



Structural report for:

Proposed gabion wall behind existing retaining wall

<i>Client name:</i>	Jose Galea
<i>Construction site address:</i>	25 Heol Corn Du Merthyr Tydfil CF48 1BW

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1 *Introduction*

1.1. Instructions

In accordance with instructions received from the client I have carried out a Structural Survey/Inspection in relation to the proposed gabion retaining wall which will be built close to the existing retaining wall at the back of the property at 25 Hoel Corn Du in Merthyr Tydfil. The existing retaining wall separates my client`s property which is at the higher level from the 15 Clos Cribyn property which is at the lower level. The inspection was carried out on 19/07/2023 & **08/11/2023**. All comments are based on visual inspection, siter measurements and architectural drawings.

2 *General Description of Property*

The property is situated at 25 Hoel Corn Du in Merthyr Tydfil. The above mentioned retaining wall and the proposed gabion retaining wall are at the northern border of the plot. See below the satellite view from Google Maps. I indicated with the red line the location of the proposed gabion retaining wall.





3 ***Existing and proposed state***

The existing terrain at the back of the 25 Hoel Corn Du is sloping towards the properties below. The slope is quite significant as indicated on the architectural drawings especially sections (2-2 to 5-5). At the border between 25 Hoel Corn Du and 15 Clos Cribyn is a retaining wall which is 1.4m high and the retaining height is 1.2m. During my site visit I was able to get to the 15 Clos Cribyn property to see the retaining wall. I spoke to the owner and she said that she doesn't have any documentation for the existing retaining wall. **The slope behind I used 16. The attached calculations of the existing retaining wall with and without the change of the level at the back gave the most probably shape of the existing retaining wall and the base.** At the back of the existing retaining wall are timber posts and timber fence. From the back of the retaining wall to my client's side of the fence is 900mm

I was contacted by my client that the excavation has been done at back of the existing retaining wall. I visited the site again on the 08/11/23 to check the shape of the existing retaining wall. It looks that it is mass masonry stepped retaining wall. I have updated the attached calculations to include the existing shape of the retaining wall. Then I also checked the existing retaining wall with the new retaining wall at the back with the increased height. After comparing both results I can say that the existing retaining wall will be fine if the new retaining wall will be 2m deep instead of 0.5m. That is due to the max moment on the existing retaining wall which will be at the -1700mm from the proposed top of the new retaining wall. As the proposed retaining wall will take all the loading from the higher ground at the back, it will at the same time reduce the loading on the existing retaining wall. There will be only the loading transferred from the active thrust "dh" due to soil and surcharge loading.



5 Conclusions

After the site visit and after receiving architectural drawings I would suggest to increase the depth of the gabions on the sections 4-4 and 5-5 to match sections 2-2 and 3-3 of the height of 2.0m. That will allow for the proposed base for the gabion retaining wall to be at the same level as the existing base of the existing retaining wall. In this case I am happy with the proposed retaining wall.

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END OF REPORT

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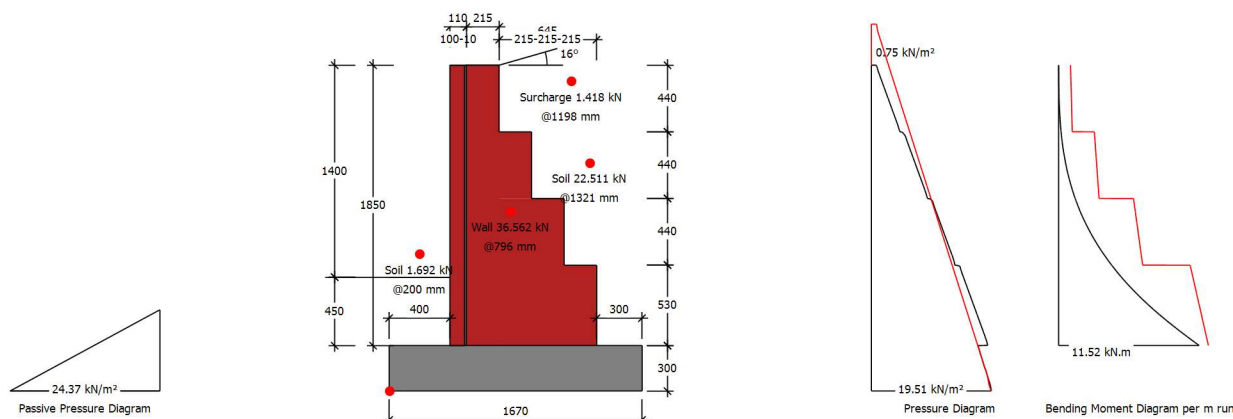
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MasterKey : Retaining Wall Design to BS 8002 : 1994, BS EN 1996-1-1:2005+A1:2012 and BS 8110 : 1997**Basic RC Retaining Wall****Gravity Masonry Cavity Filled Retaining Wall with Reinforced Concrete Base****Summary of Design Data**

