

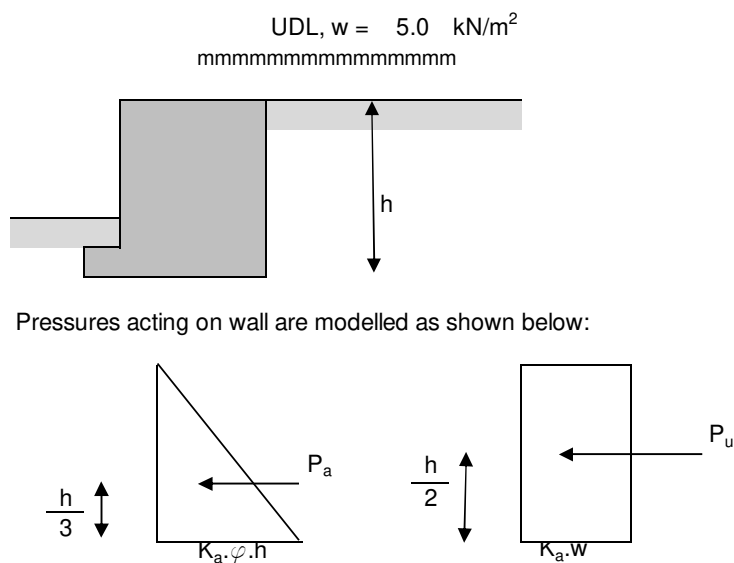
Project					
Mass Concrete Retaining Wall Design					
Date	Calc by	Checked	Job no.	Sheet no.	
July '25	WW	PHG	2109	1	

Structural Design for the design of various size mass concrete Retaining Walls

1 Introduction

The design of the mass concrete retaining walls for up to a maximum height of 5.0m
A mass concrete retaining wall is a gravity-based structure designed to resist lateral earth pressure through its own weight, without the need for reinforcement.
The design primarily addresses stability against overturning, sliding, and bearing failure, based on soil mechanics and the self-weight of concrete.
Due to the large effective depth, bending, shear, and deflection are typically negligible.
Adequate drainage is critical to prevent the buildup of hydrostatic pressure behind the wall.

2 Lateral Pressure on Retaining Walls



Horizontal thrust on wall = $P_a + P_u$

where $P_a = 0.5 \cdot K_a \cdot \phi \cdot h^2$ (Earth Pressure)

$P_u = K_a \cdot w \cdot h$ (Surcharge Pressure)

Active Earth pressure coefficient calculation

For $\Theta = 7$ degrees and for $Q = 45$ degrees

$$K_a = \cos \Theta \times \frac{\cos \Theta - (\cos^2 \Theta - \cos^2 \psi)^{0.5}}{\cos \Theta + (\cos^2 \Theta - \cos^2 \psi)^{0.5}} \quad (\text{Rankine Coeffs with inclined backfills})$$

$$K_a = 0.174$$

These values and formulas have been used in the calculations on the following pages

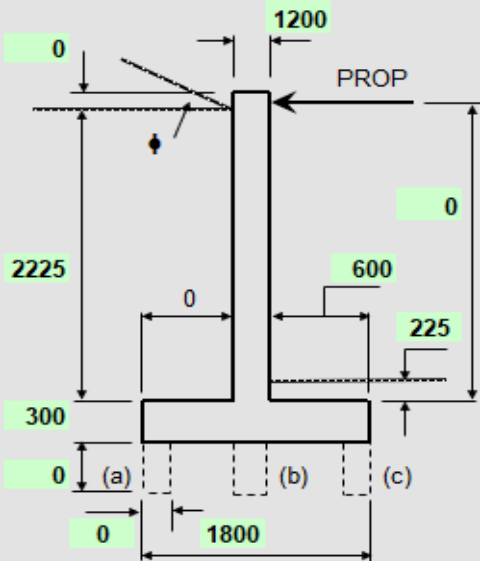
3 Retained Height - 2m

RETAINING WALL ANALYSIS

This Analysis utilises the principles of Rankine's Theory as applicable to cohesionless soils.

Friction on back of wall is neglected. i.e. $\mu = 0$.

