

Project Bryniau Road Mass Retaining Wall Design - 1 in 2 Slope					
Date Nov-19	Calc by WW	Checked PG	Job no. 1982	Sheet no. 1	

Structural Design for 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 by Bryniau Road

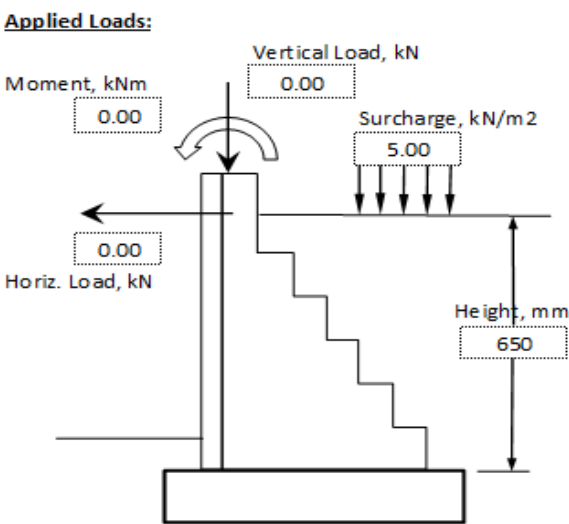
The design of mass masonry retaining walls are for various heights up to a maximum retained height of 1.50m. The design is for typical garden type retaining walls.

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

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:	1800	kg/m ³
	Backing Weight:	1800	kg/m ³
Backfill:	Slope Angle, β:	27	deg
	Angle of Friction, φ:	35	deg
	Weight:	2000	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:	100	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	



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

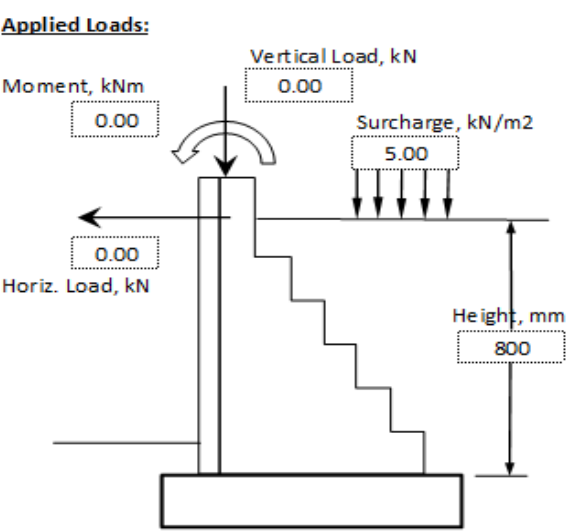
Moment Check (Ultimate)		
MR kNm	Applied Moment kNm	Check
0.64	0.07	OK
2.67	0.07	OK
2.67	0.07	OK
2.67	0.07	OK
2.67	0.07	OK
2.67	0.07	OK
2.94	1.03	OK
8.02	2.63	OK

BASE DESIGN:	Factors of Safety:	Overturning = 5.04	> 2	OK
	(Based on Unfactored Loads)	Sliding = 1.76	> 1.5	OK
	Ground Pressure:	Resultant is Inside Middle Third		
		P _x = 29.711 kN/m ²	< 100 N/mm ²	OK
		P _y = 11.582 kN/m ²	< 100 N/mm ²	OK

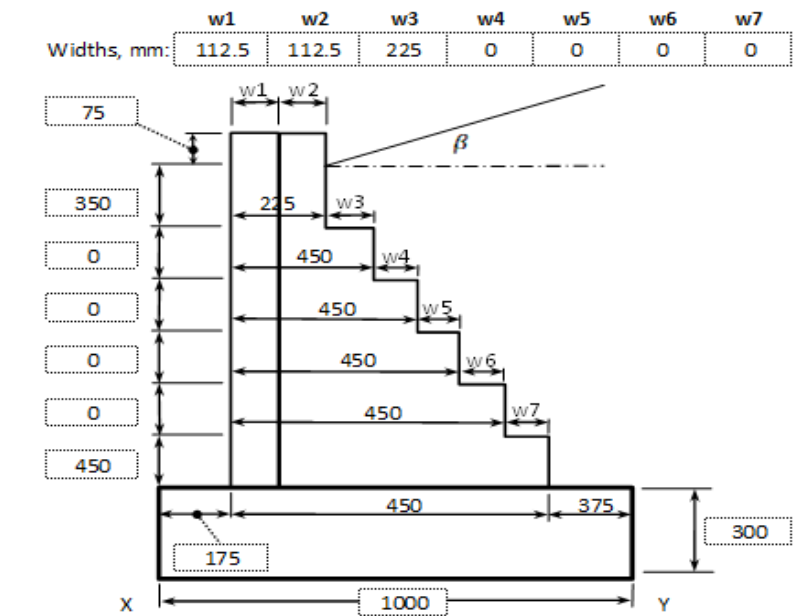
3 Max Retained Height 0.60m - 1 in 2 Slope

