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Structural Design

24 Ormes Road, Skewen, Neath

October 2020

24 Ormes Road, Skewen, Neath
October 2020

Site name: 24 Ormes Road, Skewen, Neath

Client name: Jill Howells

Type of report: Foundation Plan

Prepared by: Iwan Griffiths BEng (Hons) ICE IStructE

Signed 

Date: 13th October 2020

Revision History:

Rev.	Date	Comments
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1.Introduction

1.1. Brief

The Client has asked Grade Consulting Limited to provide structural design and specifications for a concrete raft foundation for a proposed two storey house at, 24 Ormes Road, Skewen, Neath.

Dimensions for the proposed extension were taken from the architect's plans (APPENDIX 1) and technical drawings (APPENDIX 3), supplied by the client.

The client supplied a geotechnical survey report of the site (APPENDIX 2), and the calculations in the following design are based on the ground properties given in the report.

"Section 6.3 Foundations" on page 13 of the geotechnical report recommends that the foundations are situated in the natural clayey slightly sandy gravel, which was proved at a depth of 0.35m at the location of borehole W05.

The report also recommends an allowable bearing capacity of 85kN/m², that the house foundations are set on a raft and that any new foundations are set within uniform strata across the foundation.

The calculations therefore assume a uniform strata of dense the natural clayey slightly sandy gravel with a bearing capacity of 85kN/m² .

2. CALCULATIONS

LOADINGS

MAIN ROOF LOADS

Pitch of roof at 23 degrees.

DEAD LOADS

	<u>Load/cos roof angle (23)</u>	<u>Load</u>
Felt and battens	0.054	0.05
Tiles	0.571	0.526
Insulation	0.163	0.15
Rafters	0.109	0.1
TOTAL	0.897 kN/m²	

LIVE LOADS

	<u>Load/cos roof angle (23)</u>	<u>Load</u>
Roof Live Load	0.652	0.6
TOTAL	0.652 kN/m²	

ROOF AREA = 108.232 m²

ANNEX ROOF LOADS

Pitch of roof at 34 degrees.

DEAD LOADS

	<u>Load/cos roof angle (34)</u>	<u>Load</u>
Felt and battens	0.06	0.05
Tiles	0.634	0.526
Insulation	0.181	0.15
Rafters	0.121	0.1
TOTAL	0.996 kN/m²	

LIVE LOADS

	<u>Load/cos roof angle (34)</u>	<u>Load</u>
Roof Live Load	0.627	0.52
TOTAL	0.627 kN/m²	

ROOF AREA = 34.072 m²

CEILING LOADS

DEAD LOADS

Ceiling joists	0.1
Plaster boards	0.2
TOTAL	0.3 KN/m²

LIVE LOADS

Loft live loads	0.48
TOTAL	0.48 KN/m²

CEILING AREA = 90 m²

FIRST FLOOR LOADS

DEAD LOADS

Floor joists	0.15
Floor boards	0.1
Plaster boards	0.2
TOTAL	0.45 KN/m²

LIVE LOADS

Loft live loads	1.5
TOTAL	1.5 KN/m²

FLOOR AREA = 90 m²

GROUND FLOOR LOADS

DEAD LOADS

75mm Floor screed	0.075 x 22 = 1.65
Insulation	0.15
TOTAL	1.8 KN/m²

LIVE LOADS

Loft live loads	1.5
TOTAL	1.5 KN/m²

FLOOR AREA = 116.23 m²

EXTERNAL MAIN WALL LOADS

DEAD LOADS

Timber frame	$1.98 \times 4.4 \times 33.5$
Plaster	$1 \times 0.44 \times 4.4 \times 33.5$
Pennant Stone / Brick	$3.912 \times 0.6 \times 29$
Block with Pennant Stone Cladding	$(1.98 + 0.948) \times 3.8 \times 33.5$

SIDE WALL TOTAL	797.511 kN
GABLE ABOVE WALL PLATE TOTAL	28.879 kN

EXTERNAL ANNEXE WALL LOADS

DEAD LOADS

Timber frame	$1.98 \times 2.1 \times 16.5$
Plaster	$1 \times 0.44 \times 2.1 \times 16.5$
Pennant Stone / Brick	$3.912 \times 0.6 \times 16.5$
Block with timber cladding	$(1.98 + 0.104) \times 1.5 \times 16.5$

SIDE TOTAL	174.161 kN
GABLE ABOVE WALL PLATE TOTAL	9.684 kN

INTERNAL STUD WALLS

Stud Walls with Plaster Board	$0.35 \times (37.15 \times 3.2) = 41.608 \text{ kN/m}^2$
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<u>TOTAL DEAD LOAD =</u>	1459.577 kN
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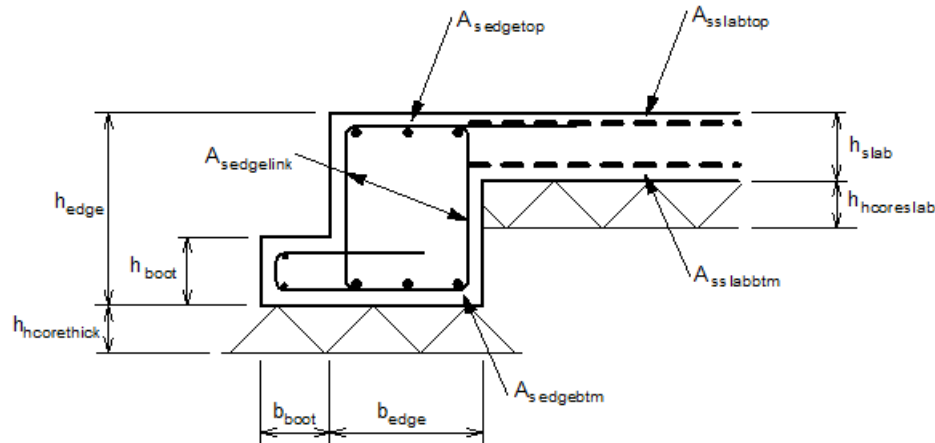
<u>TOTAL LIVE LOAD =</u>	441.553 kN
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<u>TOTAL AREA OF RAFT FOUNDATION =</u>	145.8 m²
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RAFT FOUNDATION DESIGN (BS8110 : PART 1 : 1997)

Tedds calculation version 1.0.12



Soil and raft definition

Soil definition

Allowable bearing pressure
Number of types of soil forming sub-soil
Soil density
Depth of hardcore beneath slab
Depth of hardcore beneath thickenings
Density of hardcore
Basic assumed diameter of local depression
Diameter under slab modified for hardcore
Diameter under thickenings modified for hardcore

$$q_{\text{allow}} = 85.0 \text{ kN/m}^2$$

One type only

Firm

$$h_{\text{coreslab}} = 150 \text{ mm (Dispersal allowed for bearing pressure check)}$$

$$h_{\text{corethick}} = 150 \text{ mm (Dispersal allowed for bearing pressure check)}$$

$$\gamma_{\text{hcore}} = 20.0 \text{ kN/m}^3$$

$$\phi_{\text{depbasic}} = 1500 \text{ mm}$$

$$\phi_{\text{depslab}} = \phi_{\text{depbasic}} - h_{\text{coreslab}} = 1350 \text{ mm}$$

$$\phi_{\text{depthick}} = \phi_{\text{depbasic}} - h_{\text{corethick}} = 1350 \text{ mm}$$

Raft slab definition

Max dimension/max dimension between joints
Slab thickness
Concrete strength
Poissons ratio of concrete
Slab mesh reinforcement strength
Partial safety factor for steel reinforcement
From C&CA document 'Concrete ground floors' Table 5

$$l_{\text{max}} = 16.200 \text{ m}$$

$$h_{\text{slab}} = 175 \text{ mm}$$

$$f_{\text{cu}} = 35 \text{ N/mm}^2$$

$$\nu = 0.2$$

$$f_{\text{yslab}} = 500 \text{ N/mm}^2$$

$$\gamma_s = 1.15$$

Minimum mesh required in top for shrinkage

$$\mathbf{A142}$$

Actual mesh provided in top

$$\mathbf{A393 (A_{\text{slabtop}} = 393 \text{ mm}^2/\text{m})}$$

Mesh provided in bottom

$$\mathbf{A393 (A_{\text{slabbtm}} = 393 \text{ mm}^2/\text{m})}$$

Top mesh bar diameter

$$\phi_{\text{slabtop}} = 10 \text{ mm}$$

Bottom mesh bar diameter

$$\phi_{\text{slabbtm}} = 10 \text{ mm}$$

Cover to top reinforcement

$$C_{\text{top}} = 40 \text{ mm}$$

Cover to bottom reinforcement

$$C_{\text{btm}} = 40 \text{ mm}$$

Average effective depth of top reinforcement

$$d_{\text{tslabav}} = h_{\text{slab}} - C_{\text{top}} - \phi_{\text{slabtop}} = 125 \text{ mm}$$

Average effective depth of bottom reinforcement

$$d_{\text{bslabav}} = h_{\text{slab}} - C_{\text{btm}} - \phi_{\text{slabbtm}} = 125 \text{ mm}$$

Overall average effective depth

$$d_{\text{slabav}} = (d_{\text{tslabav}} + d_{\text{bslabav}})/2 = 125 \text{ mm}$$

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Minimum effective depth of top reinforcement

$$d_{tslabmin} = d_{tslabav} - \phi_{slabtop}/2 = \mathbf{120 \text{ mm}}$$

Minimum effective depth of bottom reinforcement

$$d_{bslabmin} = d_{bslabav} - \phi_{slabbtm}/2 = \mathbf{120 \text{ mm}}$$

Edge beam definition

Overall depth

$$h_{edge} = \mathbf{475 \text{ mm}}$$

Width

$$b_{edge} = \mathbf{500 \text{ mm}}$$

Depth of boot

$$h_{boot} = \mathbf{325 \text{ mm}}$$

Width of boot

$$b_{boot} = \mathbf{275 \text{ mm}}$$

Strength of main bar reinforcement

$$f_y = \mathbf{500 \text{ N/mm}^2}$$

Strength of link reinforcement

$$f_{ys} = \mathbf{500 \text{ N/mm}^2}$$

Reinforcement provided in top

$$\mathbf{4 \text{ H25 bars } (A_{sedge\text{top}} = 1963 \text{ mm}^2)}$$

Reinforcement provided in bottom

$$\mathbf{3 \text{ H12 bars } (A_{sedge\text{btm}} = 339 \text{ mm}^2)}$$

Link reinforcement provided

$$\mathbf{2 \text{ H12 legs at 350 ctrs } (A_{sv}/s_v = 0.646 \text{ mm})}$$

Bottom cover to links

$$C_{beam} = \mathbf{40 \text{ mm}}$$

Effective depth of top reinforcement

$$d_{edge\text{top}} = h_{edge} - C_{top} - \phi_{slabtop} - \phi_{edge\text{link}} - \phi_{edge\text{top}}/2 = \mathbf{401 \text{ mm}}$$

Effective depth of bottom reinforcement

$$d_{edge\text{btm}} = h_{edge} - C_{beam} - \phi_{edge\text{link}} - \phi_{edge\text{btm}}/2 = \mathbf{417 \text{ mm}}$$

Boot main reinforcement

$$\mathbf{H8 \text{ bars at 350 ctrs } (A_{sboot} = 144 \text{ mm}^2/\text{m})}$$

Effective depth of boot reinforcement

$$d_{boot} = h_{boot} - C_{beam} - \phi_{boot}/2 = \mathbf{281 \text{ mm}}$$

Internal slab design checks

Basic loading

Slab self weight

$$W_{slab} = 24 \text{ kN/m}^3 \times h_{slab} = \mathbf{4.2 \text{ kN/m}^2}$$

Hardcore

$$W_{hcoreslab} = \gamma_{hcore} \times h_{hcoreslab} = \mathbf{3.0 \text{ kN/m}^2}$$

Applied loading

Uniformly distributed dead load

$$W_{Dudl} = \mathbf{10.0 \text{ kN/m}^2}$$

Uniformly distributed live load

$$W_{Ludl} = \mathbf{3.0 \text{ kN/m}^2}$$

Internal slab bearing pressure check

Total uniform load at formation level

$$W_{udl} = W_{slab} + W_{hcoreslab} + W_{Dudl} + W_{Ludl} = \mathbf{20.2 \text{ kN/m}^2}$$

PASS - $W_{udl} \leq q_{allow}$ - Applied bearing pressure is less than allowable

Internal slab bending and shear check

Applied bending moments

Span of slab

$$l_{slab} = \phi_{depslab} + d_{tslabav} = \mathbf{1475 \text{ mm}}$$

Ultimate self weight udl

$$W_{swult} = 1.4 \times W_{slab} = \mathbf{5.9 \text{ kN/m}^2}$$

Self weight moment at centre

$$M_{csw} = W_{swult} \times l_{slab}^2 \times (1 + \nu) / 64 = \mathbf{0.2 \text{ kNm/m}}$$

Self weight moment at edge

$$M_{esw} = W_{swult} \times l_{slab}^2 / 32 = \mathbf{0.4 \text{ kNm/m}}$$

Self weight shear force at edge

$$V_{sw} = W_{swult} \times l_{slab} / 4 = \mathbf{2.2 \text{ kN/m}}$$

Moments due to applied uniformly distributed loads

Ultimate applied udl

$$W_{udlult} = 1.4 \times W_{Dudl} + 1.6 \times W_{Ludl} = \mathbf{18.9 \text{ kN/m}^2}$$

Moment at centre

$$M_{cudl} = W_{udlult} \times l_{slab}^2 \times (1 + \nu) / 64 = \mathbf{0.8 \text{ kNm/m}}$$

Moment at edge

$$M_{eudl} = W_{udlult} \times l_{slab}^2 / 32 = \mathbf{1.3 \text{ kNm/m}}$$

Shear force at edge

$$V_{udl} = W_{udlult} \times l_{slab} / 4 = \mathbf{7.0 \text{ kN/m}}$$

Resultant moments and shears

Total moment at edge

$$M_{\Sigma e} = \mathbf{1.7 \text{ kNm/m}}$$

Total moment at centre

$$M_{\Sigma c} = \mathbf{1.0 \text{ kNm/m}}$$

Total shear force

$$V_{\Sigma} = \mathbf{9.1 \text{ kN/m}}$$

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Reinforcement required in top

K factor	$K_{slabtop} = M_{\Sigma e} / (f_{cu} \times d_{slabav}^2) = 0.003$
Lever arm	$Z_{slabtop} = d_{slabav} \times \min(0.95, 0.5 + \sqrt{(0.25 - K_{slabtop}/0.9)}) = 118.7 \text{ mm}$
Area of steel required for bending	$A_{slabtopbend} = M_{\Sigma e} / ((1.0/\gamma_s) \times f_{yslab} \times Z_{slabtop}) = 33 \text{ mm}^2/\text{m}$
Minimum area of steel required	$A_{slabmin} = 0.0013 \times h_{slab} = 228 \text{ mm}^2/\text{m}$
Area of steel required	$A_{slabtopreq} = \max(A_{slabtopbend}, A_{slabmin}) = 228 \text{ mm}^2/\text{m}$
<i>PASS - $A_{slabtopreq} \leq A_{slabtop}$ - Area of reinforcement provided in top to span local depressions is adequate</i>	

Reinforcement required in bottom

K factor	$K_{slabtm} = M_{\Sigma c} / (f_{cu} \times d_{slabav}^2) = 0.002$
Lever arm	$Z_{slabtm} = d_{slabav} \times \min(0.95, 0.5 + \sqrt{(0.25 - K_{slabtm}/0.9)}) = 118.7 \text{ mm}$
Area of steel required for bending	$A_{slabtmdbend} = M_{\Sigma c} / ((1.0/\gamma_s) \times f_{yslab} \times Z_{slabtm}) = 20 \text{ mm}^2/\text{m}$
Area of steel required	$A_{slabtmreq} = \max(A_{slabtmdbend}, A_{slabmin}) = 228 \text{ mm}^2/\text{m}$
<i>PASS - $A_{slabtmreq} \leq A_{slabtm}$ - Area of reinforcement provided in bottom to span local depressions is adequate</i>	

Shear check

Applied shear stress	$v = V_{\Sigma} / d_{slabmin} = 0.076 \text{ N/mm}^2$
Tension steel ratio	$\rho = 100 \times A_{slabtop} / d_{slabmin} = 0.327$
From BS8110-1:1997 - Table 3.8	
Design concrete shear strength	$v_c = 0.658 \text{ N/mm}^2$
<i>PASS - $v \leq v_c$ - Shear capacity of the slab is adequate</i>	

Internal slab deflection check

Basic allowable span to depth ratio	$Ratio_{basic} = 26.0$
Moment factor	$M_{factor} = M_{\Sigma c} / d_{slabav}^2 = 0.065 \text{ N/mm}^2$
Steel service stress	$f_s = 2/3 \times f_{yslab} \times A_{slabtmdbend} / A_{slabtm} = 16.580 \text{ N/mm}^2$
Modification factor	$MF_{slab} = \min(2.0, 0.55 + [(477 \text{ N/mm}^2 - f_s) / (120 \times (0.9 \text{ N/mm}^2 + M_{factor}))])$ $MF_{slab} = 2.000$
Modified allowable span to depth ratio	$Ratio_{allow} = Ratio_{basic} \times MF_{slab} = 52.000$
Actual span to depth ratio	$Ratio_{actual} = l_{slab} / d_{slabav} = 11.800$
<i>PASS - $Ratio_{actual} \leq Ratio_{allow}$ - Slab span to depth ratio is adequate</i>	

Edge beam design checks

Basic loading

Hardcore	$W_{hcorethick} = \gamma_{hcore} \times h_{hcorethick} = 3.0 \text{ kN/m}^2$
Edge beam self weight	$W_{edge} = 24 \text{ kN/m}^3 \times [(h_{edge} \times b_{edge}) + (h_{boot} \times b_{boot})] = 7.8 \text{ kN/m}$

Edge beam bearing pressure check

Effective bearing width of edge beam	$b_{bearing} = b_{edge} + b_{boot} = 775 \text{ mm}$
Total uniform load at formation level	$W_{udledge} = W_{Dudl} + W_{Ludl} + W_{edge} / b_{bearing} + W_{hcorethick} = 26.2 \text{ kN/m}^2$
<i>PASS - $W_{udledge} \leq q_{allow}$ - Applied bearing pressure is less than allowable</i>	

Edge beam bending check

Divider for moments due to udl's	$\beta_{udl} = 10.0$
Applied bending moments	
Span of edge beam	$l_{edge} = \phi_{depththick} + d_{edgetop} = 1751 \text{ mm}$
Ultimate self weight udl	$W_{edgeult} = 1.4 \times W_{edge} = 11.0 \text{ kN/m}$
Ultimate slab udl (approx)	$W_{edgeslab} = \max(0 \text{ kN/m}, 1.4 \times W_{slab} \times ((\phi_{depththick} / 2 \times 3/4) - b_{edge})) = 0.0 \text{ kN/m}$
Self weight and slab bending moment	$M_{edgesw} = (W_{edgeult} + W_{edgeslab}) \times l_{edge}^2 / \beta_{udl} = 3.4 \text{ kNm}$
Self weight shear force	$V_{edgesw} = (W_{edgeult} + W_{edgeslab}) \times l_{edge} / 2 = 9.6 \text{ kN}$

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Moments due to applied uniformly distributed loads

Ultimate udl (approx) $W_{edge\ udl} = W_{ult} \times \phi_{depth} / 2 \times 3/4 = 9.5 \text{ kN/m}$

Bending moment $M_{edge\ udl} = W_{edge\ udl} \times l_{edge}^2 / \beta_{udl} = 2.9 \text{ kNm}$

Shear force $V_{edge\ udl} = W_{edge\ udl} \times l_{edge} / 2 = 8.4 \text{ kN}$

Resultant moments and shears

Total moment (hogging and sagging) $M_{\Sigma edge} = 6.3 \text{ kNm}$

Maximum shear force $V_{\Sigma edge} = 18.0 \text{ kN}$

Reinforcement required in top

Width of section in compression zone $b_{edge\ top} = b_{edge} + b_{boot} = 775 \text{ mm}$

Average web width $b_w = b_{edge} = 500 \text{ mm}$

K factor $K_{edge\ top} = M_{\Sigma edge} / (f_{cu} \times b_{edge\ top} \times d_{edge\ top}^2) = 0.001$

Lever arm $Z_{edge\ top} = d_{edge\ top} \times \min(0.95, 0.5 + \sqrt{(0.25 - K_{edge\ top} / 0.9)}) = 380 \text{ mm}$

Area of steel required for bending $A_{s\ edge\ top\ bend} = M_{\Sigma edge} / ((1.0 / \gamma_s) \times f_y \times Z_{edge\ top}) = 38 \text{ mm}^2$

Minimum area of steel required $A_{s\ edge\ top\ min} = 0.0013 \times 1.0 \times b_w \times h_{edge} = 309 \text{ mm}^2$

Area of steel required $A_{s\ edge\ top\ req} = \max(A_{s\ edge\ top\ bend}, A_{s\ edge\ top\ min}) = 309 \text{ mm}^2$

PASS - $A_{s\ edge\ top\ req} \leq A_{s\ edge\ top}$ - Area of reinforcement provided in top of edge beams is adequate

Reinforcement required in bottom

Width of section in compression zone $b_{edge\ botm} = b_{edge} + 0.1 \times l_{edge} = 675 \text{ mm}$

K factor $K_{edge\ botm} = M_{\Sigma edge} / (f_{cu} \times b_{edge\ botm} \times d_{edge\ botm}^2) = 0.002$

Lever arm $Z_{edge\ botm} = d_{edge\ botm} \times \min(0.95, 0.5 + \sqrt{(0.25 - K_{edge\ botm} / 0.9)}) = 396 \text{ mm}$

Area of steel required for bending $A_{s\ edge\ botm\ bend} = M_{\Sigma edge} / ((1.0 / \gamma_s) \times f_y \times Z_{edge\ botm}) = 37 \text{ mm}^2$

Minimum area of steel required $A_{s\ edge\ botm\ min} = 0.0013 \times 1.0 \times b_w \times h_{edge} = 309 \text{ mm}^2$

Area of steel required $A_{s\ edge\ botm\ req} = \max(A_{s\ edge\ botm\ bend}, A_{s\ edge\ botm\ min}) = 309 \text{ mm}^2$

PASS - $A_{s\ edge\ botm\ req} \leq A_{s\ edge\ botm}$ - Area of reinforcement provided in bottom of edge beams is adequate

Edge beam shear check

Applied shear stress $V_{edge} = V_{\Sigma edge} / (b_w \times d_{edge\ top}) = 0.090 \text{ N/mm}^2$

Tension steel ratio $\rho_{edge} = 100 \times A_{s\ edge\ top} / (b_w \times d_{edge\ top}) = 0.981$

From BS8110-1:1997 - Table 3.8

Design concrete shear strength $V_{c\ edge} = 0.702 \text{ N/mm}^2$

$V_{edge} \leq V_{c\ edge} + 0.4 \text{ N/mm}^2$ - Therefore minimum links required

Link area to spacing ratio required $A_{sv_upon_Sv\ req\ edge} = 0.4 \text{ N/mm}^2 \times b_w / ((1.0 / \gamma_s) \times f_{ys}) = 0.460 \text{ mm}$

Link area to spacing ratio provided $A_{sv_upon_Sv\ proved\ edge} = N_{edge\ link} \times \pi \times \phi_{edge\ link}^2 / (4 \times S_{v\ edge}) = 0.646 \text{ mm}$

PASS - $A_{sv_upon_Sv\ req\ edge} \leq A_{sv_upon_Sv\ proved\ edge}$ - Shear reinforcement provided in edge beams is adequate

Boot design check

Effective cantilever span $l_{boot} = b_{boot} + d_{boot} / 2 = 416 \text{ mm}$

Approximate ultimate bearing pressure $q_{ult} = 1.55 \times q_{allow} = 131.8 \text{ kN/m}^2$

Cantilever moment $M_{boot} = q_{ult} \times l_{boot}^2 / 2 = 11.4 \text{ kNm/m}$

Shear force $V_{boot} = q_{ult} \times l_{boot} = 54.7 \text{ kN/m}$

K factor $K_{boot} = M_{boot} / (f_{cu} \times d_{boot}^2) = 0.004$

Lever arm $Z_{boot} = d_{boot} \times \min(0.95, 0.5 + \sqrt{(0.25 - K_{boot} / 0.9)}) = 267 \text{ mm}$

Area of reinforcement required $A_{s\ boot\ req} = M_{boot} / ((1.0 / \gamma_s) \times f_{y\ boot} \times Z_{boot}) = 98 \text{ mm}^2/\text{m}$

PASS - $A_{s\ boot\ req} \leq A_{s\ boot}$ - Area of reinforcement provided in boot is adequate for bending

Applied shear stress $V_{boot} = V_{boot} / d_{boot} = 0.195 \text{ N/mm}^2$

Tension steel ratio $\rho_{boot} = 100 \times A_{s\ boot} / d_{boot} = 0.051$

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From BS8110-1:1997 - Table 3.8

Design concrete shear strength

$$V_{cboot} = 0.287 \text{ N/mm}^2$$

PASS - $V_{boot} \leq V_{cboot}$ - Shear capacity of the boot is adequate

Corner design checks

Basic loading

Corner load number 1

Load type

Dead load

Live load

Ultimate load

Centroid of load from outside face of raft

Line load in x direction

$$W_{Dcorner1} = 36.9 \text{ kN/m}$$

$$W_{Lcorner1} = 27.6 \text{ kN/m}$$

$$W_{ultcorner1} = 1.4 \times W_{Dcorner1} + 1.6 \times W_{Lcorner1} = 95.8 \text{ kN/m}$$

$$y_{corner1} = 150 \text{ mm}$$

Corner load number 2

Load type

Dead load

Live load

Ultimate load

Centroid of load from outside face of raft

Line load in y direction

$$W_{Dcorner2} = 42.5 \text{ kN/m}$$

$$W_{Lcorner2} = 27.6 \text{ kN/m}$$

$$W_{ultcorner2} = 1.4 \times W_{Dcorner2} + 1.6 \times W_{Lcorner2} = 103.7 \text{ kN/m}$$

$$x_{corner2} = 150 \text{ mm}$$

Corner bearing pressure check

Total uniform load at formation level

$$W_{udlcorner} = W_{Dudl} + W_{Ludl} + W_{edge}/b_{bearing} + W_{hcorethick} = 26.2 \text{ kN/m}^2$$

Net bearing press avail to resist line/point loads

$$q_{netcorner} = q_{allow} - W_{udlcorner} = 58.8 \text{ kN/m}^2$$

Total line/point loads

Total unfactored line load in x direction

$$W_{\Sigma line x} = 64.5 \text{ kN/m}$$

Total ultimate line load in x direction

$$W_{\Sigma ult line x} = 95.8 \text{ kN/m}$$

Total unfactored line load in y direction

$$W_{\Sigma line y} = 70.1 \text{ kN/m}$$

Total ultimate line load in y direction

$$W_{\Sigma ult line y} = 103.7 \text{ kN/m}$$

Total unfactored point load

$$W_{\Sigma point} = 0.0 \text{ kN}$$

Total ultimate point load

$$W_{\Sigma ult point} = 0.0 \text{ kN}$$

Length of side of sq reqd to resist line/point loads

$$p_{corner} = [W_{\Sigma line x} + W_{\Sigma line y} + \sqrt{(W_{\Sigma line x} + W_{\Sigma line y})^2 + 4 \times q_{netcorner} \times W_{\Sigma point}}] / (2 \times q_{netcorner})$$

$$p_{corner} = 2288 \text{ mm}$$

Bending moment about x-axis due to load/reaction eccentricity

Moment due to load 1 (x line)

$$M_{x1} = \max(0 \text{ kNm}, W_{ultcorner1} \times p_{corner} \times (p_{corner}/2 - y_{corner1})) = 218.0 \text{ kNm}$$

Total moment about x axis

$$M_{\Sigma x} = 218.0 \text{ kNm}$$

Bending moment about y-axis due to load/reaction eccentricity

Moment due to load 2 (y line)

$$M_{y2} = \max(0 \text{ kNm}, W_{ultcorner2} \times p_{corner} \times (p_{corner}/2 - x_{corner2})) = 235.9 \text{ kNm}$$

Total moment about y axis

$$M_{\Sigma y} = 235.9 \text{ kNm}$$

Check top reinforcement in edge beams for load/reaction eccentric moment

Max moment due to load/reaction eccentricity

$$M_{\Sigma} = \max(M_{\Sigma x}, M_{\Sigma y}) = 235.9 \text{ kNm}$$

Assume all of this moment is resisted by edge beam

From edge beam design checks away from corners

Moment due to edge beam spanning depression

$$M_{\Sigma edge} = 6.3 \text{ kNm}$$

Total moment to be resisted

$$M_{\Sigma cornerbp} = M_{\Sigma} + M_{\Sigma edge} = 242.2 \text{ kNm}$$

Width of section in compression zone

$$b_{edgetop} = b_{edge} + b_{boot} = 775 \text{ mm}$$

K factor

$$K_{cornerbp} = M_{\Sigma cornerbp} / (f_{cu} \times b_{edgetop} \times d_{edgetop}^2) = 0.056$$