Wall Geometry:



Wall Data:

Wall Density:	=	2350	kg/m ³
Base (& Rib) Density:	=	2350	kg/m ³
Rib Position: (no rib=x) (a,b,c,x)	=	x	

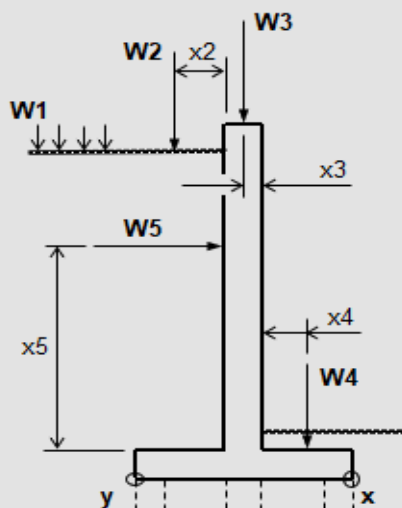
Soil Data:

Retained soil weight:	D	=	1800	kg/m ³
Angle of slope:	ϕ	=	7	°
Angle of internal friction:	θ	=	45	°
Allowable Ground Pressure		=	250	kN/m ²

Analysis Control Factors:

Factor of Safety for Overturning:	2.00
Factor of Safety for Sliding:	2.00
Coefficient of Friction:	0.45
Pressure Coeff. to be used, (Ka, Ko)	Ka

Applied Loading:



Loading Data:

Type		Dead	Live	x (mm)
W1 (udl)	kN/m ²	0.0 [1]	5.0 [2]	n/a
W2 (Line)	kN/m	0.0 [3]	0.0 [4]	0
W3 (Line)	kN/m	0.0 [5]	0.0 [6]	0
W4 (Line)	kN/m	13.4 [7]	0.0 [8]	158
W5 (Point)	kN	0.0 [9]	0.0 [10]	0

Load Combinations:

		Combination			p, c : Prop/Cant. y, n : Use Comb.
		1	2	3	
		c	c	c	
Load:		y	y	y	
W1	DL [1]	0	0	0	
	LL [2]	1	0	1	
W2	DL [3]	0	0	0	
	LL [4]	0	0	0	
W3	DL [5]	0	0	0	
	LL [6]	0	0	0	
W4	DL [7]	1	1	0	
	LL [8]	0	0	0	
W5	DL [9]	0	0	0	
	LL [10]	0	0	0	

1 = Apply Load
0 = Omit Load

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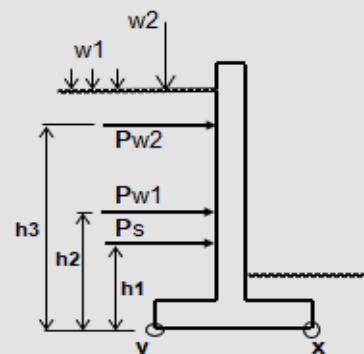
HORIZONTAL PRESSURES ON WALL (Relative to u/s Base)

Earth Pressure Coefficients: (dependant upon ϕ and θ)

Ka: Active Pressure = **0.18**

Ko: At-rest Pressure = **0.29**

Pressure	h (m)	Forces (kN)		Active Selected K = 0.18
		Active	At-rest	
Ps (backfill)	0.84	10.19	16.49	10.19
Pw1 (from w1)	DL [1] LL [2]	1.26 1.26	0.00 2.28	0.00 2.28
Pw2 (from w2)	DL [3] LL [4]	0.00 0.00	0.00 0.00	0.00 0.00



GENERAL STABILITY:

DE-STABILISING EFFECTS: (Taking M^{TS} @ 'x')

Pressure	Load Type	La (m)	Load Case 1		Load Case 2		Load Case 3	
			P	M^T	P	M^T	P	M^T
Ps:	d	0.84	10.19	8.57	10.19	8.57	10.19	8.57
Pw1: [1]	d	1.26	0.00	0.00	0.00	0.00	0.00	0.00
Pw1: [2]	l	1.26	2.28	2.88	0.00	0.00	2.28	2.88
Pw2: [3]	d	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pw2: [4]	l	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pw5: [9]	d	0.3	0.00	0.00	0.00	0.00	0.00	0.00
Pw5: [10]	l	0.3	0.00	0.00	0.00	0.00	0.00	0.00
Totals			12.47	11.46	10.19	8.57	12.47	11.46

STABILISING EFFECTS: (Taking M^{TS} @ 'x')