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:	1800	kg/m ³
	Backing Weight:	1800	kg/m ³
Backfill:	Slope Angle, β:	26	deg
	Angle of Friction, φ:	35	deg
	Weight:	2000	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:	100	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	



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
0.67	0.23	OK
2.76	0.23	OK
2.76	0.23	OK
2.76	0.23	OK
2.76	0.23	OK
3.03	1.67	OK
11.35	3.72	OK

BASE DESIGN:

Factors of Safety: (Based on Unfactored Loads)	Overturning =	5.02	> 2	OK
	Sliding =	1.80	> 1.5	OK
Ground Pressure:	Resultant is Inside Middle Third			OK
	P _x =	34.13 kN/m ²	< 100 N/mm ²	OK
	P _y =	13.245 kN/m ²	< 100 N/mm ²	OK

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, γm:			3.5	
Facing Weight:			1800	kg/m ³
Backing Weight:			1800	kg/m ³
Backfill:		Slope Angle, β:	27	deg
		Angle of Friction, φ:	35	deg
		Weight:	2000	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:	100	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:

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	225	0	0	0

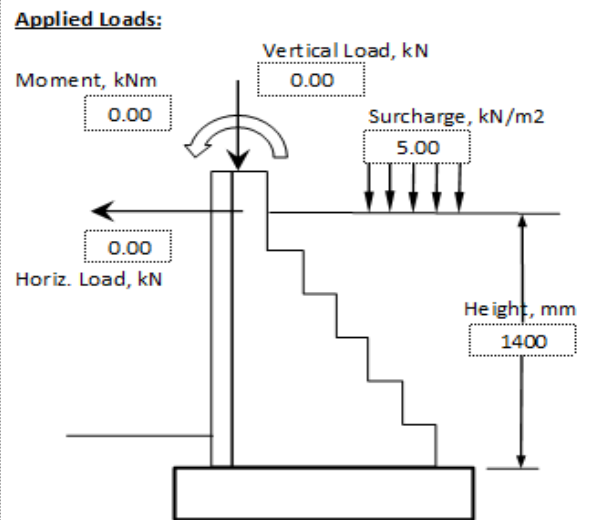
MR kNm	Applied Moment kNm	Check
0.64	0.07	OK
2.94	1.03	OK
6.76	1.03	OK
6.76	1.03	OK
6.76	1.03	OK
7.37	3.82	OK
17.73	7.13	OK

BASE DESIGN:				
Factors of Safety:		Overturning =	4.06	> 2
(Based on Unfactored Loads)		Sliding =	1.60	> 1.5
Ground Pressure:		Resultant is Inside Middle Third		OK
		Px =	45.847 kN/m ²	< 100 N/mm ²
		Py =	12.264 kN/m ²	< 100 N/mm ²

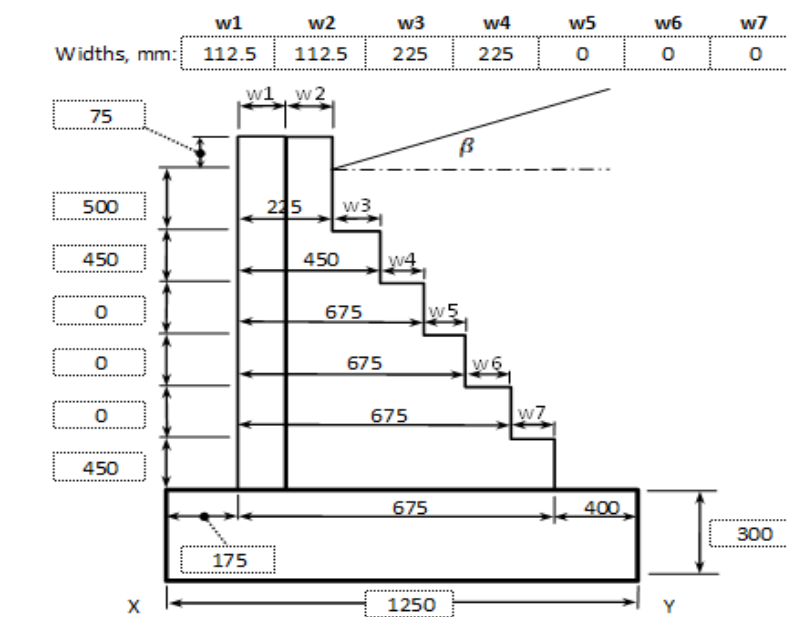
5 Max Retained Height 1.20m - 1 in 2 Slope