EC6 National Annex

Notes

Material Densities (kN/m³)

Angles

Concrete grade

Concrete covers (mm)

Reinforcement design

Surcharge and Water Table

Unplanned excavation depth

† The Engineer must satisfy him/herself to the reinforcement detailing requirements of the relevant codes of practice

UK

All dimensions are in mm and all forces are per metre run

Soil 18.00, Concrete 24.00, Masonry 20.00

Embankment 16°

fcu 30 N/mm², Permissible tensile stress 0.250 N/mm²

Base cover 50 mm

fy 500 N/mm², fyb 500 N/mm² designed to BS 8110: 1997

Surcharge 1.50 kN/m², Fully drained

Front of wall 215 mm

Soil Properties

Bearing pressure

Back Soil Friction and Cohesion

Base Friction and Cohesion

Front Soil Friction and Cohesion

Premissable service pressure @ front 100.00 kN/m², @ back 100.00 kN/m²

 $\alpha = \text{Atn}(\text{Tan}(30)/1.2) = 25.69^\circ$ $\delta = \text{Atn}(0.75 \times \text{Tan}(\text{Atn}(\text{Tan}(30)/1.2))) = 19.84^\circ$ $\phi = \text{Atn}(\text{Tan}(30)/1.2) = 25.69^\circ$ **Loading Cases**G_{soil}- Soil Self Weight, G_{wall}- Wall & Base Self Weight, F_{vHeel}- Vertical Loads over Heel,P_a- Active Earth Pressure, P_{surcharge}- Earth pressure from surcharge, P_p- Passive Earth Pressure

Case 1: Geotechnical Design

1.00 G_{soil}+1.00 G_{wall}+1.00 F_{vHeel}+1.00 P_a+1.00 P_{surcharge}+1.00 P_p

Case 2: Structural Ultimate Design

1.40 G_{soil}+1.40 G_{wall}+1.60 F_{vHeel}+1.00 P_a+1.00 P_{surcharge}+1.00 P_p**Geotechnical Design****Wall Stability - Virtual Back Pressure**

Case 1 Overturning/Stabilising

20.541/59.879

0.343

OK

Wall Sliding - Virtual Back PressureF_x/(R_{xFriction}+ R_{xPassive})

24.592/(22.090+6.532)

0.859

OK

Soil Pressure

Virtual Back (No uplift)

Max(61.997/100, 11.317/100) kN/m²

0.620

OK

Wall Back (No uplift)

Max(53.862/100, 19.451/100) kN/m²

0.539

OK

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Structural Design**Outer Leaf Details**

Partial Safety Factor (γ_{mc}/γ_{mf})	Units Category II, Execution Control Class 2	3/2.7	Table NA.1
Material	Clay bricks with water absorption between 7% and 12%		
Units and Mortar Strength	20 N/mm ² , Mortar designation M12/(i)		
Compressive Strength (f_k)	Group 1, $\gamma=20$ kN/m ³	8.58 N/mm ²	Table NA.4

Inner Leaf Details

Partial Safety Factor (γ_{mc}/γ_{mf})	Units Category I, Execution Control Class 2	2.7/2.7	Table NA.1
Material	Concrete blocks, $\gamma=20$ kN/m ³		
Units and Mortar Strength	7.3 N/mm ² , Mortar designation M12/(i)		
Blocks Ratio	Unit height=215, Least horizontal dimensions=102.5	2.10	
Compressive Strength (f_k)	Group 1	5.48 N/mm ²	Table NA.4

Wall Design (Inner Face Tension)

