

Discharge of Condition 5 – Retaining Wall (Over 1 Metre in Height)

Planning Ref: P/23/0133

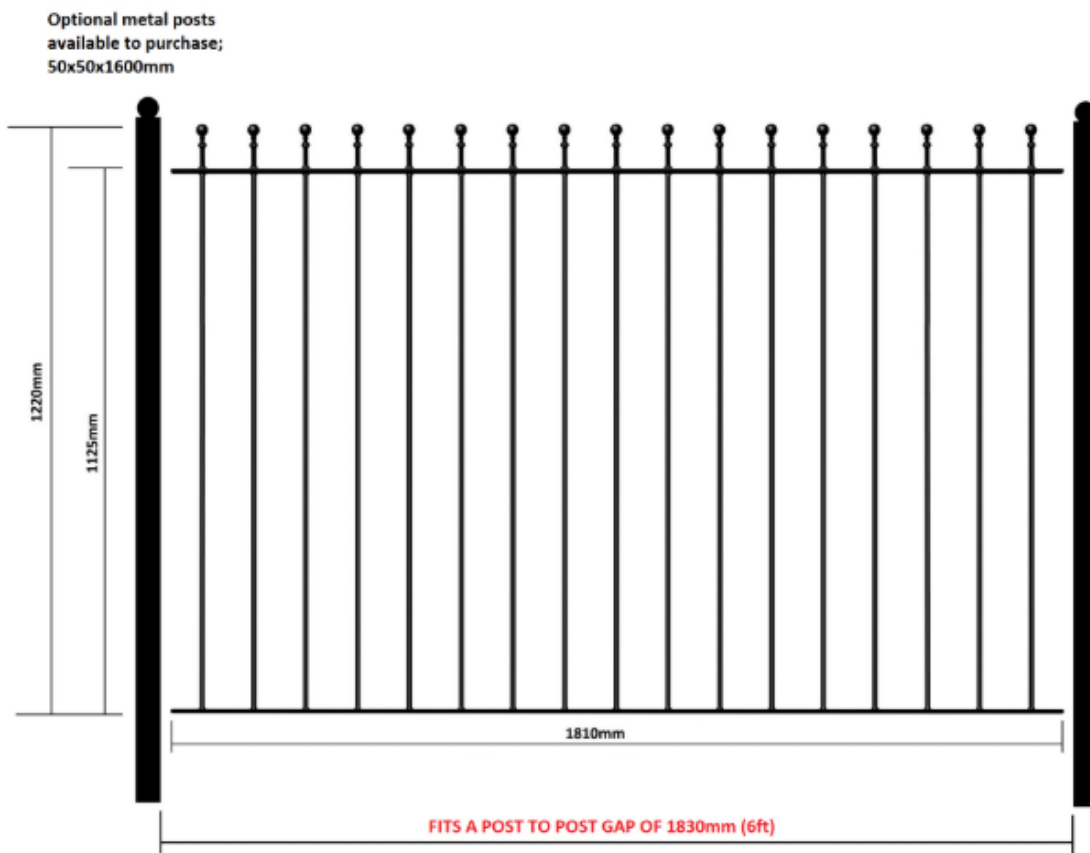
Site: Former Ynysgau Chapel, Wyndham Street, Troedyrhiw, Merthyr Tydfil, CF48 4JY

Condition 5 Wording

No development shall commence until details of the proposed retaining wall (which exceeds 1m in height) have been submitted to and approved in writing by the Local Planning Authority. These details shall include the wall's construction and its external appearance.

Proposed Retaining Wall Details

A retaining wall of approximately 1.0 to 1.4 metres in height maybe required along the rear boundary of the site, where level differences exist between the proposed dwellings and the rear adjoining land. There will be a 1100mm high guarding rail/fence installed on top of the retaining wall (see image below) to prevent falls.



The wall will be constructed using **concrete blockwork** and will be externally finished with a **smooth cement render**. No coping detail is proposed on top of the wall, and the render will be finished flush to the upper edge. The wall will provide essential support to the raised ground levels and form part of the structural boundary treatment.

Should the final design or construction method differ significantly from the details provided herein, we will notify the Local Planning Authority and submit revised drawings or calculations as required.

We trust this submission satisfies the requirements of Condition 5 at this stage and enables commencement of development following demolition.

Please find attached the structural engineers design and calculations appended to this document.

Structural Calculations

Design Stage October 2025

FOR

RETAINING WALL

AT

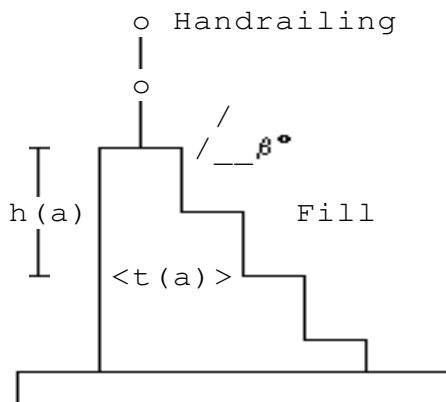
Ynysgau Chapel,
Wyndham Street,
Merthyr Tydfil

Mr. Sam Alkarnaz BEng. C.BuildE, MCABE

Masonry gravity wall

Designed in accordance with BS5628:Part 1: 1992.

