Project

Job name : Sanacija cestišča pri hiši Straža 6
Description : Vezna greda
Client : Občina Oplotnica
Author : GEOING d.o.o.
Date : 30/05/2025

Standard

Standard **EN 1992-2/Default EC**.

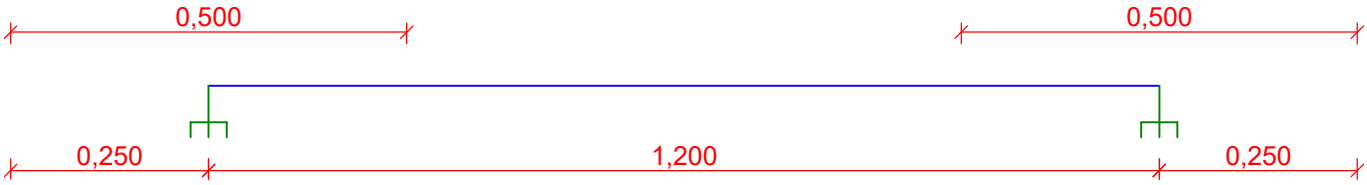
1 Beam 1

1.1 Input data

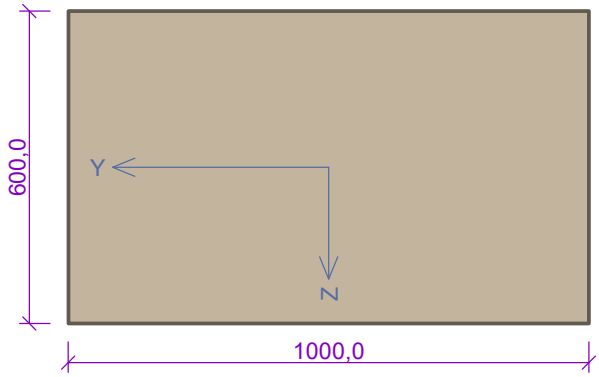
Geometry

Length = 1,20m

x [m]	Point kind	Width [m]	A/L [m]	I/L [m³]	Offset [m]
0,000	fixed support	0,500	-	-	0,250
1,200	fixed support	0,500	-	-	0,250



Cross-section



Materials

Concrete: C 30/37
f_{ck} = 30,0 MPa; f_{ctm} = 2,9 MPa; E_{cm} = 33000 MPa

Longitudinal steel: B500B
f_{yk} = 500,0 MPa; E_s = 200000 MPa

Transverse steel: B500B
f_{yk} = 500,0 MPa; E_s = 200000 MPa

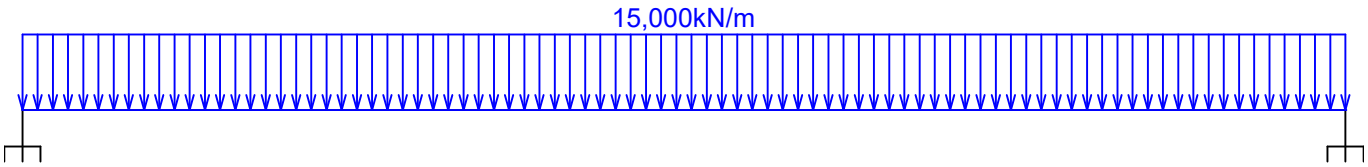
Load cases

no.	Name	Code	Type	As* main	γ_f ($\gamma_{f,inf}$)**	Factors for combinations				
						ξ	Categ.***	ψ_0	ψ_1	ψ_2
1	G1 Self weight	Self weight	Permanent	-	1,35(0,90)	0,85	-	-	-	-

* load acts in combinations as main variable
** $\gamma_{f,inf}$ for favourable dead loads
*** Category of live loads according to table A1.1 in EN 1990

G1 Self weight - load				
Type	Coor.x [m]	Length [m]	Size1	Size2
uniform	0,000	1,200	15,000kN/m	-

