

POS. 1: BSP.1, AP=2.0 M

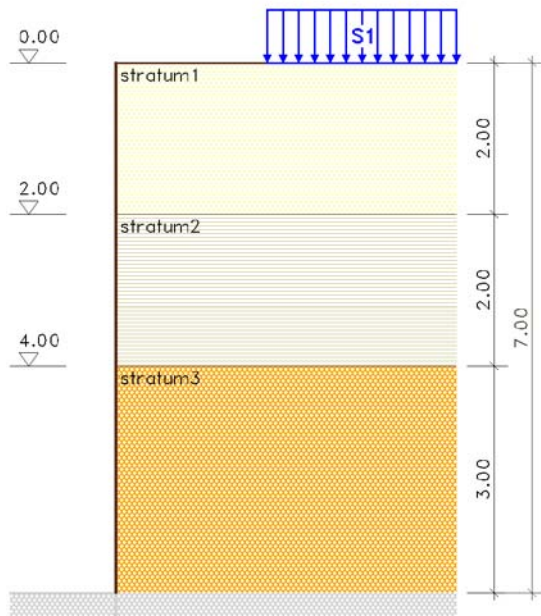
calculation of earth pressures

According to DIN 4084:2017-08 and associated standard specifications

calculation of the active earth pressure

1. system

scale 1:100



wall friction

for a rough wall surface,
angle of wall friction $\delta = 2/3 \cdot \phi'_k$

cohesion

cohesion is fully taken into account
calculated tensile stress from cohesion are not applied
minimum earth pressure is checked in all cohesive strata

soil strata

stratum	notation	soil type	d m	γ kN/m ³	γ' kN/m ³	ϕ' °	c' kN/m ²
1	stratum1	non-cohesive	2.00	18.00	8.00	30.00	---
2	stratum2	cohesive	2.00	19.50	8.00	25.00	5.00
3	stratum3	non-cohesive	---	19.00	8.00	35.00	---

d - stratum thickness γ - unit weight of soil γ' - unit weight of submerged soil ϕ' - angle of internal friction of drained soil
 c' - cohesion of the drained soil

2. loading

p - load a - distance wall head l - length \perp to the wall

2.1. strip loads

Nr.	notation	p'	a m	l m	introduction m	earth pressure distribution
S1	Streifenlast	20.00 kN/m ²	2.00	2.50	surface	DIN 4085 1)

1) acc. to [1], table C.2 (shape dependent on wall movement)

2.2. load combinations

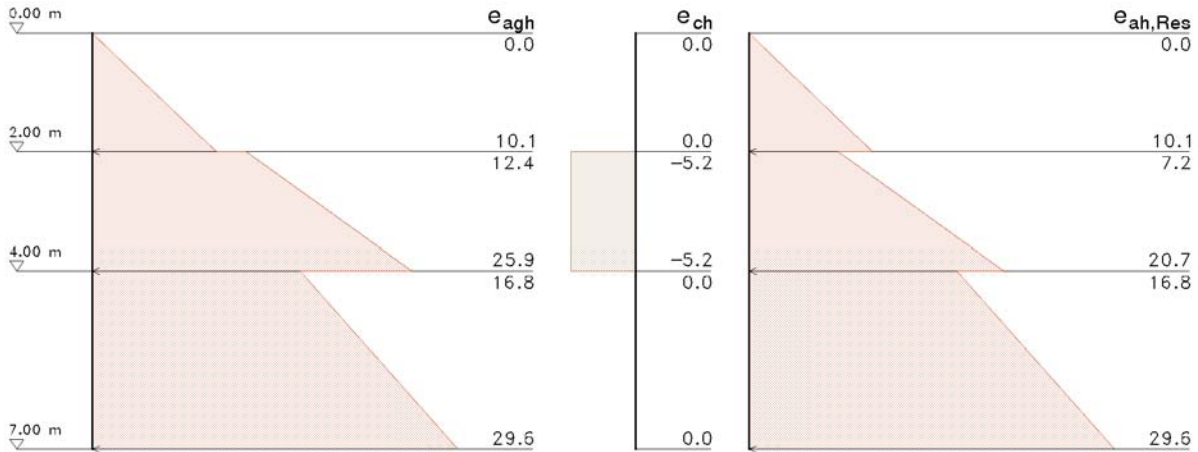
from dead load of the soil (G), water pressure (W) and the external types of loads: distributed (F), strip (S), line (L) or block (B)

