Client	D & K Bryars
Project	Horseshoe Lane Chadlington New House

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Section	By	Date	Ckd	Job No	Sheet Ref
Loading Data	KPB	Jul.17	chb	7011	01

MAIN COTTAGE ROOFS @ 40°

SLATES	–	0.65
BATTENS & BM	–	0.05
RAFTERS + PURLINS	–	0.15
INSULATION	–	0.05
PLASTERBOARD + SKIM	–	0.15

$\Sigma g_k \perp = 1.05$ (slope)

$\Sigma g_k \downarrow = 1.37$ (plan)

SNOW @ 40° $\Sigma q_k = 0.50$

$\Sigma_k = 1.89$ kN/m² on PLAN.

REAR ROOF @ VARIABLE SLOPE ($8°_{Max} - 3°_{Min}$) (R=335 L=6300 L=2400)

weathering:

METAL STANDING SEAM	–	0.10
PLY BASE	–	0.13
RAFTERS	–	0.09

$\Sigma g_k \perp = 0.32$ (slope)

$\Sigma g_k \downarrow = 0.33$ (plan)

ceiling:

BINDERS + JOISTS	–	0.12
INSULATION	–	0.05
PLASTERBOARD + SKIM	–	0.15

$\Sigma g_k = 0.65$

SNOW $\Sigma q_k = 0.75$

$\Sigma_k = 1.40$ kN/m² on PLAN.

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Section	By	Date	Ckd	Job No	Sheet Ref
Loading Data	KPB	Jul.17	chb	7011	02

DOMESTIC SUSPENDED FLOOR – BEAM & BLOCK.

FINISHES	(20)	– 0.04	(TILES.)
SCREED	(100)	– 2.40	
INSULATION	(140)	– 0.05	
SYSTEM FLOOR		– 1.83	(BTO2/525)
BATTENS		– 0.03	
PLASTERBOARD + SKIM		– 0.15	
		Σg_k = 4.50	
OCCUPANCY		Σq_k = 1.50	
(SPANS UP TO 4.0m)		Σ_k = 6.00 kN/m²	

DOMESTIC SUSP. FLOOR. - LONGER SPANS / SYSTEM TYPES.

USING RD09/503 @2.25 $\Sigma' g_k$ = 4.92 (+ 0.42)

USING RD09/390 @2.47 $\Sigma' g_k$ = 5.14 (+ 0.64)

EXTERNAL TERRACE

PAVING ON PEDESTALS	–	1.25
WATERPROOF MEMBRANE	–	0.05
INSULATION	–	0.05
SCREED TO FALLS 1:80 (65-135)	–	2.40 av (CONSIDER L/W SCREED)
SYSTEM FLOOR	–	2.47
BATTENS	–	0.03
PLASTERBOARD + SKIM	–	0.15
		$\Sigma' g_k$ = 6.40
OCCUPANCY		Σq_k = 1.50
		Σ_k = 7.90 kN/m²

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Section	By	Date	Ckd	Job No	Sheet Ref
Loading Data	KPB	Jul.17	chb	7011	03

EXTERNAL WALL TO COTTAGE

RANDOM COURSED STONE	(150)	3.40
INSULATED CAVITY	(50/100)	0.05
INSULATING BLOCKWORK	(100)	0.80
PLASTERBOARD + SKIM		0.15

Σg_k = 4.40 kN/m² (ELEVATION)

EXTERNAL WALLS TO REAR

RENDER	(12.5)	0.32
BLOCKWORK	(100)	2.03
INSULATED CAVITY	(50/100)	0.05
INSULATING BLOCKWORK	(100)	0.80
PLASTERBOARD + SKIM		0.15

Σg_k = 3.35 kN/m² (ELEVATION)

INTERNAL LB WALLS

BLOCKWORK	(140)	2.85
P'BD + SKIM 2 SIDES.		0.30

Σg_k = 3.15 kN/m² (ELEVATION)