Load	Load Type	La (m)	Load Case 1		Load Case 2		Load Case 3	
			W	M^T	W	M^T	W	M^T
Backfill	d	1.80	0.00	0.00	0.00	0.00	0.00	0.00
Slope adjustm't.	d	1.8	0.00	0.00	0.00	0.00	0.00	0.00
Self weight base	d	0.90	12.45	11.20	12.45	11.20	12.45	11.20
Self weight stem	d	1.20	61.55	73.86	61.55	73.86	61.55	73.86
Self weight rib	d	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[1] W1: UDL load	d	1.80	0.00	0.00	0.00	0.00	0.00	0.00
[2] UDL load	l	1.80	0.00	0.00	0.00	0.00	0.00	0.00
[3] W2: Line load	d	1.80	0.00	0.00	0.00	0.00	0.00	0.00
[4] Line load	l	1.80	0.00	0.00	0.00	0.00	0.00	0.00
[5] W3: Line load	d	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[6] Line load	l	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[7] W4: Line load	d	0.44	13.35	5.91	13.35	5.91	0.00	0.00
[8] Line load	l	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Totals:			87.35	90.97	87.35	90.97	74.00	85.07

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OVERTURNING:

$$\text{Factor of Safety} = \frac{\text{Stabilizing Moment}}{\text{De-Stabilizing Moment}}$$

	Load Case 1	Load Case 2	Load Case 3
Factor of Safety =	7.94 > 2.00	10.61 > 2.00	7.42 > 2.00
RESULT	SATISFACTORY	SATISFACTORY	SATISFACTORY

SLIDING:

$$\text{Factor of Safety} = \frac{\text{Stabilizing Load} \times \text{Coeff. of Friction} + (\text{Key Rib Resistance})}{\text{De-Stabilizing Load}}$$

	Load Case 1	Load Case 2	Load Case 3
Factor of Safety =	3.15 > 2.00	3.86 > 2.00	2.67 > 2.00
RESULT	SATISFACTORY	SATISFACTORY	SATISFACTORY

Maximum Resistance provided by Key Rib = 0.00 kN
(KEY RIB NOT SPECIFIED)

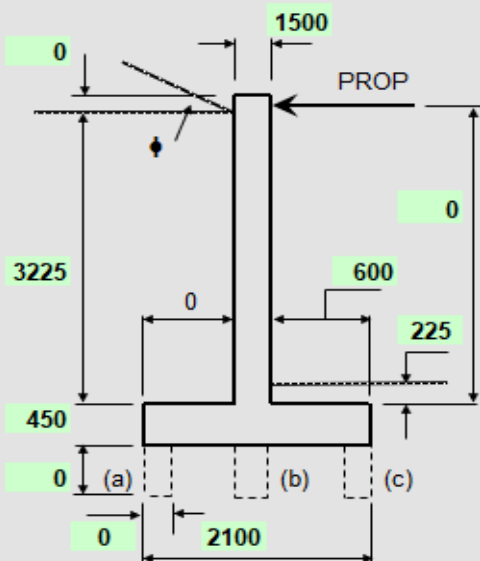
GROUND PRESSURE:

	Load Case 1	Load Case 2	Load Case 3
Resultant, (mm) from "x"	910.3	943.3	994.7
Eccentricity, (mm) (+ve value toward 'x')	-10.3	-43.3	-94.7
Pressure Spread, (mm)	1800	1800	1800
Pressure @ X (kN/m ²)	46.86	41.52	28.13
Pressure @ Y (kN/m ²)	50.20	55.54	54.09
Maximum Ground Pressure =	55.54 kN/m ²	< 250 kN/m ²	SATISFACTORY

4 **Retained Height** - 3m**RETAINING WALL ANALYSIS**

This Analysis utilises the principles of Rankine's Theory as applicable to cohesionless soils.

Friction on back of wall is neglected. i.e. $\mu = 0$.

Wall Geometry:**Wall Data:**

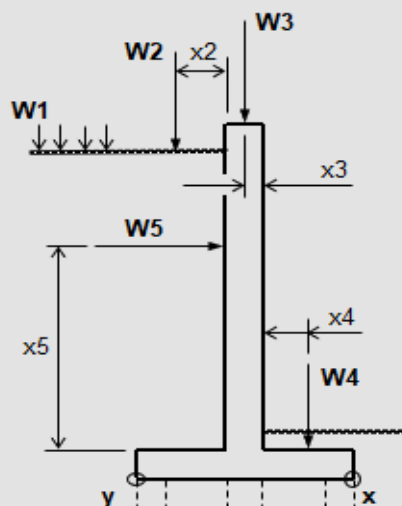
Wall Density:	=	2350	kg/m ³
Base (& Rib) Density:	=	2350	kg/m ³
Rib Position: (no rib=x) (a,b,c,x)	=	x	

Soil Data:

Retained soil weight:	D	=	1800	kg/m ³
Angle of slope:	ϕ	=	7	°
Angle of internal friction:	θ	=	45	°
Allowable Ground Pressure		=	250	kN/m ²