Lever arm

$$z_{cornerbp} = d_{edgetop} \times \min(0.95, 0.5 + \sqrt{(0.25 - K_{cornerbp}/0.9)}) = 374 \text{ mm}$$

Total area of top steel required

$$A_{scornerbp} = M_{\Sigma cornerbp} / ((1.0/\gamma_s) \times f_y \times z_{cornerbp}) = 1490 \text{ mm}^2$$

Project		24 Ormes Road, Skewen, Neath		Job no.		GC-47	
Calcs for		Jill Howells		Start page no./Revision		6	
Calcs by	IG	Calcs date	15/10/2020	Checked by	IG	Checked date	15/10/2020
Approved by		IG		Approved date		15/10/2020	

*PASS - $A_{scornerbp} \leq A_{sedgetop}$ - Area of reinforcement provided to resist eccentric moment is adequate
The allowable bearing pressure at the corner will not be exceeded*

Corner beam bending check

Cantilever span of edge beam

$$l_{corner} = \phi_{depth} / \sqrt{2} + d_{edgetop} / 2 = \mathbf{1155 \text{ mm}}$$

Moment and shear due to self weight

Ultimate self weight udl

$$W_{edgeult} = 1.4 \times W_{edge} = \mathbf{11.0 \text{ kN/m}}$$

Average ultimate slab udl (approx)

$$W_{cornerslab} = \max(0 \text{ kN/m}, 1.4 \times W_{slab} \times (\phi_{depth} / (\sqrt{2} \times 2) - b_{edge})) = \mathbf{0.0 \text{ kN/m}}$$

Self weight and slab bending moment

$$M_{cornersw} = (W_{edgeult} + W_{cornerslab}) \times l_{corner}^2 / 2 = \mathbf{7.3 \text{ kNm}}$$

Self weight and slab shear force

$$V_{cornersw} = (W_{edgeult} + W_{cornerslab}) \times l_{corner} = \mathbf{12.7 \text{ kN}}$$

Moment and shear due to udl's

Maximum ultimate udl

$$W_{cornerudl} = ((1.4 \times W_{Dudl}) + (1.6 \times W_{Ludl})) \times \phi_{depth} / \sqrt{2} = \mathbf{18.0 \text{ kN/m}}$$

Bending moment

$$M_{cornerudl} = W_{cornerudl} \times l_{corner}^2 / 6 = \mathbf{4.0 \text{ kNm}}$$

Shear force

$$V_{cornerudl} = W_{cornerudl} \times l_{corner} / 2 = \mathbf{10.4 \text{ kN}}$$

Moment and shear due to line loads in x direction

Bending moment

$$M_{cornerlinex} = W_{\Sigma ulmlinex} \times l_{corner}^2 / 2 = \mathbf{63.9 \text{ kNm}}$$

Shear force

$$V_{cornerlinex} = W_{\Sigma ulmlinex} \times l_{corner} = \mathbf{110.7 \text{ kN}}$$

Moment and shear due to line loads in y direction

Bending moment

$$M_{cornerliney} = W_{\Sigma ultliney} \times l_{corner}^2 / 2 = \mathbf{69.2 \text{ kNm}}$$

Shear force

$$V_{cornerliney} = W_{\Sigma ultliney} \times l_{corner} = \mathbf{119.8 \text{ kN}}$$

Total moments and shears due to point loads

Bending moment about x axis

$$M_{cornerpointx} = \mathbf{0.0 \text{ kNm}}$$

Bending moment about y axis

$$M_{cornerpointy} = \mathbf{0.0 \text{ kNm}}$$

Shear force

$$V_{cornerpoint} = \mathbf{0.0 \text{ kN}}$$

Resultant moments and shears

Total moment about x axis

$$M_{\Sigma cornerx} = M_{cornersw} + M_{cornerudl} + M_{cornerlinex} + M_{cornerpointx} = \mathbf{80.5 \text{ kNm}}$$

Total shear force about x axis

$$V_{\Sigma cornerx} = V_{cornersw} + V_{cornerudl} + V_{cornerlinex} + V_{cornerpoint} = \mathbf{142.8 \text{ kN}}$$

Total moment about y axis

$$M_{\Sigma cornery} = M_{cornersw} + M_{cornerudl} + M_{cornerliney} + M_{cornerpointy} = \mathbf{75.2 \text{ kNm}}$$

Total shear force about y axis

$$V_{\Sigma cornery} = V_{cornersw} + V_{cornerudl} + V_{cornerliney} + V_{cornerpoint} = \mathbf{133.8 \text{ kN}}$$

Deflection of both edge beams at corner will be the same therefore design for average of these moments and shears

Design bending moment

$$M_{\Sigma corner} = (M_{\Sigma cornerx} + M_{\Sigma cornery}) / 2 = \mathbf{77.9 \text{ kNm}}$$

Design shear force

$$V_{\Sigma corner} = (V_{\Sigma cornerx} + V_{\Sigma cornery}) / 2 = \mathbf{138.3 \text{ kN}}$$

Reinforcement required in top of edge beam

K factor

$$K_{corner} = M_{\Sigma corner} / (f_{cu} \times b_{edgetop} \times d_{edgetop}^2) = \mathbf{0.018}$$

Lever arm

$$Z_{corner} = d_{edgetop} \times \min(0.95, 0.5 + \sqrt{(0.25 - K_{corner} / 0.9)}) = \mathbf{380 \text{ mm}}$$

Area of steel required for bending

$$A_{scornerbend} = M_{\Sigma corner} / ((1.0 / \gamma_s) \times f_y \times Z_{corner}) = \mathbf{471 \text{ mm}^2}$$

Minimum area of steel required

$$A_{scornermin} = A_{sedgetopmin} = \mathbf{309 \text{ mm}^2}$$

Area of steel required

$$A_{scorner} = \max(A_{scornerbend}, A_{scornermin}) = \mathbf{471 \text{ mm}^2}$$

PASS - $A_{scorner} \leq A_{sedgetop}$ - Area of reinforcement provided in top of edge beams at corners is adequate

Corner beam shear check

Average web width

$$b_w = b_{edge} = \mathbf{500 \text{ mm}}$$

Applied shear stress

$$v_{corner} = V_{\Sigma corner} / (b_w \times d_{edgetop}) = \mathbf{0.691 \text{ N/mm}^2}$$

Tension steel ratio

$$\rho_{corner} = 100 \times A_{scorner} / (b_w \times d_{edgetop}) = \mathbf{0.981}$$

From BS8110-1:1997 - Table 3.8

Design concrete shear strength

$$v_{ccorner} = \mathbf{0.702 \text{ N/mm}^2}$$

Project 24 Ormes Road, Skewen, Neath				Job no. GC-47	
Calcs for Jill Howells				Start page no./Revision 7	
Calcs by IG	Calcs date 15/10/2020	Checked by IG	Checked date 15/10/2020	Approved by IG	Approved date 15/10/2020

$V_{corner} \leq V_{ccorner} + 0.4N/mm^2$ - Therefore minimum links required
 Link area to spacing ratio required $A_{sv_upon_Svreqcorner} = 0.4N/mm^2 \times b_w / ((1.0/h_s) \times f_{ys}) = \mathbf{0.460}$ mm
 Link area to spacing ratio provided $A_{sv_upon_Svprovedge} = N_{edgeline} \times \pi \times \phi_{edgeline}^2 / (4 \times S_{vedge}) = \mathbf{0.646}$ mm
PASS - $A_{sv_upon_Svreqcorner} \leq A_{sv_upon_Svprovedge}$ - Shear reinforcement provided in edge beams at corners is adequate

Corner beam deflection check

Basic allowable span to depth ratio $Ratio_{basiccorner} = \mathbf{7.0}$
 Moment factor $M_{factorcorner} = M_{\Sigma corner} / (b_{edgetop} \times d_{edgetop}^2) = \mathbf{0.626}$ N/mm²
 Steel service stress $f_{scorner} = 2/3 \times f_y \times A_{scornerbend} / A_{sedgetop} = \mathbf{79.900}$ N/mm²
 Modification factor $MF_{corner} = \min(2.0, 0.55 + [(477N/mm^2 - f_{scorner}) / (120 \times (0.9N/mm^2 + M_{factorcorner})])) = \mathbf{2.000}$
 Modified allowable span to depth ratio $Ratio_{allowcorner} = Ratio_{basiccorner} \times MF_{corner} = \mathbf{14.000}$
 Actual span to depth ratio $Ratio_{actualcorner} = l_{corner} / d_{edgetop} = \mathbf{2.884}$
PASS - $Ratio_{actualcorner} \leq Ratio_{allowcorner}$ - Edge beam span to depth ratio is adequate

3. SPECIFICATIONS

Concrete Slab to be 150mm deep as per drawing 132-006 (APPENDIX 3).

Concrete mix to be no weaker than C30.

150mm Hardcore layer to be provided beneath the slab.

Boot to be provided to raft foundation. Dimensions shown in drawing 132-006

A layer of A393 mesh, steel strength 500 N/mm^2 , to be placed at top of slab, and another at the bottom with 40mm cover.

Edge Beam reinforcement to be provided as 4 H25 bars, steel strength 500 N/mm^2 , at top, 3 H12 bars, steel strength 500 N/mm^2 , at bottom, link reinforcement 2 H12, steel strength 500 N/mm^2 , legs at 350mm ctrs.

Boot reinforcement to be provided as H8 bars, steel strength 500 N/mm^2 , at 350 ctrs.

4. OTHER NOTES

Construction work not to be started until the calculations have been approved by Building Control. All construction work should be carried out by a competent builder.

The loadings and dimensions that form the basis of these calculations have been prepared from the clients' own plans.

Written dimensions are based on original agreed plans produced.

It is recommended that all necessary checks are carried out prior to construction, tender stage and for cost and content checking at any stage.

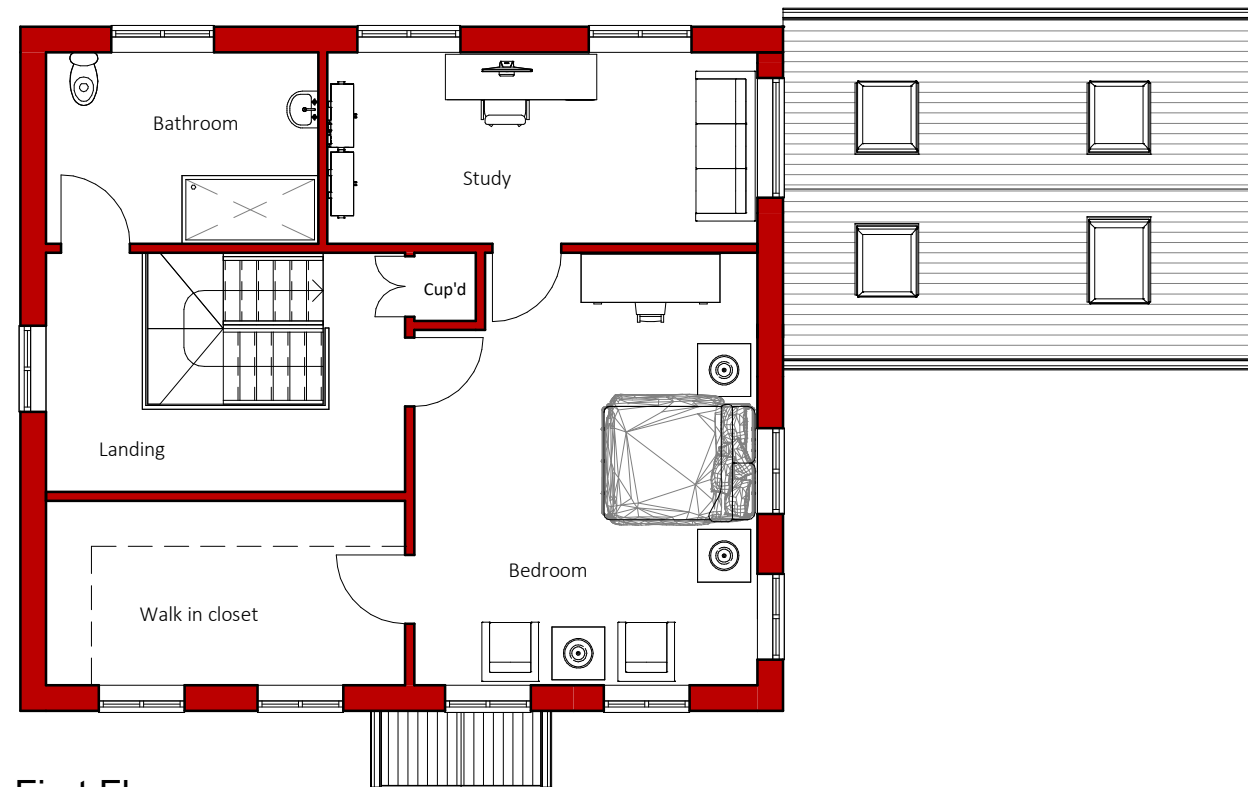
All specifications must be checked on site by the Contractor prior to the commencement of any fabrication or building works on site and where applicable, all specifications and details are to be read in conjunction with any specialist consultants' drawings; any disparity between the calculations and detailing is to be brought to the attention of the client prior to the commencement of any fabrication or building works.

For Domestic clients, the client duties pass on to the Principal Contractor or Sole Contractor. For more information visit www.hse.gov.uk.

For Domestic clients constructing a party wall, it is advised that legal advice is sought regarding the Party Wall Act 1996, prior to construction.

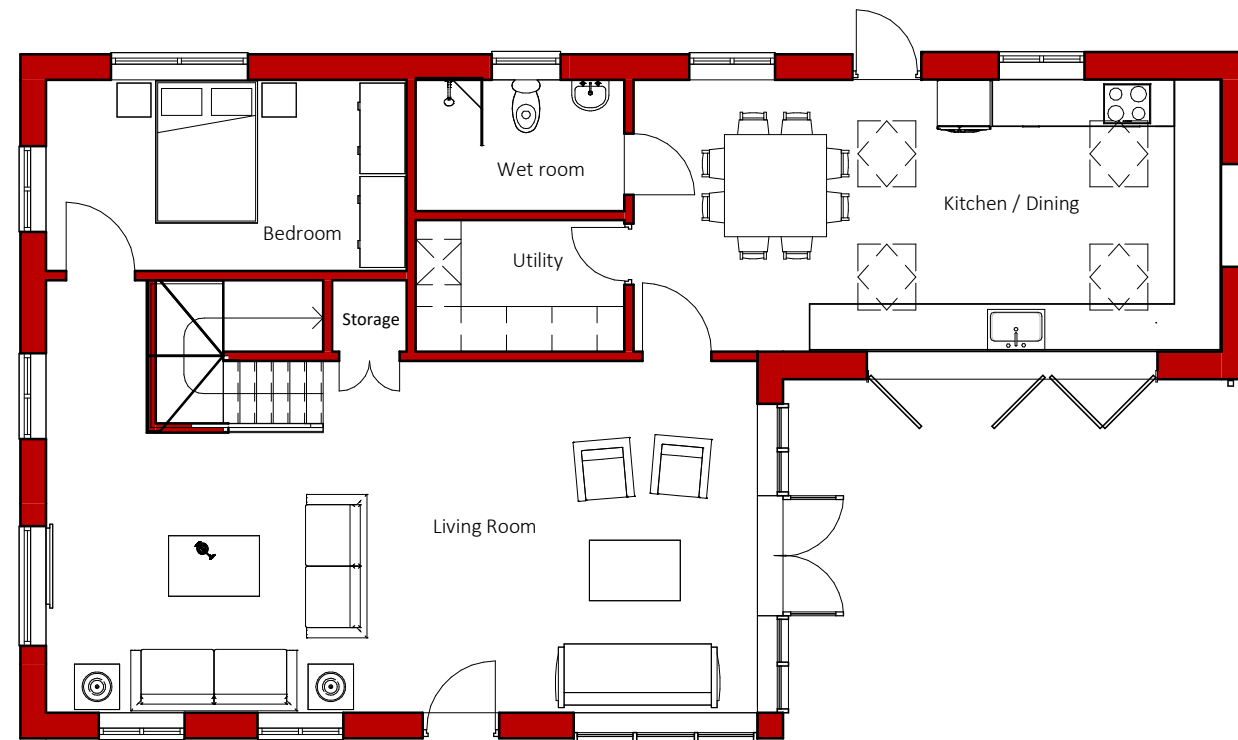
24 Ormes Road, Skewen, Neath
October 2020

APPENDIX 1

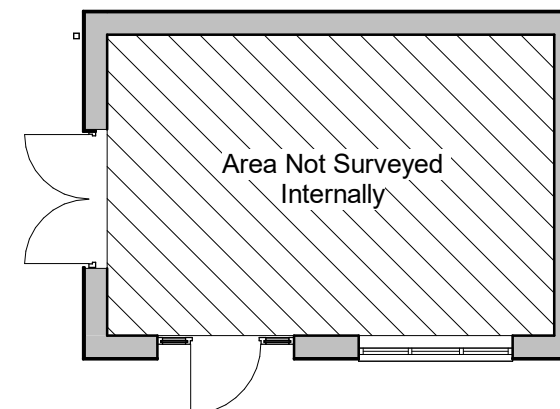


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Ground Floor



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No.	Description	By	Date
H	Layout Amended	AV	21.02.2020
I	Staircase Amended	AV	25.02.2020
J	Staircase Amended. Indicative Dims Added	AV	28.02.2020
K	Utility/Wet Room amended	AV	03.03.2020

CLIENT

Jill Howells

PROJECT

Replacement Dwelling

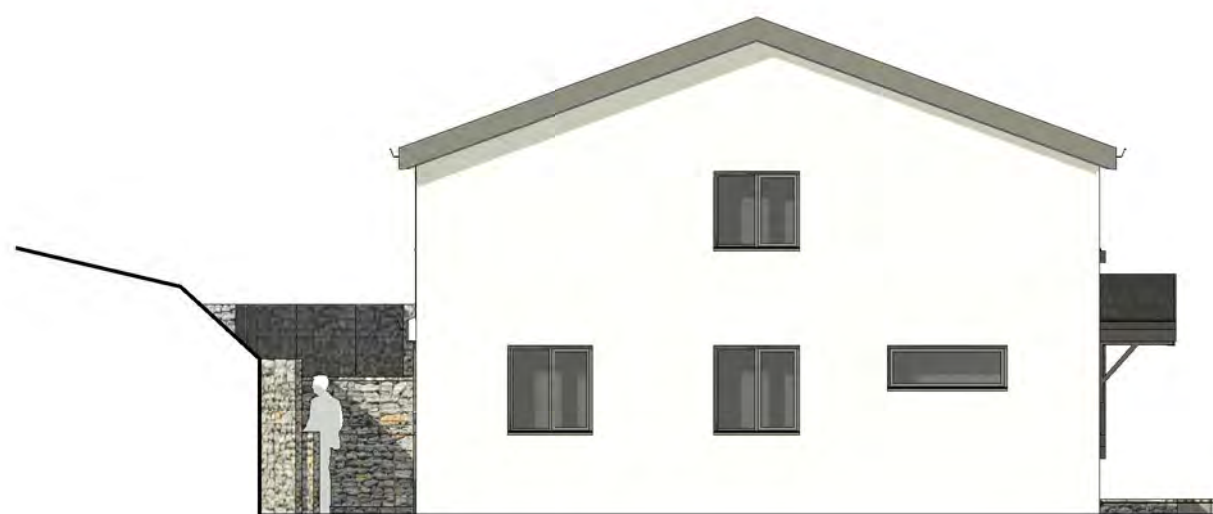
PROJECT ADDRESS

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Skewen
Neath
SA10 6SY

DRAWING TITLE

Proposed Floor Plans

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102	K	22.08.2019



West Elevation



East Elevation



Front Elevation



Rear Elevation

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No.	Description	By	Date
G	Layout Amended	AV	21.02.2020
H	Staircase Amended	AV	25.02.2020
I	Staircase Amended. Indicative Dims Added	AV	28.02.2020
J	Planner Comment Amendments.	AJW	28.05.2020

CLIENT

Jill Howells

PROJECT

Replacement Dwelling

PROJECT ADDRESS

24 Ormes Road, Skewen, Neath
SA10 6SY

DRAWING TITLE

Proposed Elevations

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October 2020

APPENDIX 2

24 ORMES ROAD, SKEWEN, NEATH

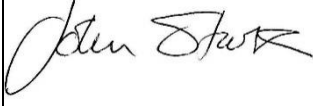
Ground Investigation Report

Report No. Q0177/GIR

February 2020

DOCUMENT CONTROL

Contract Name: 24 Ormes Road, Skewen, Neath, SA10 6SY
Contract Reference: Q0177
Report Type: Ground Investigation Report
Report Reference: Q0177/GIR
Date of Report: 20th February 2020
Client: Ms. Jill Howells

Version:	Date:	Prepared by:	Checked by:	Approved by:
First Issue	20/02/20	J. E. Stark	P. Darby	J.E. Stark
				
		Technical Manager B.Sc.(Hons)., C.Geol., FGS	Senior Engineering Geologist M.Sc., C.Geol., FGS	Technical Manager B.Sc.(Hons)., C.Geol., FGS
<i>Disclaimer: Quantum Geotechnic Limited has prepared this report in accordance with the instructions of the above-named Client for their sole and specific use. Any third parties who may use the information contained herein do so at their own risk.</i> Quantum Geotechnic Ltd, Plas Newydd, Llanedi, Pontarddulais, Swansea, SA4 0FQ ☎ 01554 744880 ✉ enquiries@quantumgeotech.co.uk				

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0.0 FOREWORD

The following Conditions and Notes on Site Investigation Procedures should be read in conjunction with this report.

General

Recommendations made and opinions expressed in the report are based on the strata observed in the excavations / recovered samples, together with the results of site and laboratory testing. No responsibility can be held for conditions which have not been revealed by the exploratory holes or which occur between exploratory holes. Whilst the report may suggest the likely configuration of strata, both between exploratory holes and below the maximum depth of investigation, this is only indicative and liability cannot be accepted for its accuracy.

Unless specifically stated, no account has been taken of possible subsidence due to mineral extraction below or close to the site.

Investigation Procedures

Intrusive techniques for ground investigation have been employed throughout the project. All intrusive operations, geotechnical / environmental sampling, logging of soils / rocks and in-situ testing complies with the recommendations of the British Code of Practice BS 5930: 2015 'Site Investigations', British Code of Practice BS 10175: 2011 +A1:2013 'Investigation of Potentially Contaminated Sites' and BS 1377: 1990, 'Methods of Test for Soils for Engineering Purposes'.

Routine Sampling

Representative bulk, disturbed and environmental samples of the different strata were taken. All samples are returned from site to Quantum Geotechnic Ltd.'s laboratory partners for controlled storage within 24 hours of sampling to await test scheduling / requirements.

In-Situ Testing, Surveying & Instrumentation

In-situ testing comprised windowless sample boreholes with standard penetration tests, supplemented by dynamic probing.

Groundwater

Where possible, the depth of entry of any influx of groundwater is recorded during the course of excavation or boring operations. The rate of inflow into the excavation or borehole is monitored during the course of the excavation or during boring procedures. Upon encountering any water strikes, work is temporarily halted and the water levels monitored for a standard twenty-minute period recording the change in water level at the end of the twenty minutes.

Groundwater conditions observed in the excavations are those appertaining to the period of investigation. It should be noted, that groundwater levels are subject to diurnal, seasonal and climatic variations as well as affects caused by drainage conditions or other causes.

Retention of Samples

After satisfactory completion of all the scheduled laboratory tests on any sample, the remaining material is discarded. Further to notifying the Client / Engineer with one week's notice, all soil and / or rock samples not tested will be discarded 28 days after submission of the approved final report.

1.0 INTRODUCTION

1.1 General

Upon the instructions of our Client, Ms. Jill Howells, Quantum Geotechnic Ltd (QG) was commissioned to undertake a ground investigation at 24 Ormes Road, Skewen, Neath.

1.2 Purpose of Ground Investigation

The purpose of the ground investigation was to allow a site-specific geotechnical assessment of the ground conditions, to aid with the design of the new dwelling following demolition of the existing structure on site and to identify any potential geotechnical and stability issues that may be present that may affect the proposed works.

1.3 Scope of Work

The general scope of work undertaken in the preparation of this assessment was as follows:

- Conduct an intrusive ground investigation with the aim of identifying the underlying ground conditions, targeting the issues that could potentially impact the reconstruction of the new property
- Carry out laboratory testing to gain geotechnical data.
- Provide an interpretative ground investigation report presenting an analysis of the ground conditions and offering recommendations on site suitability for the proposed development with regards to geotechnical parameters and overall stability.

The investigation works scoped by QG comprised of six windowless sample boreholes drilled to allow a ground model to be developed. The details of the work undertaken is described in Section 3.

General notes on the techniques employed by Quantum Geotechnic Ltd are described in the Foreword together with the limitations inherent in carrying out ground investigation work.

2.0 SITE SETTING

2.1 Site Description

The site is located at the eastern end of Ormes Road, Skewen. The postcode of the site is SA10 6SY.

The site is currently occupied by a bungalow on its western half with an outbuilding to the eastern side. A gabion retaining wall supports the higher ground to the north of the property.

The National Grid Reference of the centre of the site is SS 722 976. The approximate elevation of the site is c.70m.AOD. The site location is indicated on the aerial image capture presented below.



Figure 1: Site Location on Aerial Image ©Google Maps 2020 [Not to Scale]

2.2 Published Geology

The Six Inch to One Mile (1:10,560 scale) British Geological Survey map SS79NW shows the detailed geology of the site. An extract from the map is presented over page.



Figure 2: BGS SS79NW Extract (Not to Scale) British Geological Survey © NERC

This edition map indicates the site to have no superficial/soil cover, although Glacial Till (boulder clay) is mapped close to the south of the site boundary. The underlying solid strata is shown to be from the Hughes Beds of the Upper Coal Measures. The conjectural outcrop of the Swansea Two Feet coal seam is shown approximately 30m south of the site. The strata are shown dipping in a generally northern direction at angles of around 10°.

The current British Geological Survey on-line mapping resource 'Geology of Britain viewer' <http://mapapps.bgs.ac.uk/geologyofbritain/home.html> shows a similar setting to the large scale map, with the Hughes Beds being described as mudstones, siltstones and sandstones.

The map also details historical mining features with two adits to the east of the site; the closest being some 150m distant.

2.3 Mining History

Given the location of the site and proximity of potential historical mining features, a Coal Authority Mining Report has been obtained for the site. This is presented in Appendix V.

In summary the Report states:

Past Underground Mining: The property is in a surface area that could be affected by underground mining in 1 seam of coal at 230m to 240m depth, and last worked in 1910. Any movement in the ground due to coal mining activity associated with these workings should have stopped by now.

Present underground coal mining: The property is not within a surface area that could be affected by present underground mining.

Mine Entries: There are no recorded coal mine entries known to the Coal Authority within, or within 20 metres, of the boundary of the property.

Opencast coal mining: The property is not within the boundary of an opencast site from which coal has been removed by opencast methods. The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

Coal mining subsidence: The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994. There is no current Stop Notice delaying the start of remedial works or repairs to the property. The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

Mine Gas:

The Coal Authority has no record of a mine gas emission requiring action.

Hazards related to coal mining: The property has not been subject to remedial works, by or on behalf of the Coal Authority, under its Emergency Surface Hazard Call Out procedures.

3.0 FIELDWORK

The fieldwork was carried out between the 14th and 15th January 2020 under the direction of Quantum's Project Engineer.

The windowless sample boreholes were positioned in order to provide detailed information on the ground for the new build and to be able to draw a cross section through the site for development and assessment of the ground model.

The fieldworks comprised of six boreholes advanced by percussive windowless sampling methods. On refusal of the windowless sampling, the boreholes were extended by continuous dynamic probing, to refusal. A summary of the investigation hole depths is tabulated below. Groundwater monitoring standpipes were installed in two boreholes' one above the gabion wall; and one at house level.

In addition, two infiltration permeability tests were carried out in the boreholes WS05 and WS06 to inform the drainage strategy for the site.

Table 1: Summary of Investigation holes.

Borehole	Location)	Depth (m.bgl)	Observations
WS01	Above Gabion	2.5m	WS to 2.0m; DP extended to 2.5m.
WS02	Above Gabion	2.1m	WS to 2.0m; DP extended to 2.1m. Standpipe installed.
WS03	Road/Front	3.5m	WS to 3.0m; DP extended to 3.5m.
WS04	Road/Front	3.5m	WS to 3.0m; DP extended to 3.5m.
WS05	Adj. Bungalow	1.6m	WS to 1.4m; DP extended to 1.6m.
WS06	Adj. Bungalow	1.8m	WS to 1.5m; DP extended to 1.8m. Standpipe installed.

