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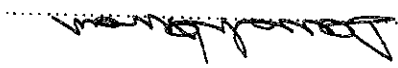
**STRUCTURAL CALCULATIONS & DETAILS
FOR
PATIO RETAINING WALL TO
PROPOSED RESIDENTIAL DEVELOPMENT
AT**

**NANT COTTAGE
COEDPOETH**

Client: Moorbridge Construction

**Cedar Bank
12 Rhyddyn Hill
Caerwre
Wrexham LL12 9EB**

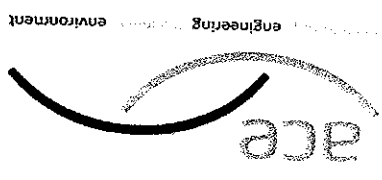
We hereby certify that the following calculations and details comply with the relevant British Standards,
Codes of Practice and Building Regulations.

Signed: 
Name: David Ashman

Qualifications: BSc(Hons), CEng, MICE, MInstuctE

Date: 12 March 2007
Job No. 13198A

Regional Offices: Hastings, Letchworth
Chairman & Managing Director: S Adams CEng, FInstuctE, MICE, MInstuctE
Directors: D P Ashman BSc, CEng, MICE, MInstuctE
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Company Secretary: Miss P Harte
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Checked by:

Made by:

DA

Brief

Design mass masonry / concrete retaining wall to patio area.

STANDARDS

BS 8002
 BS 5428
 BS 8110

RETAINING STRUCTURES
 MASONRY
 CONCRETE

SITE VISIT AND SURVEY

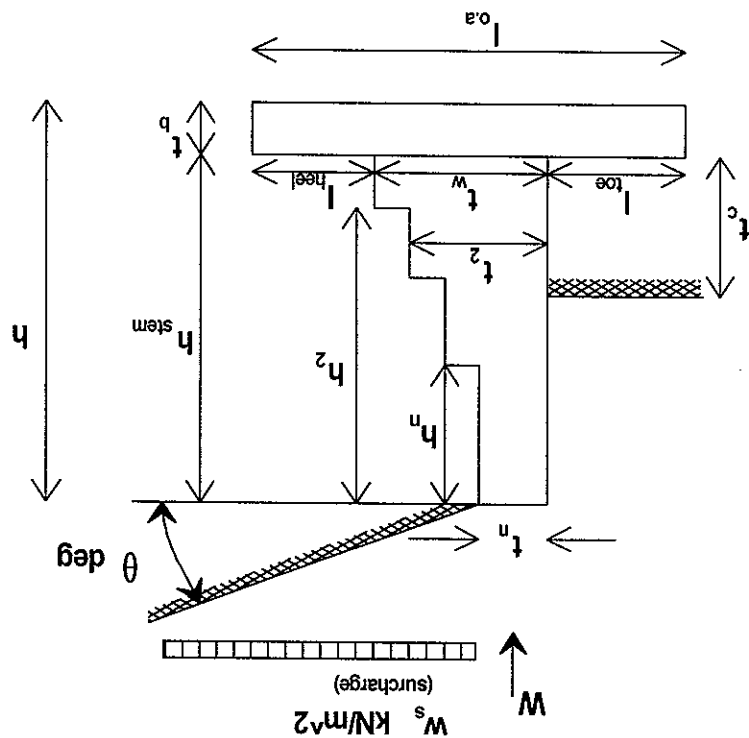
9.3.2007.

Refer SK100 for approximate site area section.

Build new wall 3.0m away from existing foundations wall to avoid surcharge from roadwork.

Ground conditions are Boulder clay and Sandy / gravel. Firm to stiff. Bearing capacity assumed as 100 kN/m².

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CANTILEVER MASONRY RETAINING WALL DESIGN (BS8110&BS5628) MASONRY CANTILEVER RETAINING WALL DESIGN TO CP2 & BS5628 (PART 1)

RETAINING WALL PRESSURES - GRANULAR FILL - NO WALL FRICTION - ASSUMED FULLY DRAINED

General Soil Data

Density of retained soil $\gamma_s = 18.0 \text{ kN/m}^3$
 Angle of internal friction $\phi = 40.0^\circ$
 Angle of soil surface $\theta = 25.0^\circ$
 Ground cover over base at front of wall
 - if $> 0\text{mm}$, assumed permanent
 $t_c = 250 \text{ mm}$

Loads on wall and ground

Surcharge load (horizontal plan area) $w_s = 10.0 \text{ kN/m}^2$
 Design vertical dead load on wall (unfactored) $W_d = 0.00 \text{ kN/m}$
 Design vertical live load on wall (unfactored) $W_l = 0.00 \text{ kN/m}$

