

Project					
Trefechan Mass Retaining Wall Design - 1 in 2 Slope					
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Structural Design for the design of various size mass masonry Retaining Walls

1 Introduction

Calculations by Wing Wong MEng(Hons) CEng MStructE

These calculations have been prepared for the structural design of the retaining walls at the site at Trefechan

The design of mass masonry retaining walls are for various heights up to a maximum retained height of 1.50m. The design is for typical garden type retaining walls.

The retaining walls below are designed for a max 1 in 2 slope behind the wall.

Allowable Ground Bearing Pressure = 50 kPa

2 Max Retained Height 0.45m - 1 in 2 Slope

STEPPED MASONRY RETAINING WALL STEM & FOUNDATION:

Masonry:		fkx:	0.25	N/mm ²
		fk:	4.00	N/mm ²
Material Factor, γ_m :			3.5	
Facing Weight:			2000	kg/m ³
Backing Weight:			1800	kg/m ³
Backfill:		Slope Angle, β :	27	deg
		Angle of Friction, ϕ :	35	deg
		Weight:	1800	kg/m ³
Design Criteria:		Length to be considered, L:	1.00	m
		Active or At-Rest Pressure:	Ka	Ka or Ko
		Ground Pressure Limit:	50	kN/m ²
		Coefficient of Friction:	0.7	
Load Factors:		Self Weight:	0.9	
		External Loads:	1.60	
		Surcharge:	1.60	
		Earth Pressure:	1.40	

Applied Loads:

Moment, kNm: 0.00

Vertical Load, kN: 0.00

Surcharge, kN/m²: 5.00

Horiz. Load, kN: 0.00

WALL STEM DESIGN: Moment of Resistance is calculated in accordance with BS 5628:1 (32.5.3), taking account of Flexural Strength.

	w1	w2	w3	w4	w5	w6	w7
Widths, mm:	112.5	112.5	225	0	0	0	0

Moment Check (Ultimate)		
MR kNm	Applied Moment kNm	Check
0.65	0.07	OK
2.66	0.07	OK
2.66	0.07	OK
2.66	0.07	OK
2.66	0.07	OK
2.66	0.07	OK
2.94	0.98	OK
7.74	2.49	OK

BASE DESIGN:				
Factors of Safety:		Overturning =	5.15	> 2
(Based on Unfactored Loads)		Sliding =	2.86	> 1.5
Ground Pressure:		Resultant is Inside Middle Third		OK
		Px =	29.424 kN/m ²	< 50 N/mm ²
		Py =	10.955 kN/m ²	< 50 N/mm ²

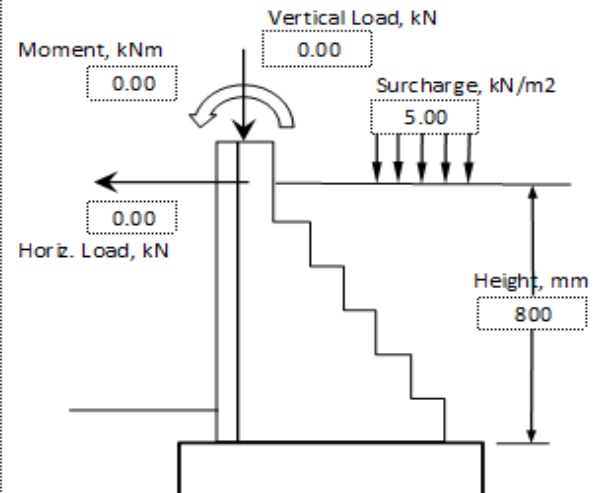
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3 Max Retained Height 0.60m - 1 in 2 Slope

STEPPED MASONRY RETAINING WALL STEM & FOUNDATION:

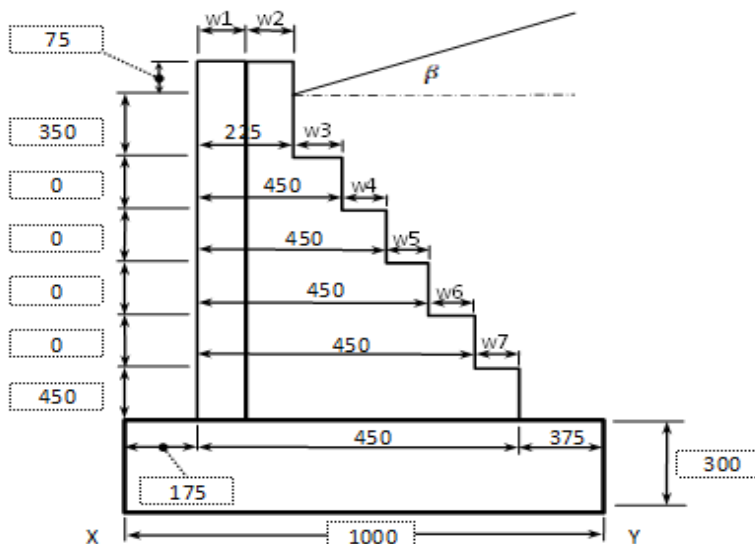
Masonry:	fkx:	0.25	N/mm ²
	fk:	4.00	N/mm ²
	Material Factor, γ_m :	3.5	
	Facing Weight:	2000	kg/m ³
	Backing Weight:	1800	kg/m ³
Backfill:	Slope Angle, β :	26	deg
	Angle of Friction, ϕ :	35	deg
	Weight:	1800	kg/m ³
Design Criteria:	Length to be considered, L:	1.00	m
	Active or At-Rest Pressure:	Ka	Ka or Ko
	Ground Pressure Limit:	50	kN/m ²
	Coefficient of Friction:	0.45	
Load Factors:	Self Weight:	0.9	
	External Loads:	1.60	
	Surcharge:	1.60	
	Earth Pressure:	1.40	

Applied Loads:



WALL STEM DESIGN: Moment of Resistance is calculated in accordance with BS 5628:1 (32.5.3), taking account of Flexural Strength.

	w1	w2	w3	w4	w5	w6	w7
Widths, mm:	112.5	112.5	225	0	0	0	0



Moment Check (Ultimate)		
MR kNm	Applied Moment kNm	Check
0.67	0.23	OK
2.75	0.23	OK
2.75	0.23	OK
2.75	0.23	OK
2.75	0.23	OK
3.04	1.59	OK
10.86	3.51	OK

BASE DESIGN:

Factors of Safety:
(Based on Unfactored Loads)

Overturning =	5.10	> 2	OK
Sliding =	1.87	> 1.5	OK

Ground Pressure:

Resultant is Inside Middle Third	OK	
Px = 33.607 kN/m ²	< 50 N/mm ²	OK
Py = 12.296 kN/m ²	< 50 N/mm ²	OK

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4 Max Retained Height 0.90m - 1 in 2 Slope

STEPPED MASONRY RETAINING WALL STEM & FOUNDATION:

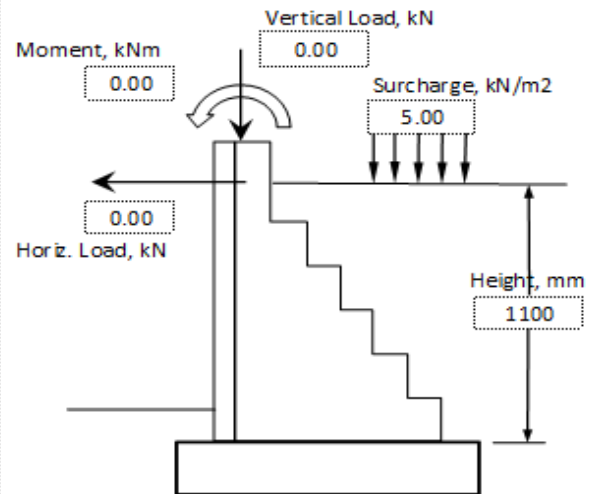
Masonry:	fkx:	0.25	N/mm ²
	fk:	4.00	N/mm ²
	Material Factor, γ_m :	3.5	
	Facing Weight:	2000	kg/m ³
	Backing Weight:	1800	kg/m ³

Backfill:	Slope Angle, β :	27	deg
	Angle of Friction, ϕ :	35	deg
	Weight:	1800	kg/m ³