Analysis Control Factors:

Factor of Safety for Overturning:	2.00
Factor of Safety for Sliding:	2.00
Coefficient of Friction:	0.45
Pressure Coeff. to be used, (Ka, Ko)	Ka

Applied Loading:**Loading Data:**

Type	Dead	Live	x
			(mm)
W1 (udl)	kN/m ² 0.0 [1]	5.0 [2]	n/a
W2 (Line)	kN/m 0.0 [3]	0.0 [4]	0
W3 (Line)	kN/m 0.0 [5]	0.0 [6]	0
W4 (Line)	kN/m 19.4 [7]	0.0 [8]	158
W5 (Point)	kN 0.0 [9]	0.0 [10]	0

Load Combinations:

			Combination			p, c : Prop/Cant. y, n : Use Comb.
			1	2	3	
			c	c	c	1 = Apply Load 0 = Omit Load
Load:			y	y	y	
W1	DL	[1]	0	0	0	
	LL	[2]	1	0	1	
W2	DL	[3]	0	0	0	
	LL	[4]	0	0	0	
W3	DL	[5]	0	0	0	
	LL	[6]	0	0	0	
W4	DL	[7]	1	1	0	
	LL	[8]	0	0	0	
W5	DL	[9]	0	0	0	
	LL	[10]	0	0	0	

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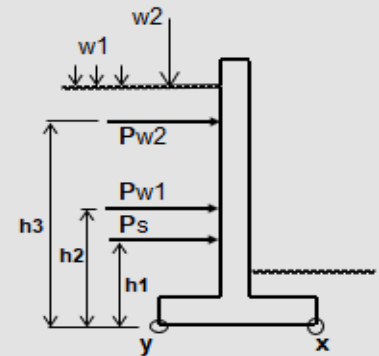
HORIZONTAL PRESSURES ON WALL (Relative to u/s Base)

Earth Pressure Coefficients: (dependant upon ϕ and θ)

Ka: Active Pressure = 0.18

Ko: At-rest Pressure = 0.29

Pressure	h (m)	Forces (kN)		Active Selected K = 0.18
		Active	At-rest	
Ps (backfill)	1.23	21.58	34.92	21.58
Pw1 (from w1)	DL [1]	1.84	0.00	0.00
	LL [2]	1.84	3.33	3.33
Pw2 (from w2)	DL [3]	0.00	0.00	0.00
	LL [4]	0.00	0.00	0.00



GENERAL STABILITY:

DE-STABILISING EFFECTS: (Taking M^{TS} @ 'x')

Pressure	Load Type	La (m)	Load Case 1		Load Case 2		Load Case 3	
			P	M^T	P	M^T	P	M^T
Ps:	d	1.23	21.58	26.43	21.58	26.43	21.58	26.43
Pw1: [1]	d	1.84	0.00	0.00	0.00	0.00	0.00	0.00
Pw1: [2]	l	1.84	3.33	6.11	0.00	0.00	3.33	6.11
Pw2: [3]	d	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pw2: [4]	l	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pw5: [9]	d	0.45	0.00	0.00	0.00	0.00	0.00	0.00
Pw5: [10]	l	0.45	0.00	0.00	0.00	0.00	0.00	0.00
Totals			24.90	32.54	21.58	26.43	24.90	32.54

STABILISING EFFECTS: (Taking M^{TS} @ 'x')

Load	Load Type	La (m)	Load Case 1		Load Case 2		Load Case 3	
			W	M^T	W	M^T	W	M^T
Backfill	d	2.10	0.00	0.00	0.00	0.00	0.00	0.00
Slope adjustm't.	d	2.1	0.00	0.00	0.00	0.00	0.00	0.00
Self weight base	d	1.05	21.79	22.87	21.79	22.87	21.79	22.87
Self weight stem	d	1.35	111.52	150.55	111.52	150.55	111.52	150.55
Self weight rib	d	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[1] W1: UDL load	d	2.10	0.00	0.00	0.00	0.00	0.00	0.00
[2] UDL load	l	2.10	0.00	0.00	0.00	0.00	0.00	0.00
[3] W2: Line load	d	2.10	0.00	0.00	0.00	0.00	0.00	0.00
[4] Line load	l	2.10	0.00	0.00	0.00	0.00	0.00	0.00
[5] W3: Line load	d	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[6] Line load	l	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[7] W4: Line load	d	0.44	19.35	8.56	19.35	8.56	0.00	0.00
[8] Line load	l	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Totals:			152.66	181.99	152.66	181.99	133.31	173.43