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Consult bhb

Section	By	Date	Ckd	Job No	Sheet Ref
Loading Data	KPB	Jul.17	chb	7011	04

EXTERNAL RETAINING WALLS. (BELOW G & OUTER LEAF)

215 HOLLOW CORE CONC FILLED + REINFORCED } -4.50

INSULATED CAVITY (50/100) -0.05
INSULATING BLOCKWORK (100) -0.80
P'BOARD + SKIM -0.15

Σg_k -5.50 kN/m² (Elevation)

Client D & K Bryars

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Section	By	Date	Ckd	Job No	Sheet Ref
Timber Elements	KPB	Jul.17	chb	7011	05

COTTAGE - MAIN ROOF (Lean-to Similar)

RAFTERS @ 45°

DEAD LOAD - 0.9 kN/m²

SPACING - 400 mm

SPAN - 1.100 m (main) or 1.250 m (Lean-to)

TRADA - T28

PROVIDE - 47 x 100 C16 @ 400 c/c (2.29m)
(minimum)

PURLINS.

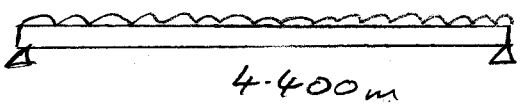
DEAD LOAD - 0.9 kN/m²

SPACING - 1.150 m

SPAN - 4.400 m (Middle Bay)

TRADA - n/a

DESIGN.



UDL = 1.89 cos 45 x 1.15 x 4.4
= 6.8 kN.

$M_{max} = \frac{6.8 \times 4.4}{8} = 3.74 kNm$

$I_{x\,min} = \frac{5}{384} \cdot \frac{6.8 \times 4400^2}{7.2 \times 0.003} = 7936 cm^4$

$Z_{x\,min} = \frac{3.74 \times 10^6}{7.5 \times 1.25} = 399 cm^3$
(k3)

FOR 145w MEMBER d = 128 mm (bending)
OR
d = 187 mm (deflection)

PROVIDE 145 x 195 C24 (OR LARGER)
(par size)

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Section	By	Date	Ckd	Job No	Sheet Ref
Timber Elements	KPB	Jul.17	chb	7011	06

REAR ROOF

RAFTERS

DEAD LOAD – 0.23 kN/m²

SPACING – 400mm

SPAN – 2.225 to 2.985 [(5960/2) ÷ cos3°]

TRADA – T36 (<10°)

PROVIDE – 47 x 145 C16 @ 400% (3.27m)

CEILING JOISTS.

DEAD LOAD – 0.20 kN/m² (NO STORAGE)

SPACING – 400mm

SPAN – 2.200 to 2.980

TRADA – T8

PROVIDE – 47 x 145 C16 @ 400% (3.27m)

BINDERS (USE PURLIN TABLES FOR MIN. SCOPE)

DEAD LOAD – 0.23+0.2 = 0.43kN/m²

SPACING – 2.98m

SPAN – 2.150m (between steels)

TRADA – T14

PROVIDE – 63 x 200 C16 (2.16m)

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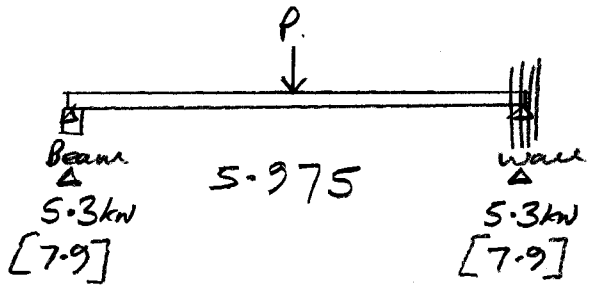
Section	By	Date	Ckd	Job No	Sheet Ref
Steel Supports to Rear Roof	KPB	Aug.17	chb	7011	07



