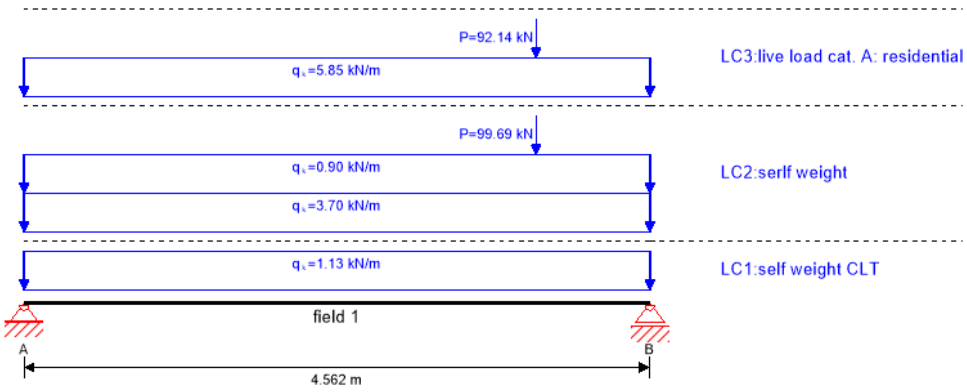
system



global utilization ratio — 86 %

ULS	ULS fire	SLS	SLS vibration	support
86 %	27 %	12 %	0 %	-1 %

section: wooden beam 30/75

section width	section height	area	Iy	Iz
[cm]	[cm]	[mm²]	[mm⁴]	[mm⁴]
30	75	225,000	10,546,880,000	1,687,500,000

section fire: wooden beam 30/75

section width	section height	area	Iy	Iz
[cm]	[cm]	[mm²]	[mm⁴]	[mm⁴]
30	75	225,000	10,546,880,000	1,687,500,000

fire resistance class:R 0 — time: **0 min**

fire protection layering : no additional fire protection

k_0	d_0	$d_{char,0,h}$	$d_{ef,h}$	$d_{char,0,v}$	$d_{ef,v}$
[-]	[mm]	[mm]	[mm]	[mm]	[mm]
1	7	0.0	0.0	0.0	0.0

material values

material	$f_{m,k}$	$f_{t,0,k}$	$f_{t,90,k}$	$f_{c,0,k}$	$f_{c,90,k}$	$f_{v,k}$	$f_{r,k\ min}$	$E_{0,mean}$	G_{mean}	$E_{0,5}$
	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]	[N/mm²]
GL 32h	32.00	25.60	0.50	32.00	2.50	2.50	1.20	14,200.00	350.00	11,800.00

load

load case groups

	load case category	Typ	duration	Kmod	γ_{inf}	γ_{sup}	Ψ_0	Ψ_1	Ψ_2
LC1	self weight CLT	G	permanet	0.6	1	1.35	1	1	1
LC2	serlf weight	G	permanet	0.6	1	1.35	1	1	1
LC3	live load cat. A: residential	Q	medium term	0.8	0	1.5	0.7	0.5	0.3

