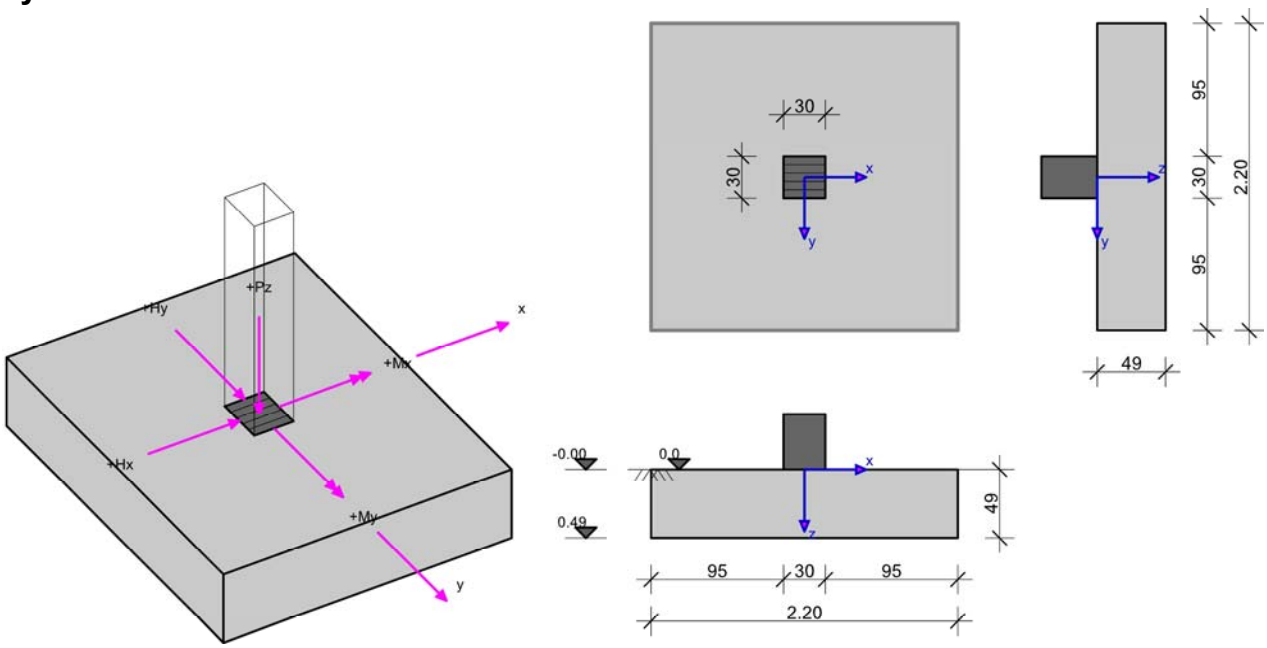
RIB Software SE	Funda V18.0 Build-No. 31102018	Type: Rectangular foundation
File: Einführungsbeispiel.RTfun		

System information



Soil engineering: DIN EN 1997-1	Design:DIN EN 1992-1-1
Design situation: permanent	

Material coefficient, reinforced concrete (C30/37, B500S)

Concrete	γ_c	$\gamma_{c,accid.}$	α_{cc}	γ_B [kN/m³]	f_{ck} [MN/m²]	f_{cd} [MN/m²]
C30/37	1.50	1.30	0.85	25.00	30.00	17.00

Reinforcement	γ_s	$\gamma_{s,accid.}$	f_{yd} [MN/m²]	f_{yk} [MN/m²]	f_{tk} [MN/m²]
B500S	1.15	1.00	434.78	500.00	540.00

Subsoil geometry and material

h_e [m]	t_w [m]	φ [°]	c [kN/m²]	tan $\delta_{s,f}$	γ_1 [kN/m³]	γ_2 [kN/m³]
0.000	0.490	30.00	0.00	0.577	20.00	20.00
σ_{Rd}= 130.00 kN/m², User-defined						

Loading

Load cases

LC	I	LC_I	Source	Type of action	Name
0				Dead load	
1				Permanent load	Lastfall 1

Dead load sum - Load case 0

LC	P_z [kN]
0	59.3

Column loads and imported loads

Type: S = column loads; I = imported loads; c = characteristic; d = design

LC	Type	P_z [kN]	H_x [kN]	H_y [kN]	M_x [kNm]	M_y [kNm]	ΔM_{xII} [kNm]	ΔM_{yII} [kNm]	e_x [m]	e_y [m]
1	S,c	533.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.000