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OVERTURNING:

$$\text{Factor of Safety} = \frac{\text{Stabilizing Moment}}{\text{De-Stabilizing Moment}}$$



	Load Case 1	Load Case 2	Load Case 3
Factor of Safety =	5.59 > 2.00	6.89 > 2.00	5.33 > 2.00
RESULT	SATISFACTORY	SATISFACTORY	SATISFACTORY

SLIDING:

$$\text{Factor of Safety} = \frac{\text{Stabilizing Load} \times \text{Coeff. of Friction} + (\text{Key Rib Resistance})}{\text{De-Stabilizing Load}}$$

	Load Case 1	Load Case 2	Load Case 3
Factor of Safety =	2.76 > 2.00	3.18 > 2.00	2.41 > 2.00
RESULT	SATISFACTORY	SATISFACTORY	SATISFACTORY

Maximum Resistance provided by Key Rib = 0.00 kN
(KEY RIB NOT SPECIFIED)

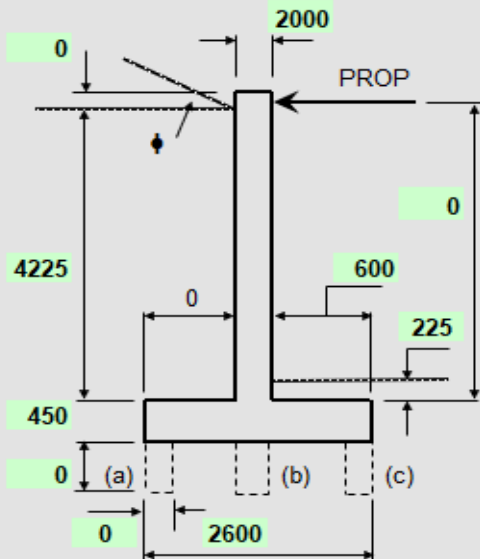
GROUND PRESSURE:

	Load Case 1	Load Case 2	Load Case 3
Resultant, (mm) from "x"	979.0	1019.0	1056.9
Eccentricity, (mm) (+ve value toward 'x')	71.0	31.0	-6.9
Pressure Spread, (mm)	2100	2100	2100
Pressure @ X (kN/m ²)	87.44	79.13	62.23
Pressure @ Y (kN/m ²)	57.95	66.26	64.72
Maximum Ground Pressure = 87.44 kN/m ² < 250 kN/m ² SATISFACTORY			

5 Retained Height - 4m**RETAINING WALL ANALYSIS**

This Analysis utilises the principles of Rankine's Theory as applicable to cohesionless soils.

Friction on back of wall is neglected. i.e. $\mu = 0$.

Wall Geometry:**Wall Data:**

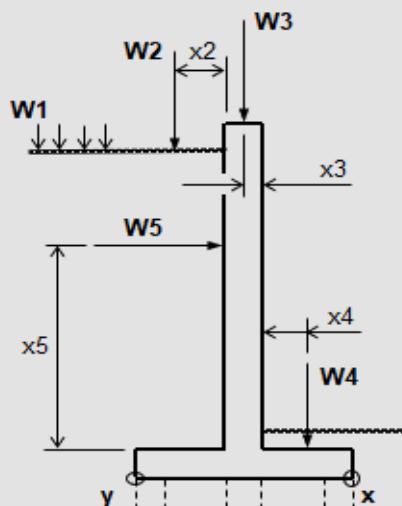
Wall Density:	=	2350	kg/m ³
Base (& Rib) Density:	=	2350	kg/m ³
Rib Position: (no rib=x)	(a,b,c,x)	=	x

Soil Data:

Retained soil weight:	D	=	1800	kg/m ³
Angle of slope:	ϕ	=	7	°
Angle of internal friction:	θ	=	45	°
Allowable Ground Pressure		=	250	kN/m ²

Analysis Control Factors:

Factor of Safety for Overturning:	2.00
Factor of Safety for Sliding:	2.00
Coefficient of Friction:	0.45
Pressure Coeff. to be used, (Ka, Ko)	Ka

Applied Loading:**Loading Data:**

Type	Dead	Live	x (mm)
W1 (udl)	kN/m ² 0.0 [1]	5.0 [2]	n/a
W2 (Line)	kN/m 0.0 [3]	0.0 [4]	0
W3 (Line)	kN/m 0.0 [5]	0.0 [6]	0
W4 (Line)	kN/m 25.4 [7]	0.0 [8]	158
W5 (Point)	kN 0.0 [9]	0.0 [10]	0

