

MasterSeries Free Trial Version

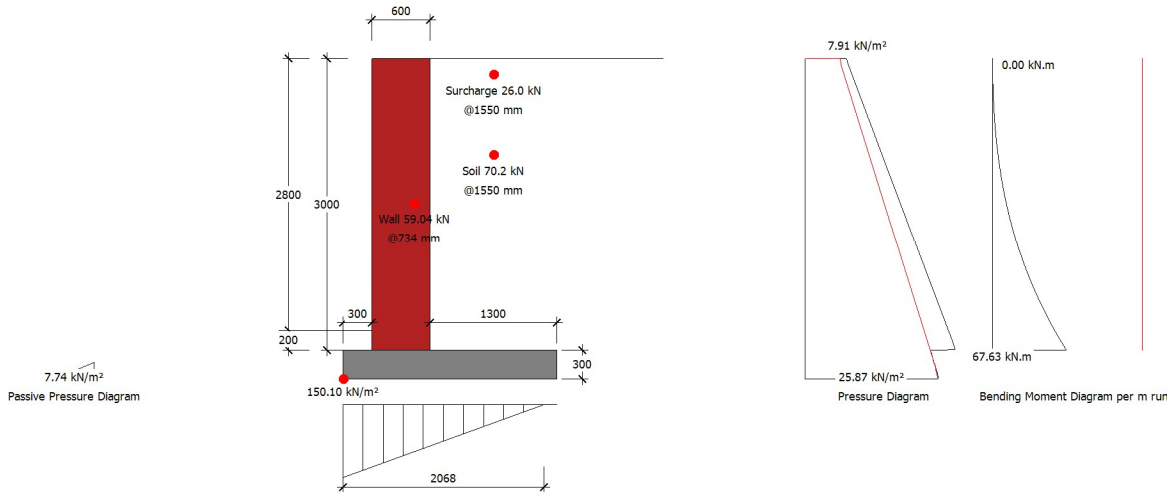
Trial Version

For evaluation purposes only
Not to be used commercially

Job Ref : Retaining Wall 3m high 10kN Su
Sheet : 1 /10002
Made by : R Evans
Date : 03 September 2016 / Ver. 2016.07
Checked : R Evans
Approved :

Tel: +44 (028) 9036 5950

MasterKey : Retaining Wall Design to BS 8002, BS 5628 : 2005 and BS 8110 : 1997
Basic RC Retaining Wall
Reinforced Masonry Retaining Wall with Reinforced Concrete Base



Summary of Design Data

Notes All dimensions are in mm and all forces are per metre run
Material Densities (kN/m³) Soil 18.00, Concrete 24.00, Masonry 24.00
Concrete grade fcu 30 N/mm², Permissible tensile stress 0.250 N/mm²
Concrete covers (mm) Wall inner cover 130 mm, Wall outer cover 30 mm, Base cover 50 mm
Reinforcement design fy 460 N/mm², fyb 460 N/mm² designed to BS 8110: 1997
Surcharge and Water Table Surcharge 20.00 kN/m², Fully drained
† The Engineer must satisfy him/herself to the reinforcement detailing requirements of the relevant codes of practice

Soil Properties

Soil bearing pressure Allowable pressure @ front 200.00 kN/m², @ back 100.00 kN/m²
Back Soil Friction and Cohesion $\delta = \text{Atn}(\text{Tan}(30)/1.2) = 25.69^\circ$
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 $\phi = \text{Atn}(\text{Tan}(30)/1.2) = 25.69^\circ$

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 71.187/192.454 0.370 OK

Wall Sliding - Virtual Back Pressure

Fx/(Rx_{Friction}+ Rx_{Passive}) 53.792/(56.017+0.662) 0.949 OK

Soil Pressure

Virtual Back (No uplift) Max(131.924/200, 9.204/100) kN/m² 0.660 OK
Wall Back 150.101/200 kN/m², Length under pressure 2.068 m 0.751 OK

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Structural Design**Masonry Wall Details**

Partial Safety Factor (γ_{mc}/γ_{mf})	Normal manufacturing, Normal construction	3.5/3	Table 4a/4b
Material	Concrete blocks, $\gamma=24$ kN/m ³		
Units and Mortar Strength	35 N/mm ² , Mortar designation M12/(i)		
Blocks Ratio	Unit height=600, Least horizontal dimensions=600	1.00	
Compressive Strength (fk)	Solid Concrete block wall	13.22 N/mm ²	Table 2

Wall Design (Inner Steel)

Critical Section	Critical @ 0 mm from base, Case 2		
Steel Provided (Cover)	B25@600 (130 mm)	818 mm ²	OK
Leverarm $z=\text{fn}(d,b,As,fy,fk)$	457 mm, 1000 mm, 818 mm ² , 460 N/mm ² , 13.2 N/mm ²	420 mm	
$Mr=\text{fn}(\text{above},\gamma_{mf},\gamma_{ms})$	3.00, 1.15	137.6 kN.m	
Moment Capacity Check (M/Mr)	M 67.6 kN.m, Mr 137.6 kN.m	0.492	OK
Shear Capacity Check	F 55.7 kN, fv 0.700 N/mm ² , Fvr 128.1 kN	0.43	OK

Base Top Steel Design

Steel Provided (Cover)	Main B12@200 (50 mm) Dist. B10@200 (62 mm)	565 mm ²	OK
Compression Steel Provided (Cover)	Main B10@200 (50 mm) Dist. B10@200 (60 mm)	393 mm ²	
Leverarm $z=\text{fn}(d,b,As,fy,Fcu)$	244 mm, 1000 mm, 565 mm ² , 460 N/mm ² , 30 N/mm ²	232 mm	
$Mr=\text{fn}(\text{above},As',d',x,x/d)$	393 mm ² , 55 mm, 20 mm, 0.08	57.3 kN.m	
Moment Capacity Check (M/Mr)	M 47.4 kN.m, Mr 57.3 kN.m	0.828	OK
Shear Capacity Check	F 56.2 kN, vc 0.467 N/mm ² , Fvr 113.9 kN	0.49	OK

Base Bottom Steel Design

Steel Provided (Cover)	Main B10@200 (50 mm) Dist. B10@200 (60 mm)	393 mm ²	OK
Compression Steel Provided (Cover)	Main B12@200 (50 mm) Dist. B10@200 (62 mm)	565 mm ²	
Leverarm $z=\text{fn}(d,b,As,fy,Fcu)$	245 mm, 1000 mm, 393 mm ² , 460 N/mm ² , 30 N/mm ²	233 mm	
$Mr=\text{fn}(\text{above},As',d',x,x/d)$	565 mm ² , 56 mm, 14 mm, 0.06	39.9 kN.m	
Moment Capacity Check (M/Mr)	M 6.8 kN.m, Mr 39.9 kN.m	0.169	OK
Shear Capacity Check	F 44.3 kN, vc 0.412 N/mm ² , Fvr 101.0 kN	0.44	OK