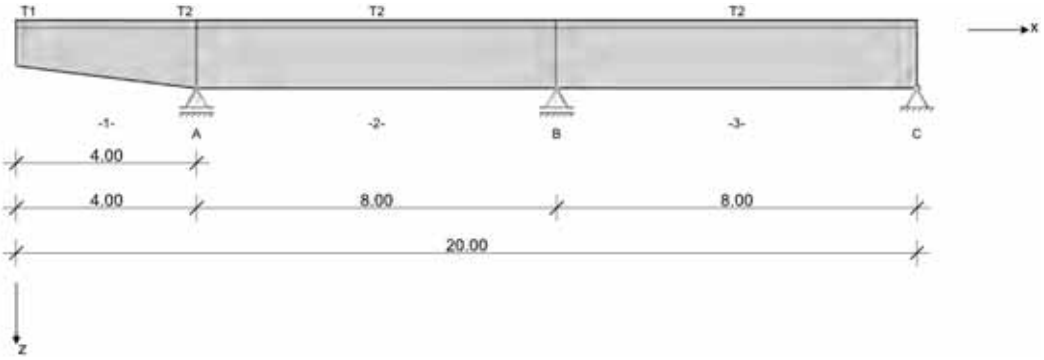
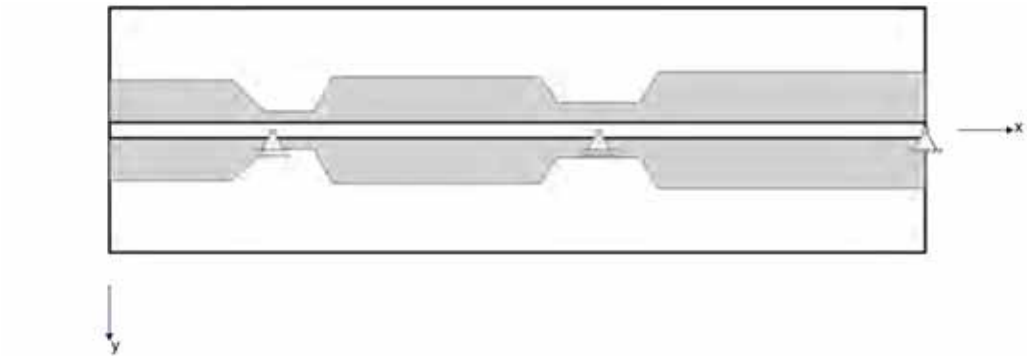
RIB Software SE	BALKEN V18.0 Build-No. 19102018	Type: Reinforced concrete
File: DBV Beispiel 6.Balx		

System information

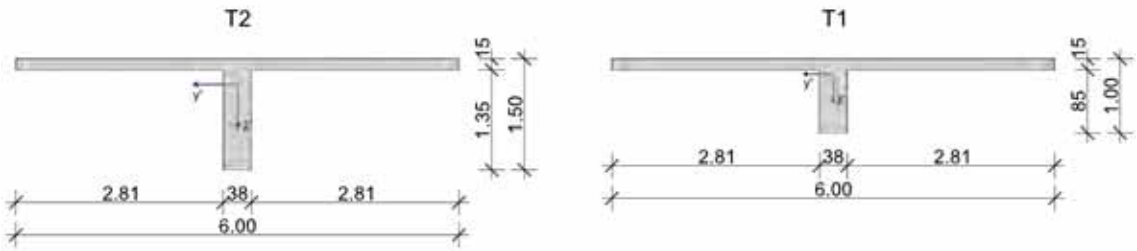


Effective slab width



Standards:	DIN EN 1992-1-1		Design	
Calculation:	effective widths are being considered		Moment redistribution:	limited < 15.00 %
Building type:	Civil engineering		Prestressing:	none
Design situation:	permanent			
Exposure class:	top:XC3	bottom:XC3		
Fire resistance class:	R60		Flame application:	3-sided

