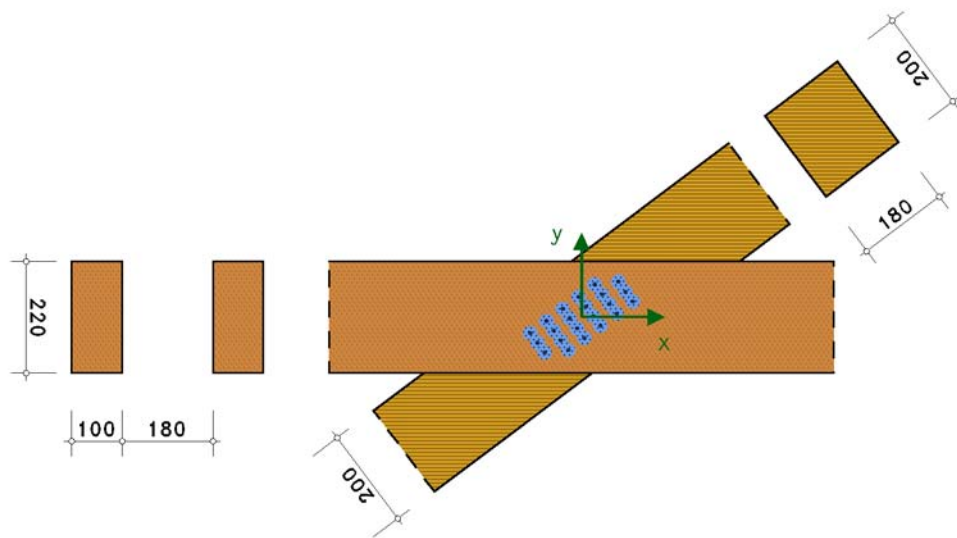
4.1.3. Lf1+1.5*Lf2, KLED: free

Nr	bar	N_d kN	M_d kNm	V_d kN	k_{mod} -	γ -
1	outer t.memb. left	-0.900	-3.000	-1.200	0.800	1.30
2	out. t. memb. right	-7.433	3.000	1.200	0.800	1.30
3	ctr. t.mem. left	-6.667	-2.000	-1.000	0.800	1.30
4	ctr. t.mem. right	0.000	2.000	1.000	0.800	1.30
5	$\Sigma H, \Sigma M, \Sigma V$	-0.002	0.000	0.003	---	---

4.1.4. 1.35*Lf1+1.5*Lf2, KLED: free

Nr	bar	N_d kN	M_d kNm	V_d kN	k_{mod} -	γ -
1	outer t.memb. left	-0.900	-3.000	-1.200	0.800	1.30
2	out. t. memb. right	-8.600	3.000	1.200	0.800	1.30
3	ctr. t.mem. left	-7.600	-2.700	-1.350	0.800	1.30
4	ctr. t.mem. right	0.000	2.700	1.350	0.800	1.30
5	$\Sigma H, \Sigma M, \Sigma V$	-0.001	0.000	0.004	---	---

5. view



6. Results only decisive load case combination

6.1. Results fasteners

6.2. fasteners

6.2.1. 1.35*Lf1+1.5*Lf2

$N_d = 7.599 \text{ kN}$, $V_d = 2.704 \text{ kN}$, $M_{v,d} = 0.000 \text{ kNm}$

forces per connection centre point, case = decisive failure case acc. to DIN EN 1995-1-1, 8.2.2

Nr	F_{M1} kN	F_{MH1} kN	F_{MV1} kN	F_{totH1} kN	F_{totV1} kN	F_{tot1} kN	α_{tot1} °	$f_{h,\alpha,k}$ N/mm ²	case	$F_{v,Rd}$ kN	$U_{n,ef}$ -	$U_{F,v}$ -
1	0.000	-0.000	-0.000	0.345	0.123	0.367	19.6	24.45	G1.(k)	6.2814	0.07	0.06
2	0.000	-0.000	-0.000	0.345	0.123	0.367	19.6	24.45	G1.(k)	6.2814	0.08	0.06
3	0.000	-0.000	-0.000	0.345	0.123	0.367	19.6	24.45	G1.(k)	6.2814	0.08	0.06
4	0.000	-0.000	-0.000	0.345	0.123	0.367	19.6	24.45	G1.(k)	6.2814	0.07	0.06
5	0.000	-0.000	-0.000	0.345	0.123	0.367	19.6	24.45	G1.(k)	6.2814	0.08	0.06
6	0.000	-0.000	-0.000	0.345	0.123	0.367	19.6	24.45	G1.(k)	6.2814	0.08	0.06
7	0.000	-0.000	-0.000	0.345	0.123	0.367	19.6	24.45	G1.(k)	6.2814	0.07	0.06
8	0.000	0.000	-0.000	0.345	0.123	0.367	19.6	24.45	G1.(k)	6.2814	0.07	0.06
9	0.000	-0.000	-0.000	0.345	0.123	0.367	19.6	24.45	G1.(k)	6.2814	0.08	0.06
10	0.000	-0.000	-0.000	0.345	0.123	0.367	19.6	24.45	G1.(k)	6.2814	0.08	0.06
11	0.000	-0.000	0.000	0.345	0.123	0.367	19.6	24.45	G1.(k)	6.2814	0.07	0.06
12	0.000	0.000	-0.000	0.345	0.123	0.367	19.6	24.45	G1.(k)	6.2814	0.07	0.06
13	0.000	0.000	0.000	0.345	0.123	0.367	19.6	24.45	G1.(k)	6.2814	0.08	0.06
14	0.000	0.000	0.000	0.345	0.123	0.367	19.6	24.45	G1.(k)	6.2814	0.08	0.06
15	0.000	-0.000	0.000	0.345	0.123	0.367	19.6	24.45	G1.(k)	6.2814	0.07	0.06
16	0.000	0.000	0.000	0.345	0.123	0.367	19.6	24.45	G1.(k)	6.2814	0.07	0.06
17	0.000	0.000	0.000	0.345	0.123	0.367	19.6	24.45	G1.(k)	6.2814	0.08	0.06
18	0.000	0.000	0.000	0.345	0.123	0.367	19.6	24.45	G1.(k)	6.2814	0.08	0.06
19	0.000	0.000	0.000	0.345	0.123	0.367	19.6	24.45	G1.(k)	6.2814	0.07	0.06
20	0.000	0.000	0.000	0.345	0.123	0.367	19.6	24.45	G1.(k)	6.2814	0.08	0.06
21	0.000	0.000	0.000	0.345	0.123	0.367	19.6	24.45	G1.(k)	6.2814	0.08	0.06
22	0.000	0.000	0.000	0.345	0.123	0.367	19.6	24.45	G1.(k)	6.2814	0.07	0.06