Stem details

Density of wall stem brickwork $\gamma_w = 20.0 \text{ kN/m}^3$
 Wall base section thickness $t_w = 700.0 \text{ mm}$
 Height retained $h = 2000 \text{ mm}$

Base details

Density of wall base $\gamma_b = 23.6 \text{ kN/m}^3$
 Length of heel $l_{heel} = 250 \text{ mm}$
 Length of toe $l_{toe} = 250 \text{ mm}$

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Base thickness	$t_b = 300 \text{ mm}$
Length of base	$l_{o-a} = l_{toe} + l_w + l_{heel} = 1200 \text{ mm}$
Height of active soil (at back of stem and heel)	
Height of wall stem	$h_{stem} = h - l_b = 1700 \text{ mm}$
Load factors	
Dead Load Factor	$\gamma_{L,d} = 1.40$
Imposed Load Factor	$\gamma_{L,i} = 1.60$
Coefficients using Rankine	
Active coefficient (Sloping Surface) - no friction	
$K_{a-s} = (\cos(\theta) - \sqrt{(\cos(\theta))^2 - (\cos(\phi))^2}) / (\cos(\theta) + \sqrt{(\cos(\theta))^2 - (\cos(\phi))^2}) = 0.303$	
Active coefficient (level surface)	$K_a = (1 - \sin(\phi)) / (1 + \sin(\phi)) = 0.217$
Passive coefficient (level surface)	$K_p = (1 + \sin(\phi)) / (1 - \sin(\phi)) = 4.599$
At - rest coefficient	$K_o = (1 - \sin(\phi)) = 0.357$
For a one metre width - (Horizontal Components - Active Earth Pressures)	
At the virtual back of the wall (back of heel)	
Surcharge	
pressure	$p_s = K_{a-s} \times w_s = 3.0 \text{ kN/m}^2$
force - horizontal	$F_s = (p_s \times h_{soil}) \times (\cos(\theta))^2 = 5.3 \text{ kN/m}$
overturning moment about toe	$M_s = F_s \times h_{soil} / 2 = 5.6 \text{ kNm/m}$
Backfill	
pressure	$p_a = K_{a-s} \times \gamma_s \times h_{soil} = 11.6 \text{ kN/m}^2$
force - horizontal	$F_a = (p_a \times h_{soil} / 2) \times (\cos(\theta))^2 = 10.0 \text{ kN/m}$
overturning moment about the toe	$M_a = F_a \times h_{soil} / 3 = 7.1 \text{ kNm/m}$
Total horizontal force (unfactored)	$F_t = F_s + F_a = 15.3 \text{ kN/m}$
Total horizontal force (factored)	$F_{L,tot} = \gamma_{L,i} \times F_s + \gamma_{L,d} \times F_a = 22.5 \text{ kN/m}$
Total overturning moment (unfactored)	$M_t = M_s + M_a = 12.7 \text{ kNm/m}$
Total overturning moment (factored)	$M_{L,tot} = \gamma_{L,i} \times M_s + \gamma_{L,d} \times M_a = 18.9 \text{ kNm/m}$
Average load factor	$\gamma_{L,av} = M_{L,tot} / M_t = 1.49$
STABILITY CHECKS	
(Unfactored Loads - Active Soil Pressures)	
1) SLIDING	
Coefficient of friction	$\mu = \tan(\phi) \times \text{factor} = 0.839 \quad \text{factor} = 1.00$
Passive pressures in front of wall	

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Top of base $pp_1 = k_p \times t_c \times \gamma_s = 20.7 \text{ kN/m}^2$

Underside of base $pp_2 = k_p \times (t_c + t_b) \times \gamma_s = 45.5 \text{ kN/m}^2$

Total resistance

Base $PP_{base} = (pp_1 + pp_2) \times t_b / 2 = 9.9 \text{ kN/m}$

Passive resistance Soil in front of wall assumed to resist sliding

$P = PP_{base} \times \text{soil_resists} = 9.9 \text{ kN/m}$

Factor of safety against sliding

Factor of safety required $FOS_{reqd_sliding} = 2.00$

Length of heel provided

$l_{heel} = 250 \text{ mm}$

Conservatively, it is assumed that the surcharge load does not provide downward pressure on the heel in the sliding calculation.