LC1:self weight CLT

continous load

field	load at start
	[kN/m]
1	1.13

LC2:serlf weight

continous load	
field	load at start
	[kN/m]
1	3.70
1	0.90

point load		
field	distance from start	load at start
	[m]	[kN]
1	3.734	99.69

LC3:live load cat. A: residential

continous load	
field	load at start
	[kN/m]
1	5.85

point load		
field	distance from start	load at start
	[m]	[kN]
1	3.734	92.14

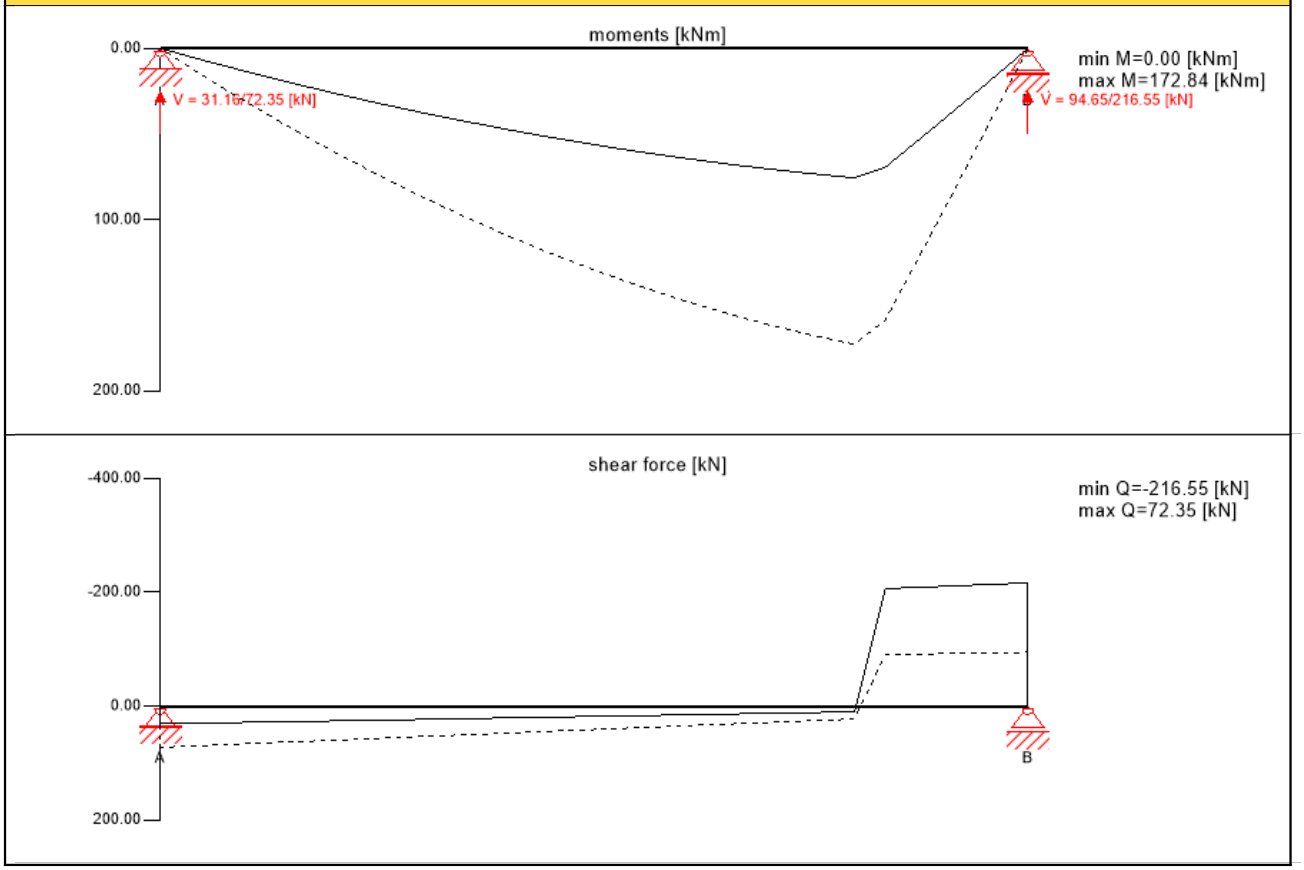
ULS combinations	
	combination rule
LCO1	1.12/1.00 * LC1 + 1.12/1.00 * LC2
LCO2	1.12/1.00 * LC1 + 1.12/1.00 * LC2 + 1.25/0.00 * LC3

ULS combinations fire	
	combination rule
LCO3	1.00/1.00 * LC1 + 1.00/1.00 * LC2
LCO4	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.30 * LC3

SLS characteristic combination	
	combination rule
LCO5	1.00/1.00 * LC1 + 1.00/1.00 * LC2
LCO6	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * LC3

SLS quasi-permanent combination	
	combination rule
LCO7	1.00/1.00 * LC1 + 1.00/1.00 * LC2
LCO8	1.00/1.00 * LC1 + 1.00/1.00 * LC2 + 1.00/0.00 * 0.30 * LC3

