calculation of earth pressures
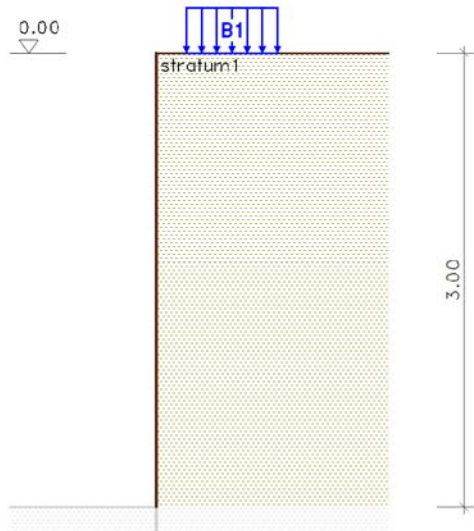According to DIN 4084:2017-08 and associated standard specifications

calculation of the active earth pressure

1. system
scale 1:50

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

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

soil strata

stratum	notation	soil type	d m	γ kN/m³	γ' kN/m³	φ' °	c' kN/m²
1	stratum1	cohesive ~~	---	19.00	10.00	22.50	15.00

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 $\perp$ 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	Blocklast1	164.70 kN	80.74	0.20	0.60	3.40	surface	DIN 4085 [1]

[1] acc. to [1], table C.2 (shape dependent on wall movement)
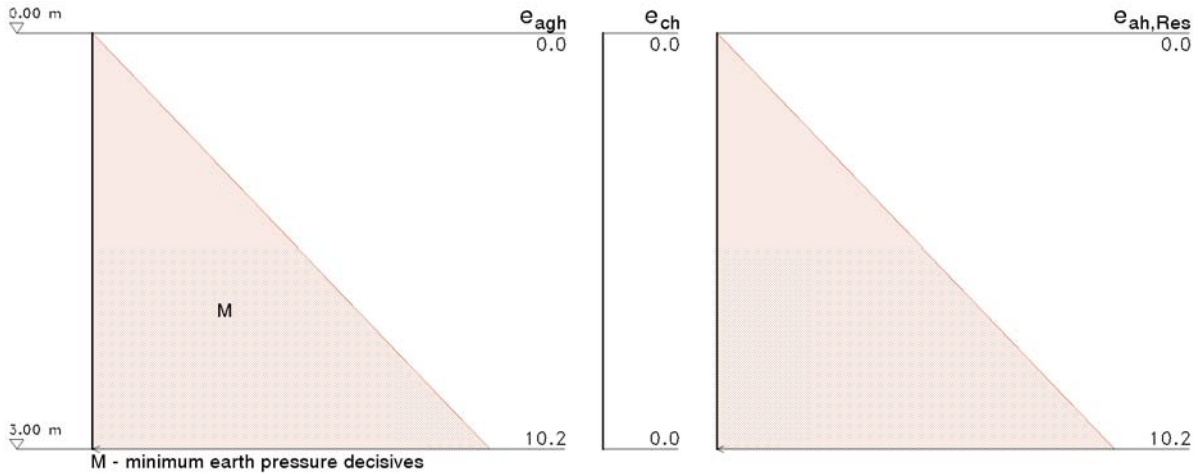
2.2. load combinations
from dead load of the soil (G), water pressure (W) and the external typs of loads: distributed (F), strip (S), line (L) or block (B)

LK	notation	factorization
1	load combination1	G

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

M - minimum earth pressure decisives

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)
$K_{agh,min}$ coefficient of earth pressure for consideration of the minimum pressure according to [1] section 6.2.5
e_{ah}/e_{av} horiz. and vertical ordinate of earth pressure
e_{ares} res. ordinate of earth pressure from horizontal and vertical proportion

z	$\Sigma(\gamma \cdot h)$	K_{agh}	c_{cal}	K_{ach}	$K_{agh,min}$	e_{ah}	e_{av}	e_{ares}
m	kN/m²	-	kN/m²	-	-	kN/m²	kN/m²	kN/m²
0.00	0.00	0.384	15.00	1.109	0.179	0.00*	0.00*	0.00*
3.00	114.00	0.384	15.00	1.109	0.179	10.18*	5.11*	11.39*