All site operations, sampling and logging, including in-situ testing were undertaken in accordance with the relevant British Standards, namely: BS5930:2015 *Code of practice for ground investigation*; BS EN 1997-2:2007 *Eurocode 7. Geotechnical design. Ground investigation and testing*; BS1377-9:1999 *Method of test for soils for civil engineering purposes. In-situ testing*; BS EN ISO 14688-1:2018 *Geotechnical investigation and testing. Identification and classification of soil. Identification and description*; and BS EN ISO 14688-2:2018 *Geotechnical investigation and testing. Identification and classification of soil. Principles for a classification* and BS EN ISO 22476-2:2005+A1:2011 *Geotechnical investigation and testing. Field testing. Dynamic probing*.

The relative positions of the holes are shown on the site plan included in Appendix I. The engineering logs of the investigation holes are presented in Appendix II. The permeability test results are presented in Appendix III.

4.0 LABORATORY TESTING

4.1 General

The laboratory testing was scheduled by Quantum and comprised of geotechnical testing on selected soil samples obtained from the investigation to inform interpretation of the ground.

4.2 Geotechnical Laboratory Testing

All the geotechnical soil testing was carried out in accordance with the procedure stipulated in the various sections of BS 1377:1999 Parts 1 – 9 Methods of test for soils for civil engineering purposes. Table 2 details the tests undertaken.

Table 2: Summary of Scheduled Geotechnical Tests.

Type of Test	No. of Tests
Natural Moisture Content	9
Atterberg Limits.	9
PSD - Wet Sieve	9
PSD - Sedimentation	9
pH & Sulphate	6

A full set of geotechnical laboratory test certificates are provided within Appendix IV.

5.0 GROUND CONDITIONS

5.1 Summary of Strata Encountered

A detailed description of the strata encountered during the investigation is given in the Engineering Geologist's logs presented in Appendix II. Table 3 summarises the strata encountered in the investigation holes.

Table 3: Summary of strata encountered

Borehole	Depth (m.bgl)		Description
	From	To	
WS01 <i>Above Gabion</i>	GL	0.45	Made Ground: Silty slightly Sandy GRAVEL
	0.45	>2.0	Firm slightly gravelly & sandy CLAY <i>Slow groundwater ingress at 1.9m depth</i>
WS02 <i>Above Gabion</i>	GL	0.35	Made Ground: Sandy GRAVEL (Hardcore)
	0.35	0.7	Made Ground: Slightly sandy & gravelly CLAY
	0.7	1.8	Firm slightly gravelly & sandy CLAY
	1.8	>2.0	Medium dense clayey slightly sandy GRAVEL <i>Medium groundwater ingress at 1.7m depth</i>
WS03 <i>In Road</i>	GL	1.3	Made Ground: Slightly clayey, silty & sandy GRAVEL
	1.3	1.6	Soft organic SILT/CLAY
	1.6	2.3	Soft slightly gravelly & sandy CLAY
	2.3	>3.0	Soft to firm slightly sandy gravelly CLAY <i>No groundwater</i>
WS04 <i>In Road</i>	GL	1.5	Made Ground: Slightly clayey, silty & sandy GRAVEL
	1.5	2.2	Soft slightly sandy slightly organic SILT/CLAY
	2.2	>3.0	Soft to firm slightly sandy gravelly CLAY <i>No groundwater</i>
WS05 <i>Adj. House</i>	GL	0.35	Made Ground: clayey slightly sandy GRAVEL
	0.35	>1.4	Dense clayey slightly sandy GRAVEL <i>Slow groundwater ingress at 1.2m depth</i>
WS06 <i>Adj. House</i>	GL	0.3	Made Ground: clayey slightly sandy GRAVEL
	0.3	>1.5	Dense clayey slightly sandy GRAVEL <i>Slow groundwater ingress at 1.3m depth</i>

A schematic cross section has been constructed through the site and is presented in Appendix I.

In summary, this ground model shows beneath a mantle of mixed made ground over firm variably sandy and gravelly Clay at the upper level, north of the gabion wall (WS01/WS02).

The boreholes drilled adjacent to the house (WS05/WS06), at around existing house formation level, reveal a dense clayey and sandy Gravel.

The two boreholes drilled to the south on Ormes Road (WS03/WS04) revealed up to 1.5m of mixed poorly compacted Made Ground resting on a slightly organic soft Clay; perhaps the original ground level. This gave way to soft, becoming soft to firm, sandy gravelly Clay.

All the window sample boreholes terminated in firm/stiff or dense strata at their bases. The follow on dynamic probes all showed a rapidly increasing relative density, reaching refusal within 0.5m of the window sample borehole base. This is interpreted as the on-set of weathered bedrock.

The succession of strata in each trial hole beneath the re-worked stratum, where present, revealed a weathered profile of the underlying bedrock.

5.2 Groundwater Conditions

Groundwater strikes were recorded in four of the six window sample boreholes drilled.

The depths of water strikes were as follows:

Table 4: Summary of Groundwater Strikes

Borehole	Depth of GW Strike (m.bgl)
WS01	1.9
WS02	1.7
WS03	None
WS04	None
WS05	1.2
WS06	1.3

Simple standpipes were installed in WS02 and WS06 to measure the equilibrium groundwater level.

It should be noted that groundwater levels are subject to diurnal, seasonal and climatic conditions or may vary due to other causes.

5.3 Visual & Olfactory Evidence of Soil Contamination

There was no visual and / or olfactory evidence of any soil contamination during the investigation works.

5.4 Visual & Olfactory Evidence of Groundwater & Surface Water Contamination

There was no evidence of any groundwater contamination during the investigation works.

6.0 GEOTECHNICAL ENGINEERING APPRAISAL

6.1 General

The purpose of this Ground Investigation, and subsequent reporting, was to determine and assess the existing shallow ground conditions on site in preparation for the construction of new storage tanks.

The main aims of the geotechnical investigation are to provide an assessment of the ground conditions to inform design of the proposed works and determine chemical conditions in respect of below ground structures, confirm ground water levels within the working area and highlight any potential contamination issues revealed within the ground.

6.2 Engineering Properties of Strata

The engineering descriptions of the strata are presented on the exploratory hole logs in Appendix II.

A summary of the geotechnical testing classification testing results are summarised in the table below.

Table 5: Summary of Geotechnical Test Results

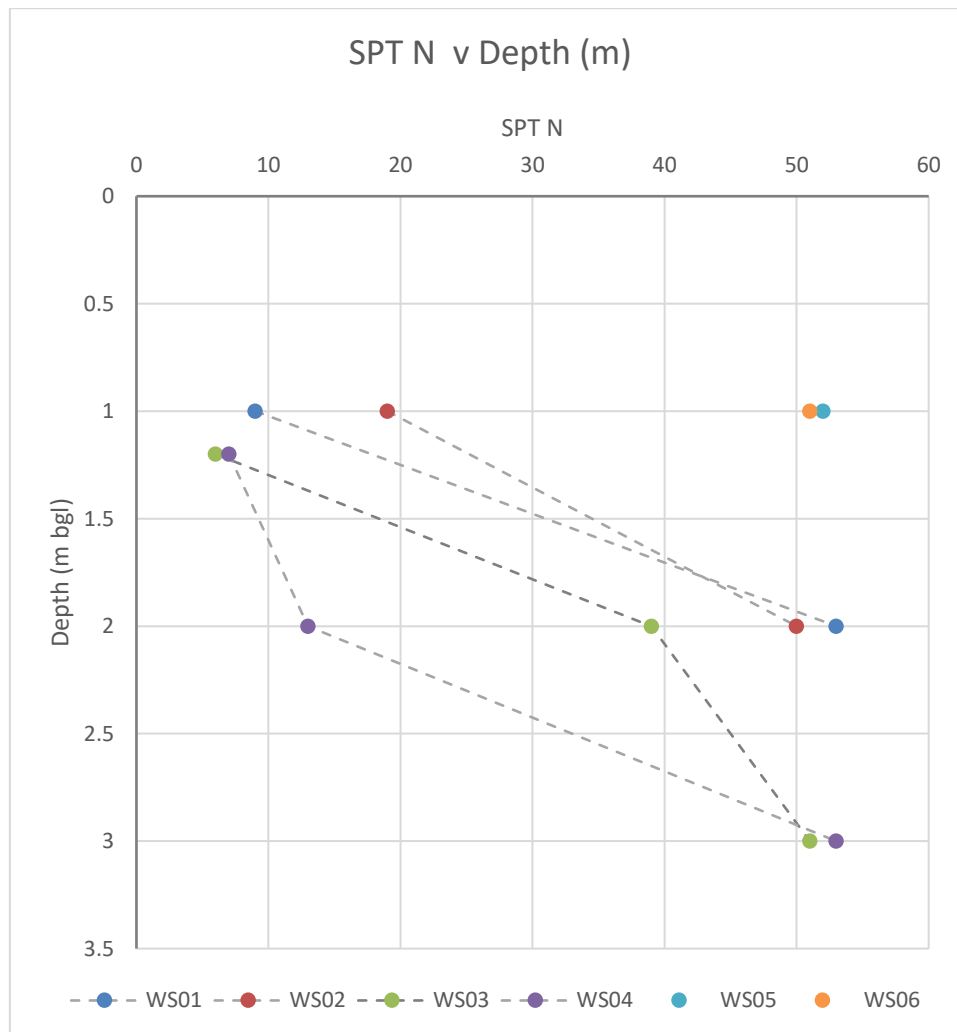
Hole	Depth (m)	Classification Tests							Particle Size Gradings				
		w	LL	PL	PI	<425 μ m	PI _{mod}	Plasticity	Cobbles	Gravel	Sand	Silt	Clay
		%	%	%	%	%	%		%	%	%	%	%
WS01	1.0	20	46	22	24	65	16	CI	0	25	19	21	35
WS02	0.7	27											
WS02	1.0	31	65	21	44	100	44	CH	0	0	1	4	95
WS02	1.3	20	52	23	29	72	21	CH	0	22	9	14	55
	2.0	10											
WS03	1.4	39											
	1.8	20											
	2.5	19	53	18	35	50	18	CH	0	32	26	14	28
WS04	0.5	12											
	1.8	25	46	19	27	87	23	CI					
	2.5	17	40	16	24	31	7	CI	0	53	23	6	18
WS05	0.5	25	51	20	31	48	15	CH	0	48	11	11	30
WS06	0.5	15	45	17	28	20	6	CI	0	72	11	4	13

Classification tests showed variable characteristics: A cohesive dominant soil was proved in WS01 & WS02 above the gabion wall, with a more mixed soil in WS05/WS06 at house level and in the ground to the south. The Modified Plasticity Index, allowing for the proportion of coarser material, ranged between 6% and 44%.

At this modified Plasticity Index these shallow soils are predominantly of *Medium* shrink/swell potential (in accordance with NHBC Standards), with one higher value in WS02 of 44%. The classification of CI and CH type soils is more akin to a completely weathered bedrock than typical clay soils in this area.

The results of the Particle Size Distribution curves (PSD) analysis undertaken confirm the range in soil types present.

The consistency and relative density of the soil profile was measured by undertaking Standard Penetration Tests in the window sample boreholes. A summary of the results is presented graphically below.



From these results, the overall average SPT N is 33, with a 25th percentile value of 12. Taking the mean value of all tests in natural soils where full penetration was achieved; the average N value is 36. Adopting the 25th percentile value as indicative of a characteristic value, the N_{char} is 17.

6.3 Foundations

Foundations for the new building on site should be set in the natural clayey slightly sandy Gravel proved at a depth of 0.35m in WS05. Foundations should be constructed at a level consistent with Building Regulations requirements and the maximum modified Plasticity Index recorded of 44%.

On the basis of the SPT testing undertaken, given the presence of relatively shallow groundwater, we would recommend an allowable bearing capacity of 85kN/m² at a depth below 0.5m in this stratum.

We would recommend that the new house foundations are set on a raft foundation to limit any differential settlements.

The existing bungalow showed evidence of differential settlement at the front (south) of the building,

suggesting a variation in founding strata across the footprint of the property. We would therefore recommend that any new foundations are set within uniform strata across the foundation. This may require excavation and replacement of unsuitable soils on the southern elevation, or possibly deepening or stepping of the foundation to suit.

6.4 Site Stability

The area of Ormes Road has an anecdotal history of generic instability.

The geological map extract presented in Section 2.2 does not detail any areas of made ground or landslip.

The BGS *GeoIndex* on-line resource shows recorded landslides along with areas of *made ground*, *landscaped ground* and *worked ground*. An extract from this is presented below for the Skewen area.

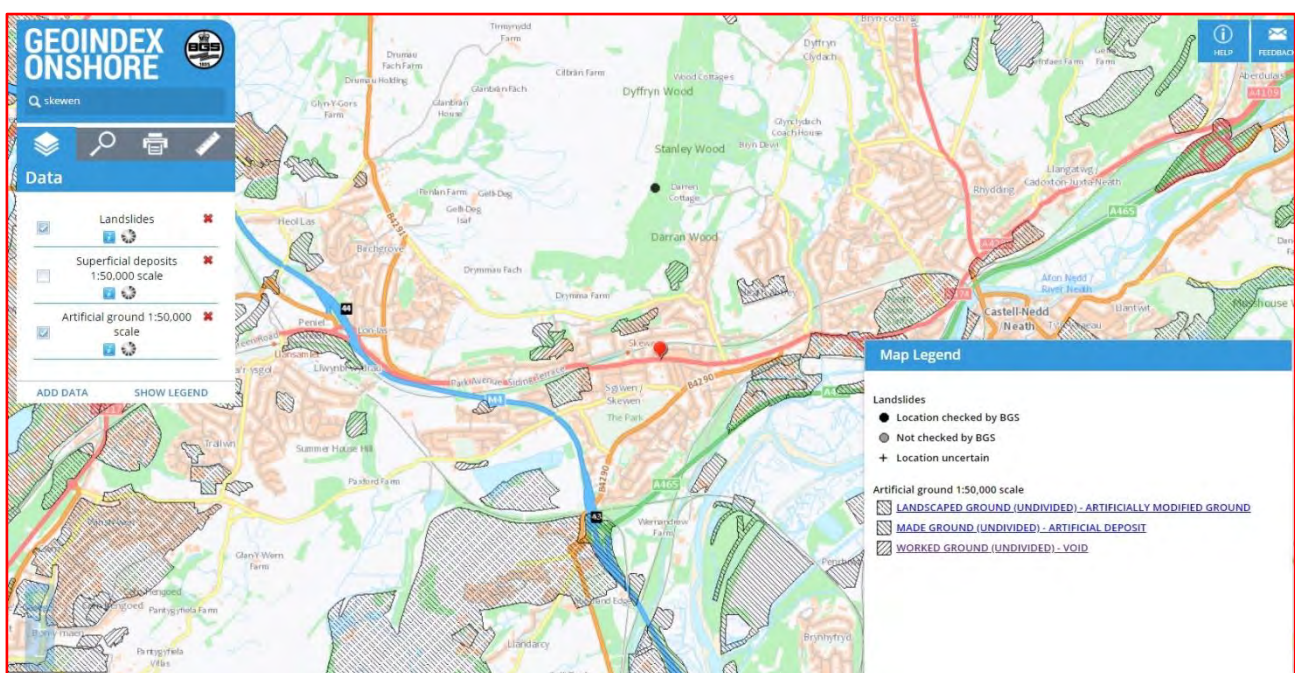


Figure 3: BGS GeoIndex Extract (British Geological Survey © NERC)

The only recorded landslip is to the north of the site. An area of *Made Ground* is mapped to the east of the site, interpreted to be associated with former coal mining activity.

The Institute of Geological Sciences South Wales Coalfield Landslip Survey (1980) mapped all landslips in the South Wales Coalfield area. No feature is noted in the Skewen area.

From the investigation work undertaken for this development site, undisturbed ground has been proved over the whole site, with the boreholes proving the on-set of bedrock at their bases.

Given the findings of the investigation and ground model concluded (Figure 2 Appendix I), the new development will be entirely within virgin ground, with the foundation footprint (and zone of influence of load) being within competent strata.

The investigation boreholes put down on the higher ground above the gabion wall forming part of the northern boundary of the site, indicate that this is founded on dense/firm ground. The material retained by the wall is essentially a firm, becoming firmer/denser with depth, variably sandy and gravelly Clay.

A properly designed retaining structure will be required immediately north of the new building. Typical characteristic parameters that could be used in the design of this, based on the ground investigation, are:

$$\phi' = 32^\circ$$

$$c' = 0 \text{ kN/m}^2$$

$$\gamma' = 19 \text{ kN/m}^3$$

Any drainage entering the site from the northern side as part of any temporary or permanent works must be trained in to formal drainage and not allowed to percolate to ground.

6.5 Earthworks

Site Preparation

Prior to commencing any earth / groundworks for any proposed works, any live services on and in the vicinity of the site, should be accurately located, protected and diverted, if required. Any ledges of hard rock, roots of trees or former services at the base of the proposed development area shall be excavated and replaced with general fill which shall be suitably compacted.

All topsoil shall be stripped. Where required for further use, stockpiled in an area provided by the contractor and agreed by the Engineer.

Any exposed formations should be protected from the effects of the weather, site traffic or water in order to prevent deterioration of this surface. It is recommended that any exposed formation be protected with a minimum thickness of 200mm of suitable granular material or a thin layer of building concrete, which should be placed immediately after excavation and exposure.

Cutting and Filling

Cutting and filling is not envisaged to be required for this development.

Excavation Plant

On the basis of the observations made during the investigation, it is considered that excavations within the natural soils will be possible with conventional excavation plant.

The excavatability of the strata below the depths of investigation cannot be commented on.

Control of Groundwater

Groundwater was encountered at 1.2m.bgl in WS05 adjacent to the existing house. Conventional foundation excavations should therefore not encounter significant groundwater inflows.

If deeper excavations that approach 1.2m, for whatever purpose, do encounter groundwater, then some instability may be encountered owing to the granular dominant nature of the soils encountered on this level of the site.

Sump pumping should be adequate for dewatering any excavations where groundwater seepage is encountered or where surface water ingress occurs. Care must be taken in any control of groundwater that a loss of fines from any formation is inhibited.

Any pumping out of groundwater from excavations should be properly trained to existing drains, assuming the appropriate permissions have been obtained.

Stability of Excavations

From observations made on site, it would be prudent to allow for temporary support or shoring of excavations which should be mandatory if manned entry is required. Given the presence of groundwater, temporary support of the excavations should be allowed for.

6.6 Concrete Classification

The Aggressive Chemical Environment for Concrete (ACEC) classification for the site has been assessed according to the guidelines within BRE Special Digest (2005). For classification purposes, based on the BRE guidance, the groundwater must be classed as 'mobile' unless proven to be 'static' over a 24hr period.

The pH values of the soil samples taken from across the site ranged between 6.1 and 6.8 whilst the levels of water-soluble sulphate (SO_4) content of the tested soil samples varied between 0.03g/l and 0.06g/l.

Based on the there being little re-worked soils on the development footprint site a *greenfield* situation is assumed with a mobile water table. The Design Sulphate (DS) class for the site is assessed as DS-1 with an ACEC classification as AC-1.

6.7 Infiltration Testing

Two borehole soakaway tests were undertaken as part of the ground investigation work in the two boreholes drilled adjacent and on the level of the existing bungalow. The test results are presented in Appendix III.

The tests did not result in a sufficient drop in water level to allow calculation of the infiltration rate by conventional methods. The infiltration rate was therefore calculated using the procedure within BS5930 for borehole permeability testing by the general approach. The permeability infiltration rates calculated were:

WS05: 8.8×10^{-8} m/sec

WS06: 1.1×10^{-8} m/sec

These indicate very poor drainage characteristics that would not lend themselves to soakaway drainage.

Given the history of the wider site area as discussed in Section 6.4. We would not recommend that soakaway drainage to the ground was utilised.

7 REFERENCES

British Geological Survey (BGS)

- British Geological Survey Sheet SS79NW 1:10,560 scale.
- BGS Geology of Britain Viewer/GeoIndex (www.bgs.ac.uk).
- IGS Special Surveys Division (1980), South Wales Landslip Survey, Report No. EG80/4.

Coal Authority

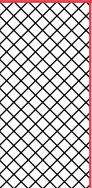
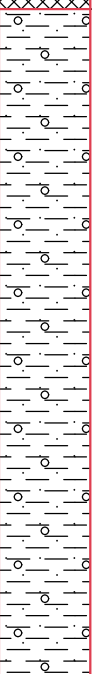
- Mining Report No. 51002233175001, January 2020

Specialist Publications

- BS 5930:2015 '*Code of Practice for Site Investigations*'
- BS 1377:1990 '*Methods of test for soils for civil engineering purposes*'.
- BS EN ISO 14688-1:2018 *Geotechnical investigation and testing. Identification and classification of soil. Identification and description.*
- BS EN ISO 14688-2:2018 *Geotechnical investigation and testing. Identification and classification of soil. Principles for a classification.*
- BS EN 1997-2:2007 *Eurocode 7. Geotechnical design. Ground investigation and testing*;
- *BS EN ISO 22476-2:2005+A1:2011 Geotechnical investigation and testing. Field testing. Dynamic probing.*
- Health and Safety Executive Guidance Note EH40/90
- BRE (2005) Special Digest 1:2005, 3rd Edition, *Concrete in aggressive ground.*
- BS 6031: 2009 *Code of Practice for Earthworks.*
- CIRIA Report 113 (1986) *Control of Groundwater for Temporary Works*
- Workmanship for excavation shall comply with BS 8000: 1989 Part 1, Sections 3.1, 3.2 and 3.3.
- Bentley and Carter (1991) *Correlations of Soil Properties.*

APPENDIX I – SITE PLANS

APPENDIX II – EXPLORATORY HOLE LOGS

Contract : 24 Ormes Road, Skewen Client : Jill Howells										Window Sample No. WS01	
Dates : 14/1/20 - 14/1/20 Location : Above Gabion baskets					Job Number : Q0177 Engineer :			Ground Level : Coordinates:			
Samples		Sample Run		Tests		STRATA					
Depth	Type No.	Diam. (mm)	Recovery (%)	Depth	SPT & Hand Vane Results	Depth (Thickness)	DESCRIPTION	Legend	Depth (Thickness)	Water	
0.20	D 1					(0.45)	MADE GROUND: Black silty slightly sandy GRAVEL. Gravel is angular to sub angular fine to coarse sandstone siltstone and tile, fine to medium coal and ash.		(0.45)		
		87	55			0.45	Firm mottled brownish orange grey slightly gravelly slightly sandy CLAY. Gravel is angular to sub angular fine to coarse siltstone.		0.45		
1.00 - 2.00	B 2			1.00	SPT (C) 9 (1-0-1-2-3-3)	(1.55)	with pockets of slightly sandy slightly gravelly Silt.		(1.55)		
		77	95								
2				2.00	SPT (C) 53 (7-9-12-13-14-14)	2.00	Sampling terminated on refusal of sampler and CPT. Continued with Dynamic probe.		2.00		
Equipment / plant used: Dart terrier rig Remarks: Available STATS checked and area CAT and genny scanned prior to excavation. On completion hole backfilled with bentonite pellets with arisings to surface as existing layer. Slow water ingress at 1.9mbgl											
		Plas Newydd, Llanedi, Pontarddulais, Swansea, SA4 0FQ Tel: 01554 744880 Fax: email: enquiries@quantumgeotech.co.uk				Operator: DS&ST		Logged By: A Jones		Sheet No. 1 Of 1	
						m Per Page 3.5		All measurements in metres unless otherwise stated			

Contract : 24 Ormes Road, Skewen

Client : Jill Howells

Borehole No.

WS01

Dates : 14/1/20 - 14/1/20

Job Number : Q0177

Ground Level :

Location : Above Gabion baskets

Engineer :

Coordinates:



Plas Newydd, Llanedi,
Pontarddulais, Swansea, SA4 0FQ
Tel: 01554 744880
Fax:
email: enquiries@quantumgeotech.co.uk

Operator:
DS&ST

Logged By:
A Jones

Sheet No.
1 Of 1

**m Per
Page**
2

All measurements in
metres unless
otherwise stated

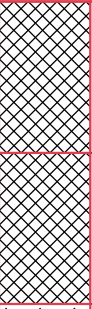
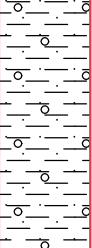
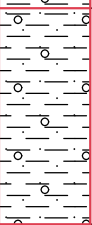


Contract : 24 Ormes Road, Skewen											Dynamic Probe WS01	
Client : Jill Howells												
Dates : 14/1/20 - 14/1/20					Job Number : Q0177					Ground Level :		
Location : Above Gabion baskets					Engineer :					Coordinates:		

Depth (m)	Reading (Blows / 100mm)					BLOW COUNT (N100 VALUES)										Torque (Nm)	Remarks
	1	2	3	4	5	5	10	15	20	25	30	35	40	45			
0.5																	
1.0																	
1.5																	
2.0	7																
		9															
			13														
				31													
2.5					50												
3.0																	
3.5																	
4.0																	
4.5																	
5.0																	
5.5																	
6.0																	
6.5																	
7.0																	
7.5																	
8.0																	
8.5																	
9.0																	
9.5																	

Equipment: Dart terrier rig					Comments: Continued from window sample refusal.				
Test carried out in accordance with BS 1377 (1990):Part 9, Sect.3.2									

	Plas Newydd, Llanedi, Pontarddulais, Swansea, SA4 0FQ Tel: 01554 744880 Fax: email: enquiries@quantumgeotech.co.uk	Operator:	Logged By:	Sheet No.	m Per Page	All measurements in metres unless otherwise stated	
		DS&ST	A Jones	1 Of 1	10		

Contract : 24 Ormes Road, Skewen Client : Jill Howells										Window Sample No. WS02	
Dates : 14/1/20 - 14/1/20 Location : Above Gabion baskets					Job Number : Q0177 Engineer :			Ground Level : Coordinates:			
Samples		Sample Run		Tests		STRATA					
Depth	Type No.	Diam. (mm)	Recovery (%)	Depth	SPT & Hand Vane Results	Depth (Thickness)	DESCRIPTION	Legend	Depth (Thickness)	Water	
1	0.30	D 1			SPT (C) 19 (3-3-4-5-5-5)	(0.35)	MADE GROUND: Grey slightly silty slightly sandy GRAVEL. Gravel is angular fine to coarse Limestone.		(0.35)		
						(0.35)	MADE GROUND: Soft to firm mottled brownish orange grey slightly gravelly slightly sandy re-worked CLAY. Gravel is angular to sub angular fine to coarse siltstone, siltstone and rare brick fragments with pockets of slightly sandy slightly gravelly Silt.		(0.35)		
	0.70	D 2	87	100		(0.70)	Firm mottled brownish orange grey slightly gravelly slightly sandy CLAY. Gravel is angular to sub angular fine to coarse siltstone and sandstone.		(0.60)		
	1.00 - 1.30	B 3				(0.60)					
	1.30 - 1.80	B 4				1.30	Pale brown slightly sandy gravelly CLAY. Gravel is angular to sub-angular fine to coarse siltstone and sandstone.		(0.50)		
2			77	100		(0.50)					
	2.00	D 5			SPT (C) 50/75mm (16-22-50---)	1.80 (0.20)	Pale brown clayey slightly sandy GRAVEL. Gravel is angular to sub angular fine to coarse siltstone and sandstone.		1.80 (0.20)		
						2.00	Sampling terminated on refusal of sampler and CPT. Continued with Dynamic probe.		2.00		
Equipment / plant used: Dart terrier rig Remarks: Available STATS checked and area CAT and genny scanned prior to excavation. On completion hole installed with water monitoring standpipe. Medium water ingress at 1.7mbgl											
		Plas Newydd, Llanedi, Pontarddulais, Swansea, SA4 0FQ Tel: 01554 744880 Fax: email: enquiries@quantumgeotech.co.uk				Operator: DS&ST		Logged By: A Jones		Sheet No. 1 Of 1	
						m Per Page 3.5		All measurements in metres unless otherwise stated			

Contract : 24 Ormes Road, Skewen

Client : Jill Howells

Borehole No.