$FOS_{sliding} = (((l_{heel} \times (\gamma_s \times (h_{stem} + l_{heel} \times \tan(\theta/2) + \gamma_b \times t_b)) + l_{loa} \times \gamma_b \times t_b + W_v + (t_w \times (\gamma_w \times h_{stem} + \gamma_b \times t_b))) \times \mu) + P) / F_t$

$FOS_{sliding} = 2.850$

Factor of safety against sliding = 2.8 i.e. > 2.0 - OK

2) OVERTURNING

Factor of safety against overturning

Factor of safety required $FOS_{reqd_turn} = 2.00$

Length of toe provided

$l_{loa} = 250 \text{ mm}$

Conservatively, it is assumed that the surcharge load does not provide downward pressure on the heel in the overturning calculation.

Taking Moments about front of the toe

$M_{r1} = (W_v + h_{stem} \times t_w \times \gamma_w) \times (l_{loa} + t_w / 2) = 14.3 \text{ kNm/m}$

$M_{r2} = l_{heel} \times h_{stem} \times \gamma_s \times (l_{loa} + t_w + l_{heel} / 2) = 8.2 \text{ kNm/m}$

$M_{r3} = (l_{loa} + t_w + l_{heel})^2 \times t_b \times \gamma_b / 2 = 5.1 \text{ kNm/m}$

$M_{r4} = l_{heel} \times l_{heel} \times \tan(\theta) / 2 \times \gamma_s \times (l_{loa} + t_w + l_{heel} \times 2/3) = 0.3 \text{ kNm/m}$

Resisting moment $M_r = M_{r1} + M_{r2} + M_{r3} + M_{r4} = 27.9 \text{ kNm/m}$

Factor of safety against overturning $FOS_{o_turn} = M_r / \text{abs}(M_i) = 2.20$

Factor of safety against overturning = 2.2 i.e. > 2.0 - OK

Overall length of base

$l_{o_a} = l_{loa} + t_w + l_{heel} = 1.200 \text{ m}$

3) BEARING PRESSURE (INCLUDING LIVE LOADS AND TOE COVER)

Total overturning moment for bearing calculation $M_i = 12.7 \text{ kNm/m}$

Total resisting moment for bearing calculation $M_r = 27.9 \text{ kNm/m}$

Total vertical load on base

$N = t_w \times h_{stem} \times \gamma_w + (h_{stem} + l_{heel} \times \tan(\theta/2) \times l_{heel} \times \gamma_s + t_c \times l_{loa} \times \gamma_s + l_{o_a} \times t_b \times \gamma_b + W_v + W_s \times l_{heel} + W_l$

$N = 43.8 \text{ kN/m}$

Eccentricity of vertical load

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$$e_1 = (M_t - \text{abs}(M_t) + t_c \times l_{oe}^2 \times \gamma_s / 2 + w_s \times l_{heel} \times (l_{oe} + t_w + l_{heel} / 2) + W_1 \times (l_{oe} + t_w / 2)) / N = 0.412 \text{ m}$$

$$e = l_{oe} / 2 - e_1 = 0.188 \text{ m}$$

Resultant lies inside middle third

$$p_{\max} = \text{if}(\text{abs}(e) < (l_{oe} / 6), \sigma_{\max 2}, \sigma_{\max 1}) = 70.9 \text{ kN/m}^2$$

$$p_{\text{bearing}} = 100 \text{ kN/m}^2$$

Maximum bearing pressure is 71 kN/m² i.e. < Allowable - OK

DESIGN BASE PRESSURES BASED UPON ACTIVE EARTH PRESSURES

For a one metre width - (Horizontal Components - Active Earth Pressures)

Resultant lies inside middle third

$$\sigma_{\max} = \text{if}(\text{abs}(e) < l_{oe} / 6, \sigma_{\max 2}, \sigma_{\max 1}) = 70.9 \text{ kN/m}^2$$

$$\sigma_{\min} = \text{if}(\text{abs}(e) < l_{oe} / 6, \sigma_{\min 2}, 0 \text{ kN/m}^2) = 2.1 \text{ kN/m}^2$$

$$l_p = \text{if}(\text{abs}(e) < (l_{oe} / 6), l_{b2}, l_{b1}) = 1.200 \text{ m}$$

Pressures under the heel/stem interface

$$l_{p_heel} = l_p - l_{oe} - t_w = 0.250 \text{ m}$$

$$\sigma_{heel} = \max(((\sigma_{\max} - \sigma_{\min}) \times l_{p_heel} / l_p) + \sigma_{\min}, 0 \text{ kN/m}^2) = 16.5 \text{ kN/m}^2$$