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:	1800	kg/m ³
	Backing Weight:	1800	kg/m ³
Backfill:	Slope Angle, β:	27	deg
	Angle of Friction, φ:	35	deg
	Weight:	2000	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:	100	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	



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
0.69	0.55	OK
3.13	2.63	OK
7.20	2.63	OK
7.20	2.63	OK
7.20	2.63	OK
7.81	7.13	OK
26.29	11.92	OK

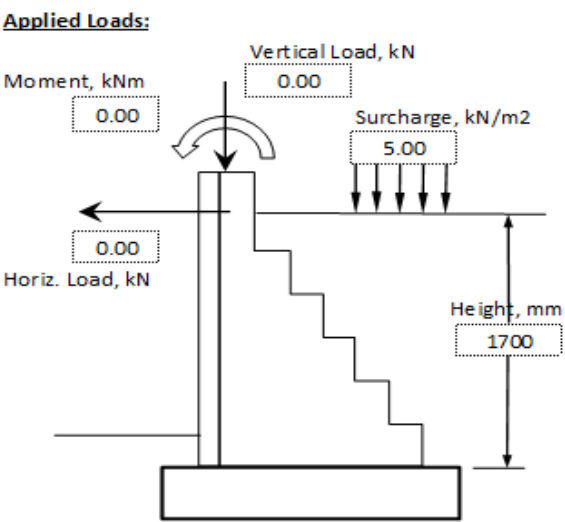
BASE DESIGN:

Factors of Safety: (Based on Unfactored Loads)	Overtuning =	3.58	> 2	OK
	Sliding =	1.52	> 1.5	OK
Ground Pressure:	Resultant is Inside Middle Third			OK
	P _x =	58.895 kN/m ²	< 100 N/mm ²	OK
	P _y =	10.982 kN/m ²	< 100 N/mm ²	OK

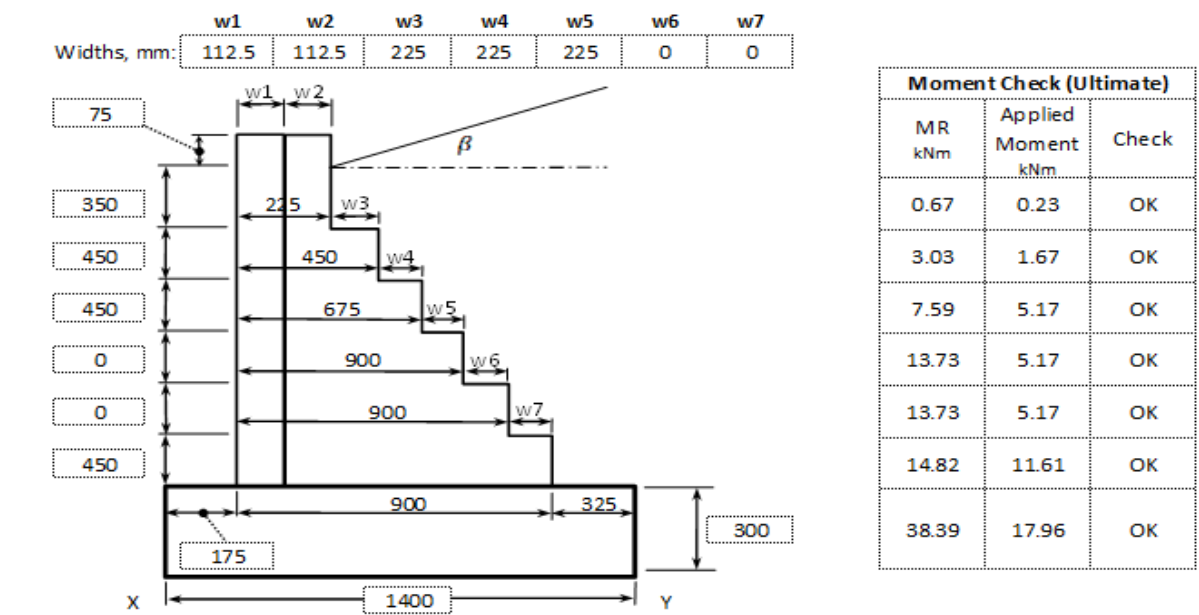
6 Max Retained Height 1.50m - 1 in 2 Slope

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:	1800	kg/m ³
	Backing Weight:	1800	kg/m ³
Backfill:	Slope Angle, β :	26	deg
	Angle of Friction, ϕ :	35	deg
	Weight:	2000	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:	100	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	



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



BASE DESIGN:

Factors of Safety: (Based on Unfactored Loads)	Overturning = 3.45	> 2	OK
	Sliding = 1.52	> 1.5	OK
Ground Pressure:	Resultant is Inside Middle Third OK		
	Px = 69.78 kN/m ²	< 100 N/mm ²	OK
	Py = 11.505 kN/m ²	< 100 N/mm ²	OK