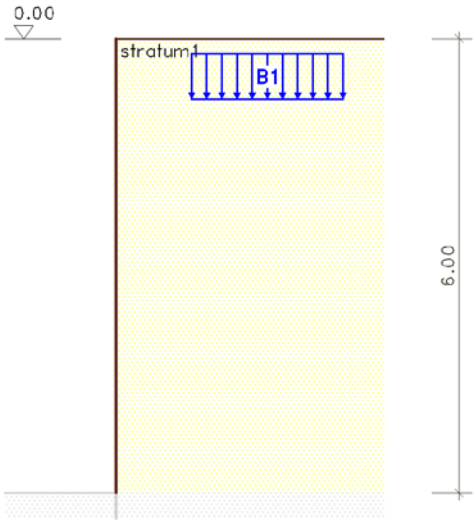
calculation of earth pressures

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 $\delta = 2/3 \cdot \varphi'_k$

soil strata

stratum	notation	soil type	d m	γ kN/m³	γ' kN/m³	φ' °	c' kN/m²
1	stratum1	non-cohesive	---	18.00	8.00	30.00	---

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 - lenght ⊥ to the wall b - wide ∥ to the wall

2.1. block loads

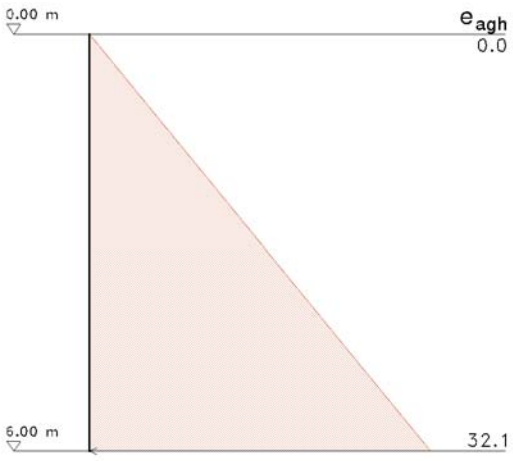
Nr.	notation	P	p' kN/²	a m	l m	b m	introduction m	earth pressure distribution	
B1	Blocklast	800.00 kN	266.67	1.00	2.00	1.50	z = 0.80	DIN 4085	1)

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

3. active earth pressure

3.1. from dead load of the soil

e_{agh} horiz. earth pressure due to soil weight



soil

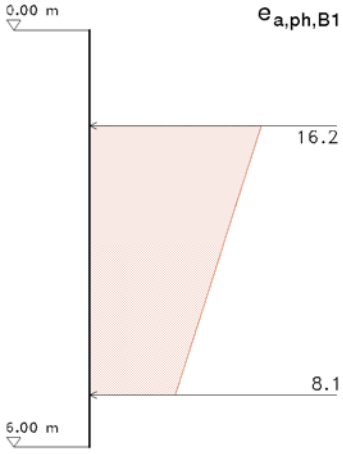
$\Sigma(\gamma \cdot h)$ total soil weight at the depth considered
K_{agh} coefficient of earth pressure acc. to [2] section 6.02.3, eqn.(6.02)
e_{ah}/e_{av} horiz. and vertical ordinate of earth pressure
e_{ares} res. ordinate of earth pressure from horizontal and vertical proportion

z m	$\Sigma(\gamma \cdot h)$ kN/m²	K_{agh} -	e_{ah} kN/m²	e_{av} kN/m²	e_{ares} kN/m²
0.00	0.00	0.297	0.00	0.00	0.00
6.00	108.00	0.297	32.11	11.69	34.17

horizontal component of the earth pressure force $E_{h=}$ 96.33 kN/m
vertical component of the earth pressure force $E_{v=}$ 35.06 kN/m
earth pressure force E = 102.51 kN/m
point of application of the earth pressure force $z_{E=}$ 4.00 m

3.2. from external loads

$e_{a,ph,B1}$ horiz. earth pressure from Blocklast



B1: Blocklast

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 [2] section 6.02.4.3, eqn.(6.08)
e_{ah}/e_{av} horiz. and vertical ordinate of earth pressure
e_{ares} res. ordinate of earth pressure from horizontal and vertical proportion

z m	p(z) kN/m²	K_{aph} -	e_{ah} kN/m²	e_{av} kN/m²	e_{ares} kN/m²
1.38	36.77	0.441	16.20	5.90	17.24
5.24	18.39	0.441	8.10	2.95	8.62

horizontal component of the earth pressure force $E_{h=}$ 46.99 kN/m
vertical component of the earth pressure force $E_{v=}$ 17.10 kN/m
earth pressure force E = 50.00 kN/m
point of application of the earth pressure force $z_{E=}$ 3.10 m

4. summary

kind of earth pressure	earth pressure force			
	E_h kN/m	E_v kN/m	E kN/m	z_E m
soil	**96.33**	35.06	102.51	4.00
Blocklast	46.99	17.10	50.00	3.10

literature and standard specifications:
[1] DIN 4085: Baugrund, Berechnung des Erddrucks, August 2017
[2] Dörken/Dehne/Kliesch: Grundbau in Beispielen, Teil 1, Werner Verlag, 5.Aufl., 2013