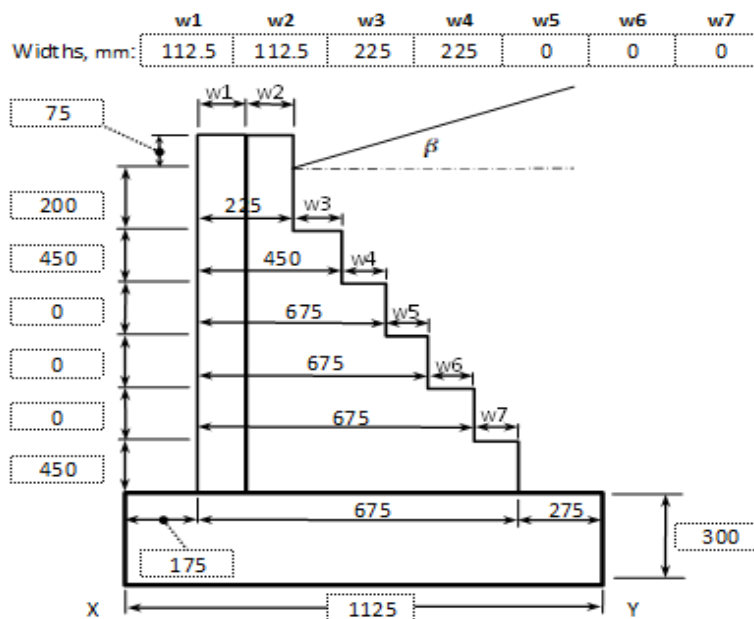
Design Criteria:			
Length to be considered, L:	1.00	m	
Active or At-Rest Pressure:	Ka	Ka or Ko	
Ground Pressure Limit:	50	kN/m ²	
Coefficient of Friction:	0.45		

Load Factors:	Self Weight:	0.9	
	External Loads:	1.60	
	Surcharge:	1.60	
	Earth Pressure:	1.40	

Applied Loads:



WALL STEM DESIGN: Moment of Resistance is calculated in accordance with BS 5628:1 (32.5.3), taking account of Flexural Strength.



Moment Check (Ultimate)		
MR kNm	Applied Moment kNm	Check
0.65	0.07	OK
2.94	0.98	OK
6.72	0.98	OK
6.72	0.98	OK
6.72	0.98	OK
7.35	3.60	OK
16.93	6.69	OK

BASE DESIGN:

Factors of Safety: (Based on Unfactored Loads)	Overturning =	4.14	> 2	OK
	Sliding =	1.68	> 1.5	OK
Ground Pressure:				
Resultant is Inside Middle Third				
	Px =	45.044 kN/m ²	< 50 N/mm ²	OK
	Py =	11.306 kN/m ²	< 50 N/mm ²	OK

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5 Max Retained Height 1.20m - 1 in 2 Slope

STEPPED MASONRY RETAINING WALL STEM & FOUNDATION:

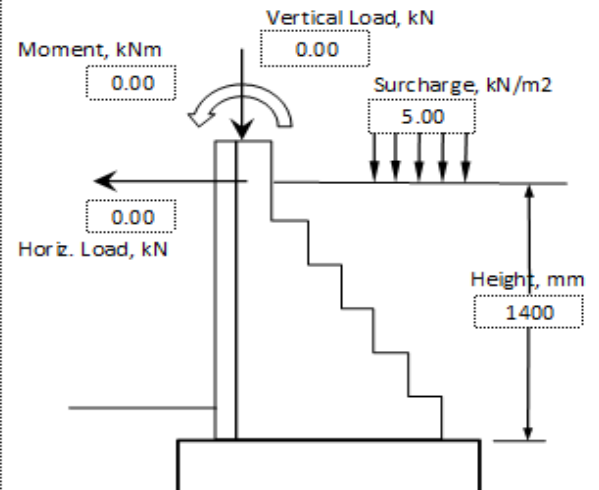
Masonry:	fkx:	0.25	N/mm ²
	fk:	4.00	N/mm ²
	Material Factor, γ_m :	3.5	
	Facing Weight:	2000	kg/m ³
	Backing Weight:	1800	kg/m ³

Backfill:	Slope Angle, β :	27	deg
	Angle of Friction, ϕ :	35	deg
	Weight:	1800	kg/m ³

Design Criteria:	Length to be considered, L:	1.00	m
	Active or At-Rest Pressure:	Ka	Ka or Ko
	Ground Pressure Limit:	50	kN/m ²
	Coefficient of Friction:	0.45	