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Combinations

Combination for check of ultimate limit state (ULS), 1st order

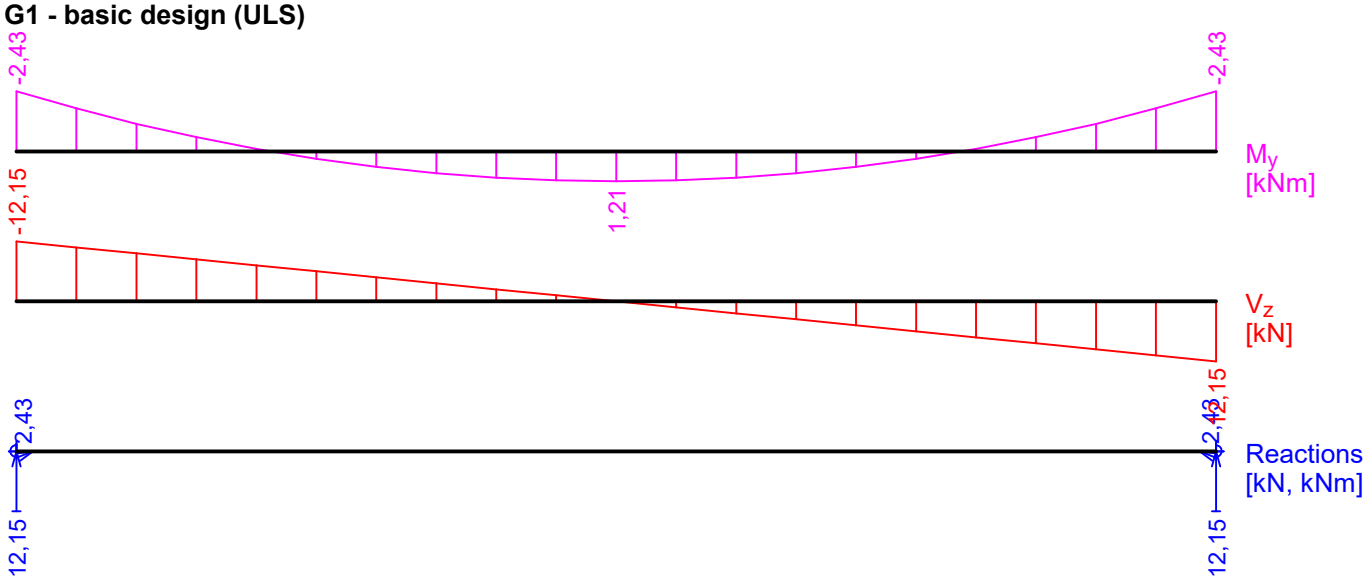
Number	Comb. name and type
	Composition
1	G1; basic combination
	$\gamma_{f,sup,1}(1,35)$*G1

Combination for check of serviceability limit state (SLS), 1st order

Number	Comb. name and type
	Composition
1	G1; characteristic combination
	G1
2	G1; frequent combination
	G1
3	G1; quasi-permanent combination
	G1

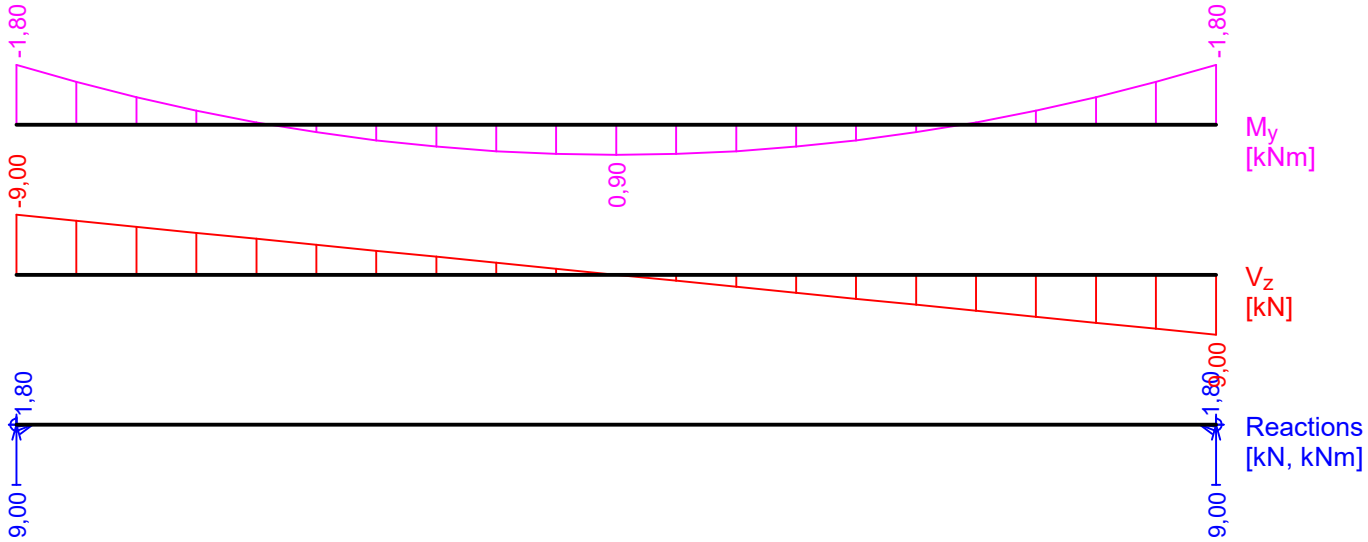
Internal forces

G1 - basic design (ULS)