Continuous beam geometry

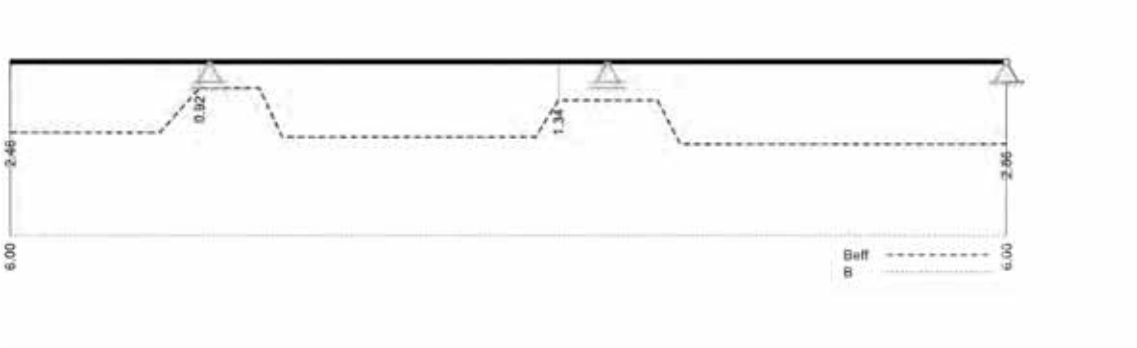


Cross-section	Type	b_w [cm]	h_w [cm]	b_t [cm]	d_t [cm]	b_b [cm]	d_b [cm]	A_c [cm²]	I_y [cm⁴]	z_s [cm]
T2	T	38.0	135.0	600.0	15.0			14130.0	26339715	34.7
T1	T	38.0	85.0	600.0	15.0			12230.0	8055834	20.7

Span	Length	Cross-section run, left				Cross-section run, right			
No.	[m]	QA	$L_{v,le}$[m]	$Q_{v,Li1}$	$Q_{v,Li2}$	$Q_{v,Re2}$	$Q_{v,Re1}$	$L_{v,ri}$[m]	QE
1	4.00	T1	4.00	T2	T2				T2
2	8.00	T2							T2
3	8.00	T2							T2

Effective slab widths

Effective slab width [m]



Support

Support	Type	c_x [kN/m]	c_z [kN/m]	$c_{\varphi x}$ [kNm]	$c_{\varphi y}$ [kNm]	Width [cm]	Notch	
							ba [cm]	h [cm]
A	Concrete, direct		rigid			40.0		
B	Concrete, direct		rigid			40.0		
C	Concrete, indirect	rigid	rigid	rigid		50.0	0.0	0.0

Material

Concrete	f_{ck} [N/mm²]	E_{cm} [N/mm²]	γ_c	α_{cc}	f_{cd} [N/mm²]	f_{ctm} [N/mm²]	γ [kN/m³]
C25/30	25.0	31500	1.50	0.85	14.2	2.6	25.00

The rising branch of the stress-strain curve is considered according to 3.2.7 (2)a.

Reinforcement	Application	f_{yk} [N/mm²]	E_s [N/mm²]	γ_s	f_{yd} [N/mm²]	Ductility	$\Delta\sigma_{RSK(N^*)}$
B500S	Longitudinal & lateral	500.00	200000	1.15	434.8	B (high)	175.00
B500S	Shear joint	500.00	200000	1.15	434.8	B (high)	175.00

Reinforcement specification

Longitudinal reinforcement

Span No.	Section [m]		As top [cm²]			As bottom [cm²]			$\varnothing_s$-top [mm]		$\varnothing_s$-bottom [mm]	
	a	b	d_1 [cm]	Web	Flange	d_1 [cm]	Web	Flange	Web	Flange	Web	Flange
1	0.000	20.000	7.0	0.00	0.00	9.0	0.00	0.00	25	10	25	10

Loading

Load cases

LC	Type of action	γ_{sup}	γ_{inf}	ψ_0	ψ_1	ψ_2	Name
1	Dead load	1.35	1.00	1.00	1.00	1.00	
2	Permanent load	1.35	1.00	1.00	1.00	1.00	
3	Moving load < 30 kN (Live load F)	1.50	0.00	0.70	0.70	0.60	
4	Traffic load	1.50	0.00	0.80	0.70	0.50	sonstige Last