Pressures under the toe/stem interface

$$\sigma_{toe} = ((\sigma_{\max} - \sigma_{\min}) \times (l_{p_heel} + t_w) / l_p) + \sigma_{\min} = 56.6 \text{ kN/m}^2$$

BASE DESIGN - HEEL

Shears and Moments

$$W_{ult_heel} = (h_{stem} \times \gamma_s + \gamma_b \times t_b) \times \gamma_{fd} + w_s \times \gamma_{fd} = 68.8 \text{ kN/m}^2$$

$$W_{ult_heel} = (l_{heel} \times \tan(\theta) / 2 \times \gamma_s) \times \gamma_{fd} = 1.5 \text{ kN/m}^2$$

Ultimate Shear (at wall face)

$$V_{ult_pos_heel} = (W_{ult_heel} + W_{ult_heel}) \times l_{heel} = 17.6 \text{ kN/m}$$

upward

$$V_{ult_neg_heel} = (\sigma_{\min} \times \max(l_{p_heel}, 0 \text{ mm}) + (\sigma_{heel} - \sigma_{\min}) \times (\max(l_{p_heel}, 0 \text{ mm}))^2 / (2 \times l_{p_heel})) \times \gamma_{fav}$$

$$V_{ult_neg_heel} = 3.5 \text{ kN/m}$$

Nett Ultimate Shear

$$V_{ult_heel} = \text{abs}(V_{ult_pos_heel} - V_{ult_neg_heel}) = 14.1 \text{ kN/m}$$

Ultimate Moment (at centre of wall)

$$\text{clockwise } M_{ult_pos_heel} = W_{ult_heel} \times l_{heel} \times (l_{heel} + t_w) / 2 + W_{ult_heel} \times l_{heel} \times (2 \times l_{heel} / 3 + t_w / 2) = 8.4 \text{ kNm/m}$$

anticlockwise

$$M_{ult_neg_heel} = ((\sigma_{\min} \times l_{p_heel} \times (l_{p_heel} + t_w) / 2) + (\sigma_{heel} - \sigma_{\min}) \times (l_{p_heel} \times (l_{p_heel} / 3 + t_w / 2))) \times \gamma_{fav}$$

$$M_{ult_neg_heel} = 1.5 \text{ kNm/m}$$

Nett Ultimate Moment

$$M_{ult_heel} = \text{abs}(M_{ult_pos_heel} - M_{ult_neg_heel}) = 6.8 \text{ kNm/m}$$

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Check shear stress to clause 3.4.5.2 (BS8110:Pt 1)
 $V_{allowable} = \min((0.8 N^{1/2}/mm), 5 N/mm^2) \times \sqrt{f_{cu}} = 4.73 N/mm^2$
 Shear stress < maximum - OK

Shear stresses to clause 3.4.5.4 (BS8110:Pt 1)
 Allowable shear stress
 $V_{c,heel} = 0.42 N/mm^2$

No shear reinforcement required

BASE DESIGN - TOE

Shears and Moments

Conservatively all soil overburden on the toe is ignored

Ultimate Shear (conservatively - at face of wall)

Ultimate Moment (at centre of wall)

$$V_{ult,toe} = ((\sigma_{ice} \times l_{oe}) + (((\sigma_{max} - \sigma_{ice}) / 2) \times l_{oe})) \times \gamma_{f,av} - l_{oe} \times l_b \times \gamma_b \times \gamma_{f,d} = 21.2 \text{ kN/m}$$

$$M_{ult,toe} = ((\sigma_{ice} \times l_{oe} \times (l_{oe} + l_w/2) + (\sigma_{max} - \sigma_{ice}) / 2 \times l_{oe} \times (2 \times l_{oe}/3 + l_w/2)) \times \gamma_{f,av} - l_{oe} \times l_b \times \gamma_b \times \gamma_{f,d} \times (l_{oe}/2 + l_w/2))$$

$$M_{ult,toe} = 10.2 \text{ kNm/m}$$

TOE REINFORCEMENT - MESH

Tension Reinforcement

Cover to bars in the bottom of the toe
 $C_{r,toe} = 35 \text{ mm}$

Effective depth to bars
 $d_{toe} = l_b - C_{r,toe} = (6 \text{ mm}) = 259 \text{ mm}$

Assume the base is a cantilevered slab

Characteristic strength of reinforcement
 $f_y = 460 \text{ N/mm}^2$

Characteristic strength of concrete
 $f_{cu} = 35 \text{ N/mm}^2$

Area of reinforcement required

$$K_{ice} = \text{abs}(M_{ult,toe}) / (d_{toe}^2 \times f_{cu}) = 0.004 \quad K' = 0.156$$