Critical Section	Critical @ 0 mm from base, Case 2		
Section Properties @ Base	$t=970$ mm, Area=9700 cm ² , $Z_b=156817$ cm ³		
Flexural Strength f_{kk1}	$f_{kk1}=0.15$, $gd=0.025$ N/mm ² , $f_{kk1}=f_{kk1}+0.9$ gd/γ_{mf}	0.211 N/mm ²	Table NA.6
$M_r=f_{kk1}.Z_b/\gamma_{mf}$	$0.211 \times 156817/2.7$	12.28 kN.m	
Moment Capacity Check (M/M _r)	M 11.5 kN.m, M _r 12.3 kN.m	0.938	OK
Shear Capacity Check	F 17.0 kN, $f_{vk}0.210$ N/mm ² , F _{vr} 81.5 kN	0.21	OK

Base Top Steel Design

Steel Provided (Cover)	Main H10@200 (50 mm) Dist. H10@200 (60 mm)	393 mm ²	OK
Compression Steel Provided (Cover)	Main H10@200 (50 mm) Dist. H10@200 (60 mm)	393 mm ²	
Leverarm $z=fn(d,b,As,f_y,F_{cu})$	245 mm, 1000 mm, 393 mm ² , 500 N/mm ² , 30 N/mm ²	233 mm	
$M_r=fn(above,As',d',x,x/d)$	393 mm ² , 55 mm, 14 mm, 0.06	39.8 kN.m	
Moment Capacity Check (M/M _r)	M 1.0 kN.m, M _r 39.8 kN.m	0.025	OK
Shear Capacity Check	F 6.4 kN, vc 0.412 N/mm ² , F _{vr} 101.0 kN	0.06	OK

Base Bottom Steel Design

Steel Provided (Cover)	Main H10@200 (50 mm) Dist. H10@200 (60 mm)	393 mm ²	OK
Compression Steel Provided (Cover)	Main H10@200 (50 mm) Dist. H10@200 (60 mm)	393 mm ²	
Leverarm $z=fn(d,b,As,f_y,F_{cu})$	245 mm, 1000 mm, 393 mm ² , 500 N/mm ² , 30 N/mm ²	233 mm	
$M_r=fn(above,As',d',x,x/d)$	393 mm ² , 55 mm, 14 mm, 0.06	39.8 kN.m	
Moment Capacity Check (M/M _r)	M 5.3 kN.m, M _r 39.8 kN.m	0.134	OK
Shear Capacity Check	F 17.0 kN, vc 0.412 N/mm ² , F _{vr} 101.0 kN	0.17	OK

The diagram illustrates a retaining wall with the following dimensions and forces:

- Dimensions:**
 - Top width: 110, 215
 - Top offset: 100, 10
 - Top offset: 215, 215, 215
 - Top offset: 2°
 - Left height: 1660
 - Left offset: 2110
 - Right height: 700, 440, 440, 530, 300
 - Right offset: 450
 - Base width: 1670
 - Base offset: 400, 300
- Forces:**
 - Surcharge: 1.418 kN @ 1198 mm
 - Soil: 24.91 kN @ 1296 mm
 - Wall: 38.252 kN @ 786 mm
 - Soil: 1.505 kN @ 200 mm
- Pressure Diagrams:**
 - Passive Pressure Diagram:** Shows a triangular distribution with a maximum value of 23.19 kN/m² at the base.
 - Pressure Diagram:** Shows a linear distribution with a maximum value of 0.61 kN/m² at the top and a minimum value of 15.20 kN/m² at the base.
 - Bending Moment Diagram per m:** Shows a stepped distribution with a maximum value of 12.73 kN.m at the base.

EC6 National Annex	UK
Notes	All dimensions are in mm and all forces are per metre run
Material Densities (kN/m ³)	Soil 18.00, Concrete 24.00, Masonry 20.00
Angles	Embankment 2°
Concrete grade	fcu 30 N/mm ² , Permissible tensile stress 0.250 N/mm ²
Concrete covers (mm)	Base cover 50 mm
Reinforcement design	fy 500 N/mm ² , fyb 500 N/mm ² designed to BS 8110: 1997
Surcharge and Water Table	Surcharge 1.50 kN/m ² , Fully drained
Unplanned excavation depth	Front of wall 241 mm
† The Engineer must satisfy him/herself to the reinforcement detailing requirements of the relevant codes of practice	

Bearing pressure	Premissable service pressure @ front 100.00 kN/m ² , @ back 100.00 kN/m ²
Back Soil Friction and Cohesion	$\phi = \text{Atn}(\text{Tan}(30)/1.2) = 25.69^\circ$
Base Friction and Cohesion	$\delta = \text{Atn}(0.75 \times \text{Tan}(\text{Atn}(\text{Tan}(30)/1.2))) = 19.84^\circ$
Front Soil Friction and Cohesion	$\phi = \text{Atn}(\text{Tan}(30)/1.2) = 25.69^\circ$