Load case 1:

T	Type	Relation	LR	a to the origin [m]	q_L/m_L [kN,kNm]	q_R/m_R [kN,kNm]	e_y [cm]	e_z [cm]	Length [m]	b_L [m]	b_R [m]
	Line load	Support A	z	0.000	90.00	90.00		0.0	16.000		
	Trapezoidal load	Span 1	z	0.000	10.50	90.00		0.0	4.000		

Load case 2:

T	Type	Relation	LR	a to the origin [m]	P [kN]	M [kNm]	e_y [cm]	e_z [cm]	n	Δx [m]
	Single load	Support N1	z	0.000	216.00				0	0.000
	Single load	Support A	z	4.000	416.00				0	0.000

Load case 3:

T	Type	Relation	LR	a to the origin [m]	q_L/m_L [kN,kNm]	q_R/m_R [kN,kNm]	e_y [cm]	e_z [cm]	Length [m]	b_L [m]	b_R [m]
	Line load	Support N1	z	0.000	40.00	40.00		0.0	11.775		
	Line load	Span 3	z	12.000	30.00	30.00		0.0	8.000		

Load case 4:

T	Type	Relation	LR	a to the origin	P	M	e_y	e_z	n	Δx

				[m]	[kN]	[kNm]	[cm]	[cm]		[m]
	Single load	Support A	z	4.000	284.00				0	0.000

Combination coefficients

Type of action	γ_{sup}	γ_{inf}	Ψ_0	Ψ_1	Ψ_2
Dead load	1.35	1.00	1.00	1.00	1.00
Permanent load	1.35	1.00	1.00	1.00	1.00
Moving load < 30 kN (Live load F)	1.50	0.00	0.70	0.70	0.60
Traffic load	1.50	0.00	0.80	0.70	0.50

Results

Support forces

Support	Load case	EXTR	A_x [kN]	A_z [kN]	M_x [kNm]	M_y [kNm]
A	1		0.00	524.65	0.00	0.00
A	2		0.00	520.07	0.00	0.00
A	3		0.00	336.95	0.00	0.00
A	4		0.00	117.67	0.00	0.00
A	Verkehr	max Az	0.00	117.67	0.00	0.00
A	Verkehr	min Az	0.00	0.00	0.00	0.00
B	1		0.00	829.69	0.00	0.00
B	2		0.00	123.86	0.00	0.00
B	3		0.00	276.98	0.00	0.00
B	4		0.00	190.66	0.00	0.00
B	Verkehr	max Az	0.00	190.66	0.00	0.00
B	Verkehr	min Az	0.00	0.00	0.00	0.00
C	1		0.00	286.65	0.00	0.00
C	2		0.00	-11.93	0.00	0.00
C	3		0.00	97.07	0.00	0.00
C	4		0.00	-24.33	0.00	0.00
C	Verkehr	max Az	0.00	0.00	0.00	0.00
C	Verkehr	min Az	0.00	-24.33	0.00	0.00

Stress resultants

Span stress resultants, summary

Span No.	max M_{yEd} [kNm]	min M_{yEd} [kNm]	max V_{zEd} [kN]	max M_{tEd} [kNm]	max N_{xEd} [kN]	min N_{xEd} [kN]
1	0.00	-2046.00	802.95	0.00	0.00	0.00
2	1771.00	-2046.00	1317.25	0.00	0.00	0.00
3	878.13	-1264.89	824.11	0.00	0.00	0.00