LK	notation	factorization
1	load combination1	G+S1

3. active earth pressure

3.1. from dead load of the soil

e_{agh} horiz. earth pressure due to soil weight
 e_{ch} horiz. relief due to cohesion
 $e_{ah,Res}$ resulting horiz. earth pressure



soil

$\Sigma(\gamma \cdot h)$ total soil weight at the depth considered
 K_{agh} coefficient of earth pressure acc. to [1] section 6.2.1, eqn.(7) (approach acc. to Müller-Breslau)
 c_{cal} computationally effective cohesion
 K_{ach} coefficient of earth pressure due to cohesion acc. to [1] section 6.2.1, eqn.(10)
 e_{ah} horiz. earth pressure ordinate

Z m	$\Sigma(\gamma \cdot h)$ kN/m ²	K_{agh} -	C_{ca1} kN/m ²	K_{ach} -	e_{ah} kN/m ²
0.00	0.00	0.279	---	---	0.00
2.00	36.00	0.279	---	---	10.06
2.00	36.00	0.346	5.00	1.043	7.23
4.00	75.00	0.346	5.00	1.043	20.71
4.00	75.00	0.224	---	---	16.83
7.00	132.00	0.224	---	---	29.62

horizontal earth pressure force $E_h = 107.68$ kN/m
 point of application of the earth pressure force $z_E = 4.59$ m

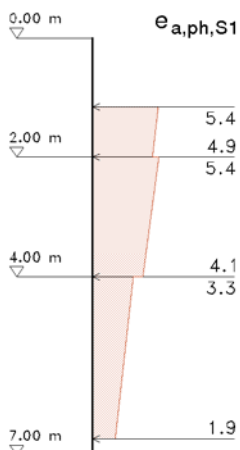
resulting earth pressure from soil

Z m	e_{ah} kN/m ²	Z m	e_{ah} kN/m ²
0.00	0.00	4.00	20.71
2.00	10.06	4.00	16.83
2.00	7.23	7.00	29.62

horizontal earth pressure force $E_h = 107.68$ kN/m
 point of application of the earth pressure force $z_E = 4.59$ m

3.2. from external loads

$e_{a,ph,S1}$ horiz. earth pressure from Streifenlast



S1: Streifenlast

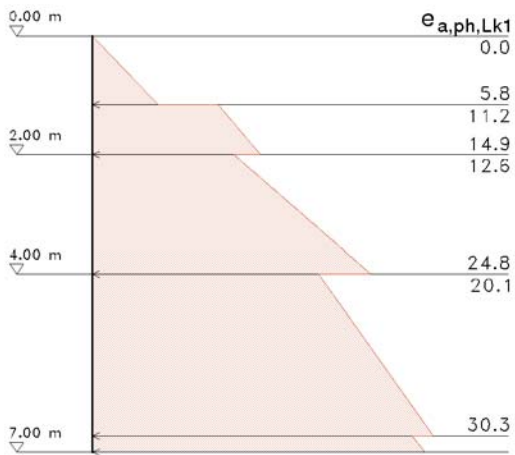
earth pressure distribution: acc. to [1], table C.2

$p(z)$ effective proportion of superimposed load at the depth considered
 K_{aph} coefficient of earth pressure acc. to [1] section 6.2.6, eqn.(15)
 e_{ah} horiz. earth pressure ordinate

Z m	$p(z)$ kN/m ²	K_{aph} -	e_{ah} kN/m ²	Z m	$p(z)$ kN/m ²	K_{aph} -	e_{ah} kN/m ²
1.15	12.96	0.414	5.36	4.00	8.89	0.459	4.08
2.00	11.75	0.414	4.86	4.00	8.89	0.373	3.31
2.00	11.75	0.459	5.39	6.73	4.98	0.373	1.86

horizontal earth pressure force $E_h = 20.84$ kN/m
 point of application of the earth pressure force $z_E = 3.44$ m

3.3. Infolge load combinations



LK 1: G+S1

Z m	Eah kN/m ²	Z m	Eah kN/m ²
0.00	0.00	4.00	24.79
1.15	5.81	4.00	20.14
1.15	11.17	6.73	30.32
2.00	14.92	6.73	28.47
2.00	12.62	7.00	29.62

horizontal earth pressure force $E_h = 128.52 \text{ kN/m}$
 point of application of the earth pressure force $z_E = 4.41 \text{ m}$

4. summary

kind of earth pressure	earth pressure force	
	E_h kN/m	z_E m
soil	107.68	4.59
res. earth pressure from soil	107.68	4.59
Streifenlast	20.84	3.44
LK 1: G+S1	128.52	4.41

literature and standard specifications:

[1] DIN 4085: Baugrund, Berechnung des Erddrucks, August 2017