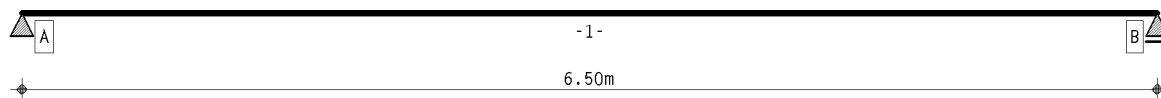


1. Options for Calculations

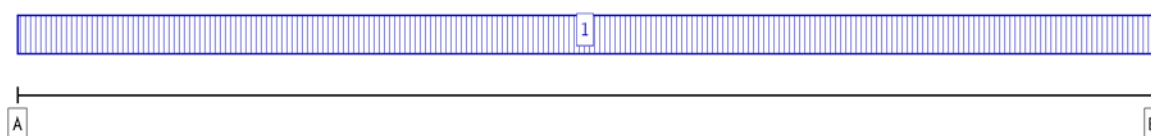
calculation acc. to DIN 1052:2008
service class 2

2. Structural system

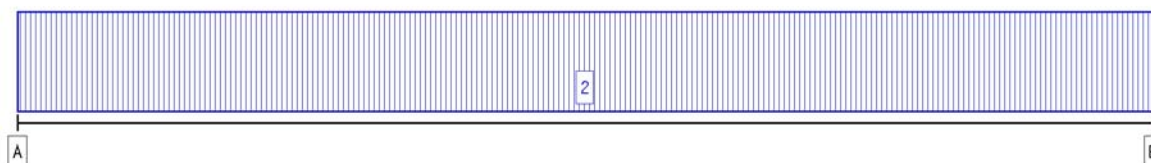


main beam

3. Loading



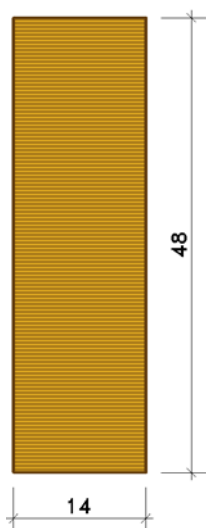
action effect 1: permanent loads (permanent, 1 load cases)



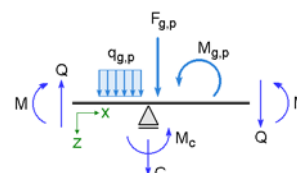
action effect 2: live loads (1) (transient, 1 load cases)

4. main beam

section scale 1: 8



timber grade web **glue lam. timber DIN, GL32c (BS16)**
char. bend. strength $f_{m,k}$: 33.0 N/mm² with $k_h = 1.032$
char. shear strength $f_{v,k}$: 2.5 N/mm²
char. ten. strength $f_{t,k}$: 19.5 N/mm²
char. compr. strength $f_{c,0,k}$: 26.5 N/mm²
char. compr. strength $f_{c,90,k}$: 3.0 N/mm²
modulus of elasticity $E_{0,mean}$: 13700 N/mm²
Dichte ρ_k/ρ_m : 410 / 492 kg/m³
deformation factor k_{def} : 0.60 -
area A_{flange} : 672.000 cm²
moment of inertia I_{flange} : 129024.000 cm⁴
definition of internal forces and moments:



5. Beam sections

beam sections

section	x_A m	x_E m	l m	l_v m	cantil.	s_{ef} mm
1	0.00	6.50	6.50	6.50	-	0.0

6. Supports

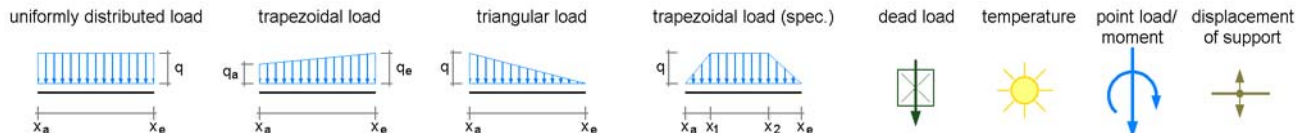
coordinates of supports

supp.name	x m	width mm	depth mm	c_F kN/m	c_M kNm/-	restraint (F) (M)	
A	0.00	150	140	fix	----	X	-
B	6.50	150	140	fix	----	X	-