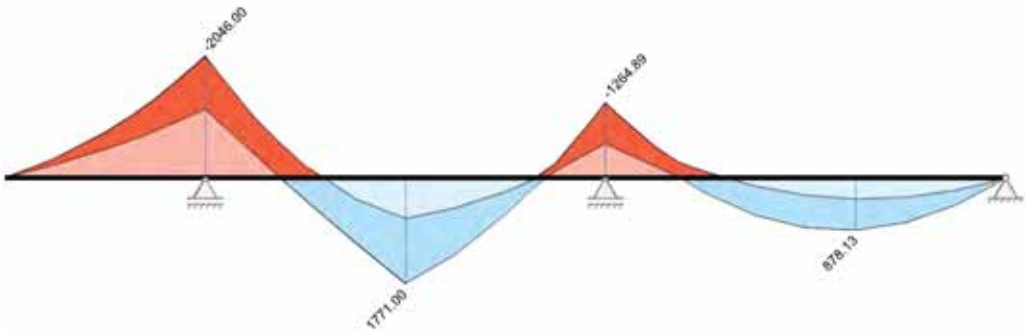
Support stress resultants, summary

Support	max M_{yEd} [kNm]	min M_{yEd} [kNm]	max V_{zEd-Li} max V_{zEd-Re} [kN]	max M_{tEd-Li} max M_{tEd-Re} [kNm]	max N_{xEd} [kN]	min N_{xEd} [kN]
A	-1160.00	-2046.00	-802.95 1317.25	0.00 0.00	0.00	0.00
B	-579.89	-1264.89	-1108.85 824.11	0.00 0.00	0.00	0.00
C	0.00	0.00	-542.46 0.00	0.00 0.00	0.00	0.00

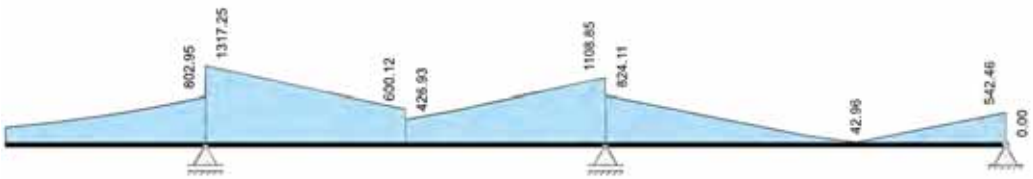
Design

Combination stress resultants

Basic combination M_{yd} [kNm]



Basic combination |V_{zd} | [kN]



Limitation of the stresses

Span / Column	Time [days]	$\sigma_{s,rare}$ [N/mm²]	$\sigma_{p,qperm}$ [N/mm²]	$\sigma_{c,rare}$ [N/mm²]	$\sigma_{c,qperm}$ [N/mm²]	IAB [-]
1	28	351.00		-16.21		1.08
B	28	319.00		-15.90		1.06
2	28	351.00		-15.63		1.04
C	28	343.00		-13.19		0.88
3	28	495.00		-31.68		2.11
D	36500	337.00		-4.69		0.84

Tabular fire protection

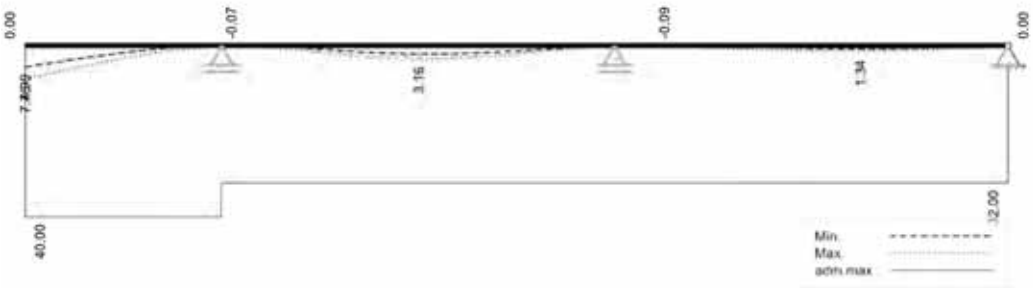
Span / Column	μ_{fi}	T_{crit} [°]	b_w [cm]		$h_{w,min}$ [cm]		b_{min} [cm]		a_{min} [cm]		a_{sd} [cm]	Util-zation
			exis.	req	exis.	req	exis.	req	exis.	req		
A	0.71	500.00	38.00	10.00	112.50	12.00	38.00	20.00	9.00	1.20	1.20	0.53
1	0.71	500.00	38.00	10.00	112.50	12.00	38.00	20.00	9.00	1.20	1.20	0.53
B	0.66	509.76	38.00	10.00	150.00	12.00	38.00	20.00	9.00	1.20	1.20	0.53
2	0.66	509.78	38.00	10.00	150.00	12.00	38.00	20.00	9.00	1.20	1.20	0.53
C	0.71	500.00	38.00	10.00	150.00	12.00	38.00	20.00	9.00	1.20	1.20	0.53
3	0.71	500.00	38.00	10.00	150.00	12.00	38.00	20.00	9.00	1.20	1.20	0.53
D	0.61	522.85	38.00	10.00	150.00	12.00	38.00	20.00	9.00	1.20	1.20	0.53