Lever arm
 $z_{toe} = \min((0.95 \times d_{toe}), (d_{toe} \times (0.5 + \sqrt{(0.25 - K_{ice}/0.9)}))) = 246 \text{ mm}$

Reinforcement required
 $A_{s,toe} = \text{abs}(M_{ult,toe}) / (1/4 \times f_y \times z_{toe}) = 95 \text{ mm}^2/\text{m}$

Minimum reinforcement
 $A_{s,min,toe} = \text{iff}(f_y == 460 \text{ N/mm}^2, 0.0013 \times l_b, 0.0024 \times l_b) = 390 \text{ mm}^2/\text{m}$

Tension steel provided
 Use A393 Mesh $A_{s,prov,toe} = A_{s,toe} = 393 \text{ mm}^2/\text{m}$

Toe - Check min and max areas of steel

Total area of concrete
 $A_c = l_b = 300000 \text{ mm}^2/\text{m}$

Minimum percentage area of reinforcement $k = 0.13 \%$

Minimum area of steel required
 $A_{s,min} = k \times A_c = 390 \text{ mm}^2/\text{m}$

Maximum area of steel allowed
 $A_{s,max} = 4 \% \times A_c = 12000 \text{ mm}^2/\text{m}$

Area of main tension steel provided in toe sufficient

Compression steel not required

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Area of main steel provided OK

Toe Distribution Steel

Minimum percentage of distribution reinforcement $k_1 = 0.13\%$

Minimum Area Required $A_{s_dist_req} = k_1 \times A_c = 390 \text{ mm}^2/\text{m}$

Area Provided $A_{s_dist_base} = A_{s_toe} = 393 \text{ mm}^2/\text{m}$

Area of distribution steel provided OK

CHECK OF NOMINAL COVER

Cover to outer tension reinforcement

$$c_{toe} = t_b - d_{s_toe} - d_{s_toe} / 2 = 36.0 \text{ mm}$$

Permissible minimum nominal cover to all reinforcement (Table 3.4)

$$c_{min_toe} = 35 \text{ mm}$$

Cover over outer steel OK (bottom of toe)

TOE SHEAR RESISTANCE

Applied shear stress

$$V_{toe} = V_{ul_toe} / d_{toe} = 0.08 \text{ N/mm}^2$$

Check shear stress to clause 3.4.5.2 (BS8110:Pt 1)

$$V_{allowable} = \min((0.8 \text{ N}^{1/2}/\text{mm}) \times \sqrt{f_{cu}}, 5 \text{ N/mm}^2) = 4.73 \text{ N/mm}^2$$

Shear stress < maximum - OK

Shear stresses to clause 3.4.5.4 (BS8110:Pt 1)

Allowable shear stress

$$V_{c_toe} = 0.42 \text{ N/mm}^2$$

No shear reinforcement required

STEM DESIGN

Width of base of wall

$$t_w = 700.0 \text{ mm}$$

Height of stem of wall

$$h_{stem} = 1700 \text{ mm}$$

DESIGN OF BASE WALL SECTION (ACTIVE PRESSURES)

Wall base section thickness $t_w = 700.0 \text{ mm}$

Depth from top of wall to base

$h_{stem} = 1700 \text{ mm}$ Warning the height of the wall is not a complete number of bricks

Applied moment at base of wall

$$M_{base} = (k_{a_s} \times (\cos(\theta))^2 \times w_s \times h_{stem}^2 / 2) \times \gamma_{f_i} + (k_{a_s} \times (\cos(\theta))^2 \times \gamma_s \times h_{stem}^3 / 6) \times \gamma_{f_d} = 10.9 \text{ kNm/m}$$

Applied shear force at base of wall

$$F_{base} = (k_{a_s} \times (\cos(\theta))^2 \times w_s \times h_{stem} \times \gamma_{f_i} + (k_{a_s} \times (\cos(\theta))^2 \times \gamma_s \times h_{stem}^2 / 2) \times \gamma_{f_d} = 15.9 \text{ kN/m}$$

CHECK RESISTANCE TO MOMENT WITH FLEXURAL STRENGTH (BS5628:PT 1:CL 36.5.3)

Flexural strength (I | to bed joints)(Table 3) $f_{lx} = 0.30 \text{ N/mm}^2$

Design dead load at the base of the wall $V_{base} = W_v + t_w \times h_{stem} \times \gamma_w = 23.80 \text{ kN/m}$

Dead load per unit area

$$g_{d_base} = V_{base} \times \gamma_{fd} / t_w = 0.03 \text{ N/mm}^2$$

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Wall bending - OK

STEM SHEAR (BS5628:PT 1:CL 33)

Mortar designation Mortar = "!!!!"