WS02

Dates : 14/1/20 - 14/1/20

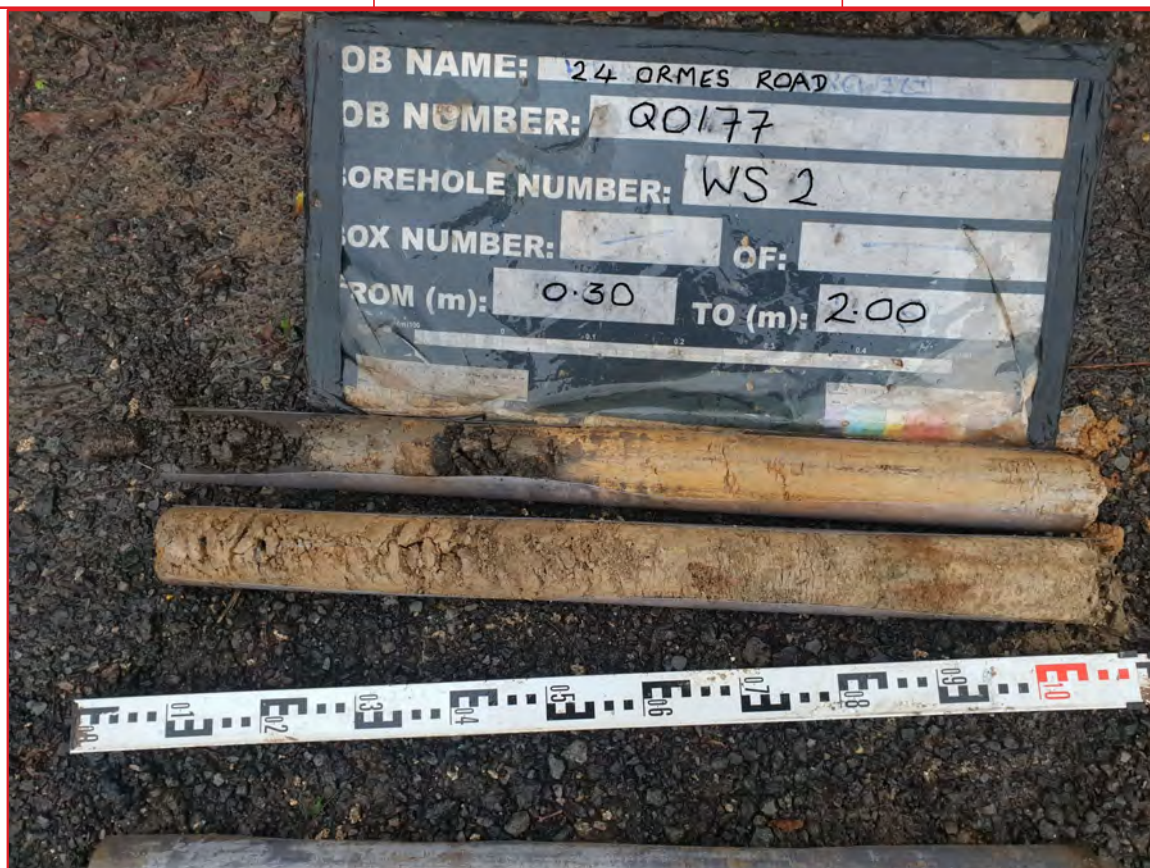
Job Number : Q0177

Ground Level :

Location : Above Gabion baskets

Engineer :

Coordinates:

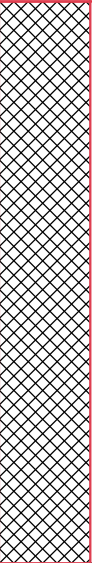
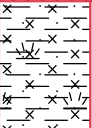
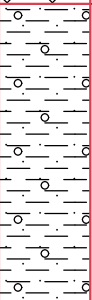
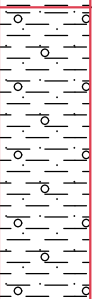


Contract : 24 Ormes Road, Skewen Client : Jill Howells											Dynamic Probe WS02	
Dates : 14/1/20 - 14/1/20 Location : Above Gabion baskets					Job Number : Q0177 Engineer :					Ground Level : Coordinates:		

Depth (m)	Reading (Blows / 100mm)					BLOW COUNT (N100 VALUES)										Torque (Nm)	Remarks
	1	2	3	4	5	5	10	15	20	25	30	35	40	45			
0.5																	
1.0																	
1.5																	
2.0	50																
2.5																	
3.0																	
3.5																	
4.0																	
4.5																	
5.0																	
5.5																	
6.0																	
6.5																	
7.0																	
7.5																	
8.0																	
8.5																	
9.0																	
9.5																	

Equipment: Dart terrier rig					Comments: Continued from window sample refusal.				
Test carried out in accordance with BS 1377 (1990):Part 9, Sect.3.2									

	Plas Newydd, Llanedi, Pontarddulais, Swansea, SA4 0FQ Tel: 01554 744880 Fax: email: enquiries@quantumgeotech.co.uk	Operator: DS&ST	Logged By: A Jones	Sheet No. 1 Of 1	m Per Page 10	All measurements in metres unless otherwise stated	
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Contract : 24 Ormes Road, Skewen Client : Jill Howells										Window Sample No. WS03	
Dates : 14/1/20 - 14/1/20 Location : Road Level					Job Number : Q0177 Engineer :			Ground Level : Coordinates:			
Samples		Sample Run		Tests		STRATA					
Depth	Type No.	Diam. (mm)	Recovery (%)	Depth	SPT & Hand Vane Results	Depth (Thickness)	DESCRIPTION	Legend	Depth (Thickness)	Water	
1	0.50 - 1.00	B 1			SPT (C) 6 (2-2-1-2-1-2)	(1.30)	MADE GROUND: Brown grey slightly clayey slightly silty slightly sandy GRAVEL with low cobble content of brick concrete and sandstone. Gravel is angular to sub angular fine to coarse sandstone, siltstone, brick and concrete.		(1.30)		
	1.40 - 1.60	D 2				1.30	Soft grey slightly sandy slightly organic SILT / CLAY.				1.30
	1.80 - 2.00	D 3	87	95			1.60		Soft mottled brownish orange grey slightly gravelly slightly sandy CLAY. Gravel is angular to sub angular fine to coarse siltstone and sandstone.		
2					SPT (C) 39 (4-5-8-8-11-12)	(0.70)			(0.70)		
	2.50 - 3.00	B 4	77	100			2.30	Soft to firm pale brown slightly sandy gravelly CLAY. Gravel is angular to sub-angular fine to coarse siltstone and sandstone.		2.30	
3					SPT (C) 51 (4-8-10-13-14-14)	3.00	Sampling terminated on refusal of sampler and CPT. Continued with Dynamic probe.		3.00		
Equipment / plant used: Dart terrier rig Remarks: Available STATS checked and area CAT and genny scanned prior to excavation. On completion hole backfilled with bentonite pellets with arisings to surface as existing layer. Water entering pit from surface, standing water level on completion = 2.2mbgl											
		Plas Newydd, Llanedi, Pontarddulais, Swansea, SA4 0FQ Tel: 01554 744880 Fax: email: enquiries@quantumgeotech.co.uk				Operator: DS&ST		Logged By: A Jones		Sheet No. 1 Of 1	
						m Per Page 3.5		All measurements in metres unless otherwise stated			

Contract : 24 Ormes Road, Skewen

Client : Jill Howells

Borehole No.

WS03

Dates : 14/1/20 - 14/1/20

Job Number : Q0177

Ground Level :

Location : Road Level

Engineer :

Coordinates:

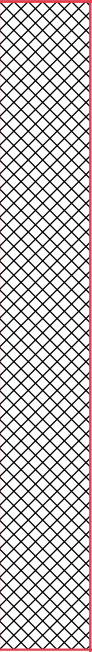
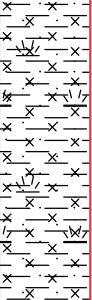
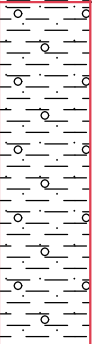


Contract : 24 Ormes Road, Skewen Client : Jill Howells											Dynamic Probe WS03	
Dates : 14/1/20 - 14/1/20 Location : Road Level					Job Number : Q0177 Engineer :					Ground Level : Coordinates:		

Depth (m)	Reading (Blows / 100mm)					BLOW COUNT (N100 VALUES)										Torque (Nm)	Remarks
	1	2	3	4	5	5	10	15	20	25	30	35	40	45			
0.5																	
1.0																	
1.5																	
2.0																	
2.5																	
3.0	13																
		18															
			19														
				25													
3.5					50												
4.0																	
4.5																	
5.0																	
5.5																	
6.0																	
6.5																	
7.0																	
7.5																	
8.0																	
8.5																	
9.0																	
9.5																	

Equipment: Dart terrier rig					Comments: Continued from window sample refusal.				
Test carried out in accordance with BS 1377 (1990):Part 9, Sect.3.2									

	Plas Newydd, Llanedi, Pontarddulais, Swansea, SA4 0FQ Tel: 01554 744880 Fax: email: enquiries@quantumgeotech.co.uk	Operator: DS&ST	Logged By: A Jones	Sheet No. 1 Of 1	m Per Page 10	All measurements in metres unless otherwise stated	

Contract : 24 Ormes Road, Skewen Client : Jill Howells										Window Sample No. WS04	
Dates : 14/1/20 - 14/1/20 Location : Road Level					Job Number : Q0177 Engineer :			Ground Level : Coordinates:			
Samples		Sample Run		Tests		STRATA					
Depth	Type No.	Diam. (mm)	Recovery (%)	Depth	SPT & Hand Vane Results	Depth (Thickness)	DESCRIPTION	Legend	Depth (Thickness)	Water	
1	0.50 - 1.00	B 1		1.20	SPT (C) 7 (1-0-1-2-2-2)	(1.50)	MADE GROUND: Brown grey slightly clayey slightly silty slightly sandy GRAVEL with low cobble content of brick concrete and sandstone. Gravel is angular to sub angular fine to coarse sandstone, siltstone, brick and concrete.		(1.50)		
2	1.80 - 2.00	D 2	87	100	SPT (C) 13 (3-5-2-3-4-4)	(0.70)	Soft grey slightly sandy slightly organic SILT / CLAY.		(0.70)		
3	2.50 - 3.00	B 3	77	70	SPT (C) 53 (7-9-14-14-12-13)	(0.80)	Soft to firm pale brown slightly sandy gravelly CLAY. Gravel is angular to sub-angular fine to coarse siltstone and sandstone.		(0.80)		
				3.00		3.00	Sampling terminated on refusal of sampler and CPT. Continued with Dynamic probe.		3.00		
Equipment / plant used: Dart terrier rig Remarks: Available STATS checked and area CAT and genny scanned prior to excavation. On completion hole backfilled with bentonite pellets with arisings to surface as existing layer. Water entering pit from surface, standing water level on completion = 2.5mbgl											
		Plas Newydd, Llanedi, Pontarddulais, Swansea, SA4 0FQ Tel: 01554 744880 Fax: email: enquiries@quantumgeotech.co.uk				Operator: DS&ST		Logged By: A Jones		Sheet No. 1 Of 1	
						m Per Page 3.5		All measurements in metres unless otherwise stated			

Contract : 24 Ormes Road, Skewen

Client : Jill Howells

Borehole No.

WS04

Dates : 14/1/20 - 14/1/20

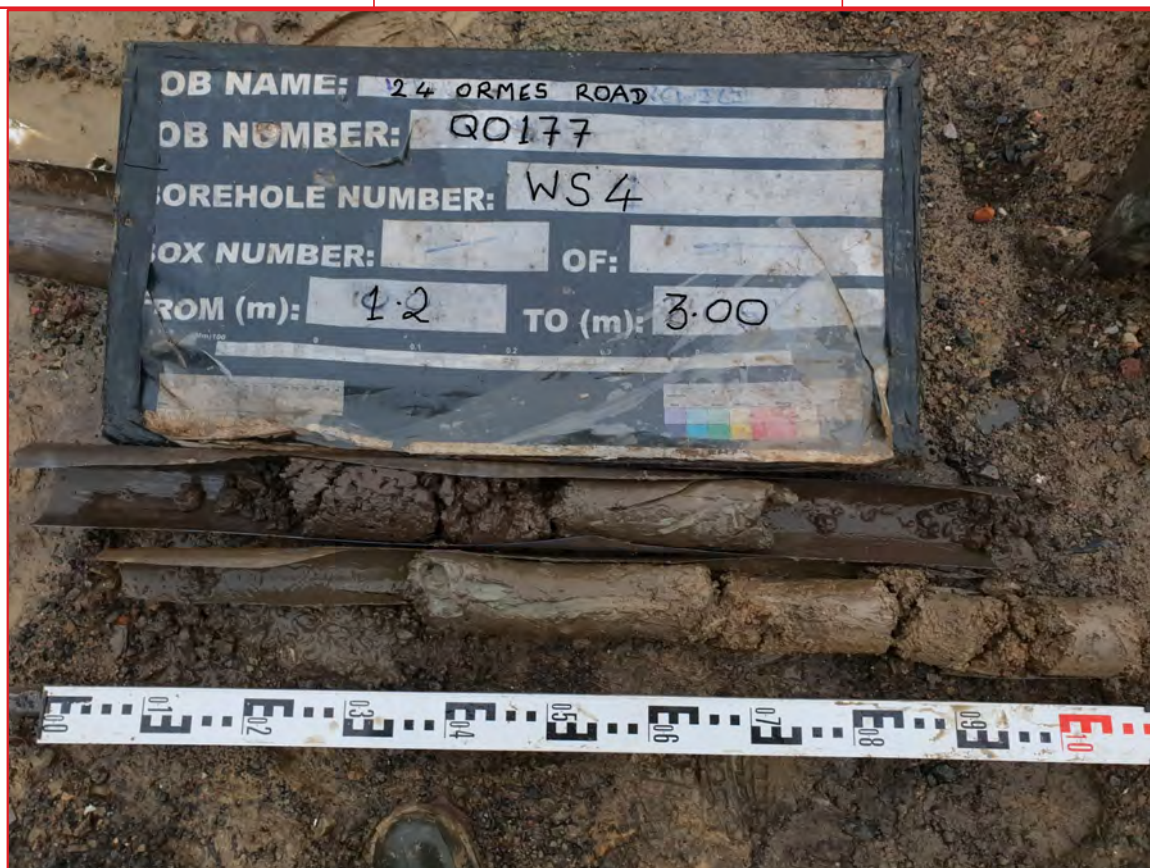
Job Number : Q0177

Ground Level :

Location : Road Level

Engineer :

Coordinates:



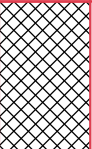
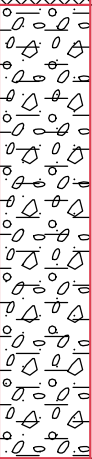
Contract : 24 Ormes Road, Skewen											Dynamic Probe WS04	
Client : Jill Howells												
Dates : 14/1/20 - 14/1/20					Job Number : Q0177					Ground Level :		
Location : Road Level					Engineer :					Coordinates:		

Depth (m)	Reading (Blows / 100mm)					BLOW COUNT (N100 VALUES)										Torque (Nm)	Remarks
	1	2	3	4	5	5	10	15	20	25	30	35	40	45			
0.5																	
1.0																	
1.5																	
2.0																	
2.5																	
3.0	16																
		19															
			25														
				32													
3.5					50												
4.0																	
4.5																	
5.0																	
5.5																	
6.0																	
6.5																	
7.0																	
7.5																	
8.0																	
8.5																	
9.0																	
9.5																	

Equipment: Dart terrier rig					Comments: Continued from window sample refusal.				
Test carried out in accordance with BS 1377 (1990):Part 9, Sect.3.2									

	Plas Newydd, Llanedi, Pontarddulais, Swansea, SA4 0FQ Tel: 01554 744880 Fax: email: enquiries@quantumgeotech.co.uk	Operator:	Logged By:	Sheet No.	m Per Page	All measurements in metres unless otherwise stated	
		DS&ST	A Jones	1 Of 1	10		

Contract : 24 Ormes Road, Skewen										Window Sample No.	
Client : Jill Howells										WS05	
Dates : 15/1/20 - 15/1/20					Job Number : Q0177			Ground Level :			
Location : Below Gabion baskets					Engineer :			Coordinates:			

	Samples		Sample Run		Tests		STRATA					Water
	Depth	Type No.	Diam. (mm)	Recovery (%)	Depth	SPT & Hand Vane Results	Depth (Thickness)	DESCRIPTION	Legend	Depth (Thickness)		
1	0.50 - 1.00	B 1				SPT (C) 52/225mm (10-15-15-17-20-)	(0.35)	MADE GROUND (Re-worked): Pale brown clayey slightly sandy GRAVEL with low cobble content of sandstone and rare brick. Gravel is angular to sub angular fine to coarse siltstone and sandstone.		(0.35)		
							0.35	Pale brown clayey slightly sandy GRAVEL. Gravel is angular to sub angular fine to coarse siltstone and sandstone.		0.35		
							(1.05)		(1.05)			
			87	0			1.40	Sampling terminated on refusal of sampler and CPT. Continued with Dynamic probe.		1.40		

Equipment / plant used: Orange wheeled rig

Remarks: Available STATS checked and area CAT and genny scanned prior to excavation. On completion hole backfilled with bentonite pellets with arisings to surface as existing layer.

Slow water ingress at 1.2mbgl

	Plas Newydd, Llanedi, Pontarddulais, Swansea, SA4 0FQ Tel: 01554 744880 Fax: email: enquiries@quantumgeotech.co.uk	Operator:	Logged By:	Sheet No.	m Per Page	All measurements in metres unless otherwise stated	
		DS&ST	A Jones	1 Of 1	3.5		

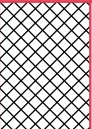
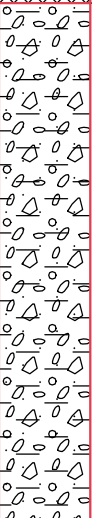
Contract : 24 Ormes Road, Skewen Client : Jill Howells											Dynamic Probe WS05	
Dates : 15/1/20 - 15/1/20 Location : Below Gabion baskets					Job Number : Q0177 Engineer :					Ground Level : Coordinates:		

Depth (m)	Reading (Blows / 100mm)					BLOW COUNT (N100 VALUES)										Torque (Nm)	Remarks
	1	2	3	4	5	5	10	15	20	25	30	35	40	45			
0.5																	
1.0																	
1.5	31																
		50															
2.0																	
2.5																	
3.0																	
3.5																	
4.0																	
4.5																	
5.0																	
5.5																	
6.0																	
6.5																	
7.0																	
7.5																	
8.0																	
8.5																	
9.0																	
9.5																	

Equipment: Orange wheeled rig					Comments: Continued from window sample refusal.				
Test carried out in accordance with BS 1377 (1990):Part 9, Sect.3.2									

	Plas Newydd, Llanedi, Pontarddulais, Swansea, SA4 0FQ Tel: 01554 744880 Fax: email: enquiries@quantumgeotech.co.uk	Operator: DS&ST	Logged By: A Jones	Sheet No. 1 Of 1	m Per Page 10	All measurements in metres unless otherwise stated	
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Contract : 24 Ormes Road, Skewen										Window Sample No.	
Client : Jill Howells										WS06	
Dates : 15/1/20 - 15/1/20					Job Number : Q0177			Ground Level :			
Location : Below Gabion baskets					Engineer :			Coordinates:			

	Samples		Sample Run		Tests		STRATA					Water
	Depth	Type No.	Diam. (mm)	Recovery (%)	Depth	SPT & Hand Vane Results	Depth (Thickness)	DESCRIPTION	Legend	Depth (Thickness)		
1	0.50 - 1.00	B 1			1.00	SPT (C) 51 (7-9-10-12-13-16)	(0.30)	MADE GROUND (Re-worked): Pale brown clayey slightly sandy GRAVEL with low cobble content of sandstone and rare brick. Gravel is angular to sub angular fine to coarse siltstone and sandstone.		(0.30)		
							0.30	Pale brown clayey slightly sandy GRAVEL. Gravel is angular to sub angular fine to coarse siltstone and sandstone.		0.30		
							(1.20)		(1.20)			
			87	0			1.50	Sampling terminated on refusal of sampler and CPT. Continued with Dynamic probe.		1.50		

Equipment / plant used: Orange wheeled rig

Remarks: Available STATS checked and area CAT and genny scanned prior to excavation. On completion hole installed with water monitoring standpipe.

Slow water ingress at 1.3mbgl

	Plas Newydd, Llanedi, Pontarddulais, Swansea, SA4 0FQ Tel: 01554 744880 Fax: email: enquiries@quantumgeotech.co.uk	Operator:	Logged By:	Sheet No.	m Per Page	All measurements in metres unless otherwise stated	
		DS&ST	A Jones	1 Of 1	3.5		

Library File: C:\USERS\ARWELJONES\QUANTUM\DESKTOP\QUANTUM 4.GLB. Form Name: WINDOW SAMPLE PREC2 WITH SPT. Version 1.10.100, 10/05/16 Output By: ArwelJones

Contract : 24 Ormes Road, Skewen											Dynamic Probe WS06	
Client : Jill Howells												
Dates : 15/1/20 - 15/1/20					Job Number : Q0177					Ground Level :		
Location : Below Gabion baskets					Engineer :					Coordinates:		

Depth (m)	Reading (Blows / 100mm)					BLOW COUNT (N100 VALUES)										Torque (Nm)	Remarks
	1	2	3	4	5	5	10	15	20	25	30	35	40	45			
0.5																	
1.0																	
1.5	11																
		27															
			50														
2.0																	
2.5																	
3.0																	
3.5																	
4.0																	
4.5																	
5.0																	
5.5																	
6.0																	
6.5																	
7.0																	
7.5																	
8.0																	
8.5																	
9.0																	
9.5																	

Equipment: Orange wheeled rig					Comments: Continued from window sample refusal.				
Test carried out in accordance with BS 1377 (1990):Part 9, Sect.3.2									

	Plas Newydd, Llanedi, Pontarddulais, Swansea, SA4 0FQ Tel: 01554 744880 Fax: email: enquiries@quantumgeotech.co.uk	Operator:	Logged By:	Sheet No.	m Per Page	All measurements in metres unless otherwise stated	
		DS&ST	A Jones	1 Of 1	10		

APPENDIX III – INFILTRATION TEST RESULTS

Test Location : WS6
Test No : 1
Date : 15/01/2020

Diagram illustrating the components of a borehole soakaway:

- GL**: Ground Level
- WL**: Water Level
- Depth to water**: Vertical distance from the ground level to the water level.
- Borehole depth**: Total vertical depth of the borehole.
- Effective depth**: Vertical depth of the water column, divided into:
 - 75% Effective Depth (top portion)
 - 25% Effective Depth (bottom portion)

Effective depth (Head of Water) = 0.70 m

$$\begin{aligned} \mathbf{v}_{p75-25} &= 0.00 \text{ m}^3 \\ \mathbf{a}_{p50} &= 0.14 \text{ m}^2 \\ \mathbf{t}_{p75-25} &= 0 \text{ min} \end{aligned}$$

Soil Infiltration rate, f = m/sec
Unable to determine

Sheet 1 of 2

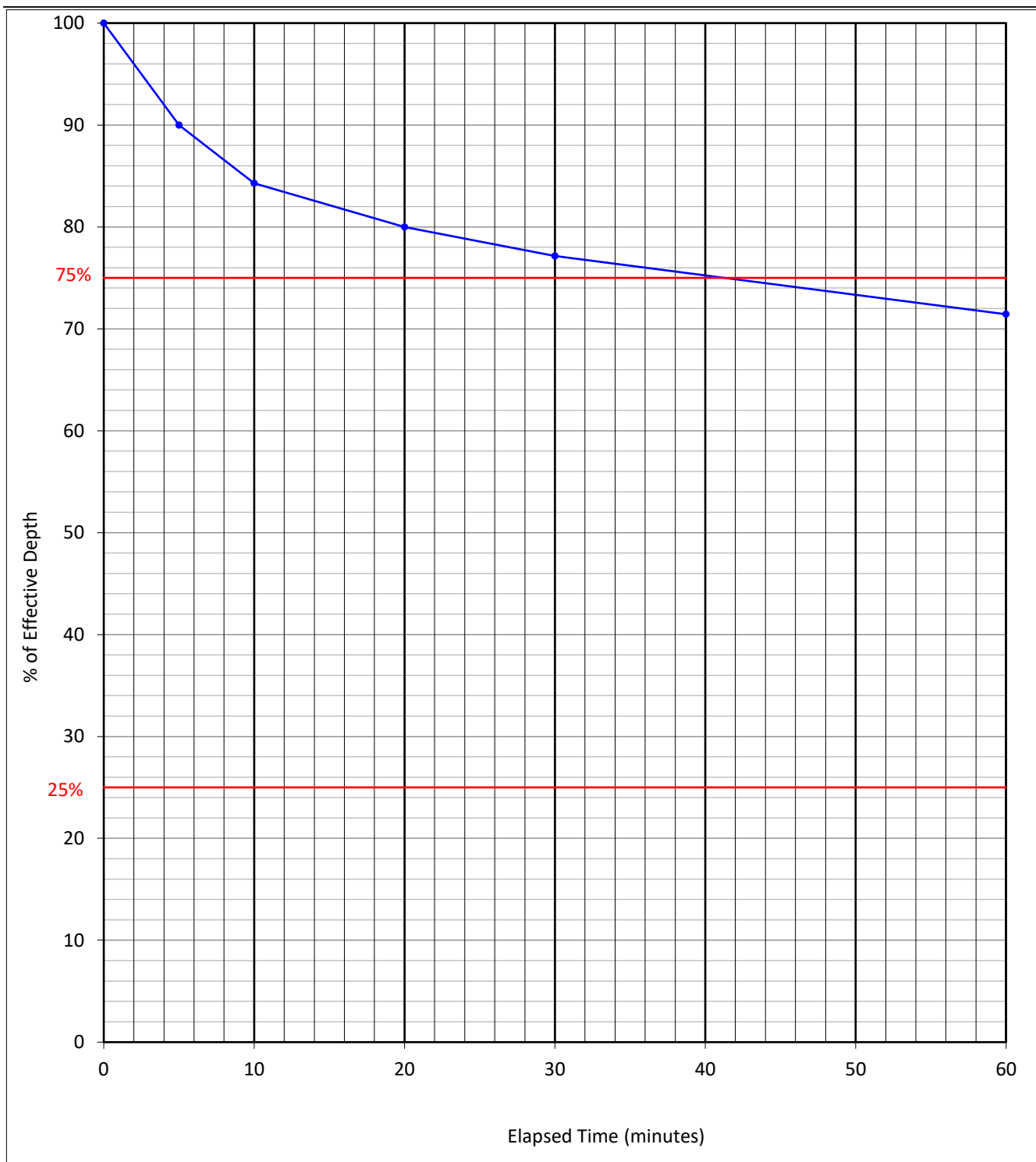
Remarks:



IN-SITU TESTING - Soakaway Test

Project: 24 Ormes Road
Project No: Q0177
Client: Jill Howells

Test Location : WS6
Test No : 1
Date : 15/01/2020



t_{p75} =	minutes
t_{p25} =	minutes

Sheet 2 of 2

Remarks:



Test Location : WS5
Test No : 1
Date : 15/01/2020

Diagram illustrating the components of a borehole soakaway:

- GL**: Ground Level
- WL**: Water Level
- Depth to water**: Vertical distance from the ground level to the water level.
- Borehole depth**: Total vertical depth of the borehole.
- Effective depth**: Vertical depth of the water column, divided into:
 - 75% Effective Depth (top portion)
 - 25% Effective Depth (bottom portion)

Effective depth (Head of Water) = 0.80 m

$$\begin{aligned} \mathbf{v}_{p75-25} &= 0.00 \text{ m}^3 \\ \mathbf{a}_{p50} &= 0.16 \text{ m}^2 \\ \mathbf{t}_{p75-25} &= 0 \text{ min} \end{aligned}$$