LOADING

$P = DL - 0.65 \times 2.15 \times 5.975 = 4.2$

$LL - 0.75 \quad \frac{2}{2} = 4.8$

$\Sigma_k = 9.0$

$[\Sigma'_U = 13.6]$

$UDL = 5 kN/m$

allow $\Sigma'_k = 1.5 kN$

$[\Sigma'_U = 2.1 kN]$

$M_x = \left(\frac{13.6}{4} + \frac{2.1}{8}\right) \times 5.975 = 22 kNm$

$I_{xx} \geq (3.66 \times 9 + 2.29 \times 1.5) \times 5.975^2 = 1299 cm^4$

PROVIDE 203 x 133 UB 25

@ 3.0m
$M_b = 46 kNm$
$I_{xx} = 2350 cm^4$
$\Delta \triangleq 9.2mm$
$\delta_w \triangleq 4.4mm$

Client	D & K Bryars
Project	Horseshoe Lane Chadlington New House
Section	Retaining Walls

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By	Date	Ckd	Job No	Sheet Ref
KPB	Sep.17	chb	7011	08

RETAINING WALLS TO BE DESIGNED AS CANTILEVERS TO SIDES AND PROPPED CANTILEVER TO UNDERCROFT

A SURCHARGE LOAD OF 1.5 KN/M² IS INCLUDED IN THE DESIGN AS TEMPORARY CONSTRUCTION LOAD

DESIGN TO BS 5628 PT II

215 HOLLOW CORE BLOCKS 7 N/mm² Grp(ii) MORTAR

REINFORCED CORES $f_y = 460$ N/mm²

$f_{cu} = 35$ N/mm²

REINFORCE FOR MAXIMUM STRENGTH.

$M_d \neq 0.4 f_k b d^2 / \gamma_{mm} = 0.4 \times \frac{4.1}{2.0} \times 10^3 \times 107.5^2 \times 10^{-6} = 9.47$ kNm/m

$M_d = Q b d^2 \Rightarrow Q = \frac{9.47 \times 10^6}{10^3 \times 107.5^2} = 0.82$

$Q = 2c(1-c) f_k / \gamma_{mm} = 2c(1-c) \frac{4.1}{2.0} = 0.82$

$\downarrow$

$-2c^2 + 2c - 0.4 = 0$

Solving $c = 0.7236$ (Checks with Table in BS.)

$z = c.d = 0.7236 \times 107.5 = 77.7$ mm

$M_d = A_s f_y z / \gamma_{m s.} \Rightarrow A_s = \frac{9.47 \times 10^6 \times 1.15}{460 \times 77.7} = 305$ mm²/m

Per Core $= 305 \times \frac{225}{1000} = 69$ mm² $\rightarrow$ 10 mm Bars.

PROVIDE B12
1 per core
($A_s = 113$ mm²)

Client D & K Bryars					
Project Horseshoe Lane Chadlington New House					
Section Retaining Walls	By KPB	Date Sep.17	Ckd chb	Job No 7011	Sheet Ref 09

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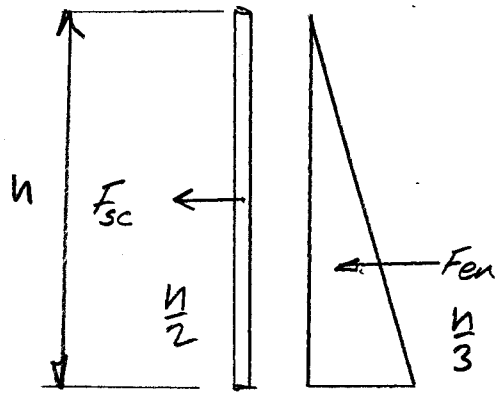
CANTILEVER SIDE WALLS



Maximum Height for Capacity

$$1.6 \times 1.5 \times 0.33 \times \frac{h^2}{2} + 1.2 \times 18 \times 0.33 \times \frac{h^2}{2} \times \frac{h}{3} = 9.47$$

$$0.396\,h^2 + 1.188\,h^3 = 9.47$$

$h \geq \underline{1.892\,m}$ for Capacity (9.464)

