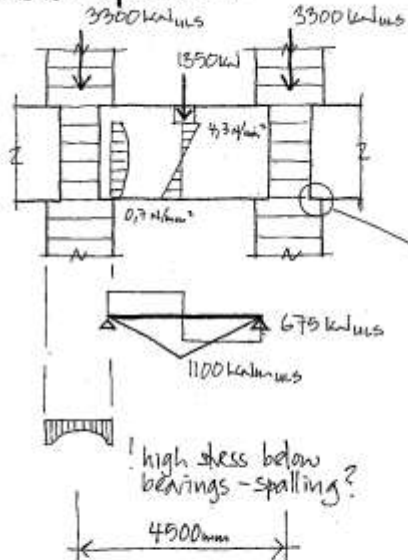


# Other Sketches Book

June2012

## Beam Spandrel:

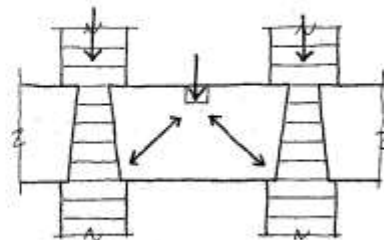


review:

- ✓ low 'beam' stresses
- X single piece large panel  $3.5m \times 2.0m \times 0.6m$
- X stone bedding
- X bearing stresses



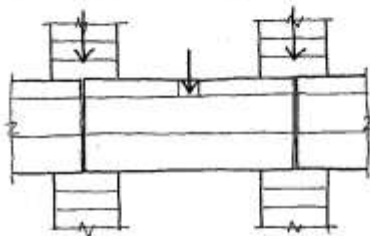
## Arch Spandrel:



review:

- ✓ low 'arch' stresses
- ✓ reduced bearing stress
- X large stone piece  $3750 \times 2000 \times 600mm$
- X stone bedding

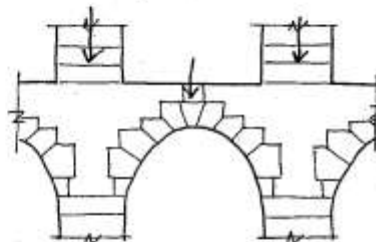
## Split Beam Spandrel:



review:

- ✓ low bearing stresses
- ✓ reduced stone size  $800 \times 600 \times 4500mm$
- ✓ similar stone bedding
- X high 'beam' stresses  $\sigma_b = 8.6 \text{ N/mm}^2$
- X rotation/prying at supports

## Stone Arch:



review:

- ✓ equal distribution of stresses
- ✓ small stone pieces
- ✓ similar stone bedding
- X high skill content and slow on site
- X high proportion of mortar joints

## Portland Stone:

Finchbury Square Stone/Mortar  
 Stone -  $f_k = 35, 2 \text{ N/mm}^2$   
 Mortar - 1:1.2:4 ( $5.9 \text{ N/mm}^2$ )

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tel 01223 369220 fax 01223 356215 [cambridge@whitbybird.com](mailto:cambridge@whitbybird.com)  
[www.whitbybird.com](http://www.whitbybird.com)

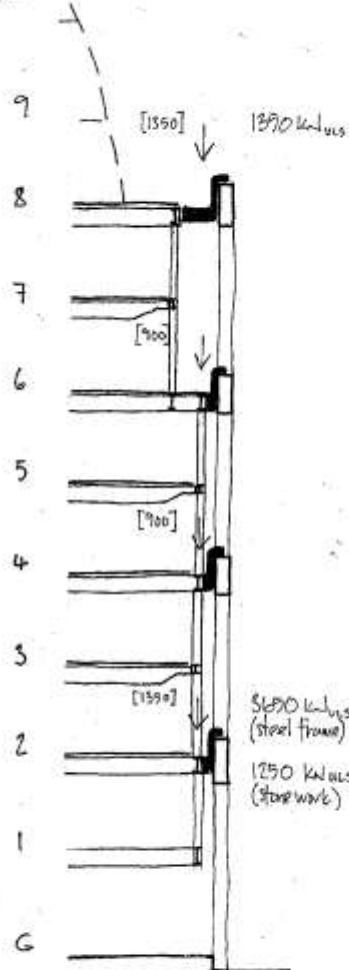
Metropole Building, London

Facade Engineering - Spandrel Options

Rev	Description	Date	By	Chk			
Scale:	n.t.s.	Date:	oct 2004	Drawn:	SSm	Checked:	
Drawing No:	3138/SK/1002	Rev:					