7. Action effects

Attention! Acc. to DIN 1052, 8.6.2 (2)

mechanically jointed cross-sections are only allowed to be loaded by line loads



Permanent action effect: permanent loads

1. additive load case: dead load (1)

→ unif.distr.load: $q = 4.00$ kN/m from $x_a = 0.00$ m to $x_e = 6.50$ m

2. **Transient action effect: live loads (1)**

2. additive load case: live loads (1/1)

→ unif.distr.load: $q = 8.00$ kN/m from $x_a = 0.00$ m to $x_e = 6.50$ m

8. verifications

1: DIN 1052:2008 load-carrying capacity

verification of bearing stress DIN 1052, 10.2.4 will be executed
Extreme rule 1

2: DIN 1052:2008 deformations (rarely)

Extreme rule 1

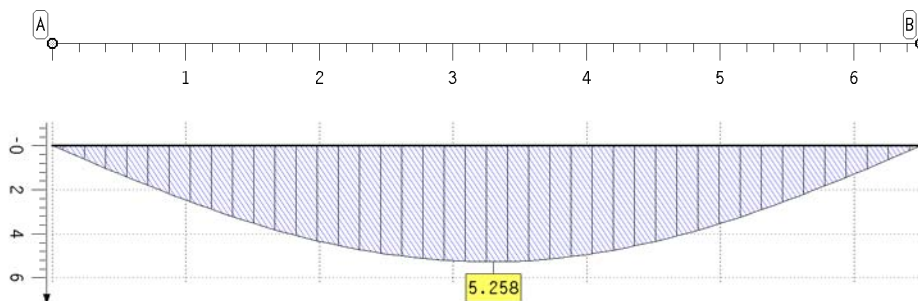
3: DIN 1052:2008 deformations (quasicontinuous)

Extreme rule 1

9. Results of action effects

9.1. Action effect 1: permanent loads

extremal deflections of main beam (characteristic)

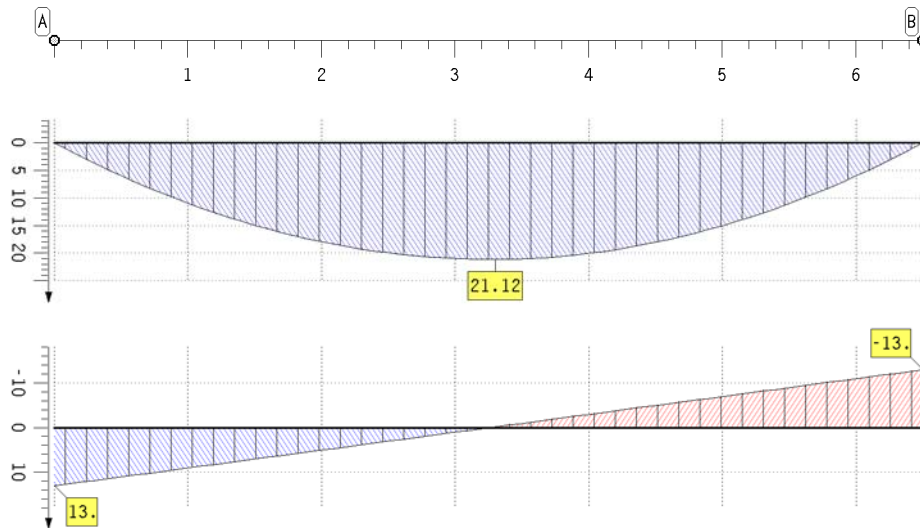


deflection
main beam
characteristic
 w in mm
Min: 0.00
Max: 5.26

extremal deflections of main beam (characteristic)

point	x m	min w mm	max w mm	point	x m	min w mm	max w mm
A	0.000	0.00	0.00	B	6.500	0.00	0.00
	1.800	4.05	4.05	minimum		0.00	0.00
	3.200	5.26	5.26	maximum		5.26	5.26
	4.700	4.05	4.05				