Maximum utilization: 0.53 in span 1 Analysis fulfilled.

Limitation of the deflection

Deflection t1 in condition II [mm]

Deflection t∞ in condition II [mm]



Deflection Δt in condition II [mm]

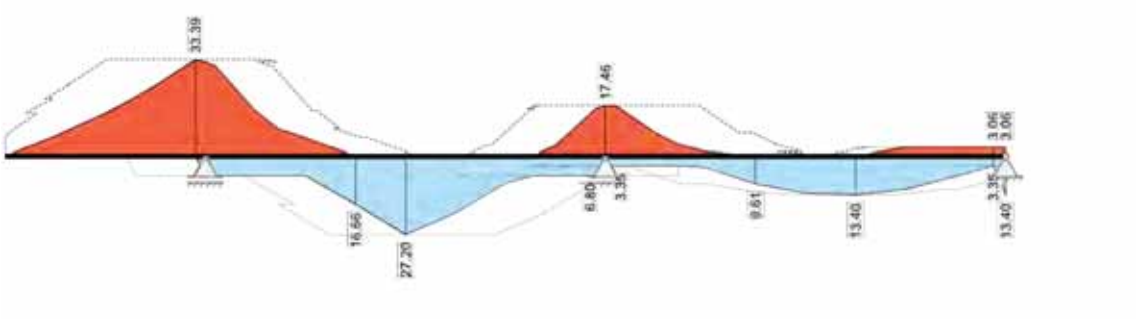
Summary

Analysis summary

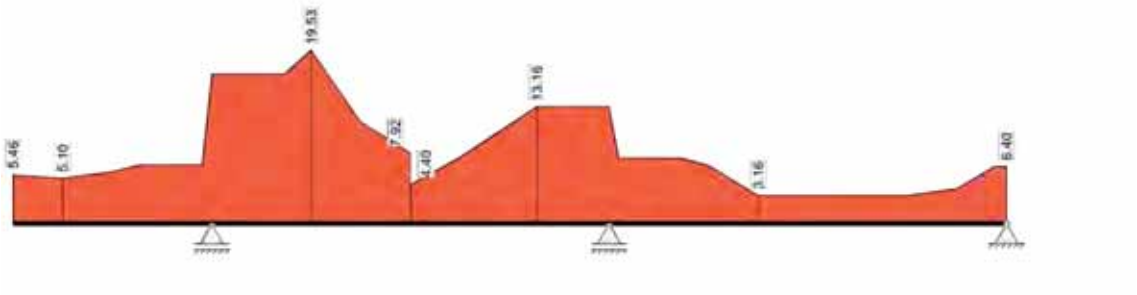
Structural analysis of continuous beam with linear eleastic stress resultant calculation and limited moment redistribution <= 15.00 %					
Design according to DIN EN 1992-1-1		Civil engineering		Design is carried out normative	
ULS	Analysis	SLS	Analysis	FLS	Analysis
Announcement behavior	yes	Decompression	w/o ana.	Fatigue - bending	w/o ana.
Bending bearing capacity	fulfilled	Limitation of the crack width	w/o ana.	Fatigue - shear force	w/o ana.
Shear loading capacity	fulfilled	Limitation of the stresses	not fulfilled		
Shear joint loading capacity	fulfilled	Limitation of the deformations	fulfilled		
Structural fire protection	fulfilled				
Notches	w/o ana.				

Required reinforcement

Required longitudinal reinforcement [cm²]



Required stirrups - web [cm²/m]



Required flange connecting reinforcement [cm²/m]