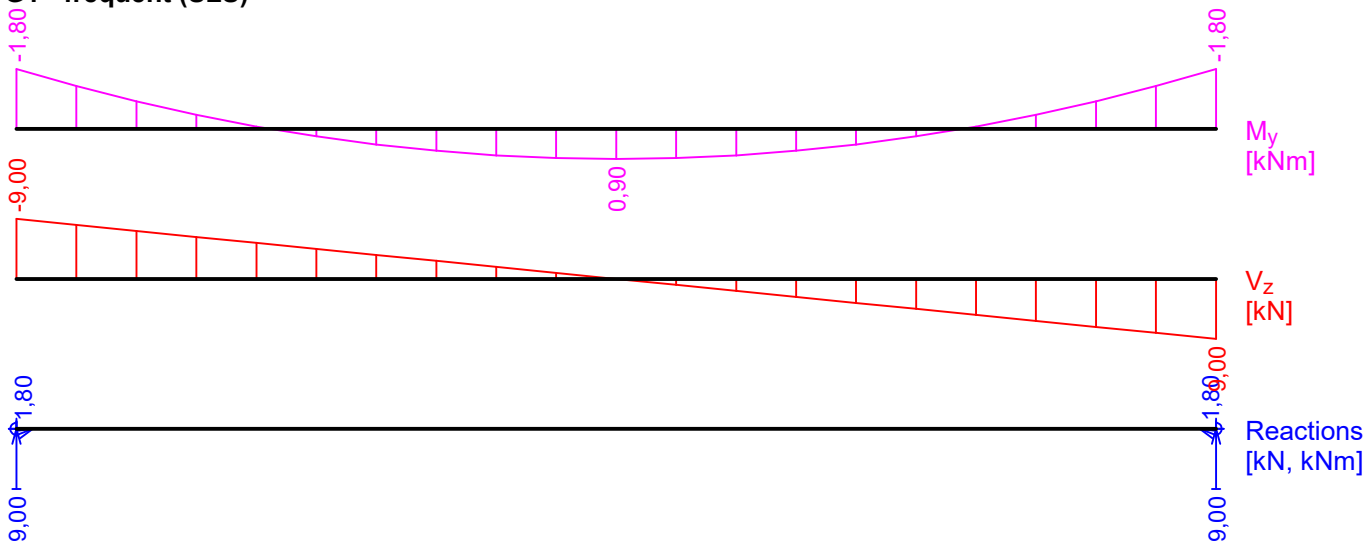


G1 - characteristic (SLS)

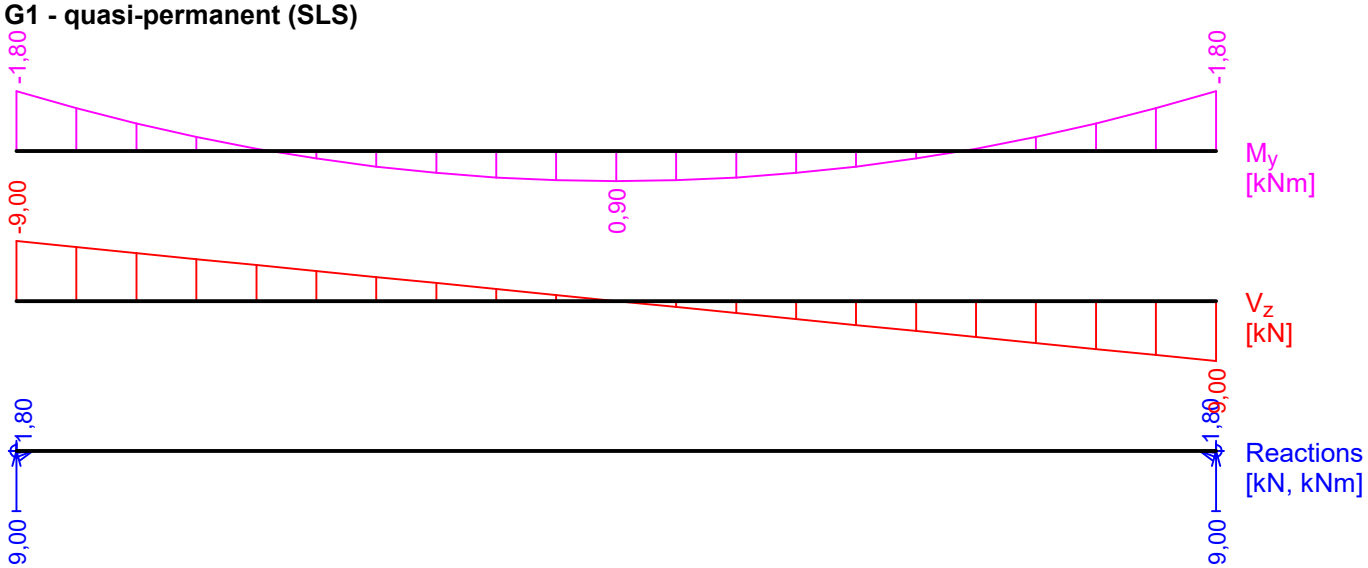
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G1 - frequent (SLS)