OR

$h \geq 18d = 1.935$ for Dimensional Limit

DETAIL SUITABLE TO $h = \underline{1.800\,m}$ (8 Block Courses)

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Section Retaining Walls	By KPB	Date Sep.17	Ckd chb	Job No 7011	Sheet Ref 10

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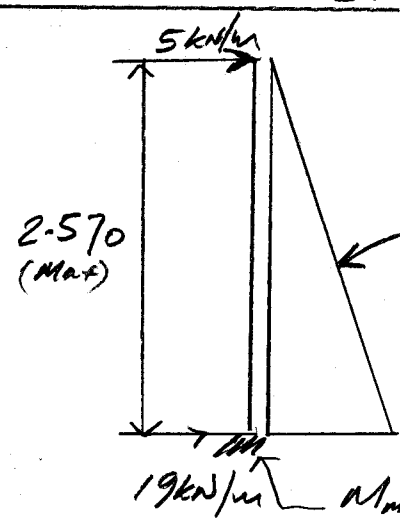
PROPPED CANTILEVER UNDERCROFT WALL



$W_{EA} = 18 \times \frac{2.57^2}{2} \times 0.33 \times 1.2 = 23.5 kN/m$

$M_{max} = 0.00596\, wL = 3.6 kNm/m$

$< 9.47 kNm/m$

DETAIL SUITABLE

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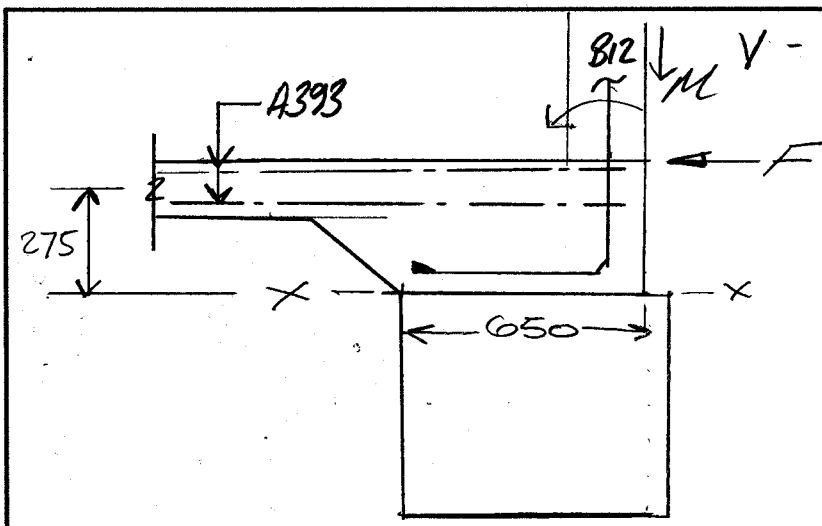
Section	By	Date	Ckd	Job No	Sheet Ref
Retaining Wall – Slab Edge Base	KPB	Sep.17	chb	7011	11



SERVICE LOADS.

V = 4.5 × 1.8 = 8.1 kN/m

H = 10.5 kN/m.

M = 6.58 kNm/m

At x–x		La		OTM	
V	= 8.1	×	217.5	1.76 kNm	
H	–		–	–	Resisted by Slab
M	–		–	−6.58	
Σ	8.1			− 4.82	

ecc = 0.594m ∴ Slab reqd for temp stability

Net OTM = $\frac{4.82 \text{ kNm}}{0.275}$ = 17.5 kN/m into slab

+ 10.5 kN/m (H)

28.0 kN/m

Resulting stress = 0.18 N/mm² ∴ OK.

Full slab must be in place prior to loading / backfilling retaining walls.

NB Future vertical load serves to further stabilise the retaining wall detail