

POSITION 32: RAUTENSTRAUCH S. 321

1. Input parameters

2. General statements

double shear plane connection, simplified verification acc. to NA.8.2.4
crossing angle $\delta = 180.0^\circ$

3. materials

3.1. outer timber members

NKL 1, gypsum board GKB, $\rho_k = 680 \text{ kg/m}^3$, $t/b = 18.0/160.0 \text{ mm}$

alignment upright (edge)

angle between force and the grain direction $\alpha = 0.0^\circ$

bar on one side left with overhang $\bar{u}_{\text{right}} = 190.0 \text{ mm}$ (measured from the node)

3.2. central timber member

NKL 1, solid coniferous timber C30, $\rho_k = 380 \text{ kg/m}^3$, $t/b = 80.0/160.0 \text{ mm}$

bar on one side right with overhang $\bar{u}_{\text{left}} = 120.0 \text{ mm}$ (measured from the node)

4. fasteners

nail, $1.8 \times 35.0 \text{ mm}$, $d_k = 4.5 \text{ mm}$, predrilled

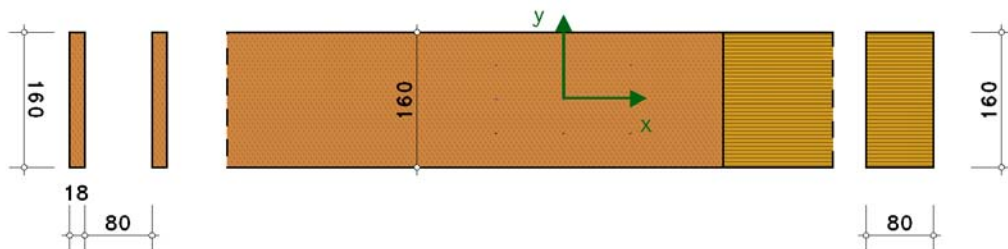
double-sided arrangement

4.1. load combinations (design internal forces)

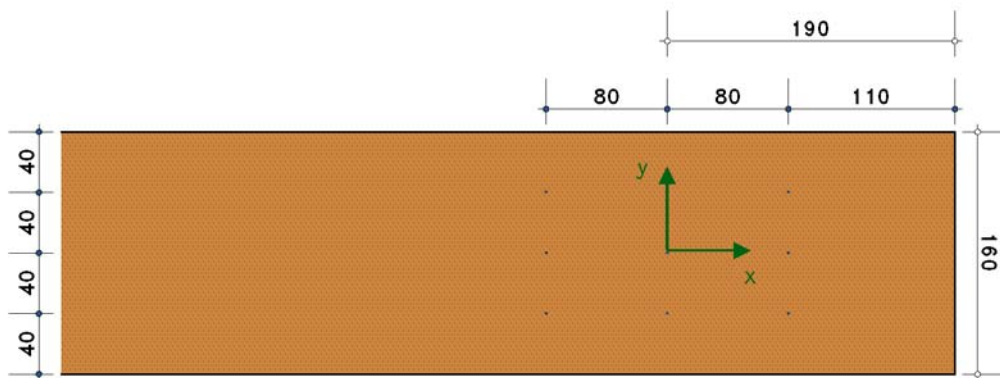
4.1.1. load, KLED: short-term

Nr	bar	N_d kN	M_d kNm	V_d kN	k_{mod} -	γ -
1	outer t.mem. left	3.400	0.000	0.000	0.800	1.30
2	ctr. t.mem. right	3.400	0.000	0.000	0.900	1.30
3	$\Sigma H, \Sigma M, \Sigma V$	0.000	0.000	0.000	---	---