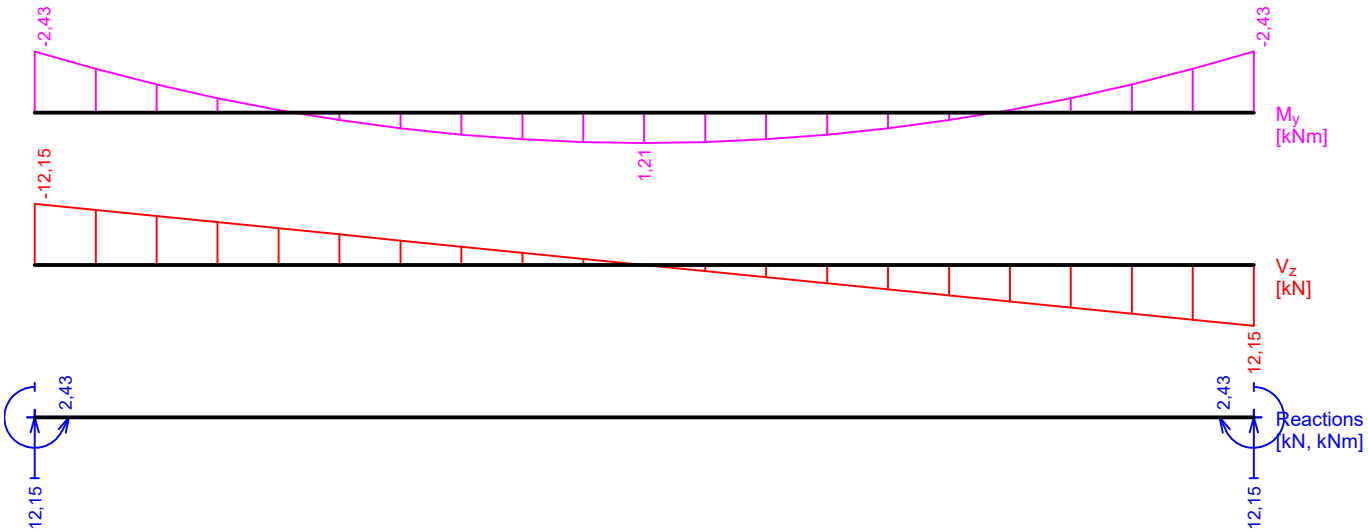
G1 - quasi-permanent (SLS)



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Envelopes

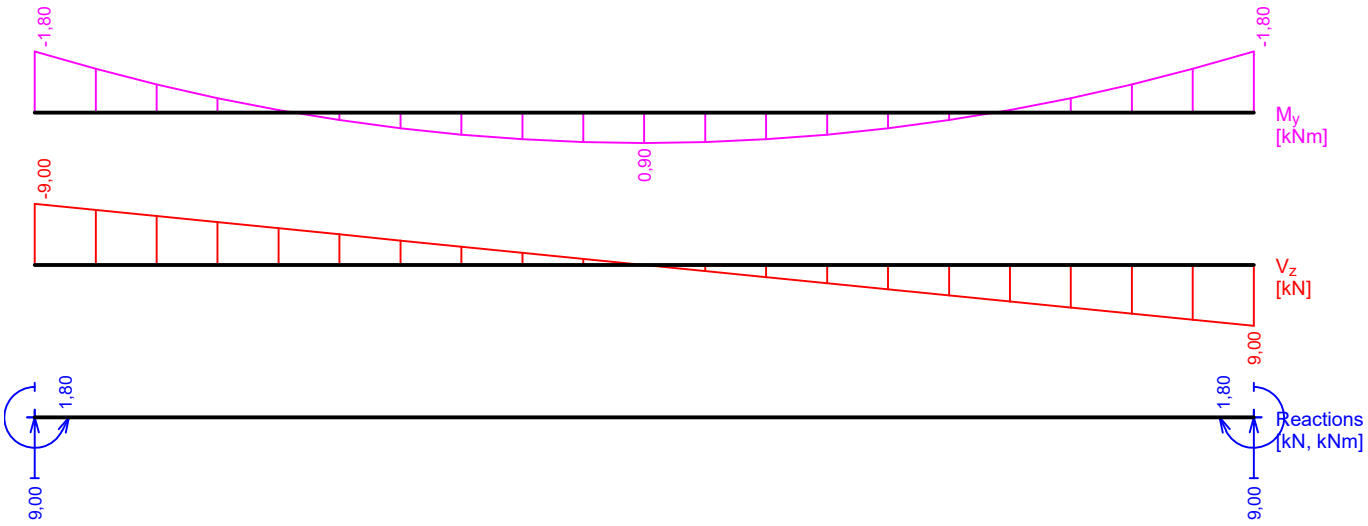
Envelope basic design (ULS)								
x [m]	Max M_{Edy} [kNm]	Min M_{Edy} [kNm]	Max V_{Edz} [kN]	Min V_{Edz} [kN]	Max R_z [kN]	Min R_z [kN]	Max RO_x [kNm]	Min RO_x [kNm]
0,000	-2,43	-2,43	-12,15	-12,15	12,15	12,15	2,43	2,43
0,060	-1,74	-1,74	-10,94	-10,94	-	-	-	-
0,120	-1,12	-1,12	-9,72	-9,72	-	-	-	-
0,180	-0,58	-0,58	-8,51	-8,51	-	-	-	-
0,240	-0,10	-0,10	-7,29	-7,29	-	-	-	-
0,300	0,30	0,30	-6,08	-6,08	-	-	-	-
0,360	0,63	0,63	-4,86	-4,86	-	-	-	-
0,420	0,88	0,88	-3,65	-3,65	-	-	-	-
0,480	1,07	1,07	-2,43	-2,43	-	-	-	-
0,540	1,17	1,17	-1,21	-1,21	-	-	-	-
0,600	1,21	1,21	0,00	0,00	-	-	-	-
0,660	1,17	1,17	1,22	1,22	-	-	-	-
0,720	1,07	1,07	2,43	2,43	-	-	-	-
0,780	0,88	0,88	3,65	3,65	-	-	-	-
0,840	0,63	0,63	4,86	4,86	-	-	-	-
0,900	0,30	0,30	6,08	6,08	-	-	-	-
0,960	-0,10	-0,10	7,29	7,29	-	-	-	-
1,020	-0,58	-0,58	8,51	8,51	-	-	-	-
1,080	-1,12	-1,12	9,72	9,72	-	-	-	-
1,140	-1,74	-1,74	10,94	10,94	-	-	-	-
1,200	-2,43	-2,43	12,15	12,15	12,15	12,15	-2,43	-2,43