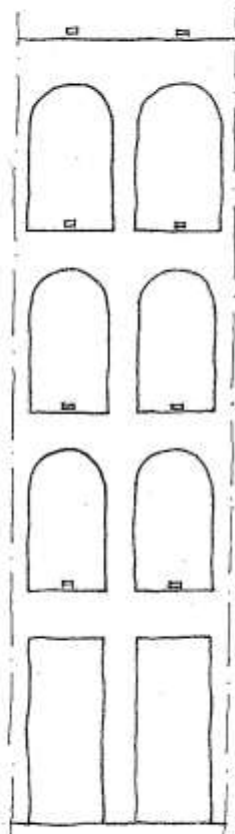
Section:

1:200

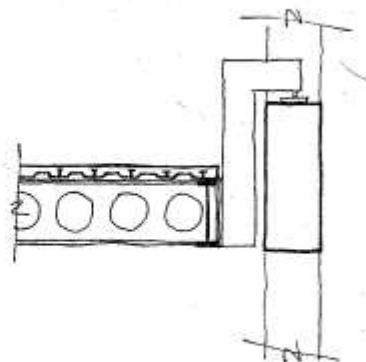


Elevation:

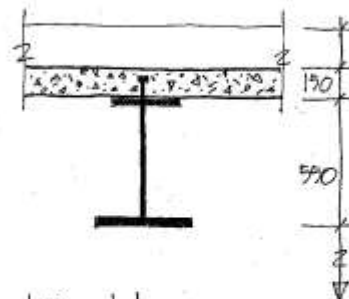
1:200



Detail:



Detail:



design data:

floor loading 3,50 + 1,00 kN/m<sup>2</sup>  
raised flr, ceiling and services 0,85  
slab 3,10  
steel 0,55

typical ULS end beam reaction  
13,5m beam @ 4,5m centres:

1L = 210 kN DL = 250 kN (35 kN cladding)

Notes:

- Finsbury Square stone/mortar:
  - portland stone  $f_k = 23,2 \text{ N/mm}^2$
  - mortar 1:1:2:4  $[5,93 \text{ N/mm}^2]$
  - $\gamma_m = 2,5$
  - beings  $f_k = 33,2 \text{ N/mm}^2$   $\gamma_{m, \text{ULS}} = 1,9$
  - columns  $f_k = 26,9 \text{ N/mm}^2$   $\gamma_{m, \text{ULS}} = 1,0$
- BS 9628 slenderness factor  $\beta$  for 600mm thick stone over 2 storeys (8m)
  - $e = 0,14$   $\beta = 0,80$
  - $e = 0,22$   $\beta = 0,69$

Stone Design:

bearing area req'd =  $\frac{1350 \text{ kN}}{19,9 \text{ N/mm}^2} = 265 \times 265 \text{ mm}$

min. pier size req'd =  $\frac{[3650 + 1250] \times 2,5}{26,7 \times 0,8} = 600 \times 950 \text{ mm}$

Bracket Design:

bracket forces shear  $P_v = 1350 \text{ kN/ULS}$   
BM = 810 kN/ULS

'standard' section say 305 UC 283 S355

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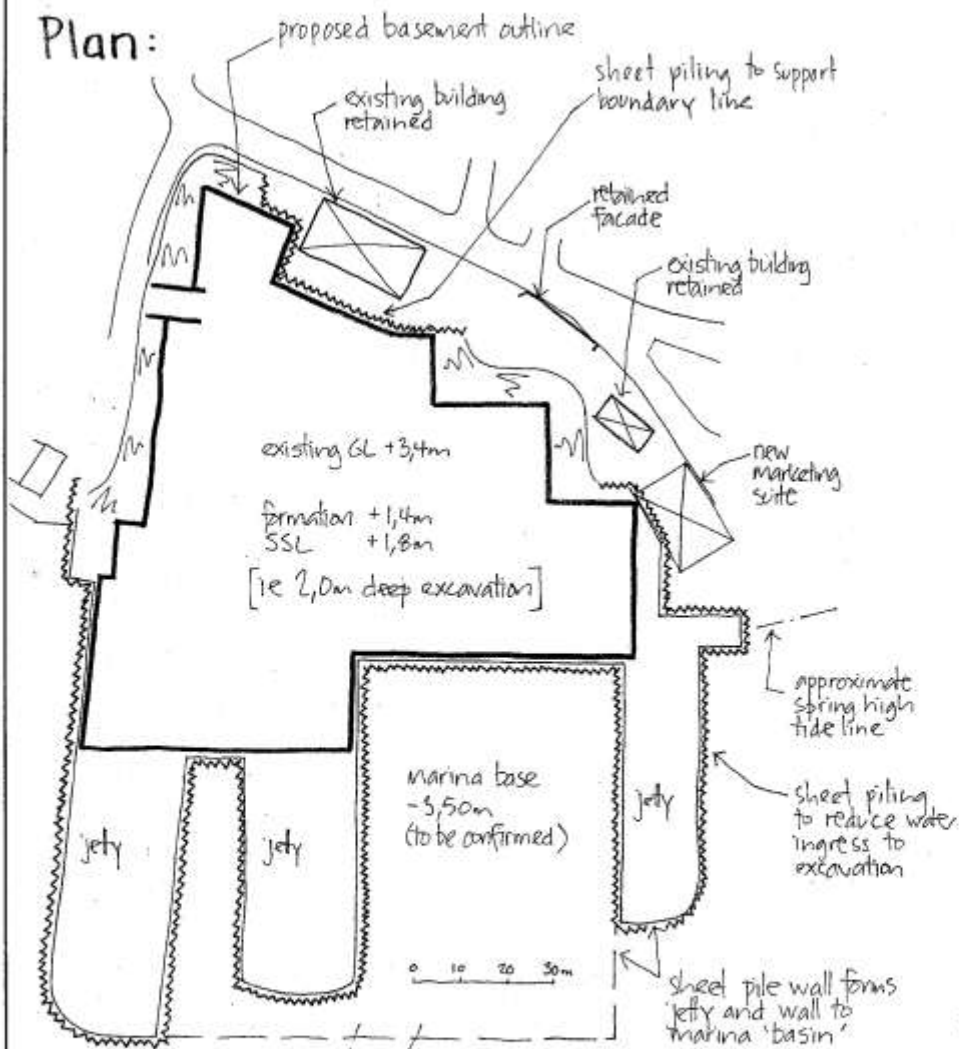
tel 01223 369220 fax 01223 366215 carl@whitbybird.com  
www.whitbybird.com

Metropole Building, London

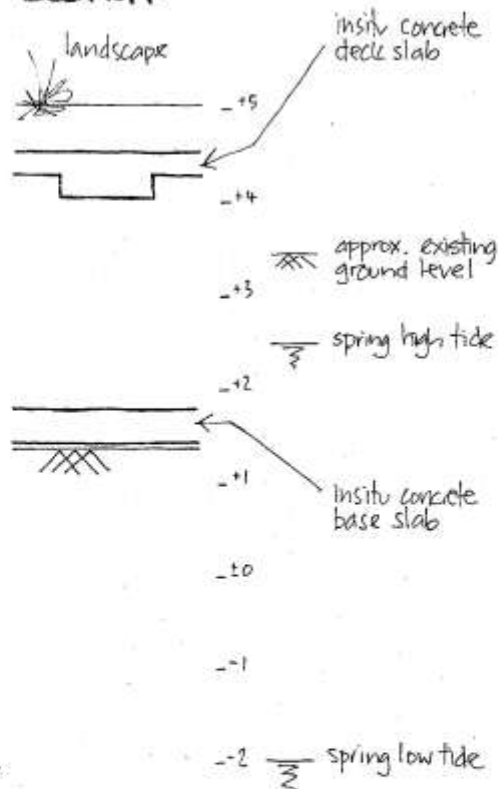
Facade Engineering - Outline Design

Rev	Description	Date	By	Chk
Scale	1:200 @ A5	Date	Sept 2004	Design
Drawing No.	2128/SK/1001			

## Plan:

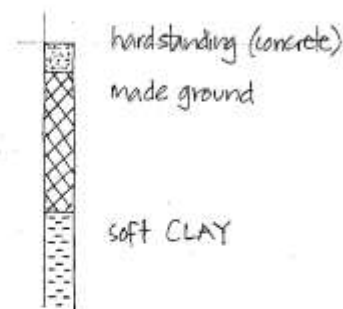


## Section:



## Geology:

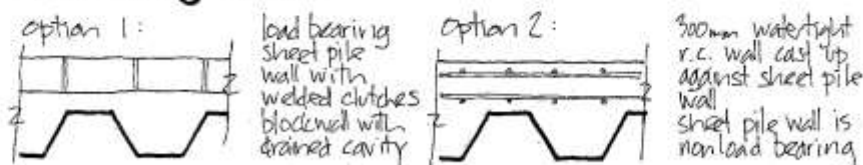
(from trial pits 2004)  
4 no. trial pits carried out 8/3/04  
top of clay varied from +2.20m to +1.60m  
TPI #2 encountered water inflows



## Note:

1. Information based on early site investigation
2. Further s.i. will be required to confirm assumptions made (further trial pits & boreholes)

## Retaining Walls:



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email: cambridge@whitby-bird.co.uk www.whitbybird.com

