

POSITION 43: HOLZBAU TASCHENBUCH 2004, S.217

1. Input parameters

2. General statements

double shear plane connection, exact verification acc. to DIN EN 1995, 8.2.2
crossing angle $\delta = 100.0^\circ$

3. materials

3.1. outer timber members

NKL 2, glue laminated timber DIN GL28h (BS14), $\rho_k = 410 \text{ kg/m}^3$, $t/b = 60.0/770.0 \text{ mm}$
angle between force and the grain direction $\alpha = -10.0^\circ$
bar on one side left with overhang $\bar{u}_{\text{right}} = 410.0 \text{ mm}$ (measured from the node)

3.2. central timber member

NKL 2, glue laminated timber DIN GL28h (BS14), $\rho_k = 410 \text{ kg/m}^3$, $t/b = 120.0/810.0 \text{ mm}$
bar on one side right with overhang $\bar{u}_{\text{left}} = 577.5 \text{ mm}$ (measured from the node)

4. fasteners Kreis 1

dowel 20 mm, S235 (1052)

coordinates of the fasteners (origin in the node, x to the right, y upwards)

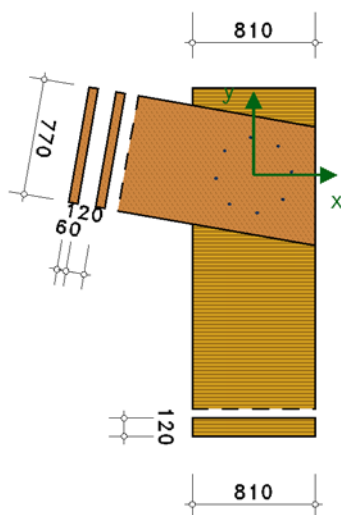
Nr	x _k mm	y _k mm	Nr	x _k mm	y _k mm
1	249.0	21.8	5	-249.0	-21.8
2	160.7	191.5	6	-160.7	-191.5
3	-21.8	249.0	7	21.8	-249.0
4	-191.5	160.7	8	191.5	-160.7

4.1. load combinations (design internal forces)

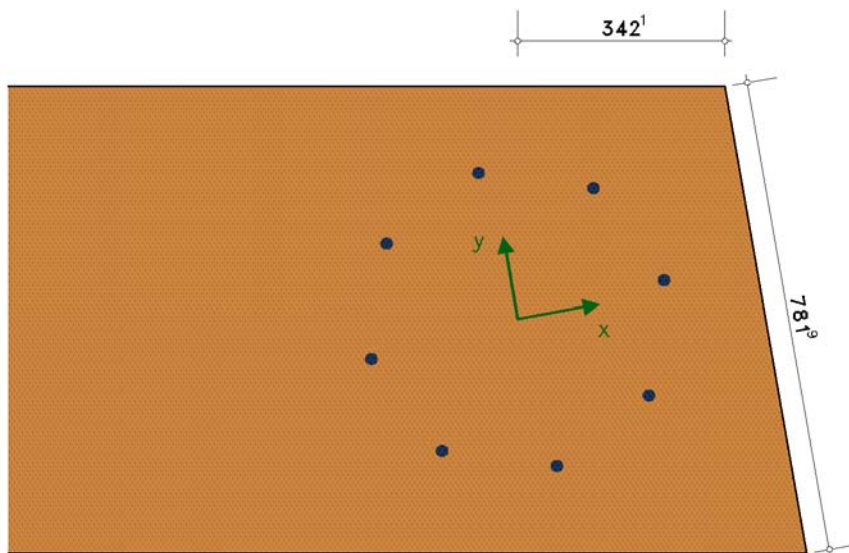
4.1.1. Lk1, KLED: medium-term

Nr	bar	N _d kN	M _d kNm	V _d kN	k _{mod} -	γ -
1	outer t.mem. left	36.000	15.750	-31.500	0.800	1.30
2	ctr. t.mem. right	37.290	-15.750	30.000	0.800	1.30
3	$\Sigma H, \Sigma M, \Sigma V$	-62.060	0.000	-70.923	---	---