Envelope characteristic (SLS)								
x [m]	Max M_{Edy} [kNm]	Min M_{Edy} [kNm]	Max V_{Edz} [kN]	Min V_{Edz} [kN]	Max R_z [kN]	Min R_z [kN]	Max RO_x [kNm]	Min RO_x [kNm]
0,000	-1,80	-1,80	-9,00	-9,00	9,00	9,00	1,80	1,80
0,060	-1,29	-1,29	-8,10	-8,10	-	-	-	-
0,120	-0,83	-0,83	-7,20	-7,20	-	-	-	-

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Envelope characteristic (SLS)								
x [m]	Max M_{Edy} [kNm]	Min M_{Edy} [kNm]	Max V_{Edz} [kN]	Min V_{Edz} [kN]	Max R_z [kN]	Min R_z [kN]	Max RO_x [kNm]	Min RO_x [kNm]
0,180	-0,43	-0,43	-6,30	-6,30	-	-	-	-
0,240	-0,07	-0,07	-5,40	-5,40	-	-	-	-
0,300	0,22	0,22	-4,50	-4,50	-	-	-	-
0,360	0,47	0,47	-3,60	-3,60	-	-	-	-
0,420	0,65	0,65	-2,70	-2,70	-	-	-	-
0,480	0,79	0,79	-1,80	-1,80	-	-	-	-
0,540	0,87	0,87	-0,90	-0,90	-	-	-	-
0,600	0,90	0,90	0,00	0,00	-	-	-	-
0,660	0,87	0,87	0,90	0,90	-	-	-	-
0,720	0,79	0,79	1,80	1,80	-	-	-	-
0,780	0,65	0,65	2,70	2,70	-	-	-	-
0,840	0,47	0,47	3,60	3,60	-	-	-	-
0,900	0,22	0,22	4,50	4,50	-	-	-	-
0,960	-0,07	-0,07	5,40	5,40	-	-	-	-
1,020	-0,43	-0,43	6,30	6,30	-	-	-	-
1,080	-0,83	-0,83	7,20	7,20	-	-	-	-
1,140	-1,29	-1,29	8,10	8,10	-	-	-	-
1,200	-1,80	-1,80	9,00	9,00	9,00	9,00	-1,80	-1,80



Reactions extremes

Reactions extremes basic design (ULS)	
x [m]	Reaction
0,000	Max R_z = 12,15kN - G1
0,000	Min R_z = 12,15kN - G1
0,000	Max RO_x = 2,43kNm - G1
0,000	Min RO_x = 2,43kNm - G1
1,200	Max R_z = 12,15kN - G1
1,200	Min R_z = 12,15kN - G1
1,200	Max RO_x = -2,43kNm - G1

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Reactions extremes basic design (ULS)	
x [m]	Reaction
1,200	Min RO_x = -2,43kNm - G1

Reactions extremes characteristic (SLS)	
x [m]	Reaction
0,000	Max R_z = 9,00kN - G1
0,000	Min R_z = 9,00kN - G1
0,000	Max RO_x = 1,80kNm - G1
0,000	Min RO_x = 1,80kNm - G1
1,200	Max R_z = 9,00kN - G1
1,200	Min R_z = 9,00kN - G1
1,200	Max RO_x = -1,80kNm - G1
1,200	Min RO_x = -1,80kNm - G1

Longitudinal reinf.

Bar type	Beginning [m]	End [m]	Cover [mm]	Profile [mm]	Count
Upper	0,000	1,200	50,0	16	5
Bottom	0,000	1,200	50,0	16	5

Reinforcement in compression considered.

Shear reinf.

Sector no.: 1, (0,00m - 1,20m)
Boundary stirrups
Profile: 10 mm; Distance: 200,0 mm

Minimum cover

50,0 mm (cust.)