Load Combinations:

			Combination			p, c : Prop/Cant. y, n : Use Comb.
			1	2	3	
			c	c	c	
Load:			y	y	y	
W1	DL	[1]	0	0	0	
	LL	[2]	1	0	1	
W2	DL	[3]	0	0	0	
	LL	[4]	0	0	0	
W3	DL	[5]	0	0	0	
	LL	[6]	0	0	0	
W4	DL	[7]	1	1	0	
	LL	[8]	0	0	0	
W5	DL	[9]	0	0	0	
	LL	[10]	0	0	0	

1 = Apply Load
0 = Omit Load

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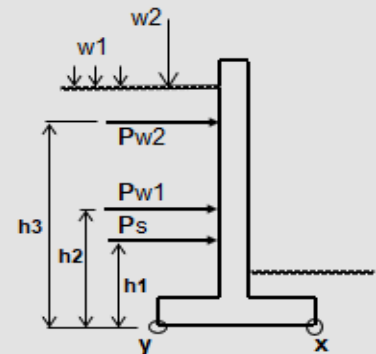
HORIZONTAL PRESSURES ON WALL (Relative to u/s Base)

Earth Pressure Coefficients: (dependant upon ϕ and θ)

Ka: Active Pressure = 0.18

Ko: At-rest Pressure = 0.29

Pressure	h (m)	Forces (kN)		Active Selected K = 0.18
		Active	At-rest	
Ps (backfill)	1.56	34.92	56.52	34.92
Pw1 (from w1)	DL [1] LL [2]	2.34 2.34	0.00 4.23	0.00 4.23
Pw2 (from w2)	DL [3] LL [4]	0.00 0.00	0.00 0.00	0.00 0.00



GENERAL STABILITY:

DE-STABILISING EFFECTS: (Taking M^{TS} @ 'x')

Pressure	Load Type	La (m)	Load Case 1		Load Case 2		Load Case 3	
			P	M^T	P	M^T	P	M^T
Ps:	d	1.56	34.92	54.41	34.92	54.41	34.92	54.41
Pw1: [1]	d	2.34	0.00	0.00	0.00	0.00	0.00	0.00
Pw1: [2]	l	2.34	4.23	9.89	0.00	0.00	4.23	9.89
Pw2: [3]	d	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pw2: [4]	l	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pw5: [9]	d	0.45	0.00	0.00	0.00	0.00	0.00	0.00
Pw5: [10]	l	0.45	0.00	0.00	0.00	0.00	0.00	0.00
Totals			39.15	64.30	34.92	54.41	39.15	64.30

STABILISING EFFECTS: (Taking M^{TS} @ 'x')

Load	Load Type	La (m)	Load Case 1		Load Case 2		Load Case 3	
			W	M^T	W	M^T	W	M^T
Backfill	d	2.60	0.00	0.00	0.00	0.00	0.00	0.00
Slope adjustm't.	d	2.6	0.00	0.00	0.00	0.00	0.00	0.00
Self weight base	d	1.30	26.97	35.06	26.97	35.06	26.97	35.06
Self weight stem	d	1.60	194.80	311.68	194.80	311.68	194.80	311.68
Self weight rib	d	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[1] W1: UDL load	d	2.60	0.00	0.00	0.00	0.00	0.00	0.00
[2] UDL load	l	2.60	0.00	0.00	0.00	0.00	0.00	0.00
[3] W2: Line load	d	2.60	0.00	0.00	0.00	0.00	0.00	0.00
[4] Line load	l	2.60	0.00	0.00	0.00	0.00	0.00	0.00
[5] W3: Line load	d	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[6] Line load	l	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[7] W4: Line load	d	0.44	25.35	11.22	25.35	11.22	0.00	0.00
[8] Line load	l	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Totals:			247.12	357.97	247.12	357.97	221.77	346.75

OVERTURNING:

Factor of Safety = $\frac{\text{Stabilizing Moment}}{\text{De-Stabilizing Moment}}$

	Load Case 1	Load Case 2	Load Case 3
Factor of Safety =	5.57 > 2.00	6.58 > 2.00	5.39 > 2.00
RESULT	SATISFACTORY	SATISFACTORY	SATISFACTORY

SLIDING:

Factor of Safety = $\frac{\text{Stabilizing Load} \times \text{Coeff. of Friction} + (\text{Key Rib Resistance})}{\text{De-Stabilizing Load}}$

	Load Case 1	Load Case 2	Load Case 3
Factor of Safety =	2.84 > 2.00	3.18 > 2.00	2.55 > 2.00
RESULT	SATISFACTORY	SATISFACTORY	SATISFACTORY