extremal internal forces



flexural moment
main beam
M in kNm
Min: -0.00
Max: 21.12

shear force
main beam
V in kN
Min: -13.00
Max: 13.00

extremal internal forces

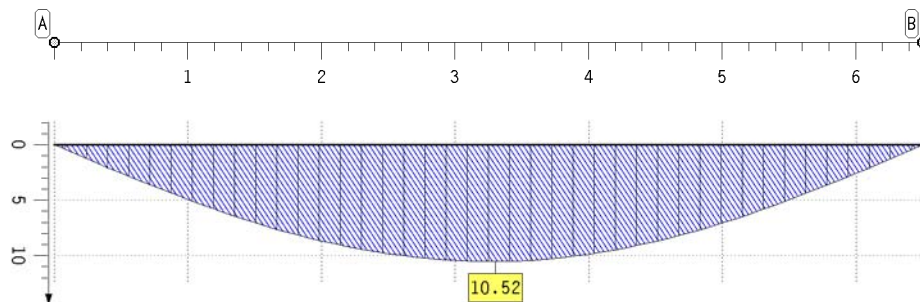
point	x	min M	max M	min V	max V	point	x	min M	max M	min V	max V
-	m	kNm	kNm	kN	kN	-	m	kNm	kNm	kN	kN
A	0.000	-0.00	-0.00	13.00	13.00	B	6.500	0.00	0.00	-13.00	-13.00
	1.600	15.68	15.68	6.60	6.60	minimum		-0.00	-0.00	-13.00	-13.00
	3.200	21.12	21.12	0.20	0.20	maximum		21.12	21.12	13.00	13.00
	4.900	15.68	15.68	-6.60	-6.60						

extremal support forces

point	x	min AP	max AP
-	m	kN	kN
A	0.000	-13.00	-13.00
B	6.500	-13.00	-13.00

9.2. Action effect 2: live loads (1)

extremal deflections of main beam (characteristic)

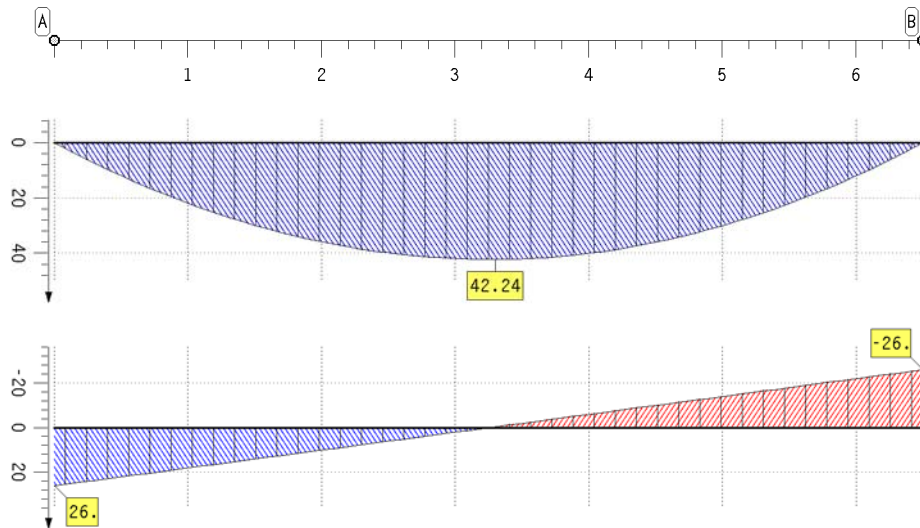


deflection
main beam
characteristic
w in mm
Min: 0.00
Max: 10.52

extremal deflections of main beam (characteristic)

point	x	min w	max w	point	x	min w	max w
-	m	mm	mm	-	m	mm	mm
A	0.000	0.00	0.00	B	6.500	0.00	0.00
	1.800	0.00	8.09	minimum		0.00	0.00
	3.200	0.00	10.52	maximum		0.00	10.52
	4.700	0.00	8.09				

extremal internal forces



extremal internal forces

point	x	min M	max M	min V	max V	point	x	min M	max M	min V	max V
-	m	kNm	kNm	kN	kN	-	m	kNm	kNm	kN	kN
A	0.000	-0.00	-0.00	0.00	26.00	B	6.500	0.00	0.00	-26.00	-0.00
	1.600	0.00	31.36	0.00	13.20	minimum		-0.00	-0.00	-26.00	-0.00
	3.200	0.00	42.24	0.00	0.40	maximum		0.00	42.24	0.00	26.00
	4.900	0.00	31.36	-13.20	-0.00						