Design dead load at the base of the wall $V_{base} = W_v + t_w \times h_{stem} \times \gamma_w = 23.80 \text{ kN/m}$

Design vertical dead load per unit area $g_{A_{base}} = V_{base} \times \gamma_{fd} / t_w = 0.03 \text{ N/mm}^2$

Characteristic shear strength of masonry

$f_{v_I} = \min(1.75 \text{ N/mm}^2, 0.35 \text{ N/mm}^2 + (0.6 \times g_{A_{base}})) = 0.37 \text{ N/mm}^2$

$f_{v_{III}} = \min(1.4 \text{ N/mm}^2, 0.15 \text{ N/mm}^2 + (0.6 \times g_{A_{base}})) = 0.17 \text{ N/mm}^2$

$f_v = \text{if}((\text{Mortar} == "!!!"), f_{v_I}, f_{v_{III}}) = 0.17 \text{ N/mm}^2$

Shear stress $V_{base} = F_{base} / t_w = 0.02 \text{ N/mm}^2$

Partial safety factor for shear $\gamma_{mv} = 2.5$

Wall base shear OK

DESIGN OF WALL SECTION 2 (ACTIVE PRESSURES)

Wall section thickness $t_{wall,2} = 500.0 \text{ mm}$

Depth from top of wall to base of section

$h_{wall,2} = 800 \text{ mm}$ Warning the height of the section is not a complete number of bricks

Applied moment at base of section

$M_{wall,2} = (k_a \times (\cos(\theta))^2 \times w_s \times h_{wall,2}^2 / 2) \times \gamma_{fd} + (k_a \times (\cos(\theta))^2 \times \gamma_s \times h_{wall,2}^3 / 6) \times \gamma_{fd} = 1.8 \text{ kNm/m}$

Applied shear force at base of section

$F_{wall,2} = (k_a \times (\cos(\theta))^2 \times w_s \times h_{wall,2}) \times \gamma_{fd} + (k_a \times (\cos(\theta))^2 \times \gamma_s \times h_{wall,2}^2 / 2) \times \gamma_{fd} = 5.2 \text{ kN/m}$

CHECK RESISTANCE TO MOMENT WITH FLEXURAL STRENGTH (BS5628:PT 1:CL 36.5.3)

Flexural strength (I) to bed joints (Table 3) $f_{kx} = 0.30 \text{ N/mm}^2$

Design dead load at the base of the wall $V_{wall,2} = W_v + t_{wall,2} \times h_{wall,2} \times \gamma_w = 8.00 \text{ kN/m}$

Dead load per unit area $g_{d_{wall,2}} = V_{wall,2} \times \gamma_{fd} / t_{wall,2} = 0.01 \text{ N/mm}^2$

Section modulus

$Z_{wall,2} = t_{wall,2}^2 / 6 = 41.67 \times 10^6 \text{ mm}^3/\text{m}$

Restoring moment

$M_{R_{wall,2}} = (f_{kx} / \gamma_m + g_{d_{wall,2}}) \times Z_{wall,2} = 5.6 \text{ kNm/m}$

Wall bending - OK

STEM SHEAR (BS5628:PT 1:CL 33)

Mortar designation Mortar = "!!!!"

Design dead load at the base of the wall $V_{wall,2} = W_v + t_{wall,2} \times h_{wall,2} \times \gamma_w = 8.00 \text{ kN/m}$

Design vertical dead load per unit area $g_{A_{wall,2}} = V_{wall,2} \times \gamma_{fd} / t_{wall,2} = 0.01 \text{ N/mm}^2$

Characteristic shear strength of masonry

$f_{v_I} = \min(1.75 \text{ N/mm}^2, 0.35 \text{ N/mm}^2 + (0.6 \times g_{A_{wall,2}})) = 0.36 \text{ N/mm}^2$

Wall section base shear OK

Wall Dimensions

Masonry Flexural Strength

Masonry Flexural Strength - 0.3 N/mm^2

700mm thick and 1700mm from base to the top of the wall

Section 2

500mm thick and 800mm from base of section 2 to the top of the wall

Base Top Reinforcement - Mesh

Heel (Top) Reinforcement

Base Bottom Reinforcement - Mesh

10e (Bottom) Reinforcement

Provide A393 Mesh (Bottom)