Ultimate limit state (ULS) - design results



ULS flexural design

field	dist.	$f_{m,k}$	γ_m	k_{mod}	$k_{sys,z}$	k_{hm}	$f_{m,y,d}$	$M_{y,d}$	$\sigma_{m,y,d}$	ratio	
	[m]	[N/mm²]	[-]	[-]	[-]	[-]	[N/mm²]	[kNm]	[N/mm²]		
1	3.65	32.00	1.25	0.80	1.00	1.00	20.48	172.84	6.15	30 %	LCO2

ULS shear analysis

field	dist.	$f_{v,k}$	γ_m	k_{mod}	$f_{v,d}$	V_d	$\tau_{v,d}$	ratio	
	[m]	[N/mm²]	[-]	[-]	[N/mm²]	[kN]	[N/mm²]		
1	3.81	2.50	1.25	0.80	1.60	206.28	1.38	86 %	LCO2

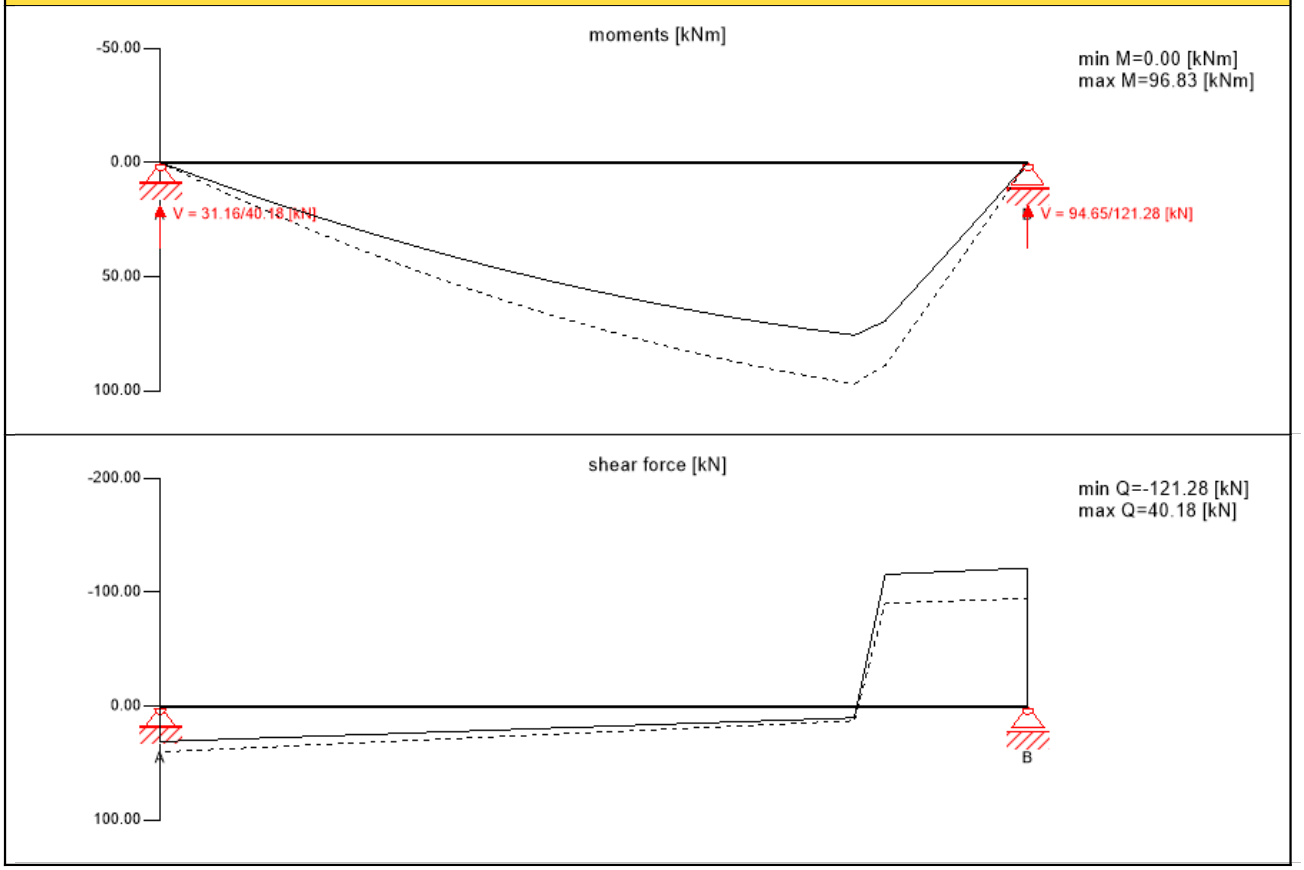
flexural stress analysis

$M_{y,d}$ =	172.84	kNm		$f_{m,k}$ =	32.00	N/mm²	
$N_{t,d}$ =	0.00	kN		γ_m =	1.25	-	
				k_{mod} =	0.80	-	
				$k_{sys,y}$ =	1.00	-	
				k_{hm} =	1.00	-	
				k_l =	1.00	-	
$\sigma_{t,d}$ =	0.00	N/mm²		$f_{t,d}$ =	17.56	N/mm²	