Brightlingsea Marina

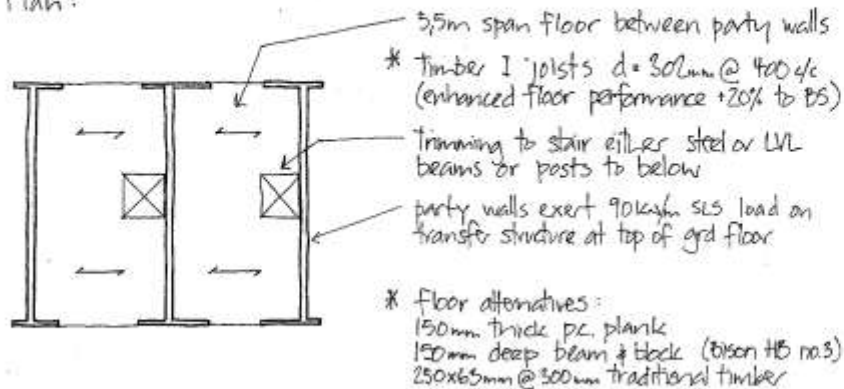
Review of Basement Construction

Rev	Description	Date	By	Chk
Scale:	1:1000 @ A3	Date:	March 04	Drawn:
Drawing No.:	3433/SK/004	Checked:	SSm	Rev:

## Typical Town House Building:

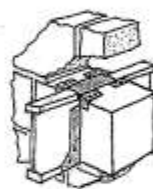
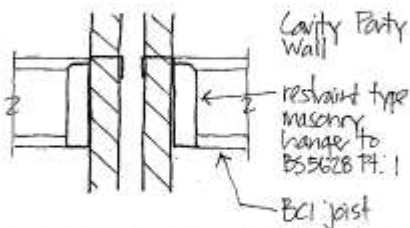
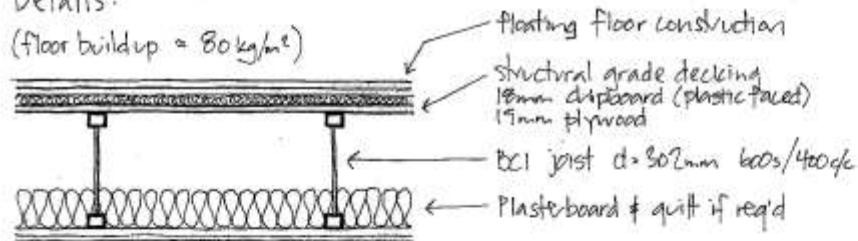
(Buildings A, E, F, I and L)

Plan:



Details:

(floor buildup =  $80\text{ kg/m}^2$ )



Solid Party Wall

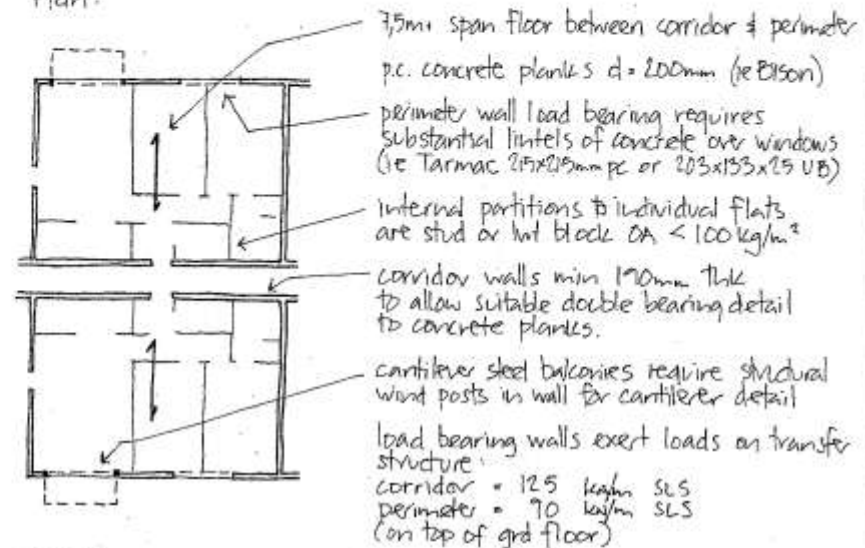
straddle hanger detail

dense party wall blocks (ie Tarmac SPW)

## Typical Apartment / Mixed Use Building:

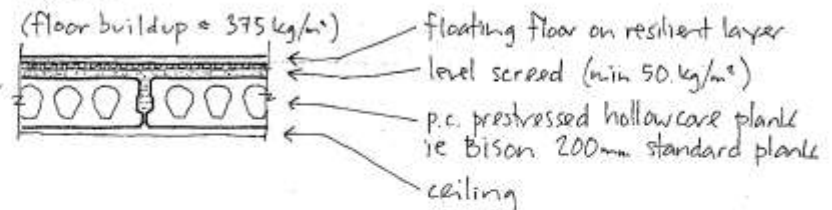
(Buildings B, D, G, H, J and K)