Soil Infiltration rate, f = m/sec
Unable to determine

Sheet 1 of 2

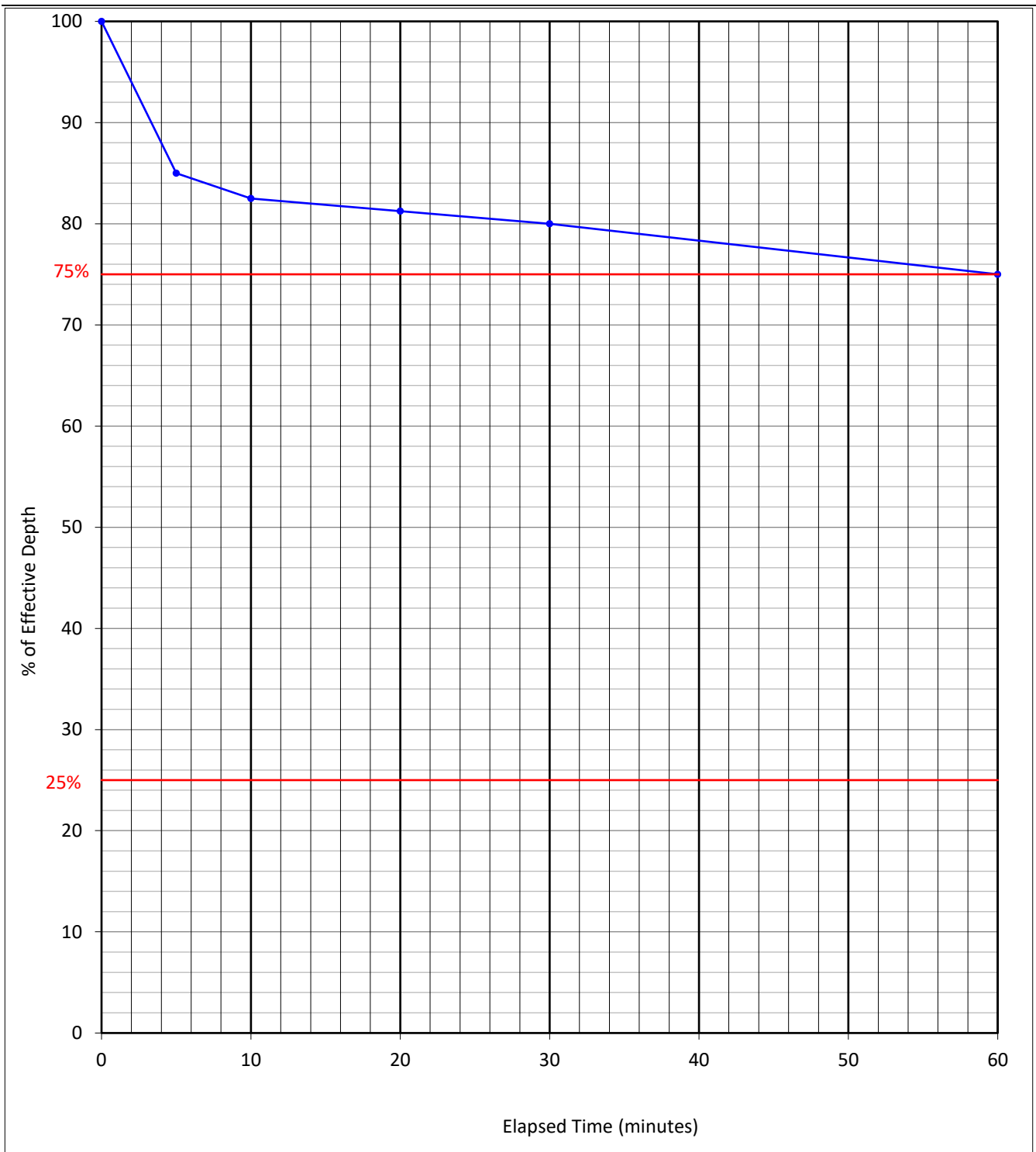
Remarks:



IN-SITU TESTING - Soakaway Test

Project: 24 Ormes Road
Project No: Q0177
Client: Jill Howells

Test Location : WS5
Test No : 1
Date : 15/01/2020



t_{p75} =	minutes
t_{p25} =	minutes

Sheet 2 of 2

Remarks:



APPENDIX IV – GEOTECHNICAL LABORATORY TEST RESULTS



Contract Number: 47604

Client Ref: **Q0177**

Report Date: **14-02-2020**

Client PO:

Client **Quantum Geotechnic Ltd**
Ty Berwig
Bynea
Llanelli.
Carmarthenshire.
SA14 9ST

Contract Title: **24 Ormes Road, Skewen**
For the attention of: **John Stark**

Date Received: **03-02-2020**

Date Completed: **14-02-2020**

Test Description	Qty
Moisture Content BS 1377:1990 - Part 2 : 3.2 - * UKAS	13
4 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.3 & 5.3 - * UKAS	8
PSD Wet Sieve method BS 1377:1990 - Part 2 : 9.2 - * UKAS	7
Water Soluble Sulphate 2:1 extract BS 1377:1990 - Part 3 : 5.3 - @ Non Accredited Test	5
pH value of soil BS 1377:1990 - Part 3 : 9.5 - @ Non Accredited Test	5
PSD: Sedimentation by pipette carried out with Wet Sieve (Wet Sieve must also be selected) BS 1377:1990 - Part 2 : 9.4 - * UKAS	7
Disposal of samples for job	1

Notes: Observations and Interpretations are outside the UKAS Accreditation
* - denotes test included in laboratory scope of accreditation
- denotes test carried out by approved contractor
@ - denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved Signatories:

Emma Sharp (Office Manager) - Paul Evans (Quality/Technical Manager) - Richard John (Advanced Testing Manager)
Sean Penn (Administrative/Accounts Assistant) - Shaun Jones (Laboratory manager) - Wayne Honey (Administrative/Quality Assistant)

Natural Moisture Content
(BS 1377:1990 - Part 2 : 3.2)

DESCRIPTIONS

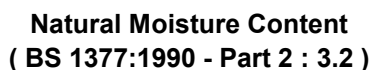
Contract Number	47604	
Site Name	24 Ormes Road, Skewen	
Date Tested	10/02/2020	

[illegible]

Operators	Checked	14/02/2020	Wayne Honey (Administrative/Quality Assistant)
Daniel Bassett	Approved	14/02/2020	Paul Evans (Quality/Technical Manager)



2788



Contract Number

47604

Site Name

24 Ormes Road, Skewen

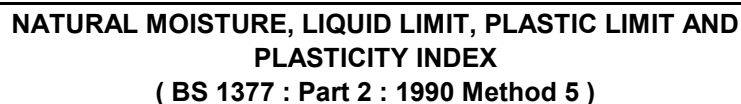
Date Tested

10/02/2020

Operators	Checked	14/02/2020	Wayne Honey (Administrative/Quality Assistant)
Daniel Bassett	Approved	14/02/2020	Paul Evans (Quality/Technical Manager)



2788



Contract Number

47604

Site Name

24 Ormes Road, Skewen

Date Tested

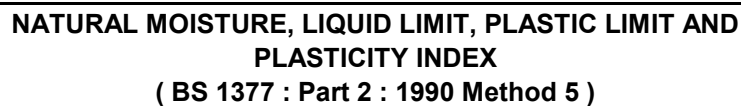
14/02/2020

DESCRIPTIONS

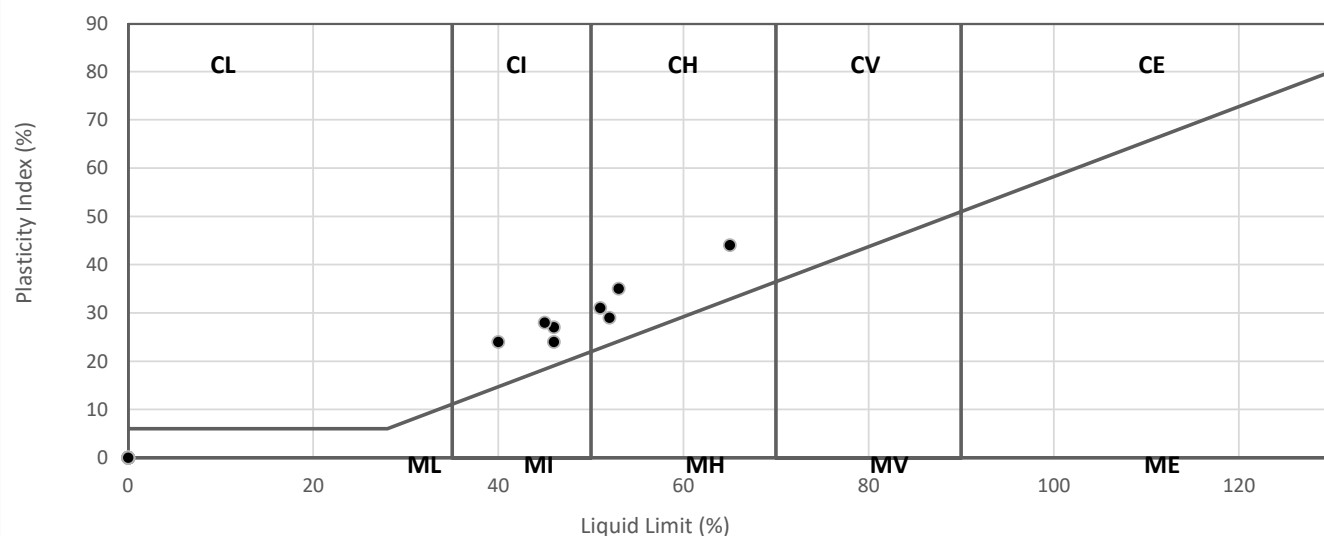
[illegible]

Operators	Checked	14/02/2020	Wayne Honey (Administrative/Quality Assistant)
** Please Select Operator **	Approved	14/02/2020	Paul Evans (Quality/Technical Manager)



[illegible]

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION
BS 5930:1999+A2:2010



Operators	Checked	14/02/2020	Wayne Honey (Administrative/Quality Assistant)
** Please Select Operator **	Approved	14/02/2020	Paul Evans (Quality/Technical Manager)

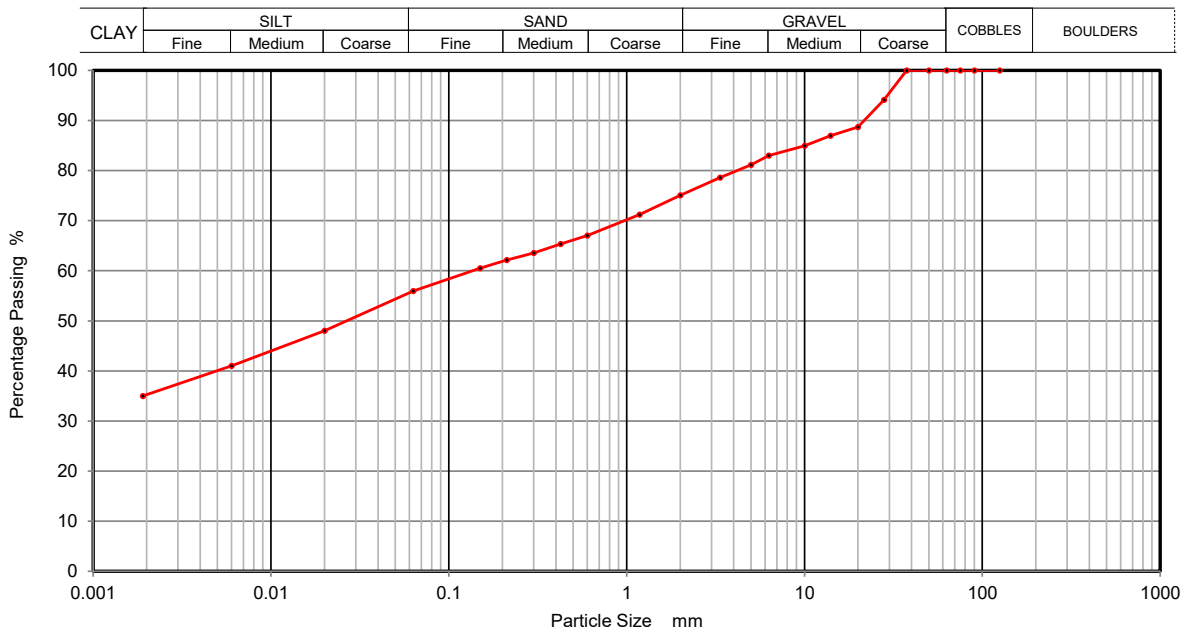




PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Contract Number	47604
Borehole/Pit No.	WS01
Sample No.	2
Depth Top	1.00
Depth Base	2.00
Sample Type	B

Site Name	24 Ormes Road, Skewen
Soil Description	Brown fine to coarse sandy silty fine to coarse gravelly CLAY
Date Tested	11/02/2020



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	48
90	100	0.0060	41
75	100	0.0020	35
63	100		
50	100		
37.5	100		
28	94		
20	89		
14	87		
10	85		
6.3	83		
5	81		
3.35	79		
2	75		
1.18	71		
0.6	67		
0.425	65		
0.3	64		
0.212	62		
0.15	61		
0.063	56		

Sample Proportions	% dry mass
Cobbles	0
Gravel	25
Sand	19
Silt	21
Clay	35

Remarks
 Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	13/02/2020	Wayne Honey	<i>W. Honey</i>
RO/MH	Approved	14/02/2020	Paul Evans	<i>P. Evans</i>

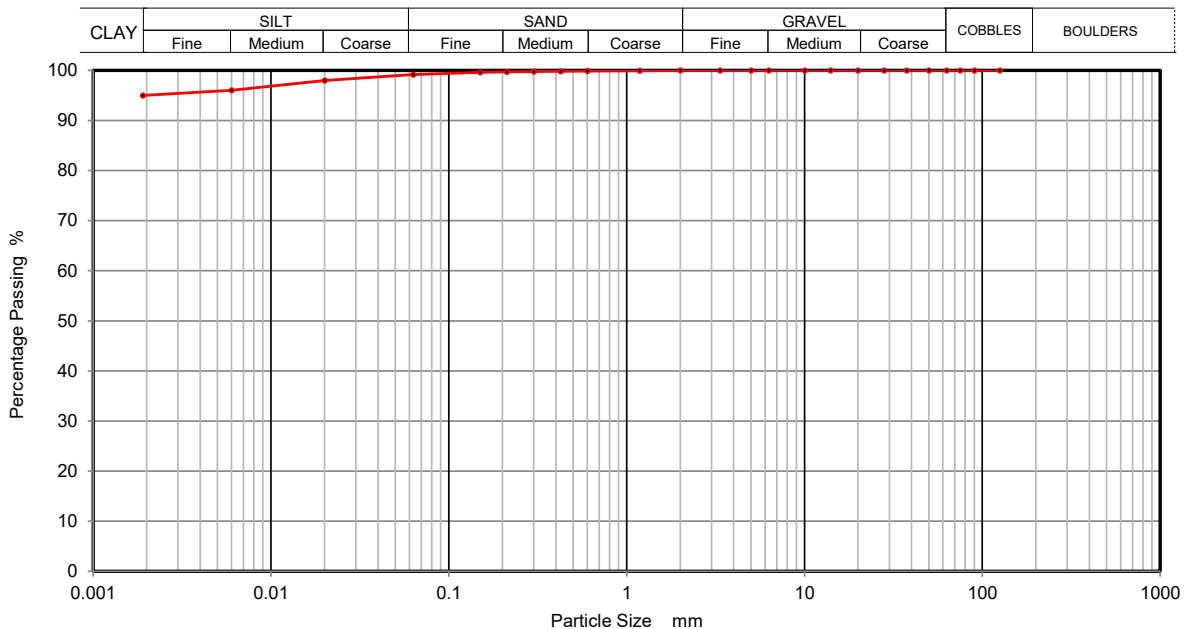




PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Contract Number	47604
Borehole/Pit No.	WS02
Sample No.	3
Depth Top	1.00
Depth Base	1.30
Sample Type	B

Site Name	24 Ormes Road, Skewen
Soil Description	Brownish grey slightly sandy slightly silty CLAY
Date Tested	11/02/2020



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	98
90	100	0.0060	96
75	100	0.0020	95
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	100		
0.212	100		
0.15	100		
0.063	99		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	1
Silt	4
Clay	95

Remarks
 Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	13/02/2020	Wayne Honey	<i>W. Honey</i>
RO/MH	Approved	14/02/2020	Paul Evans	<i>P. Evans</i>

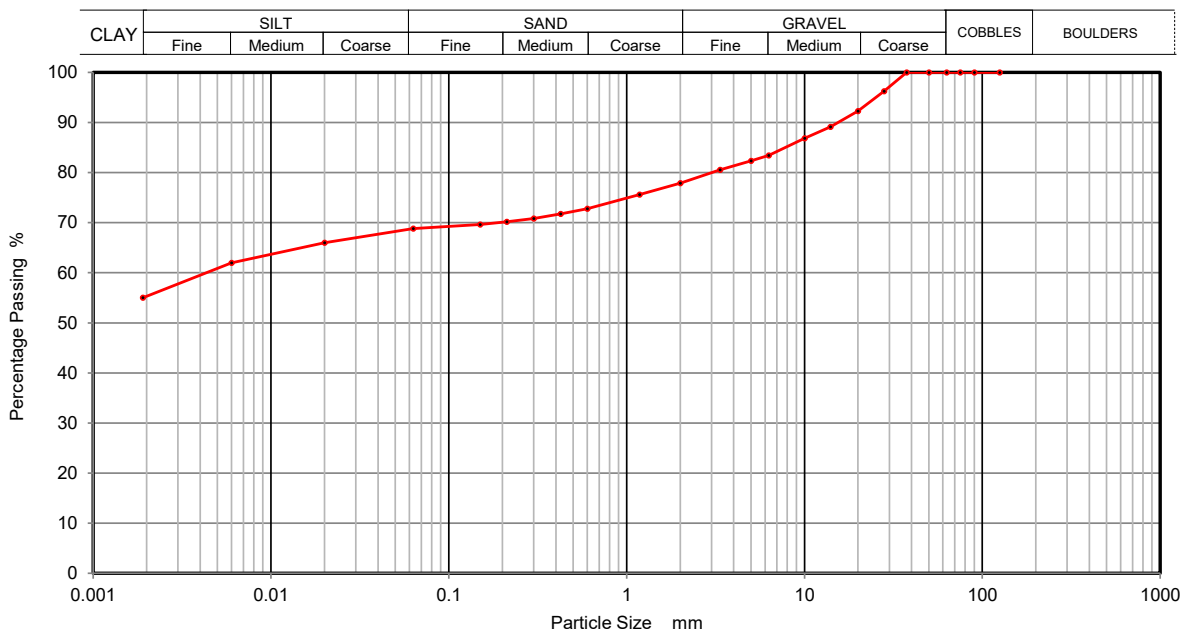




PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Contract Number	47604
Borehole/Pit No.	WS02
Sample No.	4
Depth Top	1.30
Depth Base	1.80
Sample Type	B

Site Name	24 Ormes Road, Skewen
Soil Description	Grey slightly fine to coarse sandy silty fine to coarse gravelly CLAY
Date Tested	11/02/2020



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	66
90	100	0.0060	62
75	100	0.0020	55
63	100		
50	100		
37.5	100		
28	96		
20	92		
14	89		
10	87		
6.3	83		
5	82		
3.35	81		
2	78		
1.18	76		
0.6	73		
0.425	72		
0.3	71		
0.212	70		
0.15	70		
0.063	69		

Sample Proportions	% dry mass
Cobbles	0
Gravel	22
Sand	9
Silt	14
Clay	55

Remarks
 Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	13/02/2020	Wayne Honey	<i>W. Honey</i>
RO/MH	Approved	14/02/2020	Paul Evans	<i>P. Evans</i>





PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Contract Number **47604**

Borehole/Pit No. **WS03**

Site Name **24 Ormes Road, Skewen**

Sample No. **4**

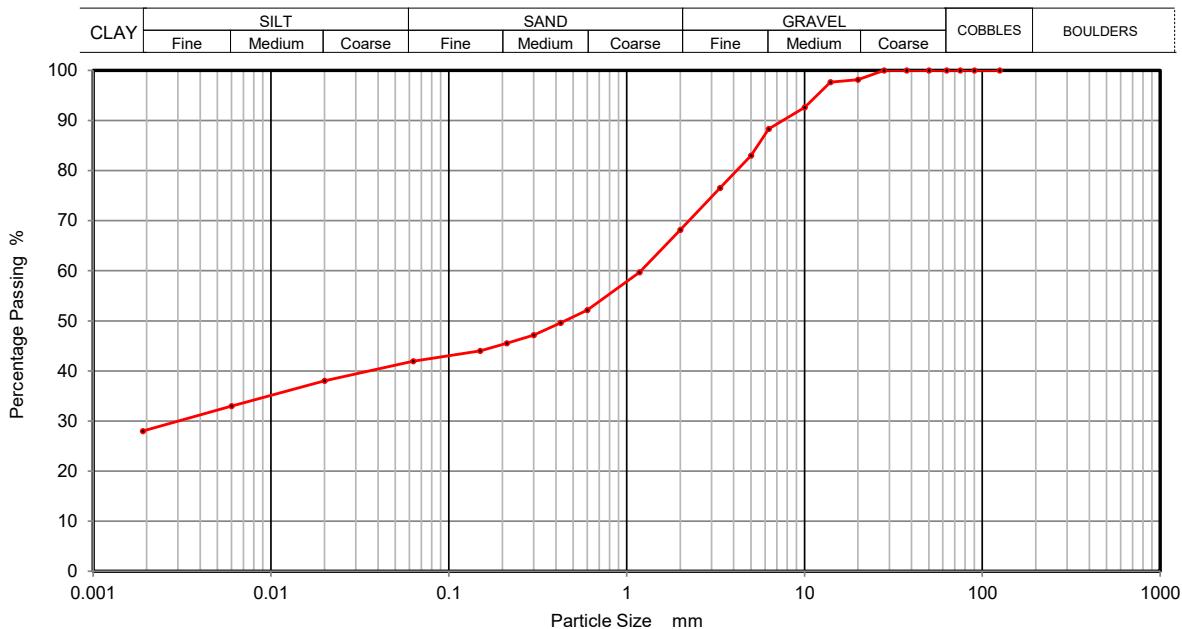
Soil Description **Grey silty fine to coarse sandy clayey fine to coarse GRAVEL**

Depth Top **2.50**

Depth Base **3.00**

Date Tested **11/02/2020**

Sample Type **B**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	38
90	100	0.0060	33
75	100	0.0020	28
63	100		
50	100		
37.5	100		
28	100		
20	98		
14	98		
10	93		
6.3	88		
5	83		
3.35	77		
2	68		
1.18	60		
0.6	52		
0.425	50		
0.3	47		
0.212	46		
0.15	44		
0.063	42		

Sample Proportions	% dry mass
Cobbles	0
Gravel	32
Sand	26
Silt	14
Clay	28

Remarks
 Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	13/02/2020	Wayne Honey	<i>W. Honey</i>
RO/MH	Approved	14/02/2020	Paul Evans	<i>P. Evans</i>



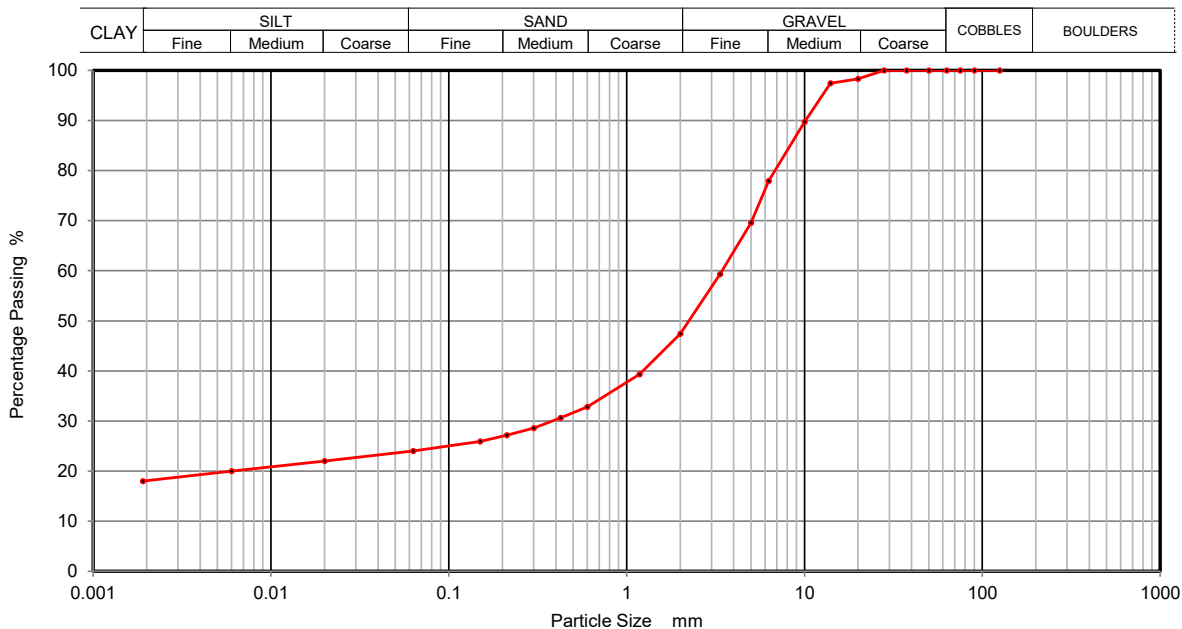
2788



PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Contract Number	47604
Borehole/Pit No.	WS04
Sample No.	3
Depth Top	2.50
Depth Base	3.00
Sample Type	B

Site Name	24 Ormes Road, Skewen
Soil Description	Grey slightly silty clayey fine to coarse sandy fine to coarse GRAVEL
Date Tested	11/02/2020



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	22
90	100	0.0060	20
75	100	0.0020	18
63	100		
50	100		
37.5	100		
28	100		
20	98		
14	97		
10	90		
6.3	78		
5	70		
3.35	59		
2	47		
1.18	39		
0.6	33		
0.425	31		
0.3	29		
0.212	27		
0.15	26		
0.063	24		

Sample Proportions	% dry mass
Cobbles	0
Gravel	53
Sand	23
Silt	6
Clay	18

Remarks
 Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	13/02/2020	Wayne Honey	<i>W. Honey</i>
RO/MH	Approved	14/02/2020	Paul Evans	<i>P. Evans</i>

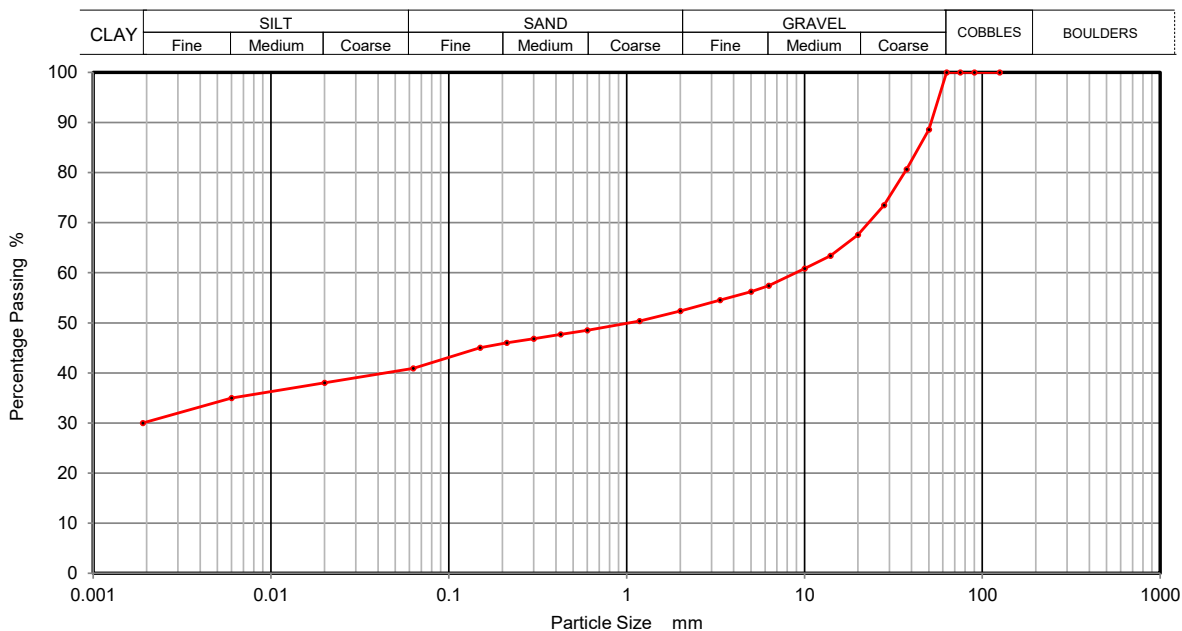




PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Contract Number	47604
Borehole/Pit No.	WS05
Sample No.	1
Depth Top	0.50
Depth Base	1.00
Sample Type	B

Site Name	24 Ormes Road, Skewen
Soil Description	Brown fine to coarse sandy silty clayey fine to coarse GRAVEL
Date Tested	11/02/2020



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	38
90	100	0.0060	35
75	100	0.0020	30
63	100		
50	89		
37.5	81		
28	73		
20	68		
14	63		
10	61		
6.3	57		
5	56		
3.35	55		
2	52		
1.18	50		
0.6	48		
0.425	48		
0.3	47		
0.212	46		
0.15	45		
0.063	41		

Sample Proportions	% dry mass
Cobbles	0
Gravel	48
Sand	11
Silt	11
Clay	30

Remarks
 Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	13/02/2020	Wayne Honey	<i>W. Honey</i>
RO/MH	Approved	14/02/2020	Paul Evans	<i>P. Evans</i>

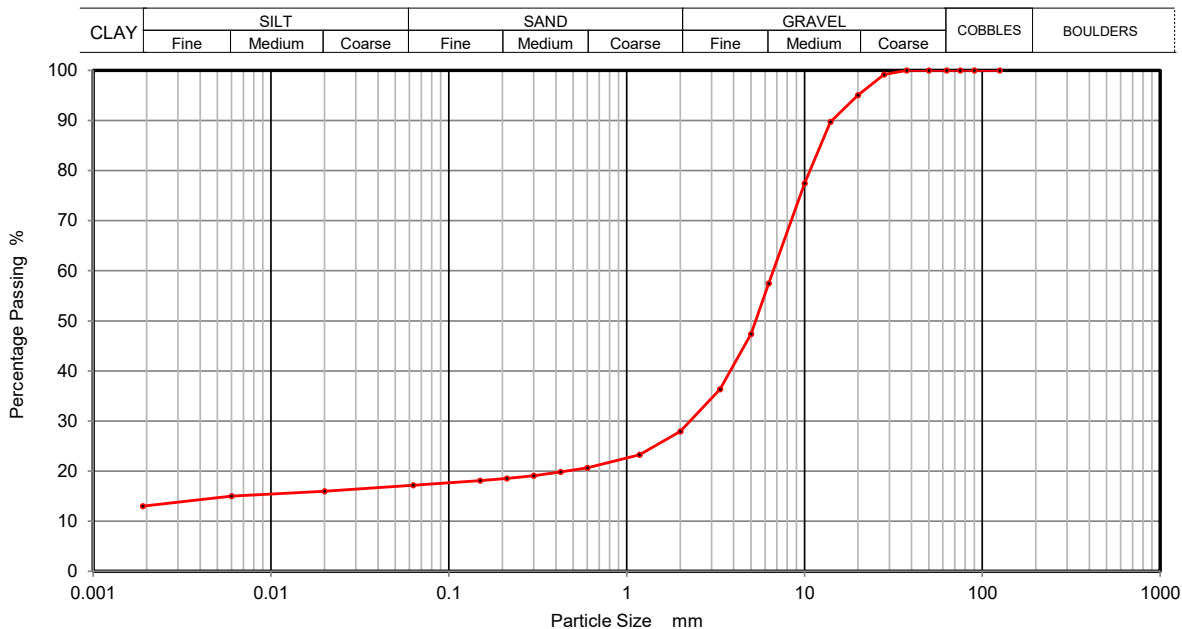




PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Contract Number	47604
Borehole/Pit No.	WS06
Sample No.	1
Depth Top	0.50
Depth Base	1.00
Sample Type	B

Site Name	24 Ormes Road, Skewen
Soil Description	Grey slightly silty fine to coarse sandy clayey fine to coarse GRAVEL
Date Tested	11/02/2020



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	16
90	100	0.0060	15
75	100	0.0020	13
63	100		
50	100		
37.5	100		
28	99		
20	95		
14	90		
10	77		
6.3	57		
5	47		
3.35	36		
2	28		
1.18	23		
0.6	21		
0.425	20		
0.3	19		
0.212	19		
0.15	18		
0.063	17		

Sample Proportions	% dry mass
Cobbles	0
Gravel	72
Sand	11
Silt	4
Clay	13

Remarks
 Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	13/02/2020	Wayne Honey	<i>W. Honey</i>
RO/MH	Approved	14/02/2020	Paul Evans	<i>P. Evans</i>



APPENDIX V – COAL AUTHORITY MINING REPORT



The Coal
Authority

CON29M

coal mining report

24 ORMES ROAD, SKEWEN, NEATH PORT TALBOT, SA10 6SY



Known or potential coal mining risks

Past underground coal mining	Page 3
Future underground coal mining	Page 3



Further action

No further reports from the Coal Authority are required. Further information on any next steps can be found in our Professional opinion.