Load case combinations

decis.= 'yes' ... Combination is decisive in an analysis

LCC	decis.	Type	Crit.	Combination
1	yes	G	GK	1.35*LC1

Geotechnical analyses

Analysis of the safety against displacement (2nd order theory γ-fold)

Analysis format: $M_{dst,d} \leq M_{stb,d}$

LCC	$M_{x,stb}$ [kNm]	$M_{x,dst}$ [kNm]	$M_{y,stb}$ [kNm]	$M_{y,dst}$ [kNm]	dst/stb
1	586.4	0.0	586.4	0.0	0.00

Analysis not carried out

Sliding analysis (2nd order theory γ-fold)

Analysis format: $T_d/R_{td} \leq 1.0$

LCC	V [kN]	H_x [kN]	H_y [kN]	R_{tk} [kN]	R_{td} [kN]	T_d [kN]	T_d/R_{td}
1	592.3	0.0	0.0	342.0	310.9	0.0	0.000

Decisive load case combination: LCC1, η=0.00 **Analysis fulfilled**

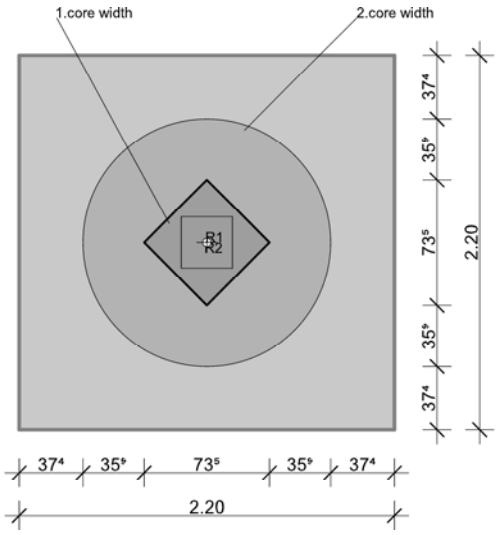
Base failure analysis (2nd order theory γ-fold)

Analysis format: $V_d \leq R_{nd}$

LCC	b_x' [m]	b_y' [m]	N_b	N_d	N_c	$E_{pc,50}$[kN]	$R_{n,c}$ [kN]	$R_{n,d}$ [kN]	V_d [kN]	V_d / R_{nd}
1	2.20	2.20	7.0	27.6	46.1	0.0	2806.9	2004.9	799.6	0.399

Decisive load case combination: LCC1, η=0.40 **Analysis fulfilled**

Gaping joint



R1/2: Decisive resultant of the core widths;
R3: Decisive resultant safety against displacement = maximum utilization [%] * foundation width (bx or by)

Foundation rotation and limitation of a gaping joint (2nd order theory, characteristic)

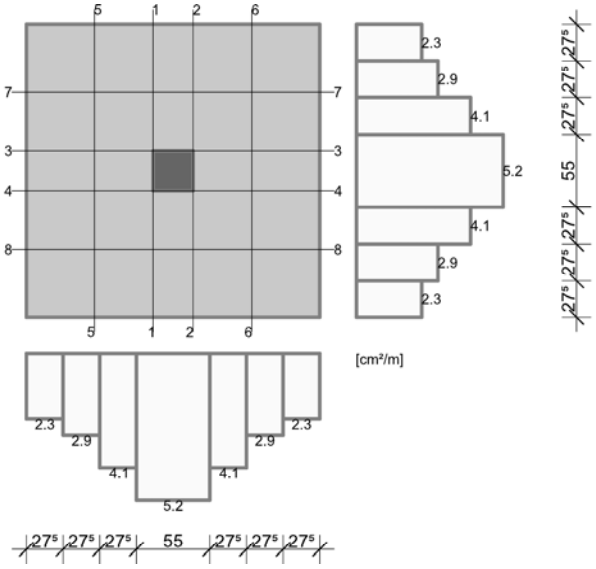
Analysis format: $e_x/b_x \leq 1/6$; $e_y/b_y \leq 1/6$; $(e_x/b_x)^2+(e_y/b_y)^2 \leq 1/9$

LCC	$P_{res,G,c}$ [kN]	$e_{x,G}$ [m]	$e_{y,G}$ [m]	$P_{res,P,c}$ [kN]	$e_{x,P}$ [m]	$e_{y,P}$ [m]	$CW1_x$	$CW1_y$	CW2	$1.KW_x$ [%]	$1.KW_y$ [%]	1.CW [%]	2.CW [%]
1	592	0.00	0.00	592	0.00	0.00	0.00	0.00	**	0.0	0.0	0.0	**