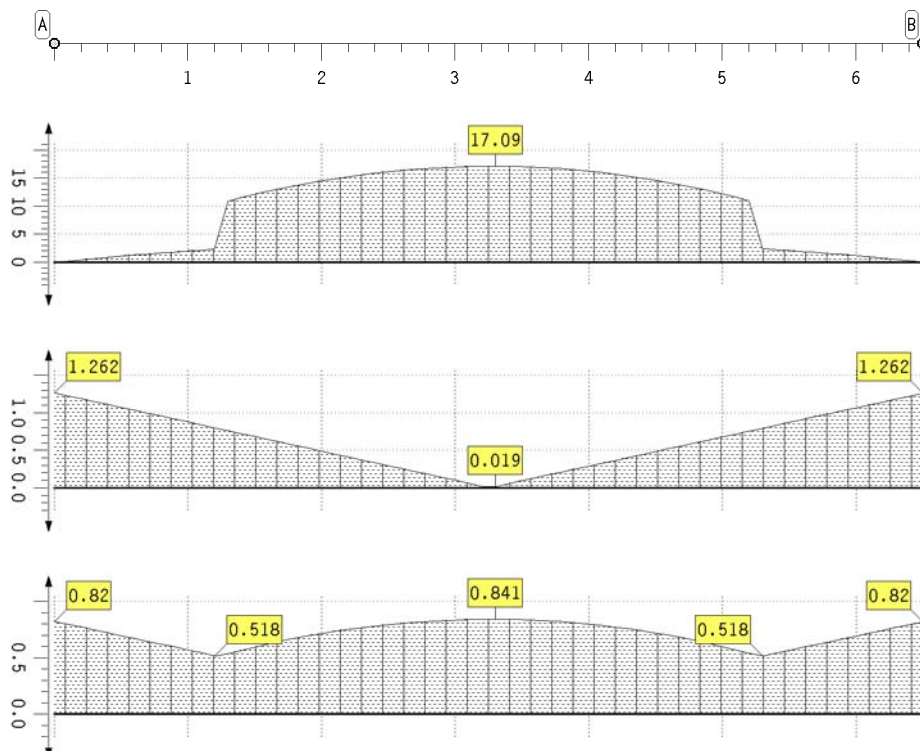
extremal support forces

point	x	min AP	max AP
-	m	kN	kN
A	0.000	-26.00	-0.00
B	6.500	-26.00	-0.00

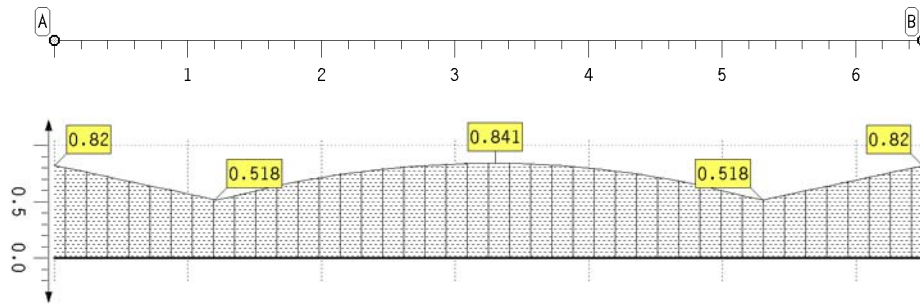
10. Results of verification of ultimate limit state