For more information on our reports please visit
www.groundstability.com



Professional opinion

According to the official mining information records held by the Coal Authority at the time of this search, evidence of, or the potential for, coal mining related features have been identified. It is unlikely that these features will impact on the stability of the enquiry boundary.

Your reference: **Q0177**
Our reference: **51002233175001**
Date: **6 January 2020**

Client name:
Quantum Geotechnical

If you require any further assistance please
contact our experts on:
0345 762 6848
groundstability@coal.gov.uk

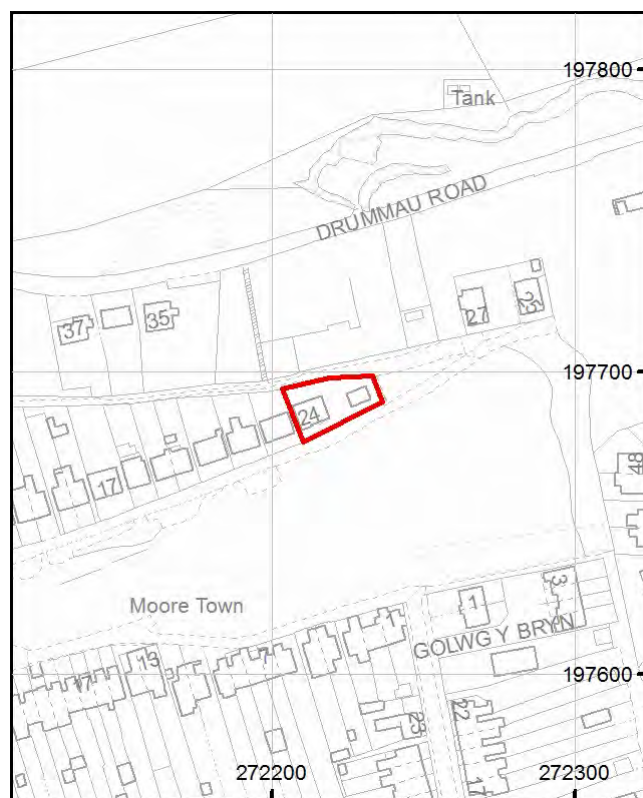


The Law
Society

Enquiry boundary

Key

Approximate position of enquiry boundary shown



We can confirm that the location is
on the coalfield



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This report is prepared in accordance with the latest Law Society's Guidance Notes 2018, the User Guide 2018 and the Coal Authority's Terms and Conditions applicable at the time the report was produced.



Accessibility

If you would like this information in an alternative format, please contact our communications team on 0345 762 6848 or email communications@coal.gov.uk.



What if this information changes?

If this report is for a residential property, insurance is included to cover any loss in property value caused by any changes in the information contained in this report. Please see the attached certificate of insurance for the terms and conditions of this insurance. The insurance does not cover non-residential property or further action reports.

Your reference: **Q0177**
Our reference: **51002233175001**
Date: **6 January 2020**

Client name:
Quantum Geotechnical

If you require any further assistance please
contact our experts on:
0345 762 6848
groundstability@coal.gov.uk

Detailed findings

Information provided by the Coal Authority in this report is compiled in response to the Law Society's CON29M Coal Mining enquiries. The said enquiries are protected by copyright owned by the Law Society of 113 Chancery Lane, London WC2A 1PL.

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1 Past underground coal mining

The property is in a surface area that could be affected by underground mining in 1 seam of coal at 230m to 240m depth, and last worked in 1910.

Any movement in the ground due to coal mining activity associated with these workings should have stopped by now.

2 Present underground coal mining

The property is not within a surface area that could be affected by present underground mining.

3 Future underground coal mining

The property is not in an area where the Coal Authority has received an application for, and is currently considering whether to grant a licence to remove or work coal by underground methods.

The property is not in an area where a licence has been granted to remove or otherwise work coal using underground methods.

The property is not in an area likely to be affected from any planned future underground coal mining.

However, reserves of coal exist in the local area which could be worked at some time in the future.

No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

4 Mine entries

There are no recorded coal mine entries known to the Coal Authority within, or within 20 metres, of the boundary of the property.

5 Coal mining geology

The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining.

6 Past opencast coal mining

The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.

7 Present opencast coal mining

The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

8 Future opencast coal mining

There are no licence requests outstanding to remove coal by opencast methods within 800 metres of the boundary.

The property is not within 800 metres of the boundary of an opencast site for which a licence to remove coal by opencast methods has been granted.

9 Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

10 Mine gas

The Coal Authority has no record of a mine gas emission requiring action.

11 Hazards related to coal mining

The property has not been subject to remedial works, by or on behalf of the Coal Authority, under its Emergency Surface Hazard Call Out procedures.

Statutory cover



Coal mining subsidence

In the unlikely event of any coal mining related subsidence damage, the Coal Authority or the mine operator has a duty to take remedial action in respect of subsidence caused by the withdrawal of support from land or property in connection with lawful coal mining operations.

When the works are the responsibility of the Coal Authority, our dedicated public safety and subsidence team will manage the claim. The house or land owner ("the owner") is covered for these works under the terms of the Coal Mining Subsidence Act 1991 (as amended by the Coal Industry Act 1994). Please note, this Act does not apply where coal was worked or gotten by virtue of the grant of a gale in the Forest of Dean, or any other part of the Hundred of St. Briavels in the county of Gloucester.

If you believe your land or property is suffering from coal mining subsidence damage and you need more information on what to do next, please use the following link to our website which sets out what your rights are and what you need to consider before making a claim.

www.gov.uk/government/publications/coal-mining-subsidence-damage-notice-form



Coal mining hazards

Our public safety and subsidence team provide a 24 hour a day, 7 days a week hazard reporting service, to help protect the public from hazards caused by past coal workings, such as a mine shaft or shallow working collapse. To report any hazards please call **01623 646 333**. Further information can be found on our website: www.gov.uk/coalauthority.



On behalf of the insurer

Coal Mining Report Insurance Policy Schedule

Policy number: 27337482

The insurer: Liberty Legal Indemnities – underwritten by Liberty Mutual Insurance Europe SE

Binding Authority contract number: RNMFP1903841

Property: 24 ORMES ROAD, SKEWEN, NEATH PORT TALBOT, SA10 6SY

Report reference number: 51002233175001

Limit of cover: £50,000.00

Dated: 6 January 2020

This policy and schedule shall be read together and any word or expression to which a specific meaning has been attached in either shall bear such meaning wherever it may appear.

Where a Coal Mining Report has been obtained in connection with a sale of the property, cover is provided for the benefit of a purchaser and their lender; in the case of a re-mortgage or where the existing owner chooses to obtain a Coal Mining Report, cover is provided for the benefit of the owner and their lender.

The policy offers protection against loss sustained by the owner of the property if any new problems or adverse entries are revealed in a subsequent Coal Mining Report which were not revealed by the original report to which the policy was attached.

The insured shall at all times comply with the requirements of the Conditions of this Policy.

Coal Mining Report Terms and Conditions can be viewed online at this link:

<https://www.groundstability.com/insurance/terms/20190404/terms.html>

Glossary



Key terms

adit - horizontal or sloped entrance to a mine

coal mining subsidence - ground movement caused by the removal of coal by underground mining

Coal Mining Subsidence Act 1991 - the Act setting out the duties of the Coal Authority to repair damage caused by coal mining subsidence

coal mining subsidence damage - damage to land, buildings or structures caused by the removal of coal by underground mining

coal seams - bed of coal of varying thickness

future opencast coal mining - a licence granted, or licence application received, by the Coal Authority to excavate coal from the surface

future underground coal mining - a licence granted, or licence application received, by the Coal Authority to excavate coal underground. Although it is unlikely, remaining coal reserves could create a possibility for future mining, which would be licensed by the Coal Authority

mine entries - collective name for shafts and adits

payments to owners of former copyhold land - historically, copyhold land gave rights to coal to the copyholder. Legislation was set up to allow others to work this coal, but they had to issue a notice and pay compensation if a copyholder came forward

shaft - vertical entry into a mine

site investigation - investigations of coal mining risks carried out with the Coal Authority's permission

stop notice - a delay to repairs because further coal mining subsidence damage may occur and it would be unwise to carry out permanent repairs

subsidence claim - a formal notice of subsidence damage to the Coal Authority since it was established on 31 October 1994

withdrawal of support - a historic notice informing landowners that the coal beneath their property was going to be worked

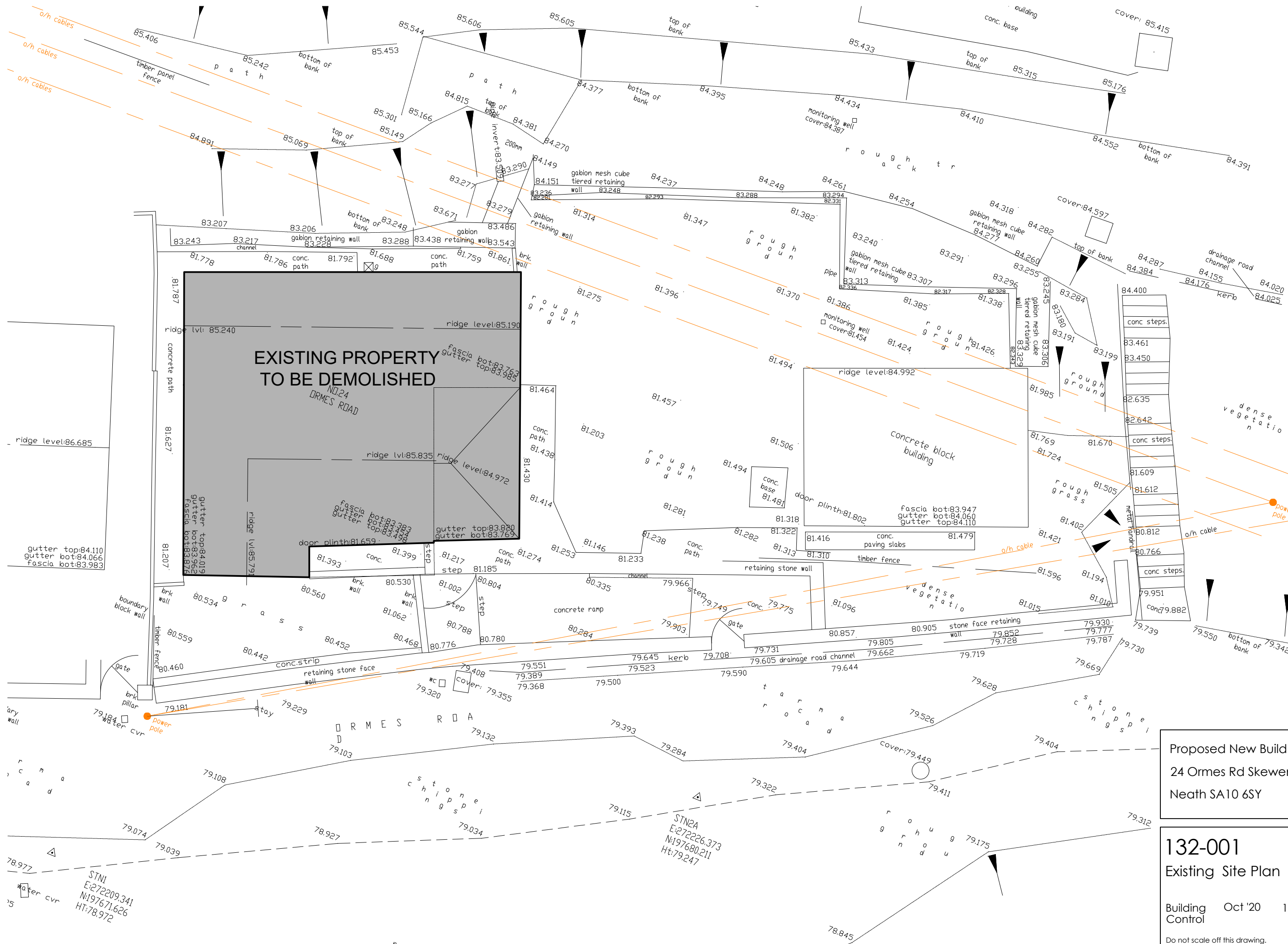
working facilities orders - a court order which gave permission, restricted or prevented coal mine workings

APPENDIX 3

Proposed New Build

24 Ormes Rd Skewen, Neath SA10 6SY

Technical Drawing

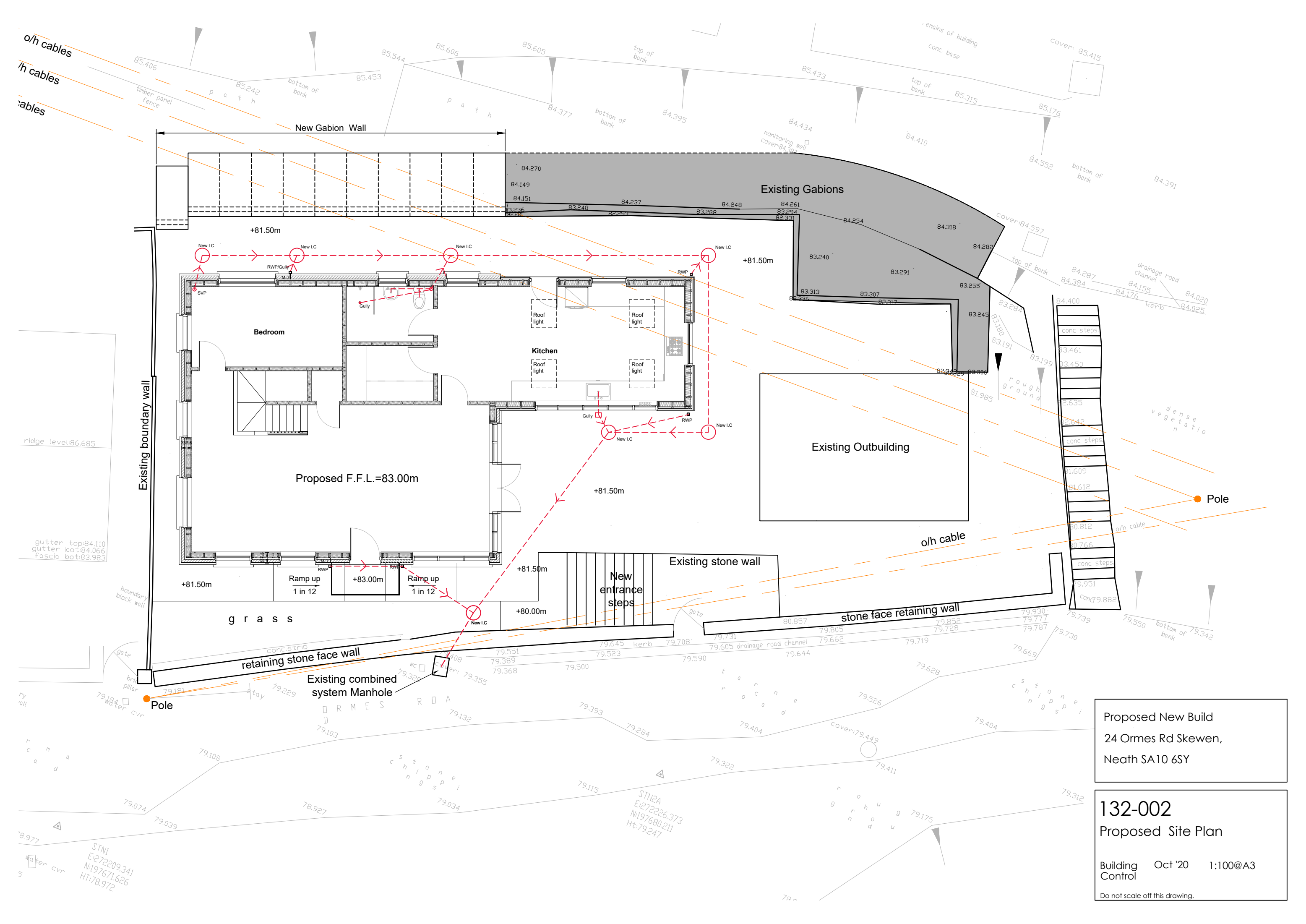


Proposed New Build
24 Ormes Rd Skewen,
Neath SA10 6SY

132-001
Existing Site Plan

Building Control Oct '20 1:100@A3

Do not scale off this drawing.



Proposed New Build

24 Ormes Rd Skewen,
Neath SA10 6SY

132-002

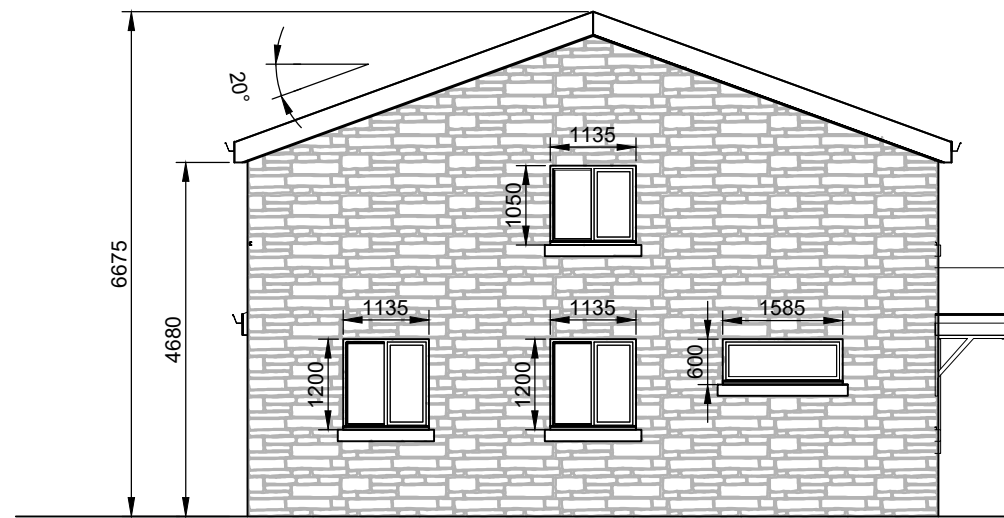
Proposed Site Plan

Building Control

Oct '20

1:100@A3

Do not scale off this drawing.



Side Elevation (view from No.23)

Scale 1:100



Front Elevation

Scale 1:100



Side Elevation

Scale 1:100



Rear Elevation

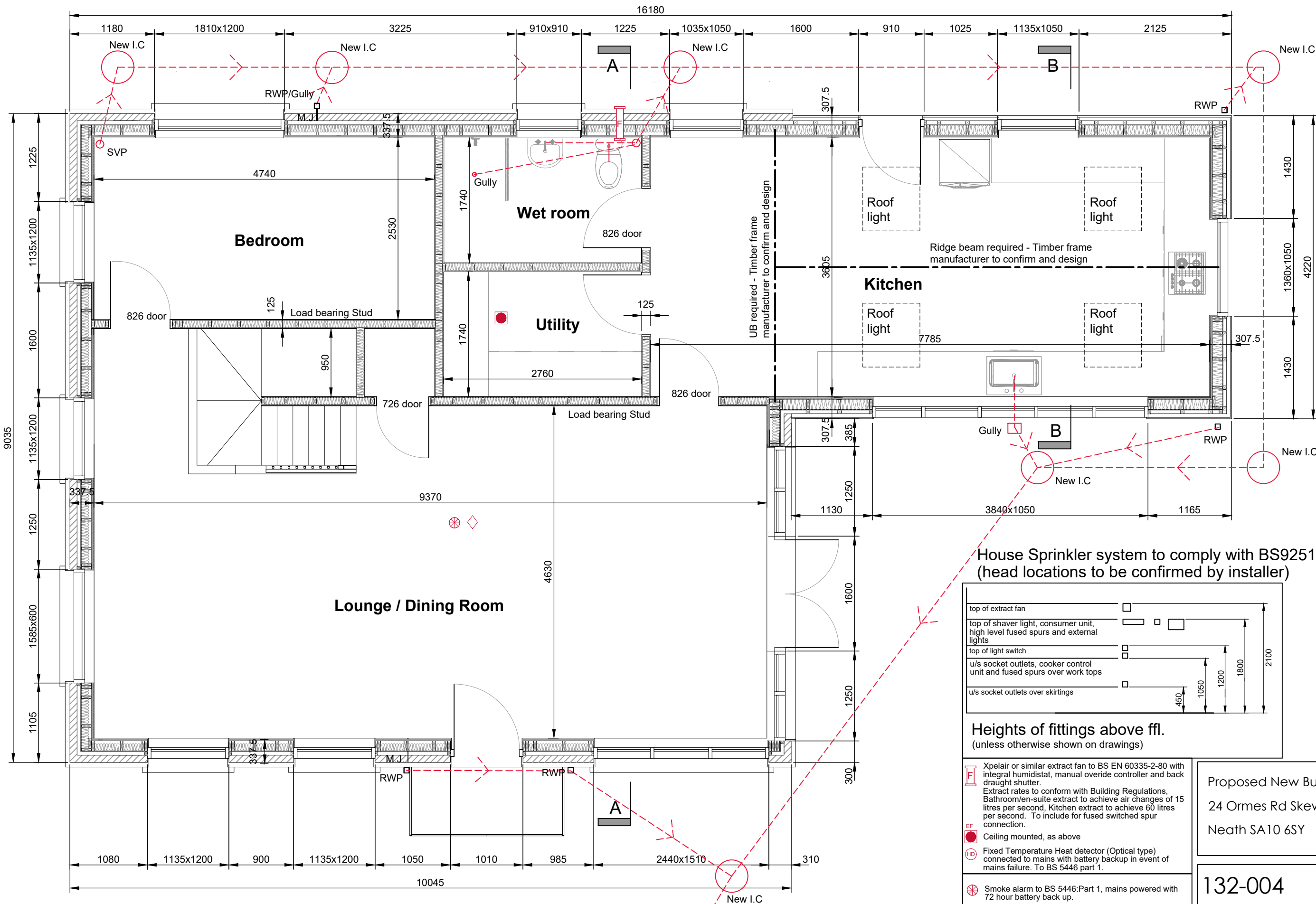
Scale 1:100

Proposed New Build
24 Ormes Rd Skewen,
Neath SA10 6SY

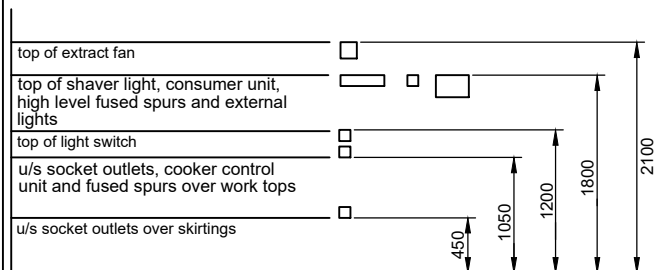
132-003
Proposed Elevations

Building Control Oct '20 1:100@A3

Do not scale off this drawing.



House Sprinkler system to comply with BS9251:2014
(head locations to be confirmed by installer)



Heights of fittings above ffl.
(unless otherwise shown on drawings)

- F** Xpelair or similar extract fan to BS EN 60335-2-80 with integral humidistat, manual override controller and back draught shutter. Extract rates to conform with Building Regulations. Bathroom/en-suite extract to achieve air changes of 15 litres per second, Kitchen extract to achieve 60 litres per second. To include for fused switched spur connection.
- EF** Ceiling mounted, as above
- HD** Fixed Temperature Heat detector (Optical type) connected to mains with battery backup in event of mains failure. To BS 5446 part 1.
- ⊗** Smoke alarm to BS 5446:Part 1, mains powered with 72 hour battery back up.
- ◇** CO alarm to BS EN 50291, mains powered with 72 hour battery back up.

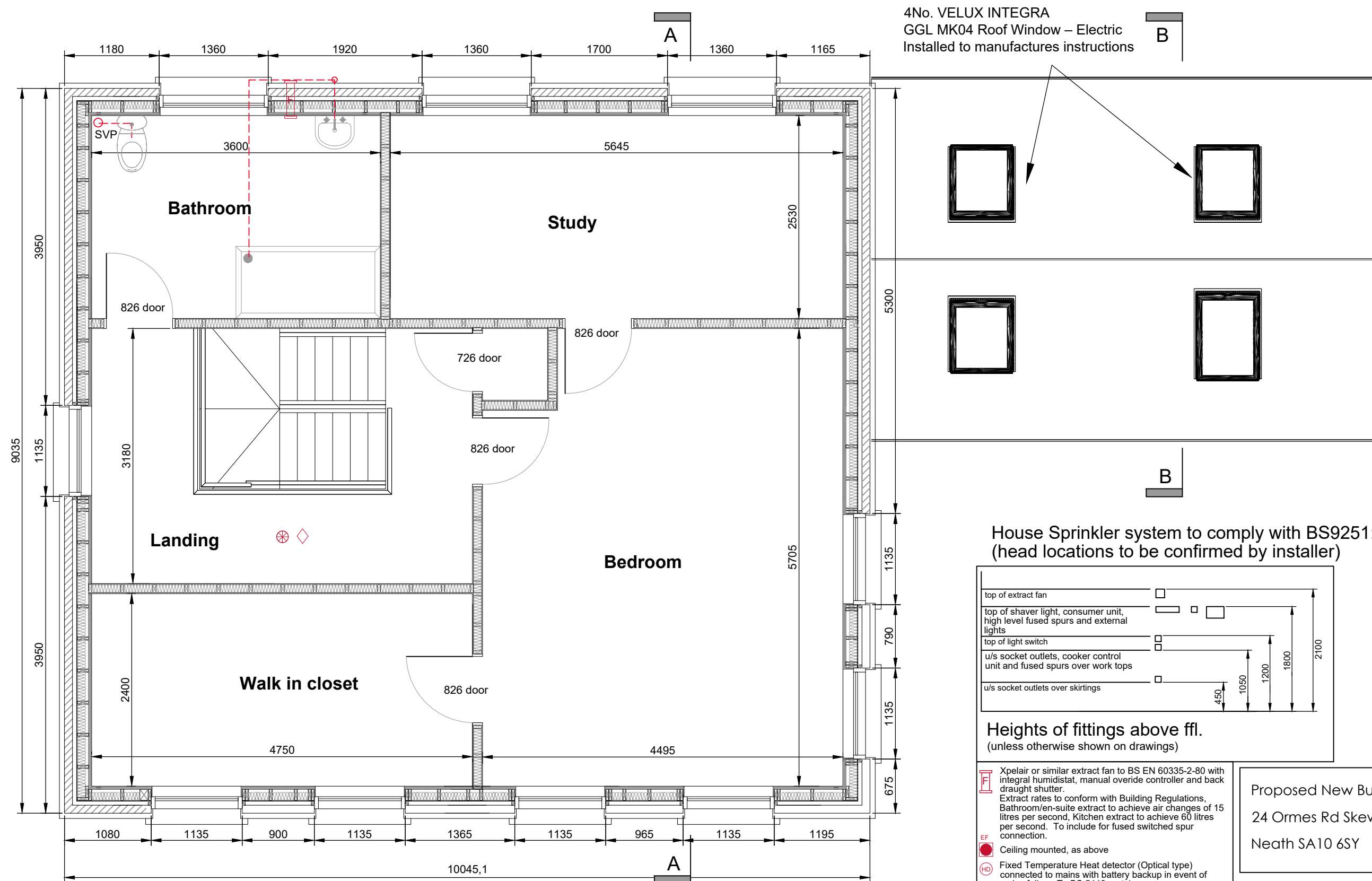
ELECTRICAL INSTALLATION
Whole of electrical installation to be in accordance with current IEE regulations and B.S.7671.
All components to be fixed strictly in accordance with manufacturer's recommendations and including all ancillary items e.g. back boxes, junction boxes, sub mains, etc.