Location: Wall on grid line A/1-2



Steps are numbered down from the top.

$h(a)$ is height at step a (from top)

$t(a)$ is thickness at step a

Soil details

Weight/unit volume of soil & wall $w_e = 18 \text{ kN/m}^3$

Internal angle of friction $\phi = 35^\circ$

Angle of backfill $\beta = 0^\circ$

Active soil pressure is applicable.

Sine angle of internal friction $sp = \sin(\text{RAD}(\phi)) = 0.5736$

Active pressure coefficient
 $ce = (1 - sp) / (1 + sp)$
 $= (1 - 0.5736) / (1 + 0.5736)$
 $= 0.271$

Masonry details

Mortar designation to Table 1 $\text{mortar} = 3$

Masonry type (1=clay 2=cal silicate 3=conc brick 4=block)
 $\text{typ}(1) = 4$

Concrete Blocks Dimensions

Height $hb = 215 \text{ mm}$

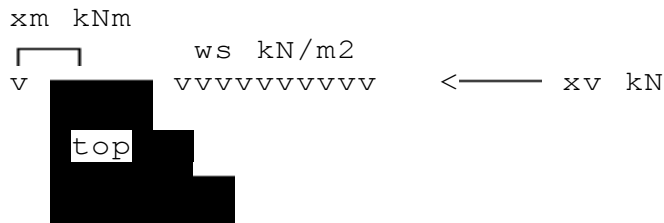
Least horiz dimension $lhd = 100 \text{ mm}$

ratio height/least horiz dim $rb = hb / lhd = 215 / 100 = 2.15$

Compressive strength of blocks $po = 7.3 \text{ N/mm}^2$

Characteristic flexural strength for bed failure and leaf greater than 250mm thick - Table 3 $fb(a)=TABLE\ 3.71\ for\ po=7.3,\ mortar=3$
 $=0.1586\ N/mm^2$
 Partial safety factor material $\gamma_{mam}=3.5$

External loading



Applied moment at top of wall $xm=0\ kNm$
 Applied shear at top of wall $xv=0\ kN$
 Weight/unit area of surcharge $ws=1.5\ kN/m^2$
 Load factor external loads at top $\gamma_{max}=1.6$
 Load factor surcharge $\gamma_{mas}=1.6$
 Load factor earth pressure $\gamma_{mae}=1.4$
 Load factor self weight $\gamma_{maf}=0.9$

Wall design

Number of steps proposed in wall $steps=3$

Step 1 Typical Analysis which is repeated for each step

Proposed height at step $h(1)=0.5\ m$
 Proposed thickness at step $t(1)=0.325\ m$
 Moment at height h earth $me=ce*we*h(a)^3/6=0.271*18*0.5^3/6$
 $=0.1016\ kNm$
 surcharge $ms=ce*ws*h(a)^2/2=0.271*1.5*0.5^2/2$
 $=0.05081\ kNm$
 Ultimate moment at height h $mu=me*\gamma_{mae}+ms*\gamma_{mas}+(xm+xv*h(a))$
 $*\gamma_{max}$
 $=0.1016*1.4+0.05081*1.6+(0+0*0.5)$
 $*1.6$
 $=0.2236$

Width of toe	$t_t=0.15 \text{ m}$
Width of heel	$t_h=0.15 \text{ m}$
Thickness of wall	$t=0.675 \text{ m}$
Height of wall	$h=1.5 \text{ m}$
Width of base	$t_b=t+t_t+t_h=0.675+0.15+0.15$ $=0.975$
Depth of base	$d_b=0.30 \text{ m}$
Overall depth	$o_d=h+d_b=1.5+0.3=1.8 \text{ m}$
Weight of fill and wall	$w_f=w_e*(t+t_h)*h=18*(0.675+0.15)*1.5$ $=22.27 \text{ kN}$
Eccentricity from A	$e_f=t_t+(t+t_h)/2=0.15+(0.675+0.15)/2$ $=0.5625 \text{ m}$

Weight of base $wb = tb * db * 24 = 0.975 * 0.3 * 24 = 7.02 \text{ kN}$
 Earth horizontal force $sfe = ce * we * od^2 / 2 = 0.271 * 18 * 1.8^2 / 2 = 7.902 \text{ kN}$
 Moment due to earth pressure $me = sfe * od / 3 = 7.902 * 1.8 / 3 = 4.741 \text{ kNm}$
 Surcharge horizontal force $sfs = ws * ce * od = 1.5 * 0.271 * 1.8 = 0.7317 \text{ kN}$
 Moment due to surcharge $ms = sfs * od / 2 = 0.7317 * 1.8 / 2 = 0.6585 \text{ kNm}$