G_{soil}- Soil Self Weight, G_{wall}- Wall & Base Self Weight, F_{vheel}- Vertical Loads over Heel,
P_a- Active Earth Pressure, P_{surcharge}- Earth pressure from surcharge, P_p- Passive Earth Pressure

Case 1: Geotechnical Design	1.00 G _{soil} +1.00 G _{wall} +1.00 F _{vheel} +1.00 P _a +1.00 P _{surcharge} +1.00 P _p
Case 2: Structural Ultimate Design	1.40 G _{soil} +1.40 G _{wall} +1.60 F _{vheel} +1.00 P _a +1.00 P _{surcharge} +1.00 P _p

Wall Stability - Virtual Back Pressure

Case 1 Overturning/Stabilising	16.295/63.348	0.257	OK
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$F_x/(R_{x\text{Friction}} + R_{x\text{Passive}})$	19.337/(23.498+5.913)	0.657	OK
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Virtual Back (No uplift)	Max(54.743/100, 23.243/100) kN/m ²	0.547	OK
Wall Back (No uplift)	Max(57.780/100, 20.207/100) kN/m ²	0.578	OK

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Inner Leaf Details

Partial Safety Factor (γ_{mc}/γ_{mf})	Units Category I, Execution Control Class 2	2.7/2.7	Table NA.1
Material	Concrete blocks, $\gamma=20$ kN/m ³		
Units and Mortar Strength	7.3 N/mm ² , Mortar designation M12/(i)		
Blocks Ratio	Unit height=215, Least horizontal dimensions=102.5	2.10	
Compressive Strength (f_k)	Group 1	5.48 N/mm ²	Table NA.4

Wall Design (Inner Face Tension)

Critical Section	Critical @ 0 mm from base, Case 2		
Section Properties @ Base	$t=970$ mm, Area=9700 cm ² , $Z_b=156817$ cm ³		
Flexural Strength f_{kk1}	$f_{kk1}=0.15$, $gd=0.027$ N/mm ² , $f_{kk1}=f_{kk1}+0.9$ gd/γ_{mf}	0.216 N/mm ²	Table NA.6
$M_r=f_{kk1}.Z_b/\gamma_{mf}$	$0.216 \times 156817/2.7$	12.53 kN.m	
Moment Capacity Check (M/M _r)	M 12.7 kN.m, M _r 12.5 kN.m	1.016	Warning
Shear Capacity Check	F 16.6 kN, $f_{vk}0.211$ N/mm ² , F _{vr} 81.8 kN	0.20	OK

Base Top Steel Design

Steel Provided (Cover)	Main H10@200 (50 mm) Dist. H10@200 (60 mm)	393 mm ²	OK
Compression Steel Provided (Cover)	Main H10@200 (50 mm) Dist. H10@200 (60 mm)	393 mm ²	
Leverarm $z=fn(d,b,As,f_y,F_{cu})$	245 mm, 1000 mm, 393 mm ² , 500 N/mm ² , 30 N/mm ²	233 mm	
$M_r=fn(above,As',d',x,x/d)$	393 mm ² , 55 mm, 14 mm, 0.06	39.8 kN.m	
Moment Capacity Check (M/M _r)	M 1.0 kN.m, M _r 39.8 kN.m	0.024	OK
Shear Capacity Check	F 6.2 kN, vc 0.412 N/mm ² , F _{vr} 101.0 kN	0.06	OK

Base Bottom Steel Design

Steel Provided (Cover)	Main H10@200 (50 mm) Dist. H10@200 (60 mm)	393 mm ²	OK
Compression Steel Provided (Cover)	Main H10@200 (50 mm) Dist. H10@200 (60 mm)	393 mm ²	
Leverarm $z=fn(d,b,As,f_y,F_{cu})$	245 mm, 1000 mm, 393 mm ² , 500 N/mm ² , 30 N/mm ²	233 mm	
$M_r=fn(above,As',d',x,x/d)$	393 mm ² , 55 mm, 14 mm, 0.06	39.8 kN.m	
Moment Capacity Check (M/M _r)	M 5.9 kN.m, M _r 39.8 kN.m	0.149	OK
Shear Capacity Check	F 19.0 kN, vc 0.412 N/mm ² , F _{vr} 101.0 kN	0.19	OK