Proposed New Build
24 Ormes Rd Skewen,
Neath SA10 6SY

132-004
Proposed Ground Floor

Building Control Oct '20 1:50@A3

Do not scale off this drawing.



Proposed New Build

24 Ormes Rd Skewen,
Neath SA10 6SY

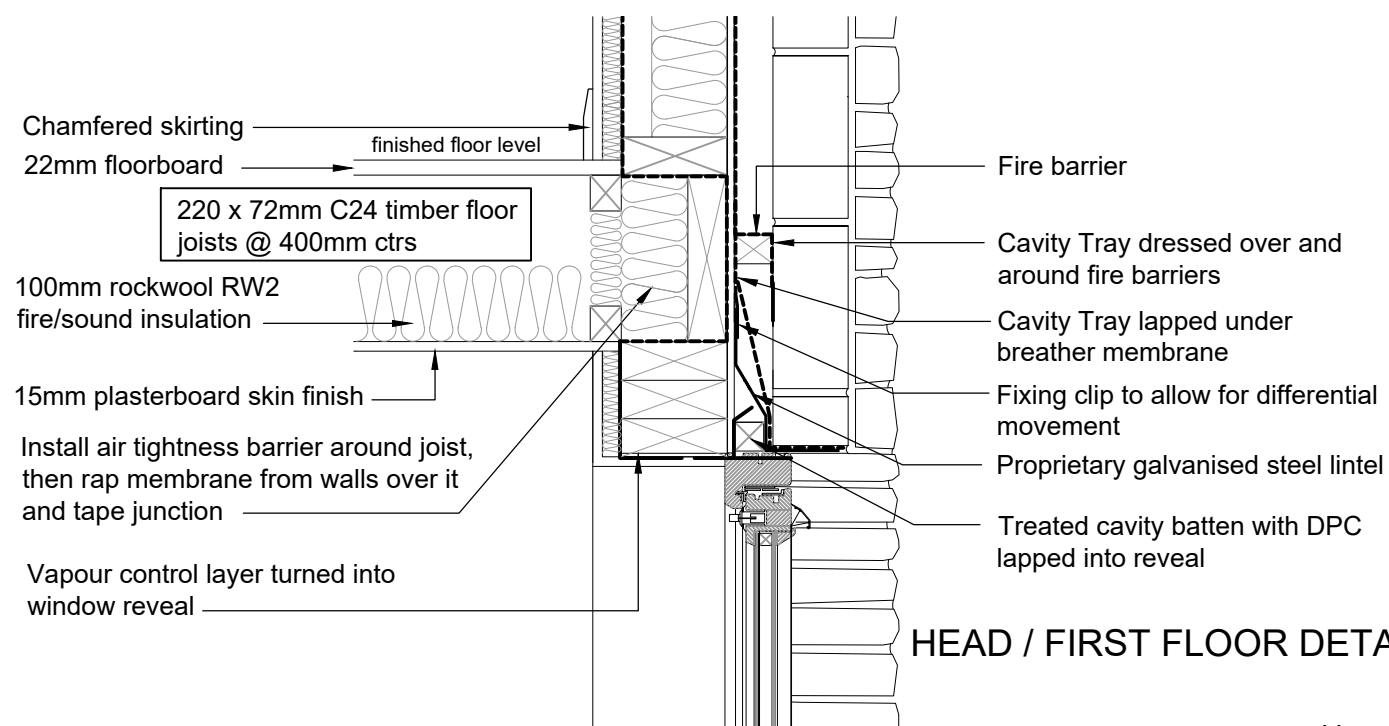
132-005

Proposed First Floor

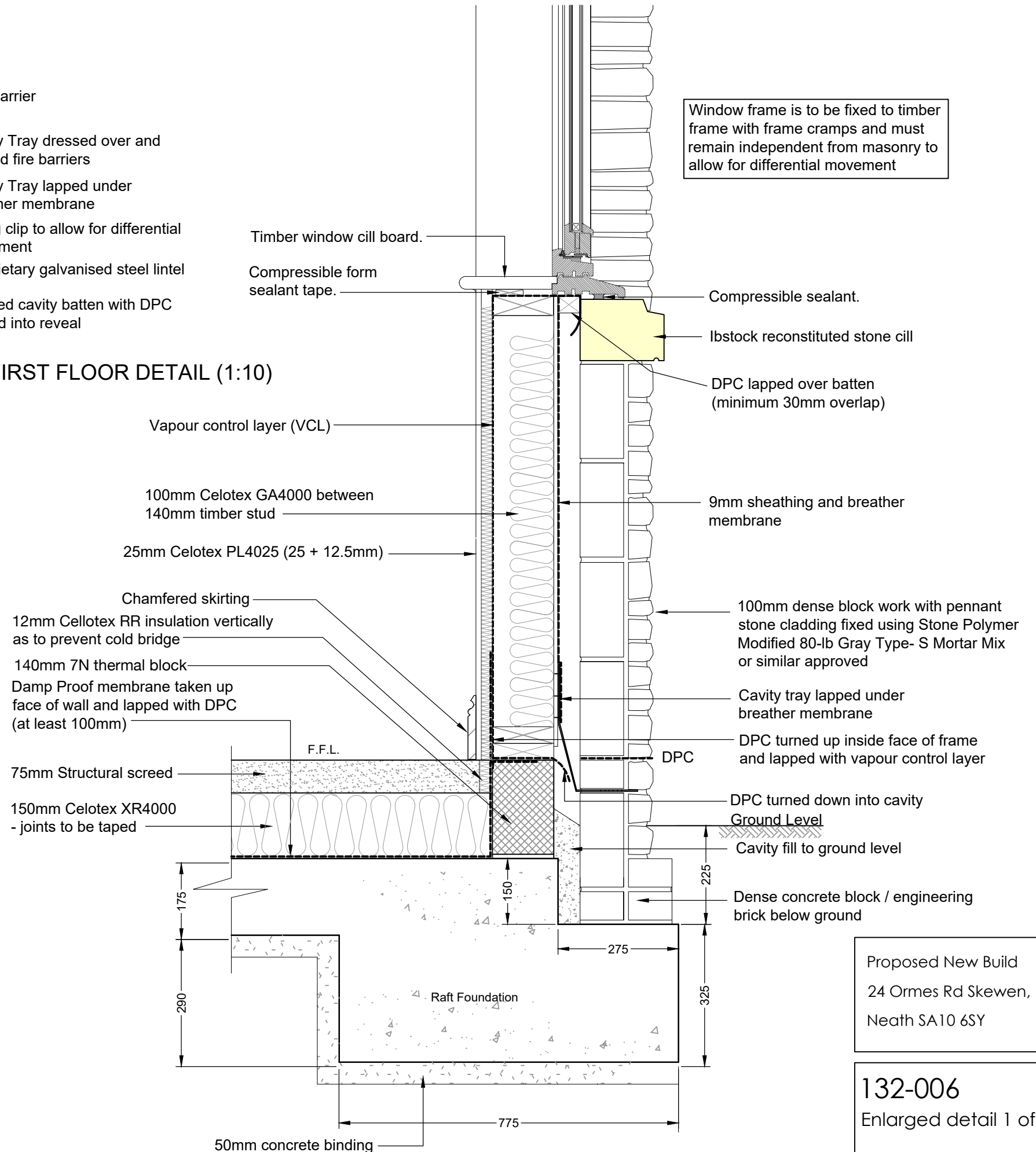
Building Control

Oct '20 1:50@A3

Do not scale off this drawing.



HEAD / FIRST FLOOR DETAIL (1:10)



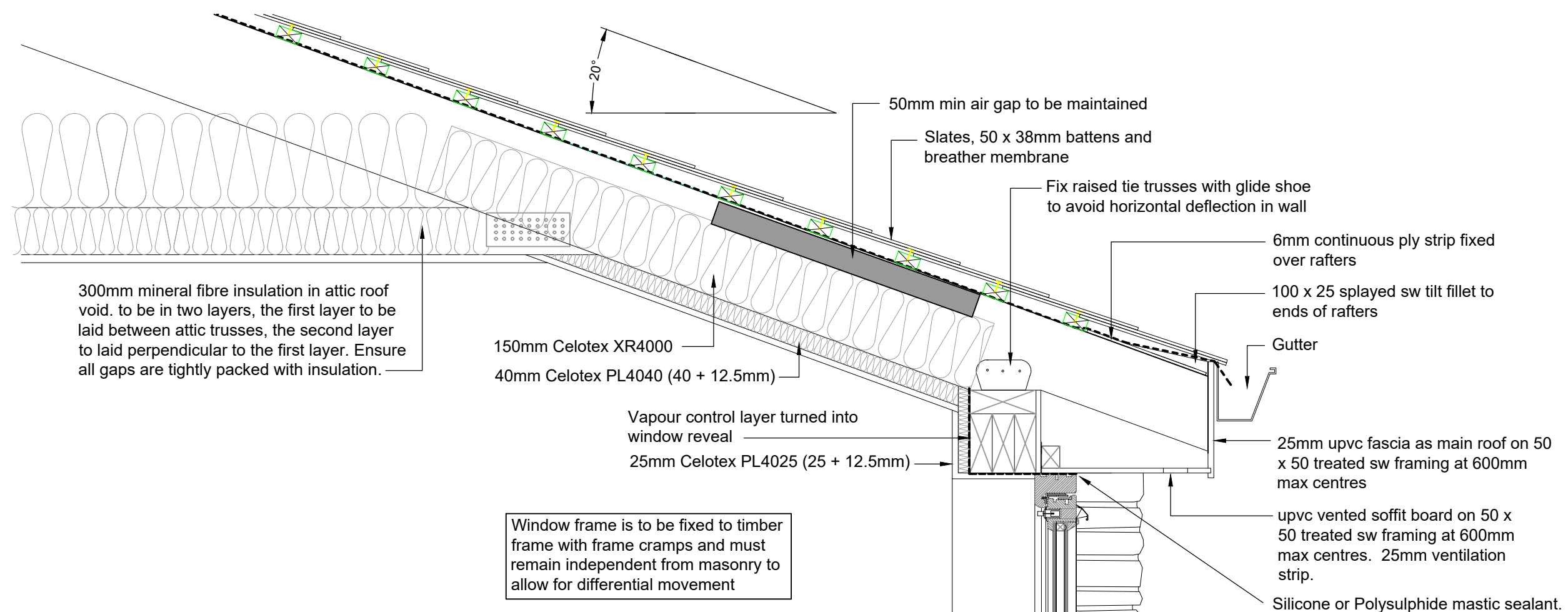
GROUND FLOOR JUNCTION MAIN HOUSE (1:10)

Proposed New Build
24 Ormes Rd Skewen,
Neath SA10 6SY

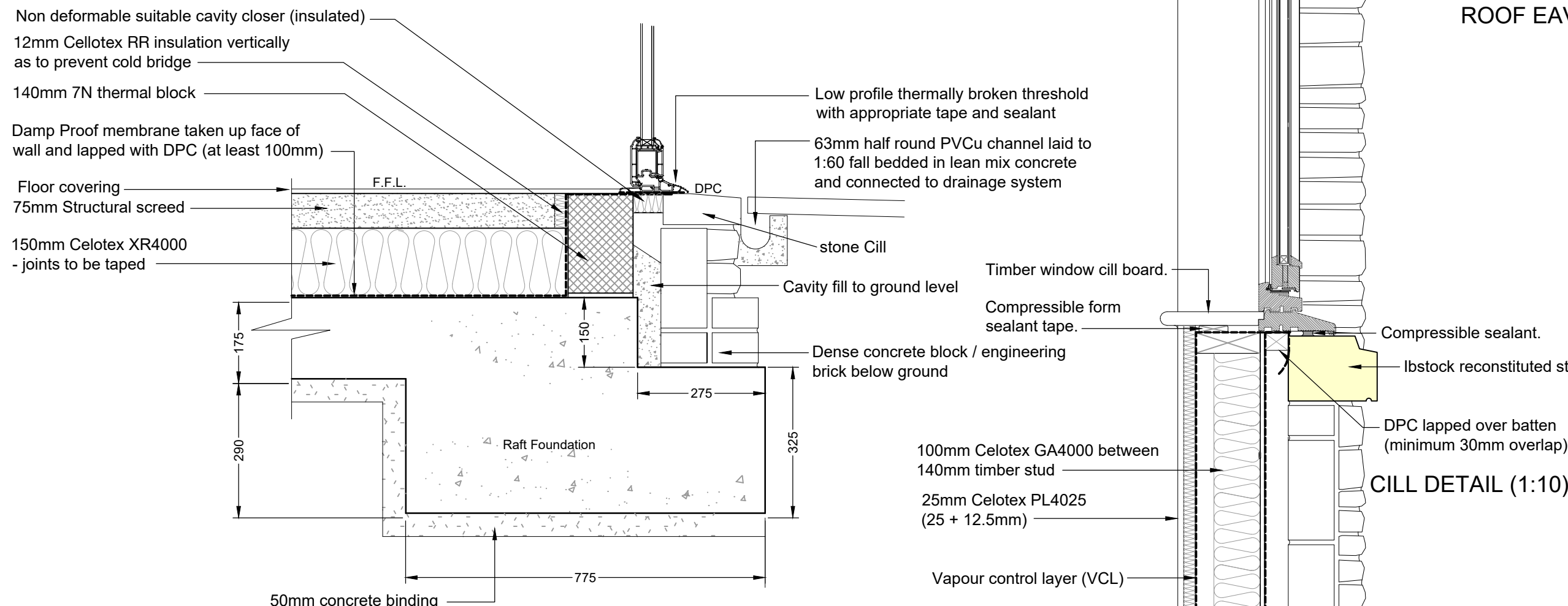
132-006
Enlarged detail 1 of 4

Building Control Oct '20 1:10@A3

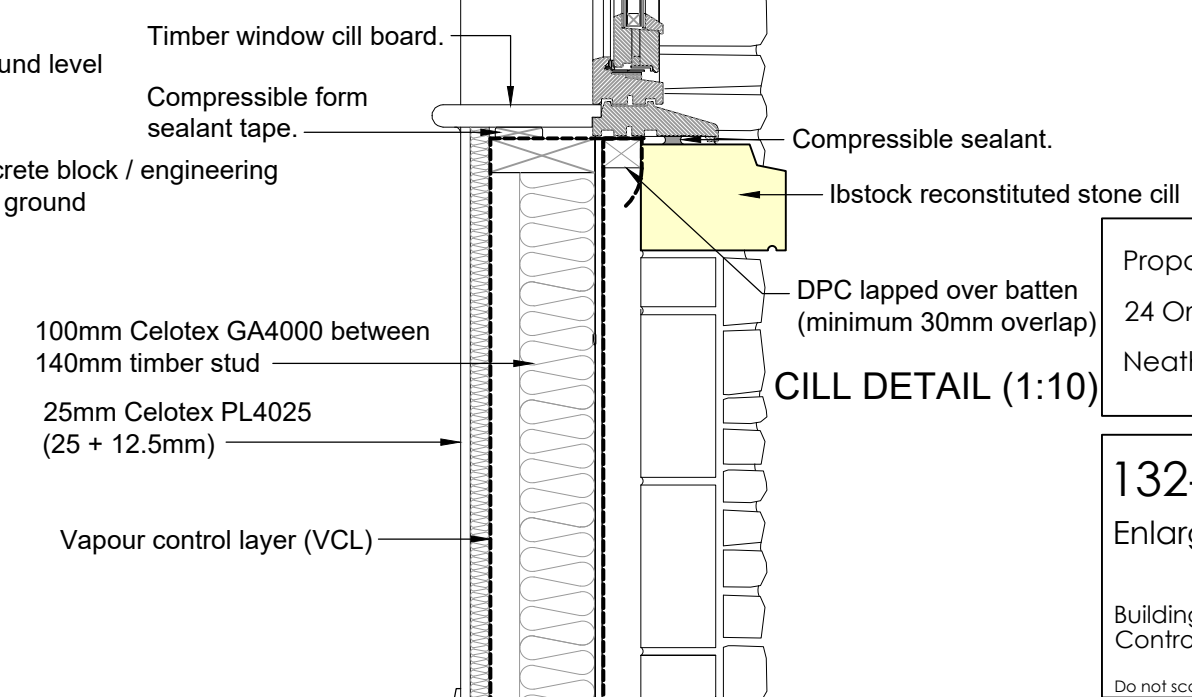
Do not scale off this drawing.



ROOF EAVES DETAIL (1:10)



THRESHOLD DETAIL (1:10)



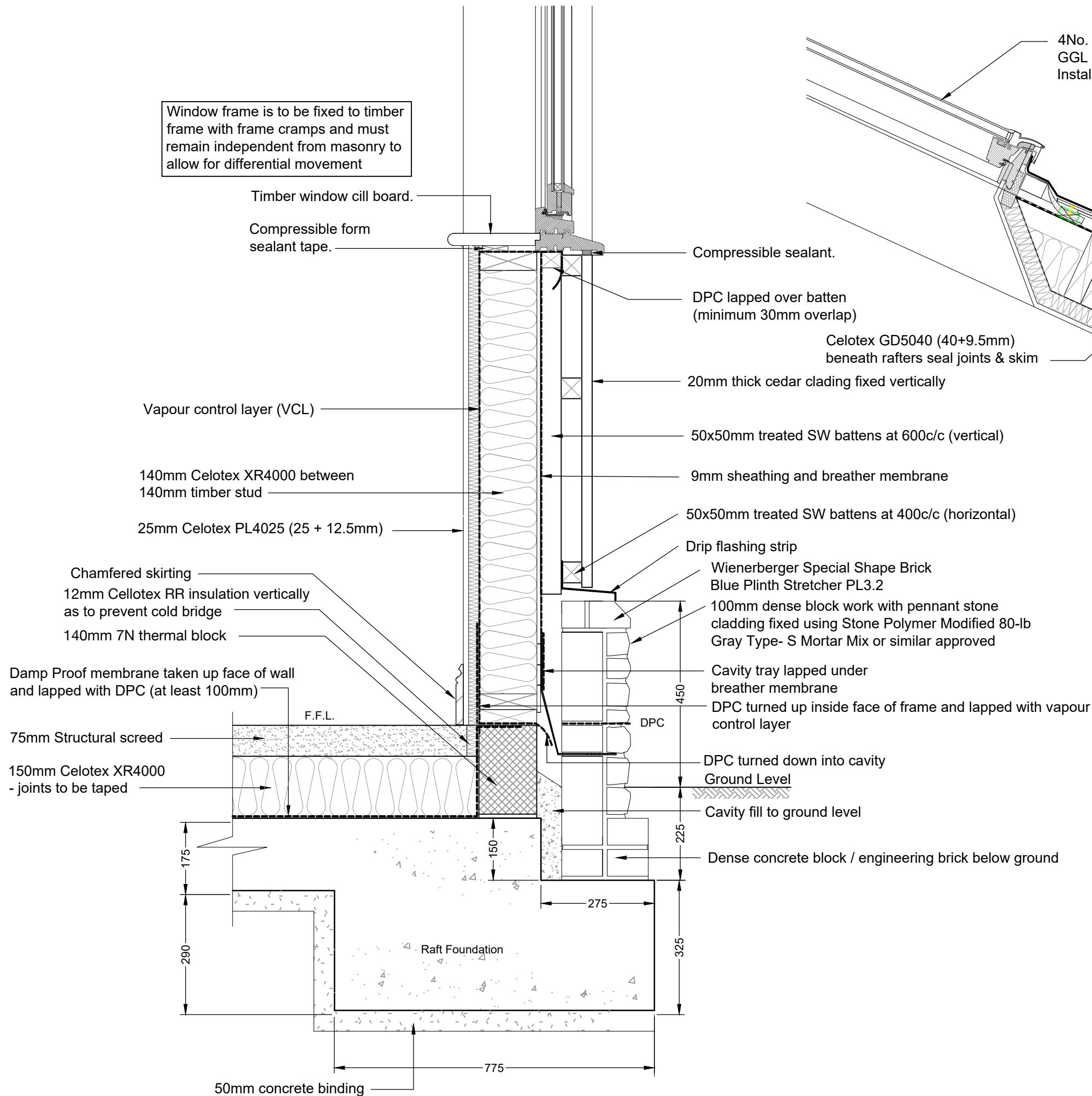
CILL DETAIL (1:10)

Proposed New Build
24 Ormes Rd Skewen,
Neath SA10 6SY

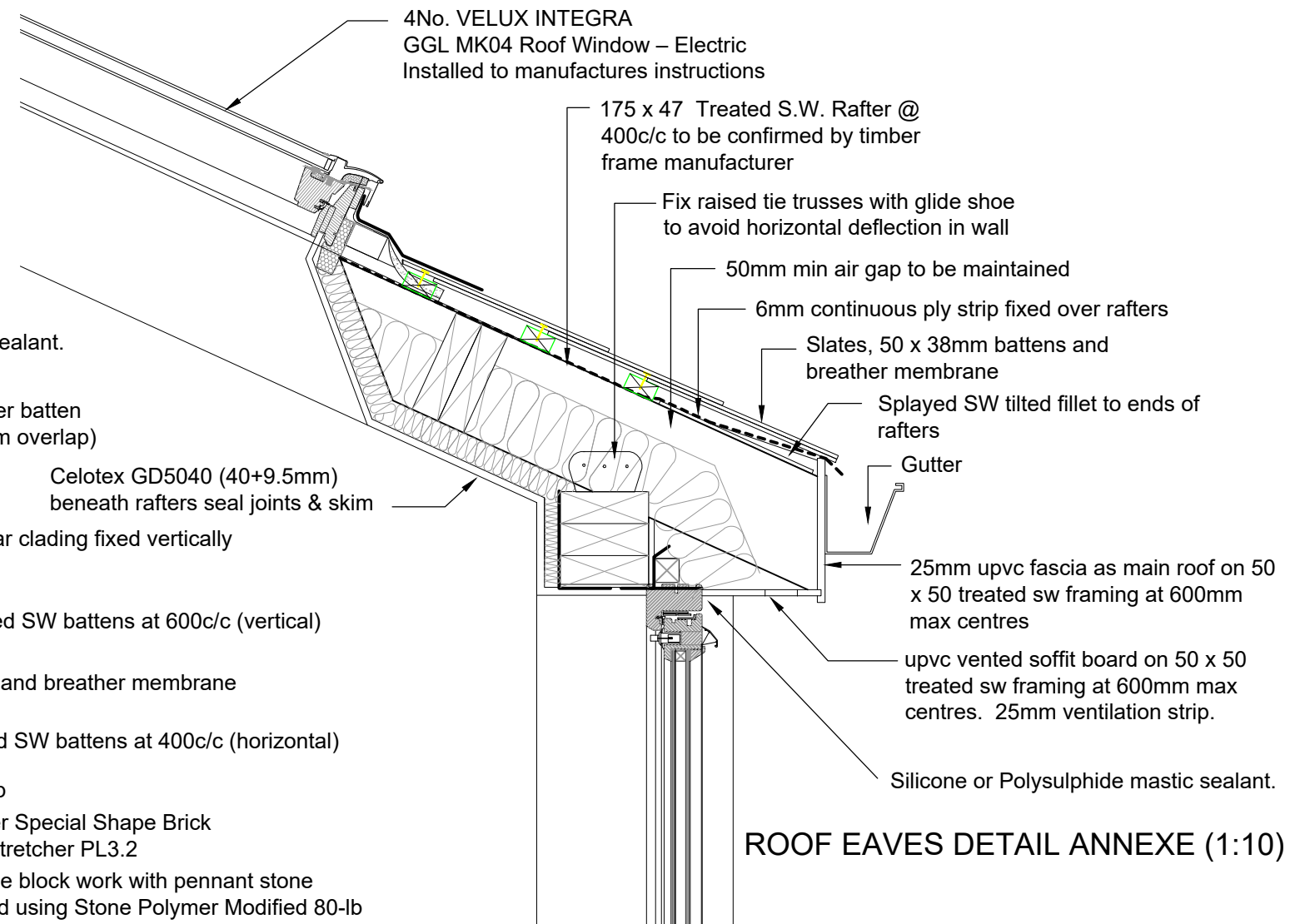
132-007
Enlarged details 2 of 4

Building Control Oct '20 1:10@A3
Do not scale off this drawing.