$\sigma_{m,y,d}$ =	6.15	N/mm²	<	$f_{m,y,d}$ =	20.48	N/mm²	✓
utilization ratio							30 %

shear stress analysis

V_d =	206.28	kN		$f_{v,k}$ =	2.50	N/mm²	
				γ_m =	1.25	-	
				k_{mod} =	0.80	-	
$\tau_{v,d}$ =	1.38	N/mm²	<	$f_{v,d}$ =	1.60	N/mm²	✓
utilization ratio							86 %

Ultimate limit state (ULS) fire design - results



ULS fire flexural design

field	dist.	$f_{m,k}$	γ_m	k_{mod}	$k_{sys,z}$	k_{fi}	$f_{m,y,d}$	$M_{y,d}$	$\sigma_{m,y,d}$	ratio	
	[m]	[N/mm²]	[-]	[-]	[-]	[-]	[N/mm²]	[kNm]	[N/mm²]		
1	3.65	32.00	1.00	1.00	1.00	1.15	36.80	96.83	3.44	9 %	LCO4

ULS fire shear analysis

field	dist.	$f_{v,k}$	γ_m	k_{mod}	k_{fi}	$f_{v,d}$	V_d	$\tau_{v,d}$	ratio	
	[m]	[N/mm²]	[-]	[-]	[-]	[N/mm²]	[kN]	[N/mm²]		
1	3.81	2.50	1.00	1.00	1.15	2.88	115.67	0.77	27 %	LCO4

