

Benchmark EC7 - Pad foundation check

This benchmark shows the results obtained by the calculation of Pad foundations in Scia Engineer. The stability check of a pad foundation with an inclined eccentric load is performed in this use case.

For more information about the geometry and parameters of the pad foundation, we refer to the file 'BM EC7 – Pad foundations reference.pdf'.

The results can be compared with the Scia Engineer file: BM EC7-Pad foundations.esa.

Input data and loading

Linear calculation, Extreme : Global
 Selection : All
 Class : GEO
 Pad foundation check

EN 1997-1 Stability check

Sn1/N1	SetC/1	0.98
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...:Input & Loading:...

Design data

Design approach	1 (Combination 2)
Partial factor sets	M2 "+" R1
Gamma Fi'	1.25
Gamma c'	1.25
Gamma cu	1.40
Gamma qu	1.40
Gamma gamma	1.00
Gamma R;v	1.00
Gamma R;h	1.00

Pad foundation data

Name	PF1
Material	C12/15
Type	Prismatic
Cast condition	Insitu

Pad foundation geometry

A [m]	B [m]	h1 [m]	h2 [m]	h3 [m]	a [m]	b [m]	ex [m]	ey [m]
3.980	3.980	0.800	0.000	0.000	0.600	0.600	0.000	0.000

Subsoil data

Name	Sub1	
Type	Drained	
Density	2000.00	kg/m ³
Fi'	32.00	deg
Sigma oc	0.0	MPa
c'	0.0	MPa
cu	0.0	MPa

Backfill material

Density	2000.00	kg/m ³
Height	0.000	m

Water table

Level	No influence
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Loading

Reaction		Elimination factor	Loading		
Rx	520.00	1.00	Hx	520.00	kN
Ry	0.00	1.00	Hy	0.00	kN
Rz	3000.00	1.00	P	3000.00	kN
Mx	0.00	1.00	Mx	0.00	kNm
My	2080.00	1.00	My	2080.00	kNm

Results

...:ULS Stability Check:...:

Determination of Effective Geometry

According to EN 1997-1 Annex D

Table of values		
Weight of backfill material	0.00	kN
Weight of pad foundation	304.14	kN
Partial safety factor	1.00	
Design weight of pad foundation and backfill G	304.14	kN
gx	0.000	m
gy	0.000	m
px	0.000	m
py	0.000	m
h	0.800	m
Design value of the vertical load Vd	3304.14	kN
Design value of the horizontal load Hd	520.00	kN
Eccentricity ex	0.755	m
Eccentricity ey	0.000	m

Effective foundation width B'	2.469	m
Effective foundation length L'	3.980	m
Effective foundation area A'	9.827	m^2

Bearing Resistance Check

According to EN 1997-1 article 6.5.2.1 and Annex D

Table of values		
Bearing resistance factor N_q	12.59	
Bearing resistance factor N_c	23.18	
Bearing resistance factor N_{γ}	11.59	
Pad foundation base inclination factor b_q	1.00	
Pad foundation base inclination factor b_c	1.00	
Pad foundation base inclination factor b_{γ}	1.00	
Shape factor s_q	1.28	
Shape factor s_c	1.30	
Shape factor s_{γ}	0.81	
Angle θ	90.00	deg
Exponent m_B	1.62	
Exponent m_L	1.38	
Exponent m	1.62	
Load inclination factor i_q	0.76	
Load inclination factor i_c	0.76	
Load inclination factor i_{γ}	0.64	
Effective backfill density	20.0	kN/m^3
Design effective overburden q'	16.00	kN/m^2
Effective subsoil density	20.0	kN/m^3
Design bearing resistance R_d	3378.27	kN
Unity check (6.1)	0.98	

Sliding Resistance Check

According to EN 1997-1 article 6.5.3

Table of values		
Design friction angle δ	26.56	deg
Design earth pressure resistance R_{pd}	0.00	kN
Design shear resistance R_d	1651.72	kN
Unity check (6.2)	0.31	

Check of Maximal Eccentricity

According to EN 1997-1 article 6.5.4 & Bautabellen für Ingenieure, 13. Auflage, Werner Verlag, 1998

Table of values	
Maximal value of eccentricity	No limit
Unity check	0.00