1.2 Check of ultimate limit state

Ultimate limit state is checked for envelope of extreme loads

Bent-up bar

Reinforcement in compression considered; moment reduction - no; shear effect considered

Check of bar spacings

Bar spacing pass.

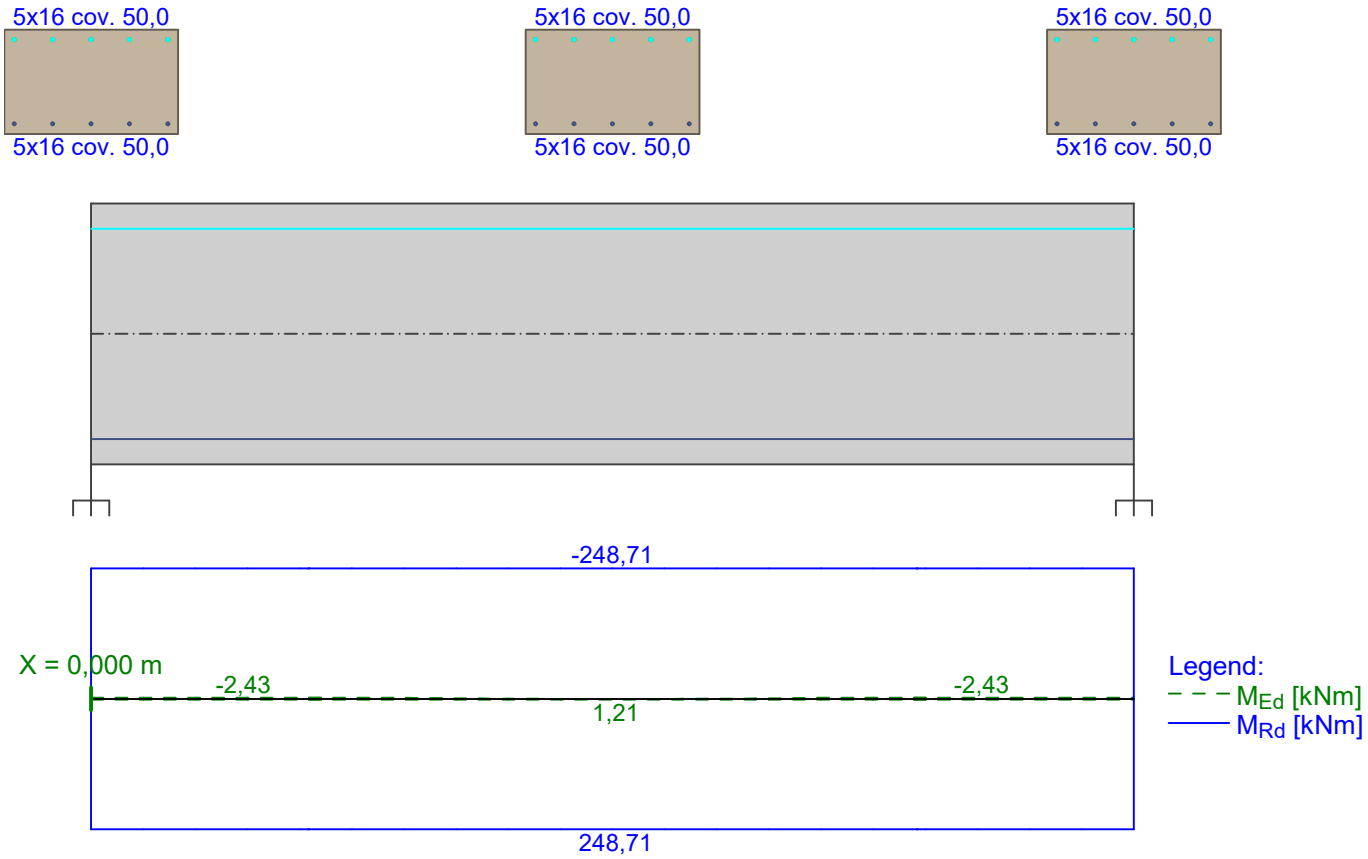
Check of min and max reinforcement level

Slab (reinforcement in tension - min, total reinforcement - max):
$\rho_{s,t}$ = 0,00185 $\geq$ $\rho_{s,min}$ = 0,00151 $\Rightarrow$ **Pass**
ρ_s = 0,00335 $\leq$ $\rho_{s,max}$ = 0,04 $\Rightarrow$ **Pass**

Critical cut at point x = 0,000m
M_{Ed} = -2,43kNm $\leq$ M_{Rd} = -248,71kNm $\Rightarrow$ Pass

