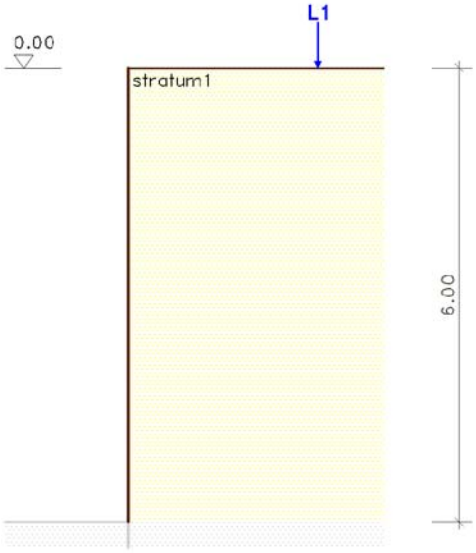
# calculation of earth pressures

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<br>m | γ<br>kN/m³ | γ'<br>kN/m³ | φ'<br>° | c'<br>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

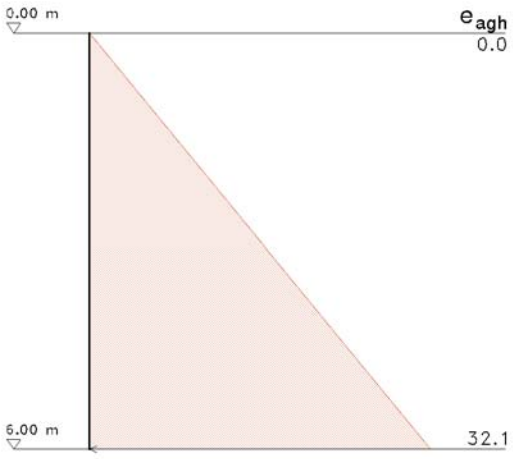
### 2.1. line loads

| Nr. | notation | p | a<br>m | introduction<br>m |
|---|---|---|---|---|
| L1 | Linienlast1 | 60.00 kN/m | 2.50 | surface |

## 3. active earth pressure

### 3.1. from dead load of the soil

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



### soil

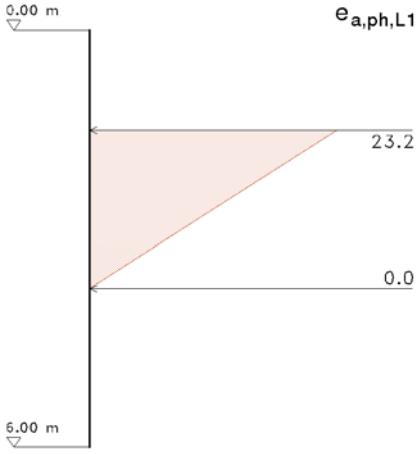
$\Sigma(\gamma \cdot h)$ total soil weight at the depth considered
$K_{agh}$ coefficient of earth pressure acc. to [2] section 6.02.3, eqn.(6.02)
$e_{ah}/e_{av}$ horiz. and vertical ordinate of earth pressure
$e_{ares}$ res. ordinate of earth pressure from horizontal and vertical proportion

| z<br>m | $\Sigma(\gamma \cdot h)$<br>kN/m² | $K_{agh}$<br>- | $e_{ah}$<br>kN/m² | $e_{av}$<br>kN/m² | $e_{ares}$<br>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

$e_{a,ph,L1}$ horiz. earth pressure from Linienlast1




### L1: Linienlast1

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<br>m | p(z)<br>kN/m² | $K_{aph}$<br>- | $e_{ah}$<br>kN/m² | $e_{av}$<br>kN/m² | $e_{ares}$<br>kN/m² |
|---|---|---|---|---|---|
| 1.44 | 52.73 | 0.441 | 23.23 | 8.46 | 24.72 |
| 3.72 | 0.00 | 0.441 | 0.00 | 0.00 | 0.00 |

horizontal component of the earth pressure force $E_{h=}$ 26.43 kN/m
vertical component of the earth pressure force $E_{v=}$ 9.62 kN/m
earth pressure force E = 28.13 kN/m
point of application of the earth pressure force $z_{E=}$ 2.20 m

# 4. summary

| kind of earth pressure | earth pressure force | | | |
|---|---|---|---|---|
| | $E_h$<br>kN/m | $E_v$<br>kN/m | E<br>kN/m | $z_E$<br>m |
| soil | **96.33** | 35.06 | 102.51 | 4.00 |
| Linienlast1 | 26.43 | 9.62 | 28.13 | 2.20 |

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