maximum utilisation of the fasteners $U_{max} = 0.08 \leq 1 \Rightarrow$ verification fulfilled

6.3. results bars

6.3.1. outer timber member mit $A_n = 40800 \text{ mm}^2$, $W_n = 1538508 \text{ mm}^3$, $I_n = 169235830 \text{ mm}^4$, $k_h = 1.100$

load	$f_{m,d}$ N/mm ²	$f_{t,d}$ N/mm ²	$f_{c,d}$ N/mm ²	$f_{v,d}$ N/mm ²	N_d kN	M_d kNm	$\sigma_{0,d}$ N/mm ²	$\sigma_{m0,d}$ N/mm ²	$\sigma_{m1,d}$ N/mm ²	V_d kN	τ_d N/mm ²	U_σ -	U_τ -
1	20.31	16.25	18.46	2.15	-0.900	-3.000	-0.02	-1.95	-1.95	-1.200	0.08	0.10	0.04

maximum utilisation of the bar $U_{max} = 0.10 \leq 1 \Rightarrow$ verification fulfilled

6.3.2. outer timber member mit $A_n = 40800 \text{ mm}^2$, $W_n = 1538508 \text{ mm}^3$, $I_n = 169235830 \text{ mm}^4$, $k_h = 1.100$

load	$f_{m,d}$ N/mm ²	$f_{t,d}$ N/mm ²	$f_{c,d}$ N/mm ²	$f_{v,d}$ N/mm ²	N_d kN	M_d kNm	$\sigma_{0,d}$ N/mm ²	$\sigma_{m0,d}$ N/mm ²	$\sigma_{mu,d}$ N/mm ²	V_d kN	τ_d N/mm ²	U_σ -	U_τ -
1	20.31	16.25	18.46	2.15	-7.433	3.000	-0.18	1.95	1.95	1.200	0.08	0.10	0.04

maximum utilisation of the bar $U_{\max} = 0.10 \leq 1 \Rightarrow$ **verification fulfilled**

6.3.3. central timber member mit $A_n = 30240 \text{ mm}^2$, $W_n = 1156490 \text{ mm}^3$, $I_n = 115648968 \text{ mm}^4$, $k_h = 1.100$

load	$f_{m,d}$ N/mm ²	$f_{t,d}$ N/mm ²	$f_{c,d}$ N/mm ²	$f_{v,d}$ N/mm ²	N_d kN	M_d kNm	$\sigma_{0,d}$ N/mm ²	$\sigma_{m0,d}$ N/mm ²	$\sigma_{mu,d}$ N/mm ²	V_d kN	τ_d N/mm ²	U_σ -	U_τ -
1	16.25	9.90	11.31	1.62	-3.600	-2.700	-0.12	-2.33	-2.33	-1.350	0.12	0.14	0.07

maximum utilisation of the bar $U_{\max} = 0.14 \leq 1 \Rightarrow$ **verification fulfilled**

6.3.4. central timber member mit $A_n = 30240 \text{ mm}^2$, $W_n = 1156490 \text{ mm}^3$, $I_n = 115648968 \text{ mm}^4$, $k_h = 1.100$

load	$f_{m,d}$ N/mm ²	$f_{t,d}$ N/mm ²	$f_{c,d}$ N/mm ²	$f_{v,d}$ N/mm ²	N_d kN	M_d kNm	$\sigma_{0,d}$ N/mm ²	$\sigma_{m0,d}$ N/mm ²	$\sigma_{mu,d}$ N/mm ²	V_d kN	τ_d N/mm ²	U_σ -	U_τ -
1	16.25	9.90	11.31	1.62	0.000	2.700	0.00	2.33	2.33	1.350	0.12	0.14	0.07

maximum utilisation of the bar $U_{\max} = 0.14 \leq 1 \Rightarrow$ **verification fulfilled**