Maximum Resistance provided by Key Rib = 0.00 kN
(KEY RIB NOT SPECIFIED)

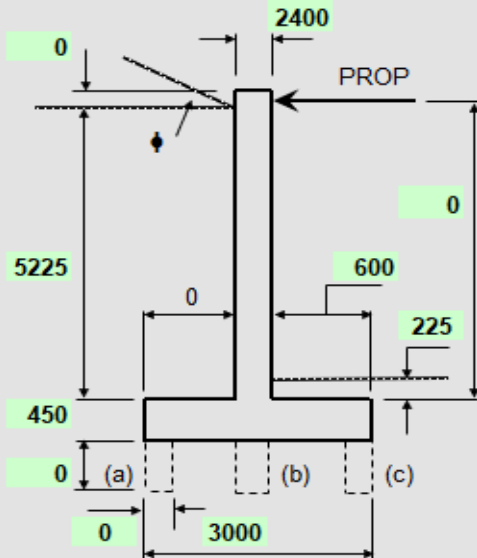
GROUND PRESSURE:

	Load Case 1	Load Case 2	Load Case 3
Resultant, (mm) from "x"	1188.3	1228.3	1273.6
Eccentricity, (mm) (+ve value toward 'x')	111.7	71.7	26.4
Pressure Spread, (mm)	2600	2600	2600
Pressure @ X (kN/m ²)	119.54	110.77	90.50
Pressure @ Y (kN/m ²)	70.55	79.33	80.10
Maximum Ground Pressure = 119.54 kN/m ² < 250 kN/m ² SATISFACTORY			

6 Retained Height - 5m**RETAINING WALL ANALYSIS**

This Analysis utilises the principles of Rankine's Theory as applicable to cohesionless soils.

Friction on back of wall is neglected. i.e. $\mu = 0$.

Wall Geometry:**Wall Data:**

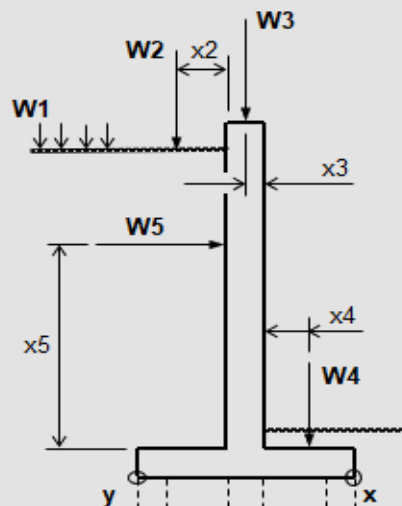
Wall Density:	=	2350	kg/m ³
Base (& Rib) Density:	=	2350	kg/m ³
Rib Position: (no rib=x) (a,b,c,x)	=	x	

Soil Data:

Retained soil weight:	D	=	1800	kg/m ³
Angle of slope:	ϕ	=	7	°
Angle of internal friction:	θ	=	45	°
Allowable Ground Pressure		=	250	kN/m ²

Analysis Control Factors:

Factor of Safety for Overturning:	2.00
Factor of Safety for Sliding:	2.00
Coefficient of Friction:	0.45
Pressure Coeff. to be used, (Ka, Ko)	Ka

Applied Loading:**Loading Data:**

Type	Dead	Live	x (mm)
W1 (udl)	kN/m ² 0.0 [1]	5.0 [2]	n/a
W2 (Line)	kN/m 0.0 [3]	0.0 [4]	0
W3 (Line)	kN/m 0.0 [5]	0.0 [6]	0
W4 (Line)	kN/m 25.4 [7]	0.0 [8]	158
W5 (Point)	kN 0.0 [9]	0.0 [10]	0

Load Combinations:

Load:		Combination			p, c : Prop/Cant. y, n : Use Comb.
		1	2	3	
		c	c	c	
		y	y	y	
W1	DL [1]	0	0	0	
	LL [2]	1	0	1	
W2	DL [3]	0	0	0	
	LL [4]	0	0	0	
W3	DL [5]	0	0	0	
	LL [6]	0	0	0	
W4	DL [7]	1	1	0	
	LL [8]	0	0	0	
W5	DL [9]	0	0	0	
	LL [10]	0	0	0	