Wall shear

Horizontal shear force $usf = (sfe * gammae) + (sfs * gammas) = (7.902 * 1.4) + (0.7317 * 1.6) = 12.23 \text{ kN}$
 Shear stress at bottom of wall $uss = usf / (t(\text{steps}) * 1000) = 12.23 / (0.675 * 1000) = 0.01812 \text{ N/mm}^2$

Weight at bottom of step 1 $uwt = t(a) * we * h(a) * gammaf = 0.325 * 18 * 0.5 * 0.9 = 2.633 \text{ kN}$
 Weight at bottom of step 2 $uwt = uwt + (t(a) * we * h(a) * gammaf) = 2.633 + (0.45 * 18 * 1 * 0.9) = 9.923 \text{ kN}$
 Weight at bottom of step 3 $uwt = uwt + (t(a) * we * h(a) * gammaf) = 9.923 + (0.675 * 18 * 1.5 * 0.9) = 26.33 \text{ kN}$
 Weight per. unit area $ga = uwt / (t(\text{steps}) * 1000) = 26.33 / (0.675 * 1000) = 0.039 \text{ N/mm}^2$
 Permissible shear stress $fv = 0.15 + 0.6 * ga = 0.15 + 0.6 * 0.039 = 0.1734 \text{ N/mm}^2$

Applied shear less than shear resistance ($0.01812 \leq 0.1734$)
 therefore section is satisfactory.

Overturning

Overturning moment about A $om = me + ms + (xm + xv * od)$
 $= 4.741 + 0.6585 + (0 + 0 * 1.8)$
 $= 5.4 \text{ kNm}$
 Restoring moment abt A fill/wall $rmf = wf * ef = 22.27 * 0.5625 = 12.53 \text{ kNm}$
 base $rmb = wb * tb / 2 = 7.02 * 0.975 / 2$
 $= 3.422 \text{ kNm}$
 surcharge $rms = ws * (t + th) * ef$
 $= 1.5 * (0.675 + 0.15) * 0.5625$
 $= 0.6961$
 total $rm = rmf + rmb + rms = 12.53 + 3.422 + 0.6961$
 $= 16.65$
 Factor of safety $fso = rm / om = 16.65 / 5.4 = 3.083$

Sliding (passive resistance ignored)

Sliding force $sf = sfe + sfs + xv = 7.902 + 0.7317 + 0$
 $= 8.634$
 Details of bearing stratas
 angle of friction $phib = 40^\circ$
 cohesion $cu = 0 \text{ kN/m}^2$
 Coefficient of friction $cf = \text{TAN}(\text{RAD}(phib * 2 / 3))$
 $= \text{TAN}(\text{RAD}(40 * 2 / 3))$
 $= 0.5022$
 Resisting force fill $rff = wf * cf = 22.27 * 0.5022 = 11.19 \text{ kN}$
 base $rfb = wb * cf + tb * cu / 2$
 $= 7.02 * 0.5022 + 0.975 * 0 / 2$
 $= 3.526 \text{ kN}$
 surcharge $rfs = ws * (t + th) * cf$
 $= 1.5 * (0.675 + 0.15) * 0.5022$
 $= 0.6215 \text{ kN}$
 total $rf = rff + rfb + rfs = 11.19 + 3.526 + 0.6215$
 $= 15.33 \text{ kN}$
 Factor of safety $fss = rf / sf = 15.33 / 8.634 = 1.776$

Bearing pressure

Weight of surcharge $sw=ws*(t+th)=1.5*(0.675+0.15)$
 $=1.238 \text{ kN}$

Moments about centre of base $m=om+(wf+sw)*(tb/2-ef)$
 $=5.4+(22.27+1.238)*(0.975/2-0.5625)$
 $=3.636 \text{ kNm}$

Section modulus of base $zb=tb^2/6=0.975^2/6=0.1584 \text{ m}^3$

Total weight $tw=wf+sw+wb=22.27+1.238+7.02$
 $=30.53 \text{ kN}$

Pressure due to weight $pw=tw/tb=30.53/0.975=31.32 \text{ kN/m}^2$

Pressure due to moment (+/-) $pm=m/zb=3.636/0.1584=22.95 \text{ kN/m}^2$

Maximum pressure $pmax=pw+pm=31.32+22.95=54.27 \text{ kN/m}^2$

Minimum pressure $pmin=pw-pm=31.32-22.95=8.364 \text{ kN/m}^2$

Summary of stability check

Factor of safety overturning 3.083

Factor of safety sliding 1.776

Maximum base pressure 54.27 kN/m²

DESIGN SUMMARY	Wall height	1.5 m	
	Wall design		
Step height (m)	Step thicknes (m)	Ultimate Moments (kNm)	
		Resistance	Applied
0.5	0.325	0.9639	0.2236
1	0.45	2.121	1.463
1.5	0.675	5.388	4.573

Summary of stability check

Factor of safety overturning 3.083

Factor of safety sliding 1.776

Maximum base pressure 54.27 kN/m²

THIS IS AN UPDATE AND NEEDS YOUR OWN L.NAM FILE.

Garage Retaining Wall

