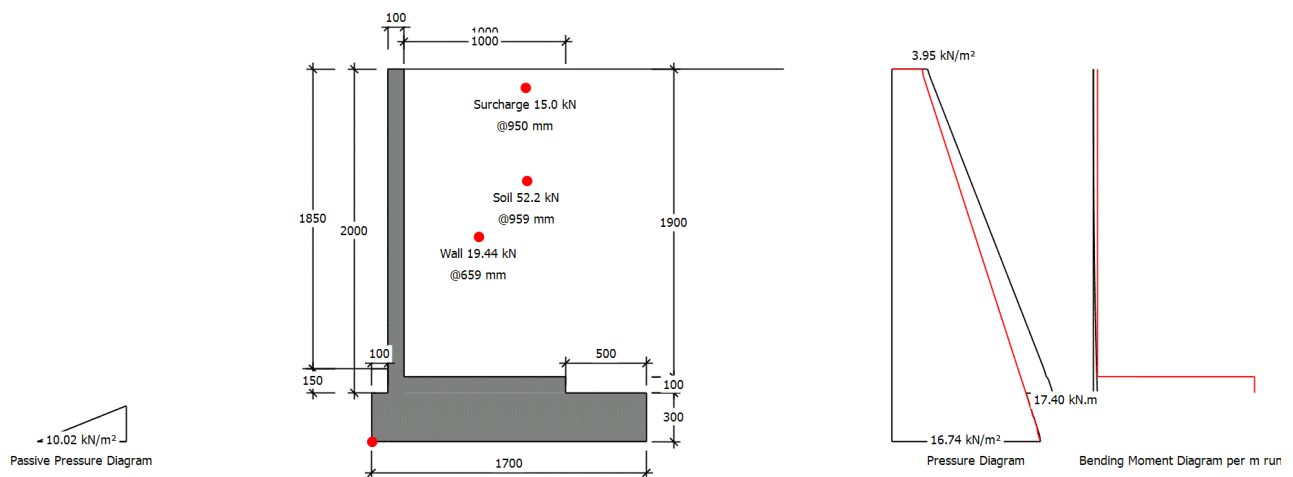


P:\30000 PROJECTS NORTH\30106 CYFARTHA RETAIL PARK\04 WIP\CALCS\30106 - 2M HIGH WALL.MRW

MASTERKEY : RETAINING WALL DESIGN TO BS 8002 : 1994 AND BS 8110 : 1997

Basic RC Retaining Wall Reinforced Concrete Retaining Wall with Reinforced 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
Concrete grade	fcu 30 N/mm², Permissible tensile stress 0.250 N/mm²
Concrete covers (mm)	Wall inner cover 30 mm, Wall outer cover 30 mm, Base cover 50 mm
Reinforcement design	fy 500 N/mm² designed to BS 8110: 1997
Surcharge and Water Table	Surcharge 10.00 kN/m², Fully drained
Unplanned excavation depth	Front of wall 230 mm
† The Engineer must satisfy him/herself to the reinforcement detailing requirements of the relevant codes of practice	

Soil Properties

Bearing pressure	Premissable service pressure @ front 150.00 kN/m², @ back 150.00 kN/m²
Back Soil Friction and Cohesion	$\phi = \text{Atn}(\tan(30)/1.2) = 25.69^\circ$
Base Friction and Cohesion	$\delta = \text{Atn}(0.75 \times \tan(\text{Atn}(\tan(26)/1.2))) = 16.95^\circ$
Front Soil Friction and Cohesion	$\phi = \text{Atn}(\tan(30)/1.2) = 25.69^\circ$

Loading Cases

G_{Soil} Soil Self Weight, G_{Wall} Wall & Base Self Weight, F_{VHeel} Vertical Loads over Heel,	
P_a Active Earth Pressure, $P_{\text{surcharge}}$ 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 $P_{\text{surcharge}}$ + 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 $P_{\text{surcharge}}$ + 1.00 P_p

Geotechnical Design

Wall Stability - Virtual Back Pressure

Case 1 Overturning/Stabilising	20.678/70.094	0.295	OK
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Wall Sliding - Virtual Back Pressure

$F_x / (R_{\text{Friction}} + R_{\text{XPassive}})$	23.152 / (23.362 + 1.107)	0.946	OK
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Soil Pressure

Virtual Back (No uplift)	Max(77.735/150, 12.429/150) kN/m²	0.518	OK
Wall Back (No uplift)	Max(85.986/150, 4.179/150) kN/m²	0.573	OK



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Date : 09/08/2024
Checked :
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Structural Design

Wall Design (Inner Steel)

Critical Section	Critical @ 101 mm from base, Case 2		
Steel Provided (Cover)	Main H16@125 (30 mm) Dist. H16@125 (46 mm)	1608 mm ²	OK
Compression Steel Provided (Cover)	Main H12@250 (30 mm) Dist. H16@150 (42 mm)	452 mm ²	
Leverarm $z = \text{fn}(d, b, A_s, f_y, F_{cu})$	62 mm, 1000 mm, 1608 mm ² , 500 N/mm ² , 30.0 N/mm ²	48 mm	
$M_r = \text{fn}(\text{above}, A_s, d', x, x/d)$	452 mm ² , 36 mm, 31 mm, 0.50	18.0 kN.m	
Moment Capacity Check (M/M_r)	M 15.3 kN.m, Mr 18.0 kN.m	0.848	OK
Shear Capacity Check	F 20.3 kN, vc 1.471 N/mm ² , Fvr 91.2 kN	0.22	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 $z = \text{fn}(d, b, A_s, f_y, F_{cu})$	245 mm, 1000 mm, 393 mm ² , 500 N/mm ² , 30 N/mm ²	233 mm	
$M_r = \text{fn}(\text{above}, A_s, d', x, x/d)$	393 mm ² , 55 mm, 14 mm, 0.06	39.8 kN.m	
Moment Capacity Check (M/M_r)	M 5.2 kN.m, Mr 39.8 kN.m	0.130	OK
Shear Capacity Check	F 18.9 kN, vc 0.412 N/mm ² , Fvr 101.0 kN	0.19	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 $z = \text{fn}(d, b, A_s, f_y, F_{cu})$	245 mm, 1000 mm, 393 mm ² , 500 N/mm ² , 30 N/mm ²	233 mm	
$M_r = \text{fn}(\text{above}, A_s, d', x, x/d)$	393 mm ² , 55 mm, 14 mm, 0.06	39.8 kN.m	
Moment Capacity Check (M/M_r)	M 0.4 kN.m, Mr 39.8 kN.m	0.011	OK
Shear Capacity Check	F 8.7 kN, vc 0.412 N/mm ² , Fvr 101.0 kN	0.09	OK

Burrows Graham Burrows Graham 5 Ambassador Place, Stockport Road Altrincham WA15 8DB Tel: 0161 804 8046	Job ref Sheet Made By Date Checked Approved : 30106 : : CA : 09/08/2024 : :