Plan:



Details:

(floor buildup =  $375\text{ kg/m}^2$ )



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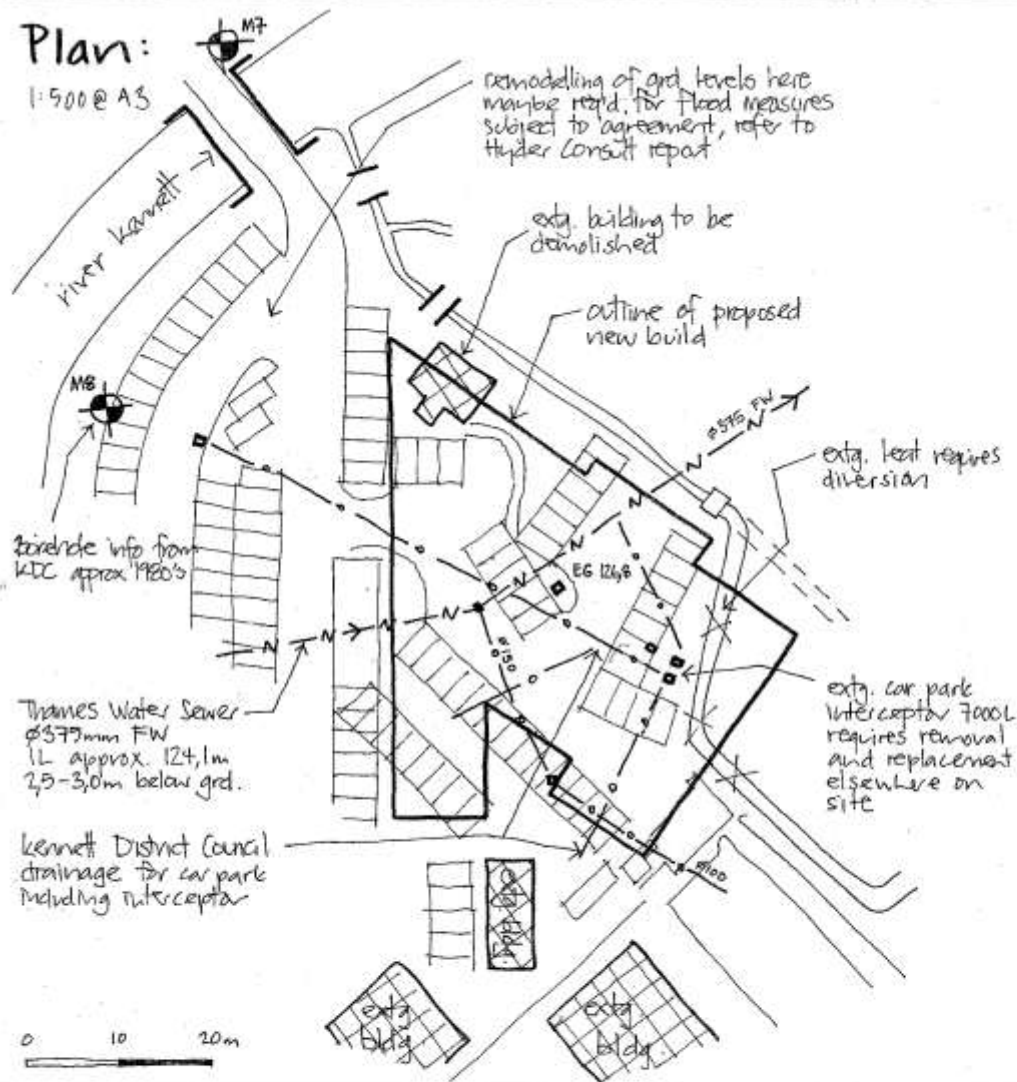
Brightlingsea Marina

Outline Structural Schemes (Superstructure)

Rev	Description	Date	By	Chk	
Scale:	n.t.s.	Date:	March 04	Drawn:	Checked:
				Sam	
Drawing No:					Rev:
3433 / SK / 005					