Ref BS 5628 Pt 1: Clause 25

Shear stress

Partial safety factor for shear

$$2.5 = \gamma_{mv} \lambda$$
$$V_{wall-2} = F_{wall-2} / t_{wall-2} = 0.01 \text{ N/mm}^2$$

$$f_{v_III} = \min(1.4 \text{ N/mm}^2, 0.15 \text{ N/mm}^2 + (0.6 \times g_{A_wall.2})) = 0.16 \text{ N/mm}^2$$

CALCULATIONS

Job No: 13198A

Date:

Sheet No:

Rev:

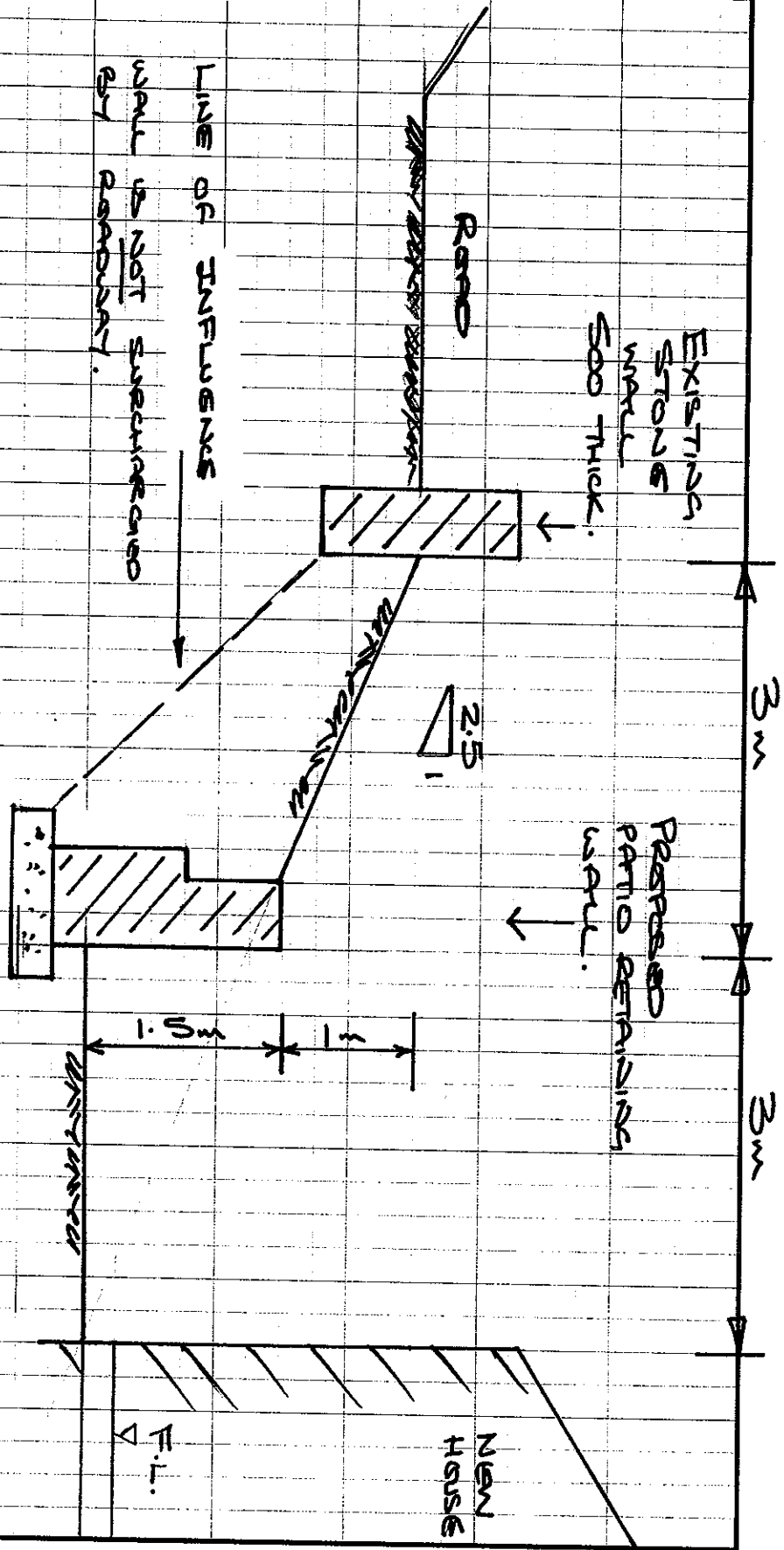
SK100

Calcs. for:

Job Title:

Checked by:

Made by:



APPENDIX. CROSS SECTION (1:50)

SITE SURVEY 6.3.07

CALCULATIONS

Made by:	Checked by:
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Job No: 13198A

Date:

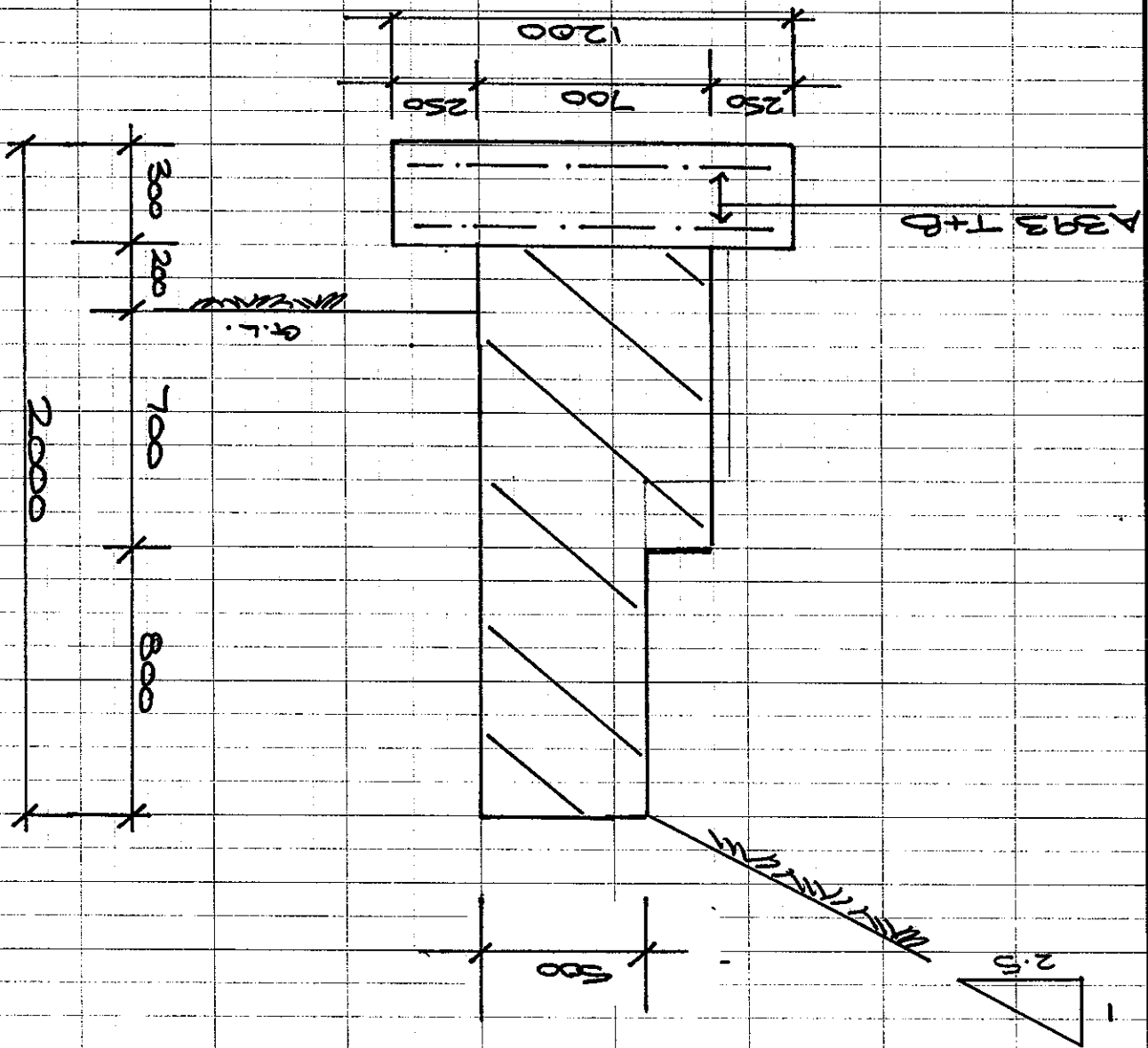
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SK101

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Job
Title:



A393 T+B

PATIO RETAINING WALL CROSS SECTION.

BASE CONCRETE GRADE RC35

REINFORCEMENT CAGE

35mm

REINFORCEMENT LAPS

1400mm

WALL STEM BUILT FROM SOLID MASS CONCRETE AND STOPS WATER.