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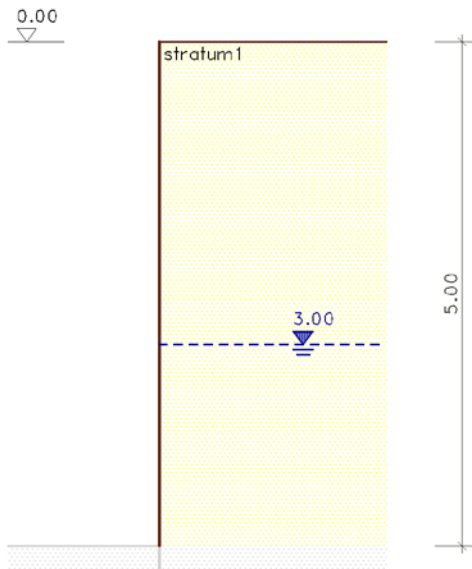According to DIN 4084:2017-08 and associated standard specifications

calculation of the active earth pressure

1. system

scale 1:75

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

ground water
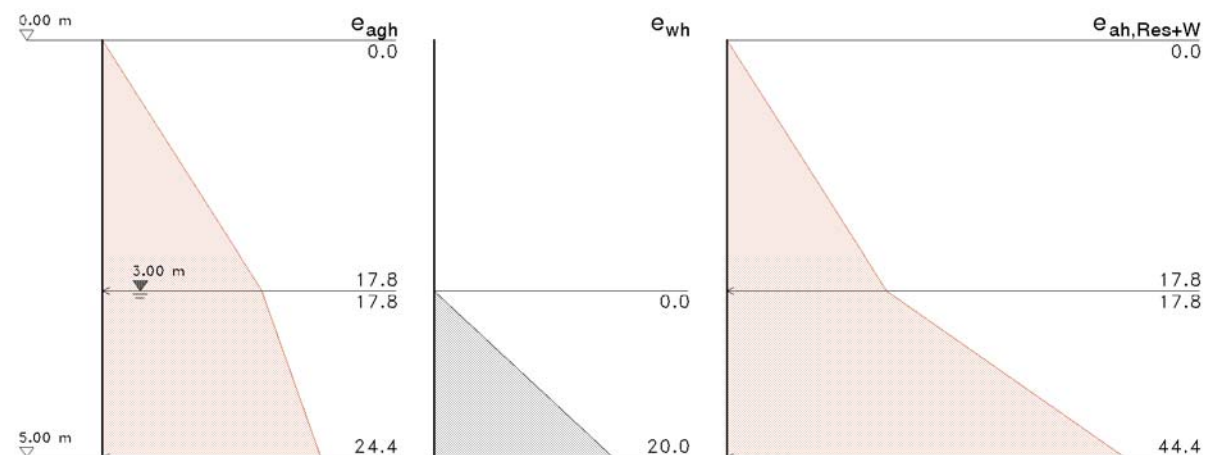behind the wall   at $z_{W,right}$ = 3.00 m

soil strata

stratum	notation	soil type	d m	γ kN/m³	γ' kN/m³	φ' °	c' kN/m²
1	stratum1	non-cohesive	---	20.00	11.00	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. active earth pressure

2.1. from dead load of the soil

e_{agh} horiz. earth pressure due to soil weight
e_{wh} horiz. water pressure
$e_{ah,Res+W}$ resulting horiz. earth and water pressure

soil

$\Sigma(\gamma \cdot h)$ total soil weight at the depth considered
K_{agh} coefficient of earth pressure acc. to [1] 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
3.00	60.00	0.297	17.84	6.49	18.98
5.00	82.00	0.297	24.38	8.87	25.94

horizontal component of the earth pressure force E_h= 68.98 kN/m
vertical component of the earth pressure force E_v= 25.11 kN/m
earth pressure force E = 73.40 kN/m
point of application of the earth pressure force z_E= 3.26 m

water pressure

e_w orinate of water pressure

z m	e_w kN/m²
3.00	0.00
5.00	20.00

horizontal water pressure load E_h = 20.00 kN/m
point of application der water pressure load z_E= 4.00 m

resulting earth pressure of soil including water pressure

z m	e_{ah} kN/m²	e_{av} kN/m²	e_{ares} kN/m²
0.00	0.00	0.00	0.00
3.00	17.84	6.49	18.98
5.00	44.38	8.87	45.26

horizontal component of the earth pressure force E_h= 88.98 kN/m
vertical component of the earth pressure force E_v= 25.11 kN/m
earth pressure force E = 92.45 kN/m
point of application of the earth pressure force z_E= 3.50 m

3. summary

kind of earth pressure	earth pressure force			
	E_h kN/m	E_v kN/m	E kN/m	z_E m
soil	68.98	25.11	73.40	3.26
water pressure	20.00	0.00	20.00	4.00
res. earth pressure from soil + water pressure	**88.98**	25.11	92.45	3.50

literature and standard specifications:
[1] Dörken/Dehne/Kliesch: Grundbau in Beispielen, Teil 1, Werner Verlag, 5.Aufl., 2013