1.core width (2.o.th) Decisive LCC1, η=0.00 **Analysis fulfilled**

Reinforced concrete design

Reinforcement distribution, bottom [cm²/m]



Design sections

Section	As-direction	Design section [m]			Design for
		Pos.	Width	Height	
1	x	-0.150	2.200	0.490	Bending
2	x	0.150	2.200	0.490	Bending
3	y	-0.150	2.200	0.490	Bending
4	y	0.150	2.200	0.490	Bending
5	x	-0.590	2.200	0.490	Bending+Shear
6	x	0.590	2.200	0.490	Bending+Shear
7	y	-0.590	2.200	0.490	Bending+Shear
8	y	0.590	2.200	0.490	Bending+Shear

Bending design

Reinforcement layer [cm]

$d_{1,b,x}$	$d_{1,b,y}$	$d_{1,t,x}$	$d_{1,t,y}$	$c_{vl,b,x}$	$c_{vl,b,y}$	$c_{vl,t,x}$	$c_{vl,t,y}$
5.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0

Bending design

	decisi.comb.		M_{max}	M_{min}	h	b	ε_b	ε_s	$z_{i,B}$	$A_{s,b}$	$A_{s,o}$
Section	$A_{s,b}$	$A_{s,o}$	[kNm]	[kNm]	[m]	[m]	[‰]	[‰]	[m]	[cm²]	[cm²]
1	1	1	162.3	162.3	0.490	2.200	-1.23	25.00	0.433	8.0	0.0
2	1	1	162.3	162.3	0.490	2.200	-1.23	25.00	0.433	8.0	0.0
3	1	1	162.3	162.3	0.490	2.200	-1.23	25.00	0.433	8.0	0.0
4	1	1	162.3	162.3	0.490	2.200	-1.23	25.00	0.433	8.0	0.0
5	1	1	46.8	46.8	0.490	2.200	-0.61	25.00	0.436	2.3	0.0
6	1	1	46.8	46.8	0.490	2.200	-0.61	25.00	0.436	2.3	0.0
7	1	1	46.8	46.8	0.490	2.200	-0.61	25.00	0.436	2.3	0.0
8	1	1	46.8	46.8	0.490	2.200	-0.61	25.00	0.436	2.3	0.0

distribute bottom x reinforcement as follows (ya=-1.100 m)

sb_y [m]	0.275	0.275	0.275	0.550	0.275	0.275	0.275			
A_{su} [cm²]	0.64	0.80	1.12	2.87	1.12	0.80	0.64			
A_{su} [cm²/m]	2.32	2.90	4.07	5.23	4.07	2.90	2.32			

distribute bottom y reinforcement as follows (xa=-1.100 m)

sb_x [m]	0.275	0.275	0.275	0.550	0.275	0.275	0.275			
A_{su} [cm²]	0.64	0.80	1.12	2.87	1.12	0.80	0.64			
A_{su} [cm²/m]	2.32	2.90	4.07	5.23	4.07	2.90	2.32			

Shear design

Analysis of the shear bearing capacityCalculation asBeam

Angle of the stirrup reinforcement: 90.00 °

Shear design - Design values based on 2nd order theory γ-fold

No.	decis.	V_{Ed}	$V_{Rd,ct}$	$V_{Rd,max}$	$V_{Rd,sy}$	$z_{i,S}$	ρ_l	θ	$a_{sb,min}$	$a_{ss,min}$	a_{sb}	a_{ss}

	Comb.	[kN]	[kN]	[kN]	[kN]	[m]	[%]	[°]	[cm²/m]	[cm²/m]	[cm²/m]	[cm²/m]
5	1	166.8	402.0	4902.4	166.8	0.350	0.02	43.5	10.42	0.00	10.42	0.00
6	1	166.8	402.0	4902.4	166.8	0.350	0.02	43.5	10.42	0.00	10.42	0.00
7	1	166.8	402.0	4902.4	166.8	0.350	0.02	43.5	10.42	0.00	10.42	0.00
8	1	166.8	402.0	4902.4	166.8	0.350	0.02	43.5	10.42	0.00	10.42	0.00

Req. shear reinforcement, stirrups 10.42 cm²/m in section: 5, Distribution:Evenly

Req. shear reinforcement, bent-up bars 0.00 cm²/m in section: 5, Distribution:Evenly

Analysis overview

Analysis	Status	LCC	Utilization
Safety against displacement	not carried out		
Sliding analysis (2.o.th)	fulfilled	1	0.00
Base failure (2.o.th)	fulfilled	1	0.40
1.core width (2.o.th)	fulfilled	1	0.00