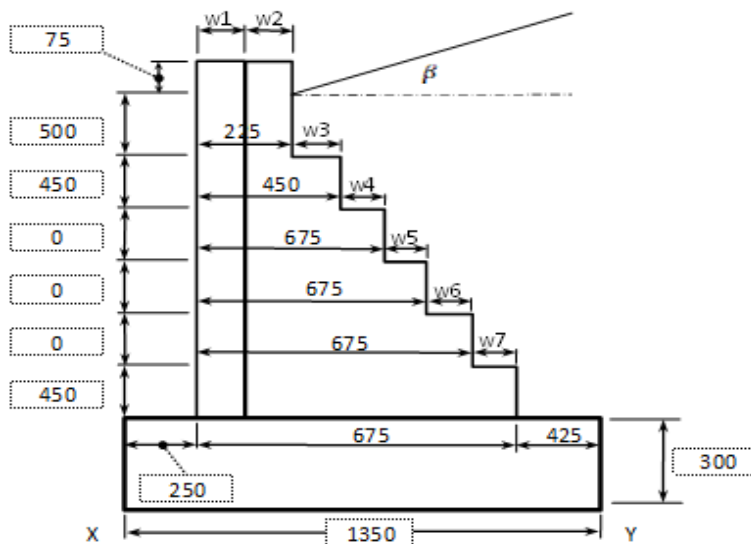
Load Factors:	Self Weight:	0.9
	External Loads:	1.60
	Surcharge:	1.60
	Earth Pressure:	1.40

Applied Loads:



WALL STEM DESIGN: Moment of Resistance is calculated in accordance with BS 5628:1 (32.5.3), taking account of Flexural Strength.

	w1	w2	w3	w4	w5	w6	w7
Widths, mm:	112.5	112.5	225	225	0	0	0



Moment Check (Ultimate)		
MR kNm	Applied Moment kNm	Check
0.69	0.53	OK
3.13	2.49	OK
7.14	2.49	OK
7.14	2.49	OK
7.14	2.49	OK
7.77	6.69	OK
28.92	11.13	OK

BASE DESIGN:

Factors of Safety: (Based on Unfactored Loads)	Overturning =	4.23	> 2	OK
	Sliding =	1.64	> 1.5	OK
Ground Pressure:	Resultant is Inside Middle Third			OK
	Px =	48.196 kN/m ²	< 50 N/mm ²	OK
	Py =	16.303 kN/m ²	< 50 N/mm ²	OK

6 Max Retained Height 1.50m - 1 in 2 Slope

STEPPED MASONRY RETAINING WALL STEM & FOUNDATION:

Masonry:

fkx:	0.25	N/mm ²
fk:	4.00	N/mm ²
Material Factor, γ _m :	3.5	
Facing Weight:	2000	kg/m ³
Backing Weight:	1800	kg/m ³

Backfill:

Slope Angle, β:	26	deg
Angle of Friction, φ:	35	deg
Weight:	1800	kg/m ³

Design Criteria:

Length to be considered, L:	1.00	m
Active or At-Rest Pressure:	K _a	K _a or K _o
Ground Pressure Limit:	50	kN/m ²
Coefficient of Friction:	0.45	

Load Factors:

Self Weight:	0.9
External Loads:	1.60
Surcharge:	1.60
Earth Pressure:	1.40

Applied Loads:

WALL STEM DESIGN: Moment of Resistance is calculated in accordance with BS 5628:1 (32.5.3), taking account of Flexural Strength.

Widths, mm:

w1	w2	w3	w4	w5	w6	w7
112.5	112.5	225	225	225	0	0

Moment Check (Ultimate)

MR kNm	Applied Moment kNm	Check
0.67	0.23	OK
3.04	1.59	OK
7.55	4.87	OK
13.58	4.87	OK
13.58	4.87	OK
14.69	10.84	OK
54.89	16.70	OK

BASE DESIGN:			
Factors of Safety: (Based on Unfactored Loads)	Overturning =	5.33	> 2 OK
	Sliding =	1.88	> 1.5 OK
Ground Pressure:	Resultant is Inside Middle Third		
	P _x =	49.358 kN/m ²	< 50 N/mm ² OK
	P _y =	26.744 kN/m ²	< 50 N/mm ² OK