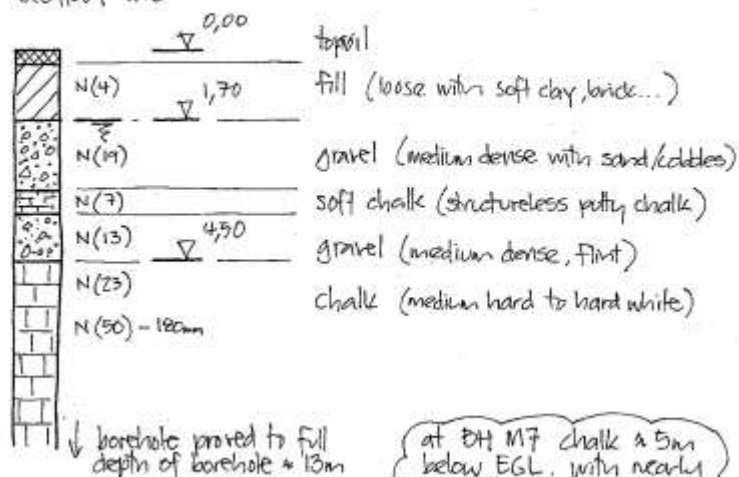
# Plan:

1:500 @ A3



## Geotechnical Information:

Section MB



at BH M7 chalk is 5m below EGL. with nearly 3m fill over 2m gravel! groundwater at 1.8m below EGL.

## Notes:

1. no site specific investigation carried out due to financial constraints on project.
2. refer to whitbybird desk study August 04
3. scope of 'enabling' works
  - diversion of TW extg sewer (or build over agreement?)
  - diversion of KDC drainage incl. interceptor
  - diversion of drainage least
  - demolition of extg. building
  - removal of trees
  - flood compensation measures
4. extg GL approx. 126.8m proposed Gfloor PFL 128.9m

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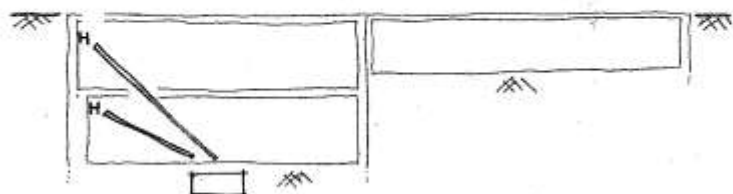
tel 01223 369220 fax 01223 369215 cambridge@whitbybird.com  
www.whitbybird.com

Riverbank Theatre, Marlborough

Site Plan

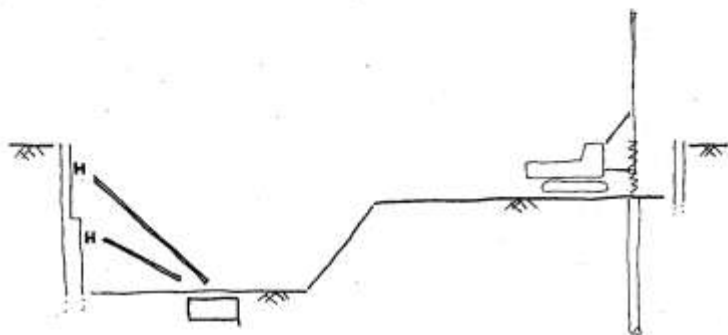
Rev	Description	Date	By	Chk
Scale:	1:500 @ A3	Date:	October 04	Drawn:
				SSM:TL
				Checked:
Drawing No.:	3450/SK/001			Rev:

## Demolition



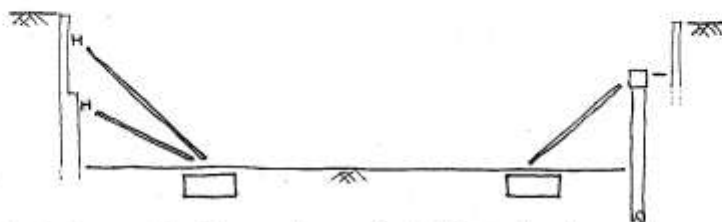
1. demolition down to ground level.
2. install temporary works (walings and raking props).
3. demolition of grd floor and remaining sub-structure.

## Secant wall installed



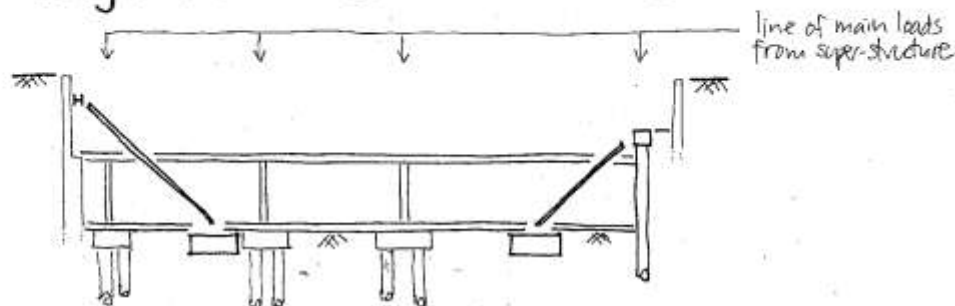
1. install high level piling mod.
2. localised sheet piling to enable uniform piling level.
3. install secant piled wall
4. cast piled wall capping beams

## Bulk excavation



1. bulk excavation leaving berm in front of secant wall.
2. install raking props to secant wall.
3. remove berm in front of secant wall.