Member bending PASS

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Shear

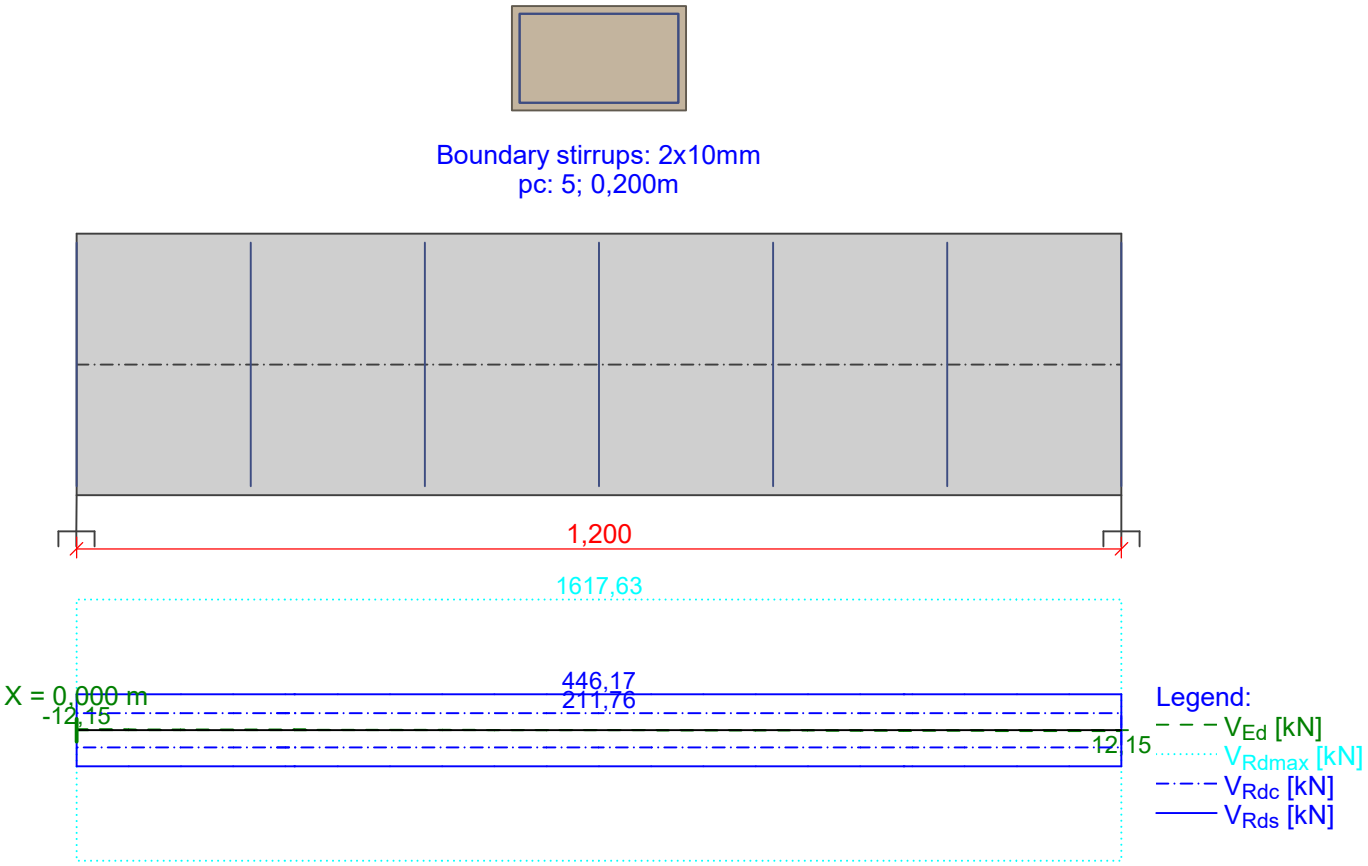
Member type: slab
Critical cut at point x = 0,000m

Shear reinforcement ratio

$\rho_{w,min}$ = 0,000876 > ρ_w = 0,000785 $\Rightarrow$ **Not enough shear reinforcement**
Max stirrup spacing $s_{l,max}$ = 406,5 mm $\geq$ 200,0 mm $\Rightarrow$ **Pass**
Max stirrup legs spacing $s_{t,max}$ = 813,0 mm < 910,0 mm $\Rightarrow$ **Distance exceeded!**

V_{Ed} = 12,15kN $\leq$ V_{Rd} = 446,17kN $\Rightarrow$ Pass
Member shear PASS

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Anchorage

End adjustment of bars - Straight bar

Type	profile	Beginning		End		Eff. length	Total length
		σ_{sd}	l_{bd}	σ_{sd}	l_{bd}		
	[mm]	[MPa]	[m]	[MPa]	[m]	[m]	[m]
Upper	16	434,78	0,580	434,78	0,580	1,200	2,359
Bottom	16	10,60	0,160	10,32	0,160	0,700	1,020

Ultimate limit state PASS

1.3 Check of serviceability limit state

Cracks

Serviceability limit state (crack width) is checked for all quasi-permanent loads

Cracks are checked only on the section side with largest tension.
Maximum crack size: w_k = 0,000mm
Maximum allowed crack width: w_{max} = 0,300mm (Environment - X0 or XC1 - crack width does not affect durability)

Crack width PASS

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Legend:
w [mm]