Window frame is to be fixed to timber frame with frame cramps and must remain independent from masonry to allow for differential movement



GROUND FLOOR JUNCTION ANNEXE (1:10)



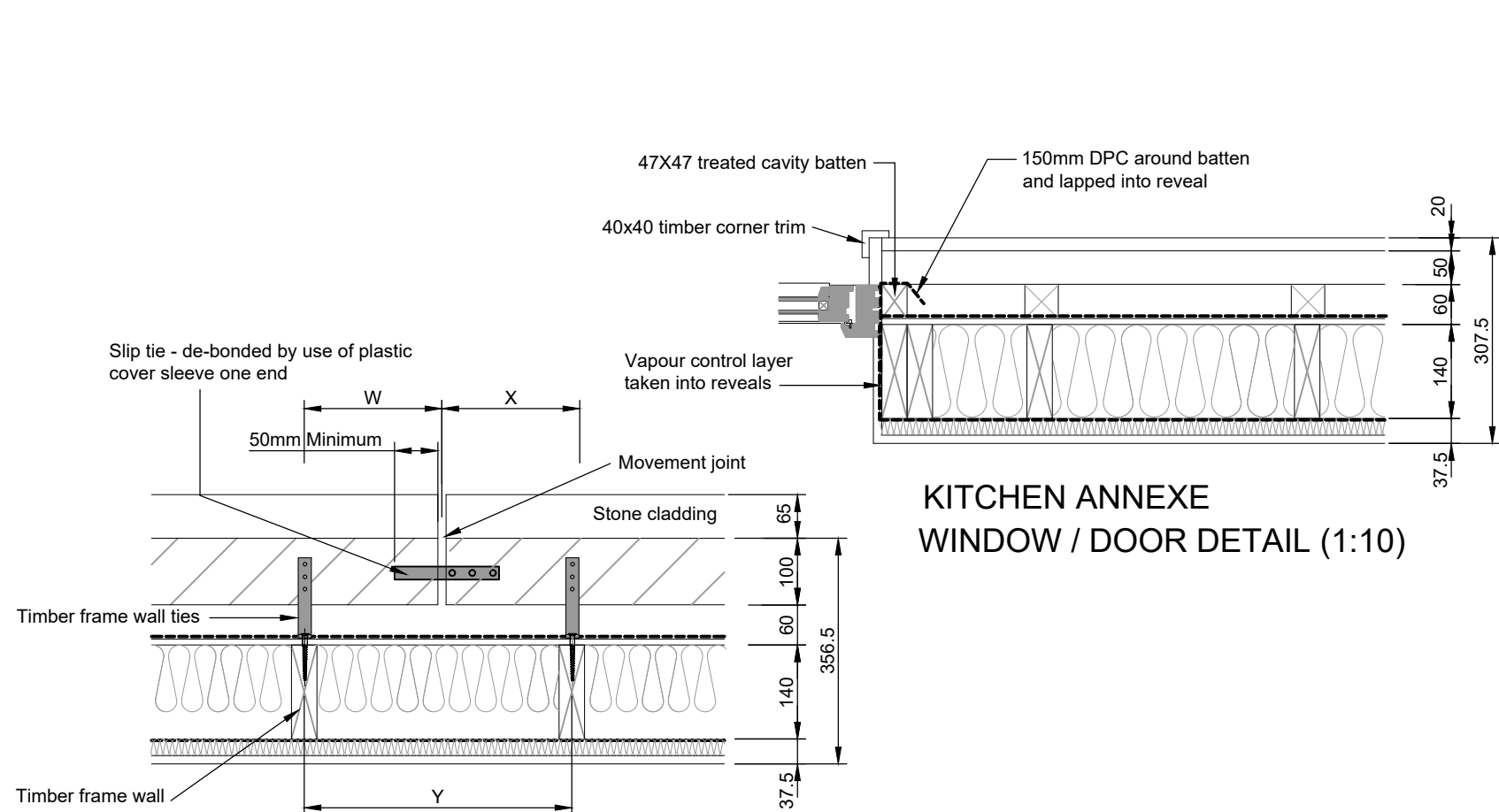
ROOF EAVES DETAIL ANNEXE (1:10)

Proposed New Build
24 Ormes Rd Skewen,
Neath SA10 6SY

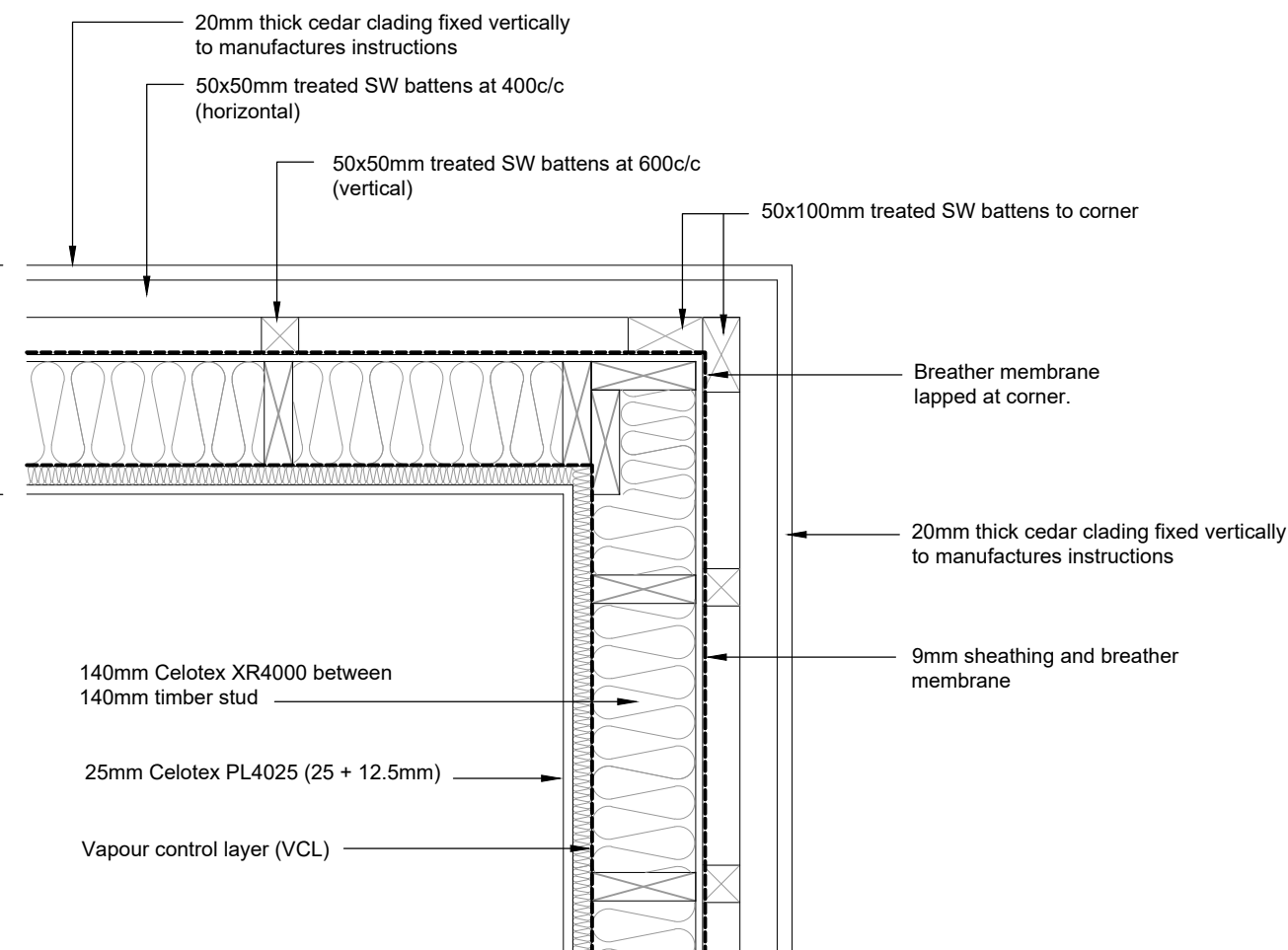
132-008
Enlarged detail 3 of 4

Building Control Oct '20 1:10@A3

Do not scale off this drawing.



**KITCHEN ANNEXE
WINDOW / DOOR DETAIL (1:10)**

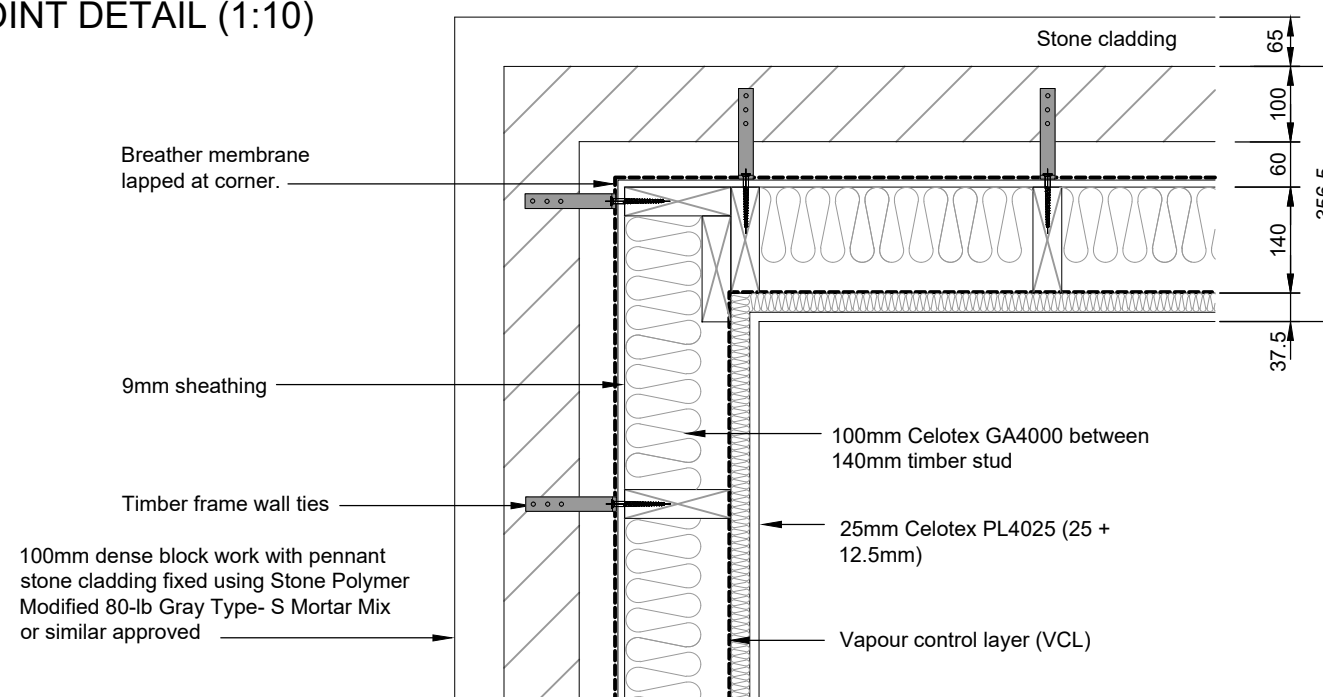


**KITCHEN ANNEXE
EXTERNAL CORNER DETAIL (1:10)**

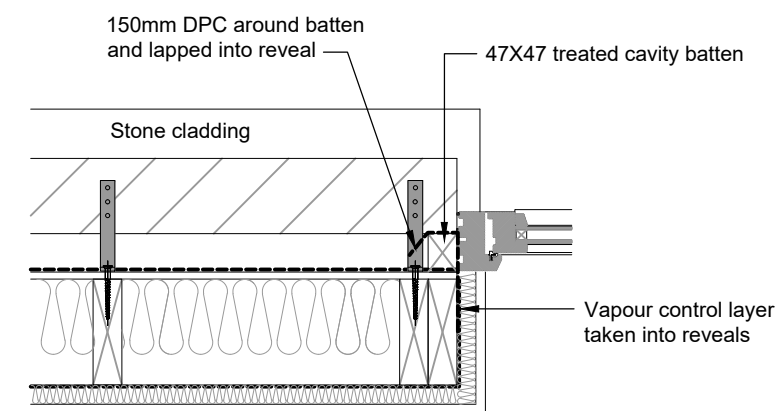
Where W & X are not more than 225mm (i.e. Y = maximum 450mm centres) no slip tie is required. Wall ties both sides of the movement joint should be spaced at maximum 300mm vertical centres.

Where W & X are not more than 225mm (i.e. Y = maximum 450mm centres) no slip tie is required. 300mm vertical centres. Slip ties should be de-bonded at one end e.g. with plastic cover sleeve, with minimum 50mm embedment into masonry either side of the movement joint.

**MAIN HOUSE
MOVEMENT JOINT DETAIL (1:10)**



**MAIN HOUSE
EXTERNAL CORNER DETAIL (1:10)**



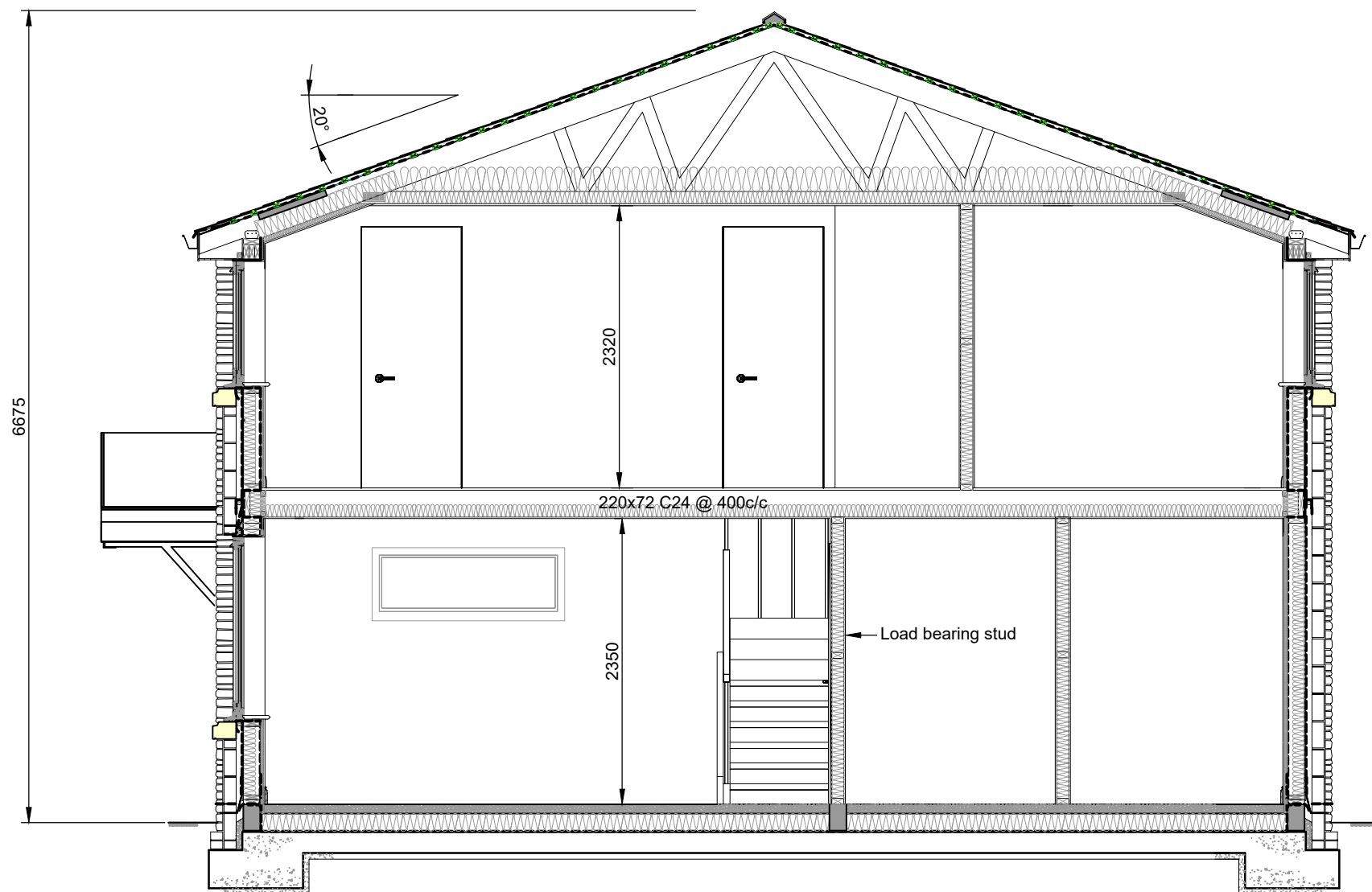
**MAIN HOUSE
WINDOW / DOOR JAM DETAIL (1:10)**

Proposed New Build
24 Ormes Rd Skewen,
Neath SA10 6SY

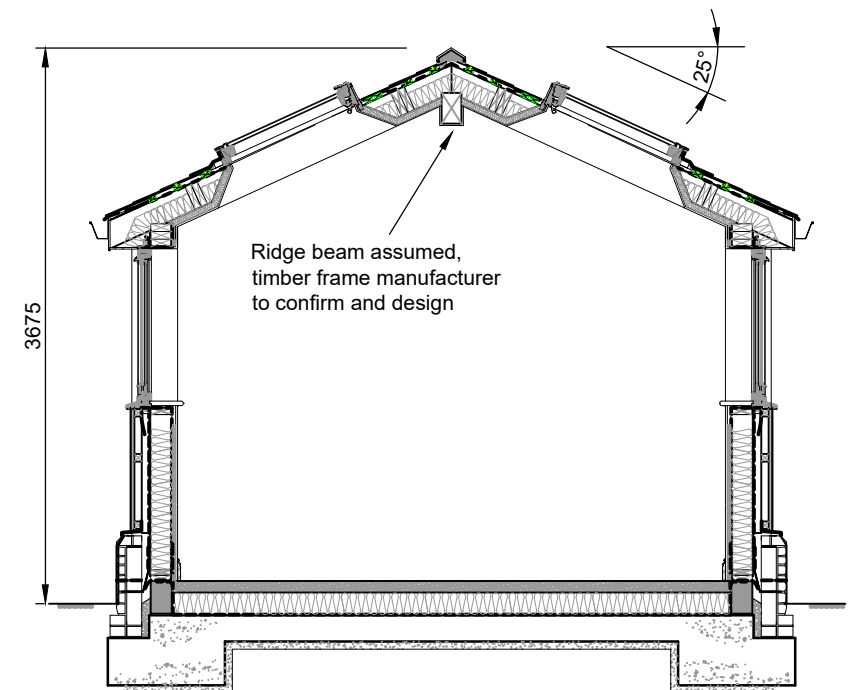
132-009
Enlarged details 4 of 4

Building Control Oct '20 1:10@A3

Do not scale off this drawing.



Section A-A
Scale 1:50



Section B-B
Scale 1:50

Proposed New Build
24 Ormes Rd Skewen,
Neath SA10 6SY

132-010
Cross Sections

Building Control Oct '20 1:50@A3

Do not scale off this drawing.

BUILDING REGULATION NOTES

DEMOLITION

Existing house to be demolished in accordance with BS6187. Before starting deconstruction/ demolition works, carry out a photographic survey of surrounding structures indicating Type and condition of adjoining or surrounding properties that might be adversely affected by removal of the structure, or by noise, vibration and/ or dust generated during deconstruction/ demolition works. Identity and locate any services above and below ground, including those required for the Contractor's use, and if no longer required arrange for their disconnection and removal. Also identify any Arrangements for protection of adjoining properties and general public, including exclusion of unauthorized persons.

GROUND FLOOR

To comprise:-

- 75mm Structural screed
- 150mm Celotex XR4000 floor insulation.
- 1200 gauge polythene Damp proof membrane
- Raft foundation slab on 50mm concrete blinding

DPM taken up wall and lapped with wall DPC to form continuous waterproof barrier. (as detailed on drawings).

EXTERNAL WALLS

Main House

356.5mm cavity walls comprising:-

- 100mm 7N dense concrete block, with 19mm render
- 50mm cavity.
- 9mm plywood sheathing bonded to timber studs.
- 140 x 38mm timber frame stud inner leaf to timber frame manufacturer's design and spec.
- insulation in between studs to inner leaf to be 100mm Celotex GA4000 with 25mm Celotex PL4025 (25 + 12.5mm) over studs.

Kitchen annexe

- 25mm cedar vertical cladding
- 50mmx50mm horizontal batten
- 50mmx50mm vertical battern
- 9mm plywood sheathing bonded to timber studs.
- 140 x 38mm timber frame stud inner leaf to timber frame manufacturer's design and spec.
- insulation in between studs to inner leaf to be 140mm Celotex XR4000 with 25mm Celotex PL4025 (25 + 12.5mm) over studs.

A vapour control layer should be fixed on the warm side of wall insulation. The vapour control layer should cover the external wall including bottom rails, head rails, studs, lintels and window reveals. The vapour control layer should be at least 500g polyethylene, or vapour control plasterboard. All joints should be lapped by at least 100mm.

NOTE: Timber frame manufacturers structural details to be submitted to the Building Control department before erection.

CAVITIES

Stainless steel cavity wall ties to BS1243 at 600mm horizontal and 450mm vertical staggered centres generally and 225mm vertically at openings and corners, to timber frame manufacturer's design and spec. Wall ties should be capable of accommodating any anticipated differential movement, fixed to stud not sheathing.

Incorporate DPC horizontally to each leaf at floor level and vertically at openings.

Lap 1200 gauge polythene DPM with wall DPC's to form a continuous moisture barrier.

Straight runs of block work in excess of 9m to have movement joints in accordance with BS 6093.

LOAD BEARING STUD PARTITIONS

Load bearing partitions to be as timber frame manufacturer's design and spec.

Stud partition to incorporate 100mm mineral Rockwool RW2 fire/sound insulation infill between studs.

NON-LOAD BEARING STUD PARTITIONS

Stud partitions to comprise 100 x 50mm sw studs at 400mm horizontal centres with cross noggins at 600mm vertical centres finished both sides with 1 layer 12.5mm plasterboard and 3mm skim.Bathrooms to have waterproof plasterboard. Stud partitions to incorporate 100mm mineral wool infill between studs,

FIRST FLOOR

To consist of 22mm fin thickness 'chipboard' floor boards generally on 220x72mm C24 SW joists at 400mm maximum centres as indicated on drawings and to be as timber frame manufacturer's design and spec..

Double joists and trimming joists formed using 2No. 220 x 50 joists bolted together at 900 centres with 12mm galv ms bolts and washers.

Double joists to be provided below partitions and bath. Trimming joists to be provided to stair opening and landing edge. Cross noggins the same size as joists to be provided where partitions run at right angles to joists.

SOUND

Timber floor to have 1 layer of 15mm plasterboard with 3mm skim finish, 100mm rockwool RW2 insulation between floor joists, ensure gaps are tightly packed with insulation and 22mm thick chipboard floor boards.

Stud partitions to bathroom, en-suite & shower room walls to incorporate 100mm mineral wool infill between studs.

CEILINGS

- 1 layer of 12.5mm plasterboard to first floor ceilings.
- 1 layer of 15mm plasterboard to ground floor ceilings.

FIRE

Fire suppression systems (sprinkler or water mist) to be designed and installed to BS 9251 and 9252. System must be 'designed for use in domestic buildings and be fit for their intended purpose. The system should cover the whole building.

All cavities to be closed at top, bottom and fire stopped with rockwool cavity fire stops. Steel beams supporting external wall to be encased in 15mm Gyproc fireline board to give half hour fire protection.

All habitable rooms to the first floor should have an obstructed openable area that is at least 0.33SqM, be a minimum of 450mm high and 450mm wide. The bottom of the openable area should not be more than 1100mm above the floor.

LINTELS

Cavity wall lintels to be Catnic CTF5 or similar with depth appropriate to span, and loadings in accordance with the manufacturer's recommendations. 150mm minimum end bearing. Openings greater than 1200mm increase lintel end bearing to 225mm. All to manufacturers design and specification.

WINDOW CILLS

Where shown window cills to be reconstituted stone as detailed on drawings. All openings at head, cill and jambs should allow movement for the timber frame and should be sealed with a purposed made sealant.

WINDOWS / DOORS

Windows & doors to clients specification, with double or triple glazed sealed units, with opening lights as indicated on elevation drawing. Glass to be low emission 'K' glass or similar approved and to have a whole unit 'U' value of 1.4Wm2K or better and to have a low g factor 0.5 to comply with the Approved document L1A.

All windows to have trickle ventilators in window frame head.

Toughened glass to be fixed to all external doors.

Installation to be in strict accordance with manufacturers specification.

All glazing to comply with Approved Document N states that the Regulation will be satisfied if glazing in "critical locations" is designed to limit the risk of injury.

Critical Locations

These are defined either directly or in the Regulation Documents.

Note: the Building Regulations are only concerned with glazing which forms part of the building structure whereas BS 6262: Part 4: 1994 sets standards for other locations in addition, such as shower screens , shower cubicles, mirror glazing for cupboards and wardrobes.

The following locations should be regarded as critical:

- Between finished floor level and 800mm above it
- Between finished floor level and 1500mm above if in doors or side panels close to either edge of a door

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RAMP TO FRONT ENTRANCE

1 in 12 ramp up to a minimum 900 x 900mm landing 150mm high with concrete brushed finished, on 100mm compacted Hardcore. Front door to have stone cill with low rise 'bump over' threshold by door manufacturer . With a vertical DPC at wall/ramp junction, see threshold detail showing upvc gutter set within concrete ramp.

JOINERY

Skirting, window head batten, internal window cills and architraves to openings

to be softwood, all to be painted.

Skirting to be 19x100mm Champhered section.

Architraves to be 19x75mm Champhered section.

Curtain Rail to be 25x100mm section.

Window cills to be 225x20mm section with rounded edge

NOGGIN AND STRAPS

Provide noggins at ceiling level in roof void to fix plasterboard, light fittings and hatch access.

- Noggins in roof comprise of: Light Fittings 75x50mm.

- Trimming to roof lights 50x147mm

STAIRWAYS, RAMPS AND GUARDS

Timber stairs from ground to first floor to have maximum rise 220mm, minimum going 220mm, winders to be 75mm minimum width, clear headroom 2000mm vertically to first floor, 900mm wide overall strings, handrail minimum 900mm above flight and 1000mm to landing. Balusters on flights or landings, to be at 100mm minimum centres.

ROOF STRUCTURE

Trussed rafters at 600mm maximum centres to BS. 5268 part 3 1985, with galvanised ms plate connectors and 100 x 25mm diagonal and lateral bracing to BS 5268. All to specialist manufacturer’s design and installed as per manufactures instruction

NOGGIN AND STRAPS

Provide noggins at ceiling level in roof void to fix plasterboard, light fittings and hatch access.

- Noggins in roof comprise of: Light Fittings 75x50mm.

- Trimming to roof lights 50x147mm

LEAD FLASHINGS

Provide cavity tray type x with 150mm dpc upstand and Code 4 lead flashing to kitchen roof/main wall abutment

ROOF FINISH

Slates, to be laid in accordance with the manufacturers recommendations on 50 x 38mm treated sw battens on breather membrane. Roofing breather membrane to be continuous over ridge, hips and valleys, dressed down into gutter and fixed to top side of softwood roof trusses.

VENTILATION

Ventilator units nailed over trusses to maintain airflow over insulation.

Incorporate continuous cavity tray type usv eaves ventilation units to soffit to give **25mm** continuous slot ventilation.

Natural ventilation opening lights to Habitable rooms, kitchens and toilets to be provided of at least 1/20th of the floor area of the room.

Mechanical ventilation equivalent to 15 litres per second is to be provided to bathrooms, utility room and toilets and 60 litres per second to kitchens.

Vent ducts to incorporate condensation traps and outfall pipework.

Trickle vents to be provided to all windows to achieve 8000mmSq background ventilation in habitable rooms.

CONSERVATION OF FUEL AND POWER.

Roof Insulation

Horizontal roof voids to be insulated with 300mm mineral wool insulation quilt laid in 2 layers, 100mm thick between rafters and 200mm over rafters. 12.5mm plasterboard and 3mm skim nailed into rafters. All to give maximum U value of 0.15 W/sq.mK

Conservation of Fuel and Power in New Dwellings : The Building Regualtions 2013, Approved Document L1a.

AIR PRESSURE TESTING.

Air Pressure testing is to be carried out in accordance with The Building Regualtions 2013, Approved Document L1a, Section 2 : Quality of construction and commissioning.

Thermal Bridging : All construction details to comply with Table K1 accredited construction details for thermal bridging and air tightness.

ABOVE GROUND PLUMBING AND DRAINAGE

Single stack UPVC soil system to be provided and fitted in accordance with the manufacturers recommendations comprising 100mm upvc soil pipe vented in accordance with part H1 of the Building Regulations, 32mm wastes to basins, 40mm wastes to sinks and 100mm outlets to wc pans. 50mm traps to wc pans, 75mm deep seal traps to all other fittings.

Resealing traps to be provided to 32mm wastes exceeding 1500mm in length and 40mm wastes exceeding 3000mm in length.

RAINWATER DISPOSAL

Rainwater system to comprise 100mm half round UPVC gutters and 63mm downpipes installed in accordance with the manufacturers recommendations.

BELOW GROUND DRAINAGE

Underground drainage to to be OSMA (or similar) Upvc drainage system and fittings laid in accordance with the manufacturers recommendations, to BS 4660:1973.

Drains under floor slab to be surrounded in 150mm of concrete up to underside of slab.

Drains passing through walls to have either concrete lintel or arched opening with 50mm clearance.

Foul Drains laid to 1 in 40 minimum falls.

Surface water drains laid to 1 in 80 minimum falls.

Manholes and covers to be Osma 450mm dia. universal inspection chambers including base, shaft and 4D.491 cover and frame. All bedded and backfilled to Osma's recommendations.

Rainwater and waste gullys to be Osma roddable bottle gully ref: 4D700 bedded to manufacturer’s recommendations

Rodding Eyes to be Osma sealed rodding eye and cover ref: 4D 356.

HEAT PRODUCING APPLIANCES.

Space and Hot Water Heating :

The system to be designed to comply with BS 5449, 1990.

Boiler to be a Combination/Condensing boiler with heat exchanger, installed in accordance with BS 6798,1987

Boiler to have Balanced Flue or fan assisted balance flue. Flue to be fitted with protective cage externally.

System Controls :

Provide fully automatic and independent temperature and time control, to include :

time controller with separate electronic control over space heating and water heating with manual override and one hour boost facility.

The responsibility of design, adequacy and suitability of each system shall be the contractors.

ELECTRICAL INSTALLATIONS.

Power and Lighting

All light & power fittings to be supplied by MK or similar approved.

All power points to be double switch socket outlets.

The responsibility of design, adequacy and suitability of each system shall be the contractors.

Extract Fans.

Extract fans to be fitted as indicated on plan.

HYGIENE.

The hot water system is to be vented.

MATERIALS AND WORKMANSHIP.

All materials and workmanship are to comply with the relevant and current British Standards, Codes of Practice, current edition of the Building Regulations, and shall be to the approval of the Building Inspector.

Plumbing to comply with BS 5572.

Electrical work to comply with the current edition of the IEE Regulations.

Generally structural timbers to be SW or whitewood C24 grade to BS 4978. To be SC3 where specified by the Engineer.

All softwood to be vacuum pressure impregnated; tanalith, vac-vac or celcure.

Softwood for joinery to BS 1186 part 1, screws to BS 1210, nails to BS 1202.

Carpentry to comply to CP 112.

All brickwork below DPC level to be Class B engineering bricks.

GENERAL.

Do not scale off the drawings.

All heights, levels, sizes and dimensions to be checked on site before any work is put in hand. Locate existing services/drainage runs prior to construction.

Existing services through site to be protected during construction.

The manufacturers recommendations are to be followed in respect of the installation and fixing of all products and any discrepancies between those recommendations and any other requirements of the specification and/or drawings are to be notified to the designer.

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