## Piling and r.c. works to substructure



1. install main piles to building
2. cast r.c. pile caps and lower slab
3. cast r.c. suspended slab around raking props
4. once r.c. slab is complete, lower walings and raking props can be removed.

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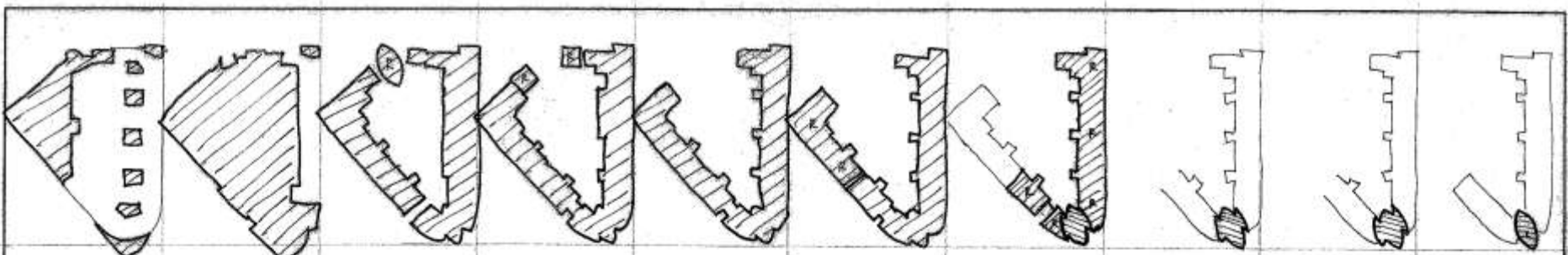
tel 01223 369220 fax 01223 356215  
cambridge@whitbybird.com  
www.whitbybird.com

30 Crown Place

Basement Structural Scheme (sheet 3)

Rev	Description	Date	By	CHK
Scale:	1:230 @ A/B	Date:	June 2005	Downs:
Drawing No:	3434/SK/1007	Checked:		Rev:





GROUND	DECK	LEVEL 01	LEVEL 02	LEVEL 03	LEVEL 04	LEVEL 05	LEVEL 06	LEVEL 07	LEVEL 08
areas of suspended insitu ground slab core areas and retail space	areas of suspended p.c. unit and r.c. slab, landscape & resi. & health fitness (pool)	areas of suspended r.c. slab & lvt roof residential space	areas of suspended r.c. slab & lvt roof residential space	areas of suspended r.c. slab residential space	areas of suspended r.c. slab & lvt roof residential space roof terrace/plant	areas of suspended r.c. slab & lvt roof residential space roof terrace/plant	areas of suspended r.c. slab residential space	areas of suspended r.c. slab residential space	areas of suspended r.c. slab & lvt roof residential space
Area <sub>retail</sub> 900m <sup>2</sup>	Area <sub>ls</sub> 2200m <sup>2</sup>	Area <sub>res</sub> 175m <sup>2</sup>	Area <sub>res</sub> 215m <sup>2</sup>	Area <sub>res</sub> 2900m <sup>2</sup>	Area <sub>ret</sub> 775m <sup>2</sup>	Area <sub>ret</sub> 1750m <sup>2</sup>	Area <sub>res</sub> 150m <sup>2</sup>	Area <sub>res</sub> 150m <sup>2</sup>	Area <sub>ret</sub> 150m <sup>2</sup>
Area <sub>core</sub> 730m <sup>2</sup>	Area <sub>resi</sub> 2000m <sup>2</sup>	Area <sub>resi</sub> 5100m <sup>2</sup>	Area <sub>resi</sub> 2900m <sup>2</sup>		Area <sub>resi</sub> 2000m <sup>2</sup>	Area <sub>resi</sub> 150m <sup>2</sup>			Area <sub>resi</sub> 190m <sup>2</sup>
	Area <sub>hp</sub> 400m <sup>2</sup>				Area <sub>plant</sub> 40m <sup>2</sup>	Area <sub>plant</sub> 100m <sup>2</sup>			
Load <sub>retail</sub> 15000kw	Load <sub>ls</sub> 50000kw	Load <sub>ret</sub> 350kw	Load <sub>ret</sub> 400kw	Load <sub>res</sub> 39000kw	Load <sub>ret</sub> 1500kw	Load <sub>ret</sub> 3500kw	Load <sub>resi</sub> 2000kw	Load <sub>resi</sub> 2000kw	Load <sub>ret</sub> 300kw
Load <sub>core</sub> 12000kw	Load <sub>resi</sub> 27000kw	Load <sub>resi</sub> 41500kw	Load <sub>resi</sub> 39000kw		Load <sub>resi</sub> 2700kw	Load <sub>resi</sub> 2000kw			Load <sub>resi</sub> 2000kw
	Load <sub>hp</sub> 7000kw				Load <sub>plant</sub> 600kw	Load <sub>plant</sub> 1500kw			
Load <sub>total</sub> 27000kw	Load <sub>total</sub> 94000kw	Load <sub>total</sub> 41850kw	Load <sub>total</sub> 39400kw	Load <sub>total</sub> 39000kw	Load <sub>total</sub> 29100kw	Load <sub>total</sub> 7000kw	Load <sub>total</sub> 2000kw	Load <sub>total</sub> 2000kw	Load <sub>total</sub> 2300kw