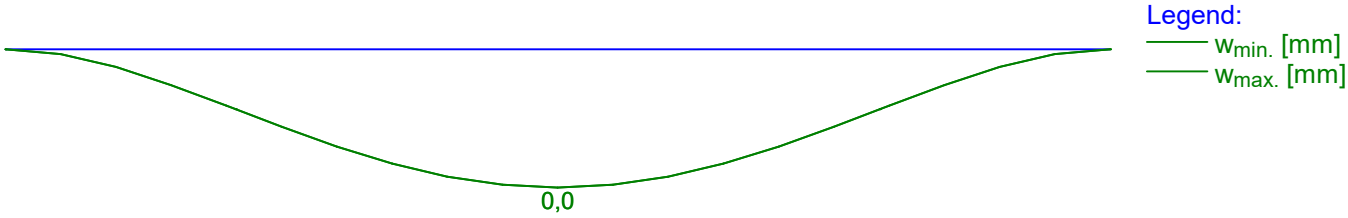
Deflection

Serviceability limit state (deflection control) is checked for all quasi-permanent, characteristic, frequent loads

Start of drying: t_s = 7 [days]
End of drying: t = 29200 [days]
Start of loading: t_0 = 28 [days]
End of loading: t = 29200 [days]
Maximum deformation from quasi-permanent combinations is 0,0mm at point x = 0,600m
Maximum allowed deformation from quasi-permanent combinations is 4,8mm

Member deflection PASS





Stress

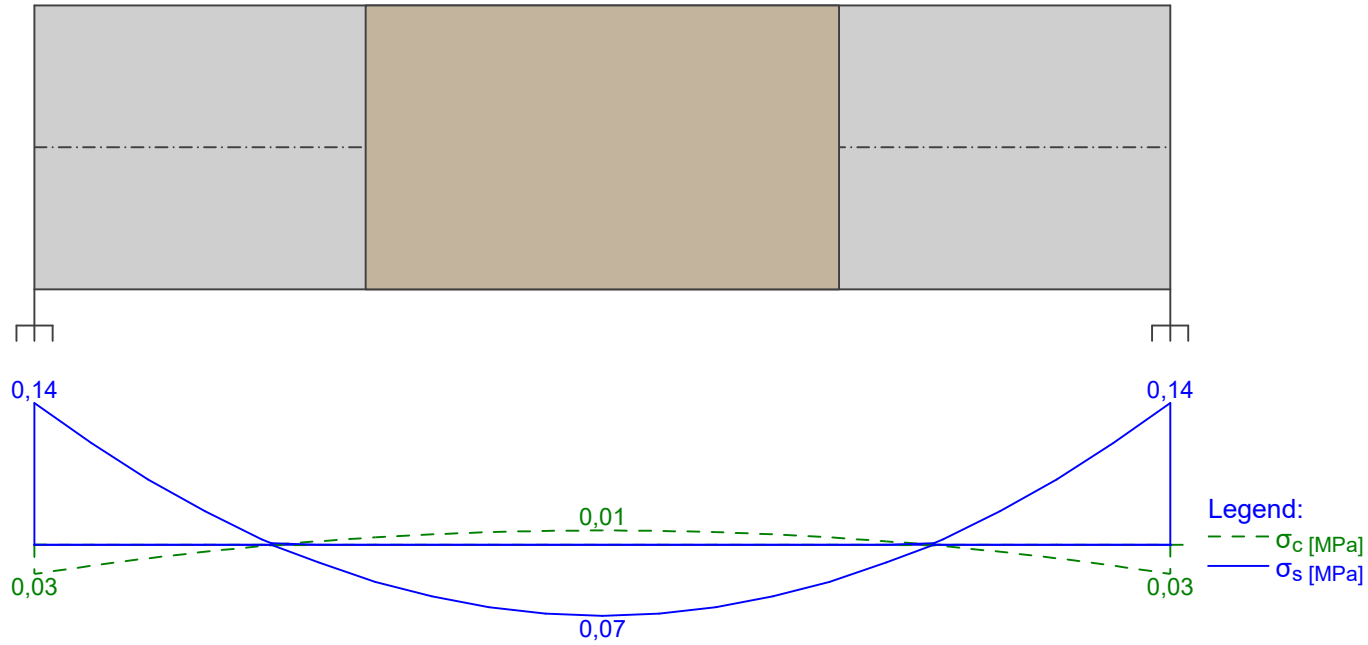
Serviceability limit state (stress restriction) is checked for all characteristic loads

Maximum compressive stress in concrete:
σ_c = 0,0MPa < $k_1 \times f_{ck}$ = 18,0MPa ⇒ Value for environment XD, XF, XS fulfilled

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σ_c = 0,0MPa < k_2 × f_{ck} = 13,5MPa ⇒ Linear creep
Maximum tensile stress in reinforcement:
σ_s = 0,1MPa < k_3 × f_{yk} = 400,0MPa ⇒ Neither unacceptable cracks nor deformations will occur

Stress on member PASS



Serviceability limit state PASS

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