10.1. Verification of ultimate limit state

results of verification of ultimate limit state



results of verification of ultimate limit state



maximal
utilization
Max: 0.84

maximal utilization

point	x	U	point	x	U	point	x	U
-	m	-	-	m	-	-	m	-
A	0.000	0.820		3.200	0.841	B	6.500	0.820
	1.200	0.518		4.200	0.769	minimum		0.518
	2.200	0.754		5.300	0.518	maximum		0.841

extremal support forces

point	x	min AP	max AP
-	m	kN	kN
A	0.000	-56.55	-13.00
B	6.500	-56.55	-13.00

verification of bearing stress

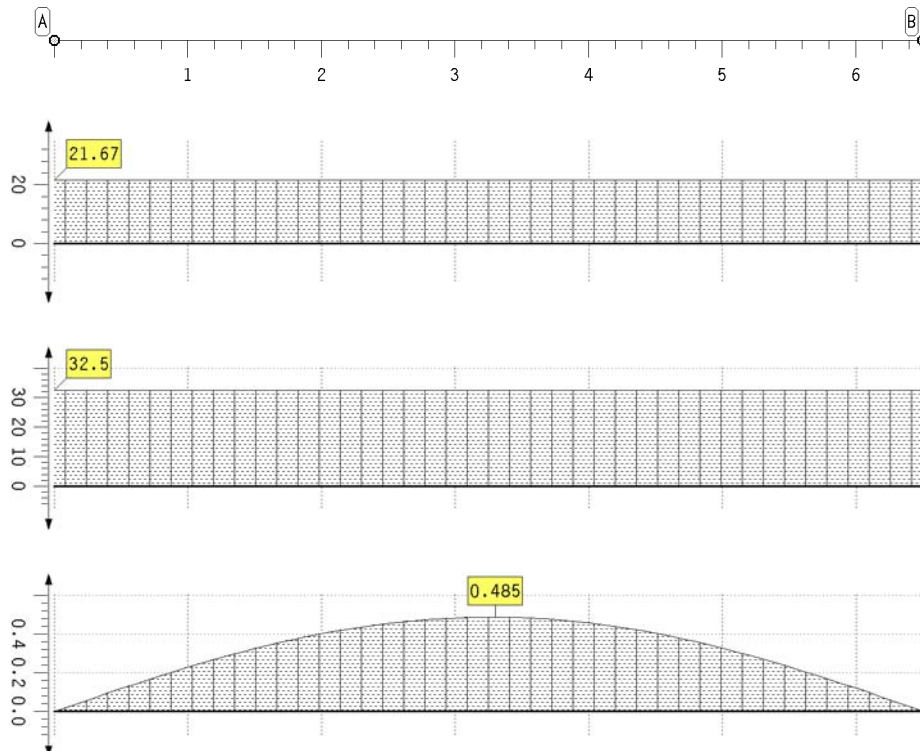
support	l _{ef}	A _{ef}	A _P	k _{c90}	k _{mod}	f _{c90d}	σ _{c90d}	u
	mm	mm ²	N			N/mm ²	N/mm ²	-
A	180	25200	56550	1.50	0.80	1.85	2.24	0.81
B	180	25200	56550	1.50	0.80	1.85	2.24	0.81

verification of bearing stresses für den main beam(u = 0.810) successful!

11. Results of verification of deflections (rarely)

11.1. Verification of deflections (rarely)

results of verification of deflections (rarely)



decisive
deflection
W_{A,req} in mm
Min: 21.67
Max: 21.67

decisive
deflection
W_{B,req} in mm
Min: 32.50
Max: 32.50

maximal
utilization
Max: 0.49

maximal utilization

point	x	U	point	x	U
-	m	-	-	m	-
A	0.000	0.000	B	6.500	0.000
	1.800	0.373	minimum		0.000
	3.200	0.485	maximum		0.485
	4.700	0.373			