1 = Apply Load
0 = Omit Load

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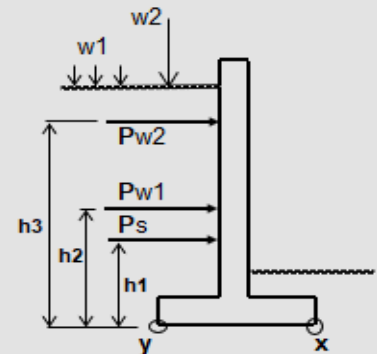
HORIZONTAL PRESSURES ON WALL (Relative to u/s Base)

Earth Pressure Coefficients: (dependant upon ϕ and θ)

Ka: Active Pressure = 0.18

Ko: At-rest Pressure = 0.29

Pressure	h (m)	Forces (kN)		Active Selected K = 0.18
		Active	At-rest	
Ps (backfill)	1.89	51.45	83.28	51.45
Pw1 (from w1)	DL [1]	2.84	0.00	0.00
	LL [2]	2.84	5.13	5.13
Pw2 (from w2)	DL [3]	0.00	0.00	0.00
	LL [4]	0.00	0.00	0.00



GENERAL STABILITY:

DE-STABILISING EFFECTS: (Taking M^{TS} @ 'x')

Pressure	Load Type	La (m)	Load Case 1		Load Case 2		Load Case 3	
			P	M^T	P	M^T	P	M^T
Ps:	d	1.89	51.45	97.33	51.45	97.33	51.45	97.33
Pw1: [1]	d	2.84	0.00	0.00	0.00	0.00	0.00	0.00
Pw1: [2]	l	2.84	5.13	14.57	0.00	0.00	5.13	14.57
Pw2: [3]	d	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pw2: [4]	l	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pw5: [9]	d	0.45	0.00	0.00	0.00	0.00	0.00	0.00
Pw5: [10]	l	0.45	0.00	0.00	0.00	0.00	0.00	0.00
Totals			56.59	111.90	51.45	97.33	56.59	111.90

STABILISING EFFECTS: (Taking M^{TS} @ 'x')

Load	Load Type	La (m)	Load Case 1		Load Case 2		Load Case 3	
			W	M^T	W	M^T	W	M^T
Backfill	d	3.00	0.00	0.00	0.00	0.00	0.00	0.00
Slope adjustm't.	d	3	0.00	0.00	0.00	0.00	0.00	0.00
Self weight base	d	1.50	31.12	46.68	31.12	46.68	31.12	46.68
Self weight stem	d	1.80	289.09	520.36	289.09	520.36	289.09	520.36
Self weight rib	d	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[1] W1: UDL load	d	3.00	0.00	0.00	0.00	0.00	0.00	0.00
[2] UDL load	l	3.00	0.00	0.00	0.00	0.00	0.00	0.00
[3] W2: Line load	d	3.00	0.00	0.00	0.00	0.00	0.00	0.00
[4] Line load	l	3.00	0.00	0.00	0.00	0.00	0.00	0.00
[5] W3: Line load	d	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[6] Line load	l	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[7] W4: Line load	d	0.44	25.35	11.22	25.35	11.22	0.00	0.00
[8] Line load	l	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Totals:			345.56	578.26	345.56	578.26	320.21	567.05

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OVERTURNING:

$$\text{Factor of Safety} = \frac{\text{Stabilizing Moment}}{\text{De-Stabilizing Moment}}$$

	Load Case 1	Load Case 2	Load Case 3
Factor of Safety =	5.17 > 2.00	5.94 > 2.00	5.07 > 2.00
RESULT	SATISFACTORY	SATISFACTORY	SATISFACTORY

SLIDING:

$$\text{Factor of Safety} = \frac{\text{Stabilizing Load} \times \text{Coeff. of Friction} + (\text{Key Rib Resistance})}{\text{De-Stabilizing Load}}$$

	Load Case 1	Load Case 2	Load Case 3
Factor of Safety =	2.75 > 2.00	3.02 > 2.00	2.55 > 2.00
RESULT	SATISFACTORY	SATISFACTORY	SATISFACTORY

Maximum Resistance provided by Key Rib = 0.00 kN
(KEY RIB NOT SPECIFIED)

GROUND PRESSURE:

	Load Case 1	Load Case 2	Load Case 3
Resultant, (mm) from "x"	1349.6	1391.7	1421.4
Eccentricity, (mm) (+ve value toward 'x')	150.4	108.3	78.6
Pressure Spread, (mm)	3000	3000	3000
Pressure @ X (kN/m ²)	149.84	140.13	123.52
Pressure @ Y (kN/m ²)	80.53	90.25	89.96
Maximum Ground Pressure = 149.84 kN/m ² < 250 kN/m ² SATISFACTORY			