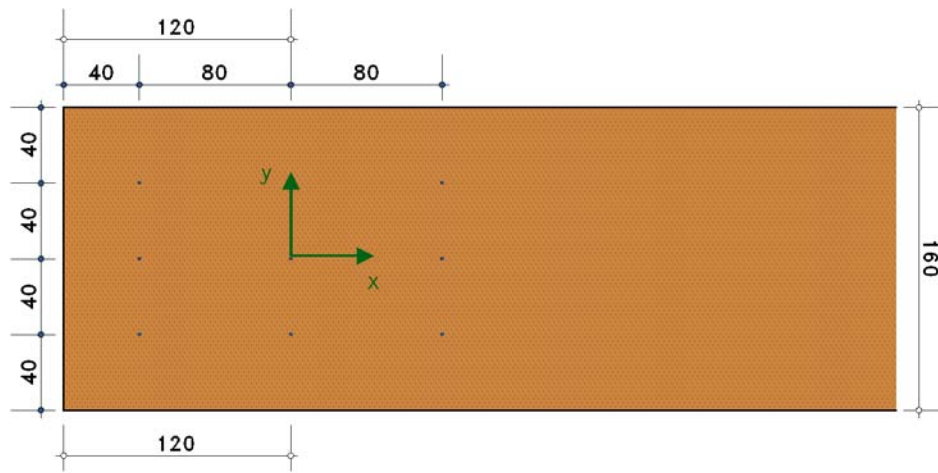
5. view



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. load

$N_d = 3.400 \text{ kN}$, $V_d = 0.000 \text{ kN}$, $M_{v,d} = 0.000 \text{ kNm}$

forces per connection centre point ($f_{red} = t_{vorh} / t_{req}$)

Nr	F_{M1} kN	F_{MH1} kN	F_{MV1} kN	F_{totH1} kN	F_{totV1} kN	F_{tot1} kN	α_{tot1} °	f_{red} -	$F_{v,Rd}$ kN	$U_{n,ef}$ -	$U_{F,v}$ -
1	0.000	0.000	-0.000	0.378	0.000	0.378	0.0	0.936	0.3955	0.96	0.96
2	0.000	0.000	-0.000	0.378	0.000	0.378	0.0	0.936	0.3955	0.96	0.96
3	0.000	-0.000	-0.000	0.378	0.000	0.378	0.0	0.936	0.3955	0.96	0.96
4	0.000	0.000	0.000	0.378	0.000	0.378	0.0	0.936	0.3955	0.96	0.96
5	0.000	0.000	0.000	0.378	0.000	0.378	0.0	0.936	0.3955	0.96	0.96
6	0.000	-0.000	0.000	0.378	0.000	0.378	0.0	0.936	0.3955	0.96	0.96
7	0.000	0.000	0.000	0.378	0.000	0.378	0.0	0.936	0.3955	0.96	0.96
8	0.000	0.000	0.000	0.378	0.000	0.378	0.0	0.936	0.3955	0.96	0.96
9	0.000	-0.000	0.000	0.378	0.000	0.378	0.0	0.936	0.3955	0.96	0.96

maximum utilisation of the fasteners $U_{max} = 0.96 \leq 1 \Rightarrow$ **verification fulfilled**

8.3. results bars

8.3.1. outer timber member mit $A_n = 5566 \text{ mm}^2$, $W_n = 151006 \text{ mm}^3$, $I_n = 12080513 \text{ mm}^4$, $k_h = 1.000$
dimensioning as tension joint acc. to NCI NA.8.1.6 (NA.1) (red. of tensile load-bear. cap. by one third)

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	2.22	0.27	2.15	0.62	3.400	0.000	0.61	0.00	0.00	0.000	0.00	2.26	0.00

maximum utilisation of the bar $U_{max} = 2.26 > 1 \Rightarrow$ **verification not fulfilled**

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8.3.2. central timber member mit $A_n = 12368 \text{ mm}^2$, $W_n = 335570 \text{ mm}^3$, $I_n = 26845584 \text{ mm}^4$, $k_h = 1.000$

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	20.77	5.26	16.62	2.77	3.400	0.000	0.27	0.00	0.00	0.000	0.00	0.05	0.00

maximum utilisation of the bar $U_{max} = 0.05 \leq 1 \Rightarrow$ **verification fulfilled**