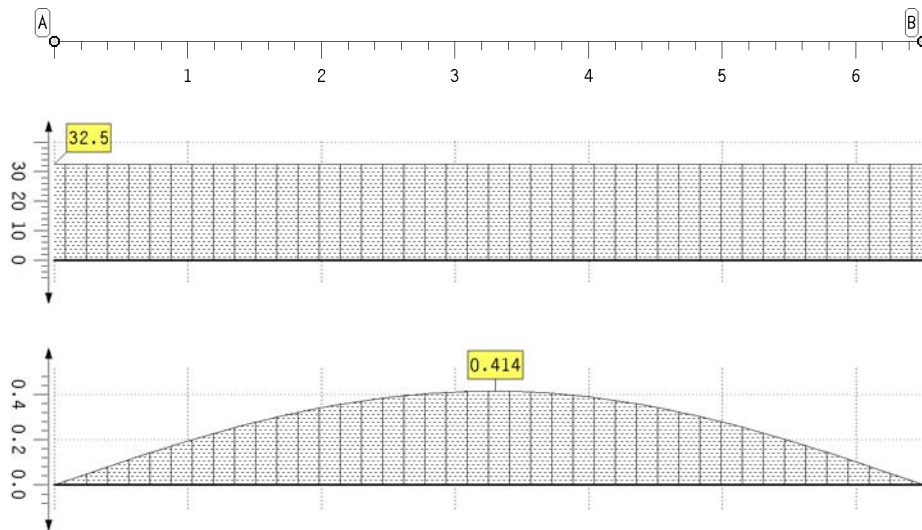
extremal support forces

point	x	min AP	max AP
-	m	kN	kN
A	0.000	-38.48	-0.00
B	6.500	-38.48	-0.00

12. Results of verification of deflections (quasicontinuous)

12.1. Verification of deflections (quasicontinuous)

results of verification of deflections (quasicontinuous)



decisive
deflection
 W_{req} in mm
Min: 32.50
Max: 32.50

maximal
utilization
Max: 0.41

maximal utilization

point	x	U	point	x	U
-	m	-	-	m	-
A	0.000	0.000	B	6.500	0.000
	1.800	0.319	minimum		0.000
	3.200	0.414	maximum		0.414
	4.700	0.319			

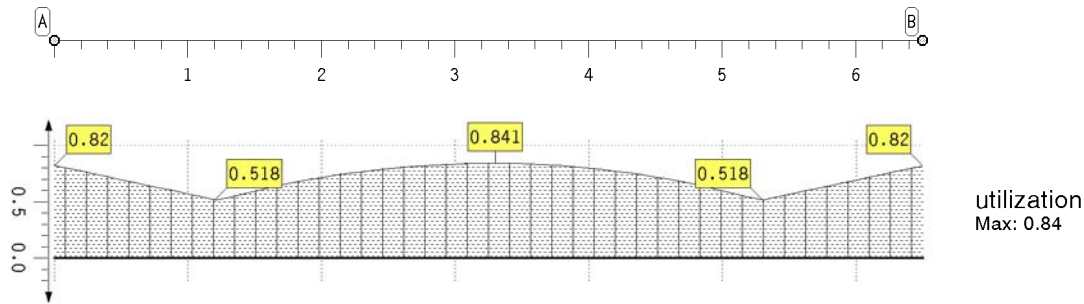
extremal support forces

point	x	min AP	max AP
-	m	kN	kN
A	0.000	-33.28	-20.80
B	6.500	-33.28	-20.80

13. Summary

13.1. Summary of all verifications

maximal utilization



maximal utilization

point	x	U	point	x	U	point	x	U
-	m	-	-	m	-	-	m	-
A	0.000	0.820		3.200	0.841	B	6.500	0.820
	1.200	0.518		4.200	0.769	minimum		0.518
	2.200	0.754		5.300	0.518	maximum		0.841

verification of bearing stress

support	l_{ef}	A_{ef}	A_p	k_{c90}	k_{mod}	f_{c90d}	σ_{c90d}	u
	mm	mm ²	N		-	N/mm ²	N/mm ²	-
A	180	25200	56550	1.50	0.80	1.85	2.24	0.81
B	180	25200	56550	1.50	0.80	1.85	2.24	0.81

verification of bearing stresses für den main beam(u = 0.81) successful!

14. Utilizations of all verifications

all verifications successful!

15. Detailed verification piont

15.1. Verification of load-carrying capacity at x = 0.00 m

internal forces and moments

state	M	V
	kNm	kN
start,min	-0.00	13.00
start,max	-0.00	56.55
end,min	-0.00	13.00
end,max	-0.00	56.55

stresses and utilization

state	k_{mod}	σ_m	σ_c	u_σ	τ	u_τ	u_2
	-	N/mm ²	N/mm ²	-	N/mm ²	-	-
start	0.8	0.00	0.00	0.00	1.26	0.82	0.82
end	0.8	0.00	0.00	0.00	1.26	0.82	0.82

resulting utilization at verification point $u_{res} = 0.820$