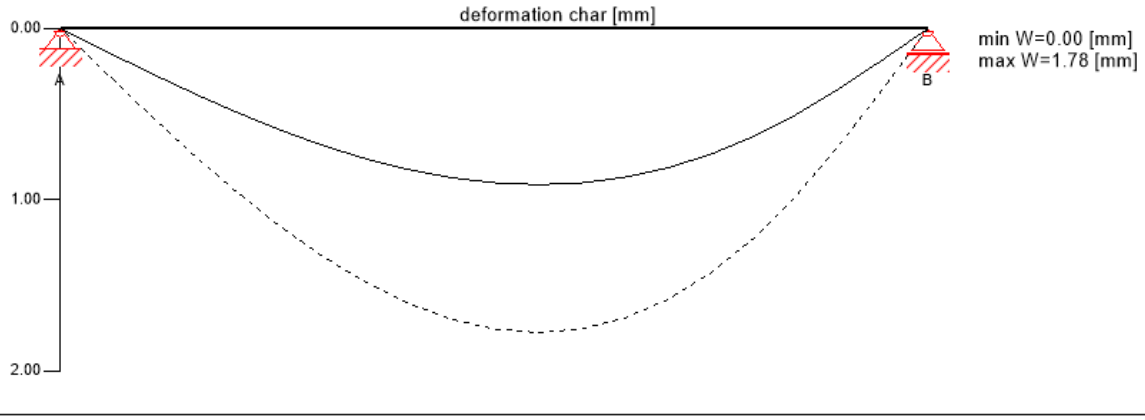
flexural stress analysis fire

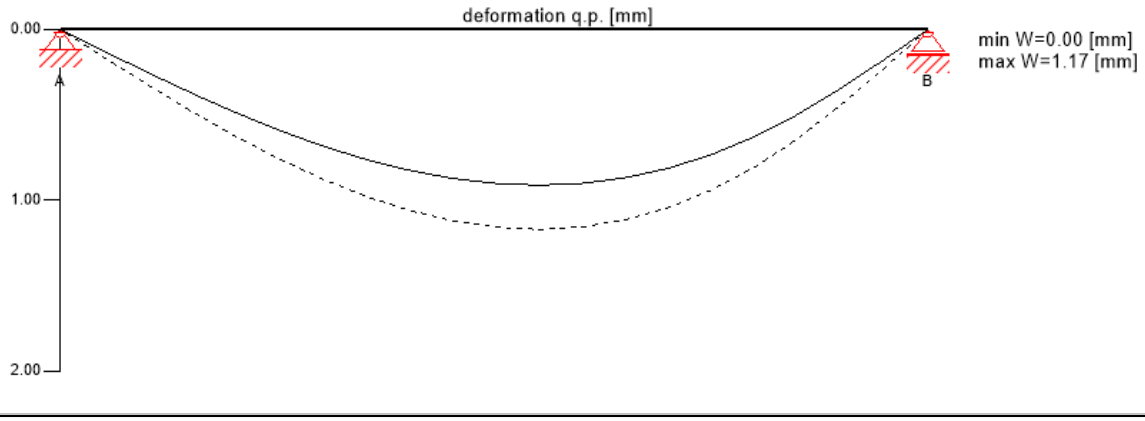
$M_{y,d}$ =	96.83	kNm		$f_{m,k}$ =	32.00	N/mm²	
$N_{t,d}$ =	0.00	kN		γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				$k_{sys,y}$ =	1.00	-	
				k_{hm} =	1.00	-	
				k_l =	1.00	-	
				k_{fi} =	1.15	-	
$\sigma_{t,d}$ =	0.00	N/mm²		$f_{t,d}$ =	31.55	N/mm²	
$\sigma_{m,y,d}$ =	3.44	N/mm²	<	$f_{m,y,d}$ =	36.80	N/mm²	✓
utilization ratio							9 %

shear stress analysis fire

V_d =	115.67	kN		$f_{v,k}$ =	2.50	N/mm²	
				γ_m =	1.00	-	
				k_{mod} =	1.00	-	
				k_{fi} =	1.15	-	
$\tau_{v,d}$ =	0.77	N/mm²	<	$f_{v,d}$ =	2.88	N/mm²	✓
utilization ratio							27 %

Service limit state design (SLS) - design results





w_{inst} = w[char]

field	limit	w_{limit}	$w_{calc.}$	ratio
	[-]	[mm]	[mm]	
1	1/300	15.2	1.8	12 %

w_{fin} = w[char] + w[q.p.]*kdef

field	limit	w_{limit}	$w_{calc.}$	ratio
	[-]	[mm]	[mm]	
1	1/150	30.4	2.5	8 %

$w_{net,fin}$ = w[q.p.] + w[q.p.]*kdef

field	limit	w_{limit}	$w_{calc.}$	ratio
	[-]	[mm]	[mm]	
1	1/250	18.2	1.9	10 %

support reaction

load case category	k_{mod}	A_V	B_V
		[kN]	
self weight CLT	0.6	2.57	2.57
		2.57	2.57
serlf weight	0.6	28.59	92.08
		28.59	92.08
live load cat. A: residential	0.8	30.07	88.75
		0.00	0.00

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