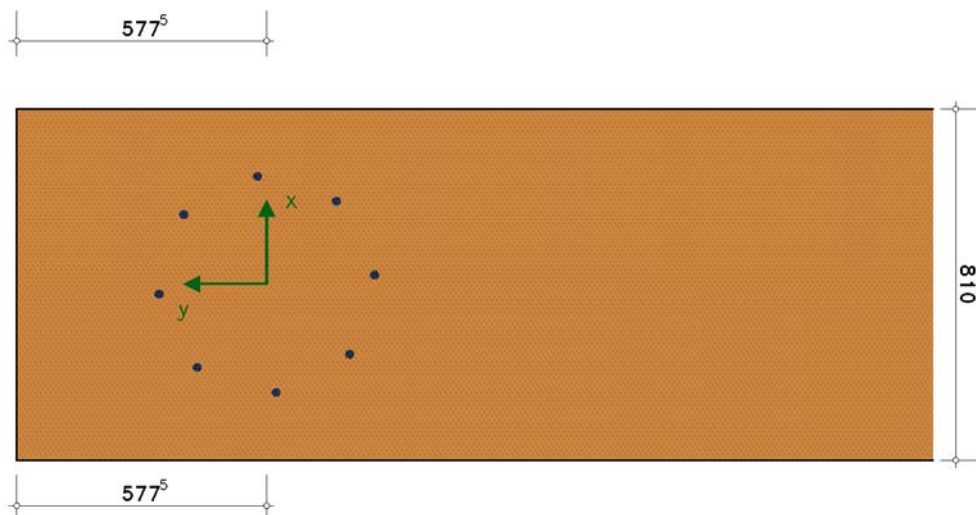
5. view



6. view outer timber members



7. view central timber member



8. Results only decisive load case combination

8.1. Results fasteners

8.2. fasteners

8.2.1. Lk1

$N_d = -24.770$ kN, $V_d = -40.923$ kN, $M_{v,d} = 15.750$ 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	7.875	0.686	7.845	-2.410	2.730	3.641	131.4	19.25	G1.(j)	14.9381	0.21	0.24
2	7.875	6.033	5.062	2.936	-0.053	2.937	-1.0	16.46	G1.(j)	13.4144	0.22	0.22
3	7.875	7.845	-0.686	4.749	-5.802	7.497	-50.7	19.58	G1.(j)	15.1193	0.43	0.50
4	7.875	5.062	-6.033	1.966	-11.148	11.320	-80.0	25.00	G1.(j)	18.0302	0.63	0.63
5	7.875	-0.686	-7.845	-3.783	-12.960	13.501	-106.3	26.69	G1.(j)	18.9327	0.71	0.71
6	7.875	-6.033	-5.062	-9.129	-10.177	13.672	-131.9	22.77	G1.(j)	16.8369	0.69	0.81
7	7.875	-7.845	0.686	-10.941	-4.429	11.804	-158.0	18.33	G1.(j)	14.4412	0.76	0.82
8	7.875	-5.062	6.033	-8.158	0.917	8.210	173.6	16.33	G1.(j)	13.3417	0.61	0.62

maximum utilisation of the fasteners $U_{max} = 0.82 \leq 1 \Rightarrow$ verification fulfilled

8.3. results bars

8.3.1. outer timber member mit $A_n = 90000 \text{ mm}^2$, $W_n = 11830976 \text{ mm}^3$, $I_n = 4554925756 \text{ mm}^4$, $k_h = 1.000$

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	17.23	12.00	16.31	2.15	36.000	15.750	0.40	1.33	1.33	-31.500	0.92	0.11	0.43

maximum utilisation of the bar $U_{\max} = 0.43 \leq 1 \Rightarrow$ **verification fulfilled**

8.3.2. central timber member mit $A_n = 94800 \text{ mm}^2$, $W_n = 12740171 \text{ mm}^3$, $I_n = 5159769365 \text{ mm}^4$, $k_h = 1.000$

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	17.23	12.00	16.31	2.15	37.290	-15.750	0.39	-1.24	-1.24	30.000	0.83	0.04	0.39

maximum utilisation of the bar $U_{\max} = 0.39 \leq 1 \Rightarrow$ **verification fulfilled**