* minimum earth pressure decisives

     horizontal component of the earth pressure force E_h= 15.27 kN/m
     vertical component of the earth pressure force E_v= 7.67 kN/m
     earth pressure force E = 17.09 kN/m
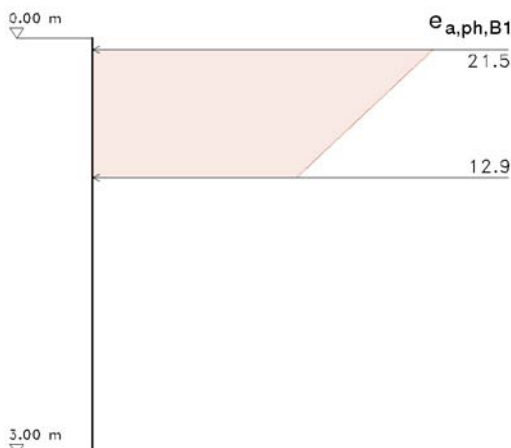   point of application of the earth pressure force z_E= 2.00 m

resulting earth pressure from soil

z	e_{ah}	e_{av}	e_{ares}
m	kN/m²	kN/m²	kN/m²
0.00	0.00	0.00	0.00
3.00	10.18	5.11	11.39

     horizontal component of the earth pressure force E_h= 15.27 kN/m
     vertical component of the earth pressure force E_v= 7.67 kN/m
     earth pressure force E = 17.09 kN/m
     point of application of the earth pressure force z_E= 2.00 m

3.2. from external loads

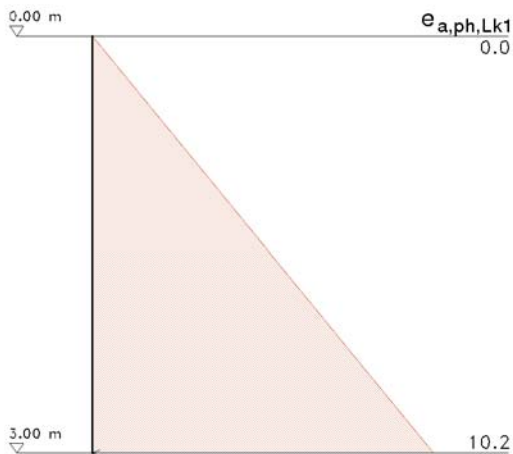$e_{a,ph,B1}$ horiz. earth pressure from Blocklast1

B1: Blocklast1

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}/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
0.08	44.60	0.483	21.53	5.77	22.29
1.01	26.76	0.483	12.92	3.46	13.37

horizontal component of the earth pressure force E_h= 15.90 kN/m
vertical component of the earth pressure force E_v= 4.26 kN/m
earth pressure force E = 16.46 kN/m
point of application of the earth pressure force z_E= 0.51 m

3.3. Infolge load combinations

0.00 m

$e_{a,ph,Lk1}$
0.0

3.00 m

10.2

LK 1: G

z m	e_{ah} kN/m²	e_{av} kN/m²	e_{ares} kN/m²
0.00	0.00	0.00	0.00
3.00	10.18	5.11	11.39

horizontal component of the earth pressure force E_h= 15.27 kN/m
vertical component of the earth pressure force E_v= 7.67 kN/m
earth pressure force E = 17.09 kN/m
point of application of the earth pressure force z_E= 2.00 m

4. summary

kind of earth pressure	E_h kN/m	E_v kN/m	E kN/m	z_E m
soil	15.27	7.67	17.09	2.00
res. earth pressure from soil	15.27	7.67	17.09	2.00
Blocklast1	**15.90**	4.26	16.46	0.51
LK 1: G	15.27	7.67	17.09	2.00

earth pressure force

literature and standard specifications:
[1] DIN 4085: Baugrund, Berechnung des Erddrucks, August 2017