

Spreadsheet for calculating earth pressure force, sliding and tipping values of retaining wall profiles.

	Enter variables here				
profile type =	4		1, 2, 3, or 4: means:	trapezoid type CAPEB	definitions see Info
height =	1.41	m	definition see info	1.41	retaining height
width =	0.70	m	definition see info	0.70	width at toe (m)
batter =	10	%	batter of front face	0.14	absolute batter (m)
β =	0	°	slope of retained terrace		
ϕ soil =	30	°	factor δ / ϕ =	0.67	δ (angle in ° from E_{ag} to right angle on α)
ϕ foundation =	30	°	angle of friction of foundation to soil	0.58	coefficient of friction μ of foundation to soil
γ wall =	15	kN/m ³	wall porosity =	25 %	specific gravity γ of stone (kN/m ³)
γ soil =	18	kN/m ³	specific gravity of soil	0.83	ratio γ wall / γ soil
ρ =	5	kN/m ²	assumed load on terrace (actual or e.g. 5 kN/m ² for people, 10 kN/m ² for vehicles).		

0.56 cope width

α_L	0.00	°	inclination of foundation and stone layers		
α	0.00	°	angle of inner surface to vertical		
A	0.89	m ²	area of profile		
G	13.31	kN/m	weight per m length		
			lever (m)	moment (kNm)	
			0.384	5.11	stabilising moment (approximation with very small error)

method Schmidt/SUS	
Kag	0.297
Kagh	0.279

earth pressure force				0.843	(Ld)
Eag	-5.32	kN/m	0.202	-1.08	
Eap	-2.10	kN/m	0.452	-0.95	dist. toe (m)
			sum g	4.04	0.267
			sum g+p	3.09	0.195

safety factor		safety factor	
SF tipping	4.75	SF sliding	1.748
	2.53		1.313

method FLL mod. Schmidt	
eagh	7.09 kN/m ²
eagv	2.58 kN/m ²
eaph	1.40 kN/m ²
eapv	0.51 kN/m ²

Eagh	-5.00	kN/m	0.470	-2.35		
Eagv	1.82	kN/m	0.700	1.27	eccentricity e (m)	
Eaph	-1.97	kN/m	0.705	-1.39	DIN	SIA
Eapv	0.72	kN/m	0.700	0.50	actual	max. allowed
	sum g	15.13	kN/m	4.04	0.083	0.117 0.233
	sum g+p	15.85	kN/m	3.15	0.151	0.233 0.233

Two methods each are shown for tipping and sliding. "a" means "active", "h" horizontal, "v" vertical, "g" component due to gravity, "p" component due to load pressure. Input values in orange cells. Main outputs are safety factors or position of force vector (distance from toe or eccentricity. If SF = 1 this means the profile is starting to tip or slide, less it has failed, more it is stable. Recommended safety factors range from 1.2 (CAPEB sliding case "g") to approx. 3 (DIN tipping case "g+p"). If in doubt use min. 1.5 for everything or 1.5 for sliding, 2 for tipping and always case "g+p".