$\Sigma \text{ AREA} = 21000 \text{ m}^2$ $\Sigma \text{ LOAD} = 285000 \text{ kW}$ includes roof + all suspended slabs, excludes car park space	<b>Foundation Outline Details:</b> CHD piling techniques - no spoil/piling arisings Raker Bulbent Piling Gerry Cooper (tel 01223 525056) $\phi 600 \text{ mm OD}$ 14m long SWL $\times 725 \text{ kW}$ (16m drill length) £25/m	notes: piles in groups of 2, 3 and 4 typically 4no. pile group with 2750x2750x1000mm pile cap 150 kg/m <sup>2</sup> rebar FNDZ mix.
--	---	--

<b>Whitby Bird &amp; Partners</b> ENGINEERS  Janus House 50 St Andrews Street Cambridge CB2 3AH  tel +44 (0)1223 369 220 fax +44 (0)1223 356 215 email: cambridge@whitby-bird.co.uk www.whitbybird.com	Homerton Street, Cambridge		Rev	Description	Date	By	CHK
	Structure Overview, Outline Load Take Down		Scale: n.t.s.	Date: Nov 2003	Drawn: SSW	Checked:	
			Drawing No: 3347/sk/011	Rev:			



## Concrete:

insitu flat slab

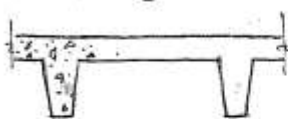
725 kg/m<sup>2</sup>  
305 mm



traditional construction, max. future proof  
note Norwich Forum soffits

insitu trapezoid slab

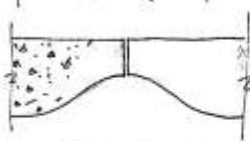
450 kg/m<sup>2</sup>  
530 mm



exposed needs grp formwork £25/m<sup>2</sup>  
structurally efficient

precast (bespoke)

550 kg/m<sup>2</sup>  
500 mm



possible hybrid p.c. & insitu frame  
future phases repetition issue

## Steel:

simflor

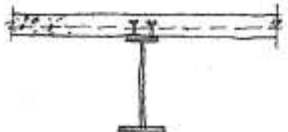
425 kg/m<sup>2</sup>  
335 mm



possible thermodeck scheme  
inherent fire protection to steel beams

hdsrib

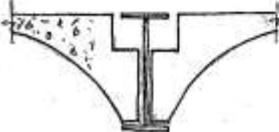
325 kg/m<sup>2</sup>  
500 mm



suspended ceiling req'd + steel fire protection

precast (bespoke)

550 kg/m<sup>2</sup>  
500 mm

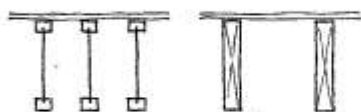


steel fire protection req'd, future proof as above

## Timber:

engineered timber

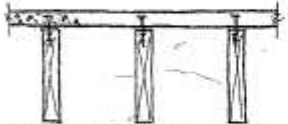
100 kg/m<sup>2</sup>  
435 mm



possibly with steel frame  
no thermal mass, acoustics problem?

timber/concrete composite?

290 kg/m<sup>2</sup>  
480 mm



fire engineered solution with thermal mass  
unusual construction (cost risk)

## Notes:

design load (imposed) 6.5 kg/m<sup>2</sup>  
[book stacks to 2.7m height]

possible assessment criteria:

1. construction access (but with 7.2m grid ✓)
2. thermal mass
3. foundation loads
4. structural depth
5. repetition
6. future proof

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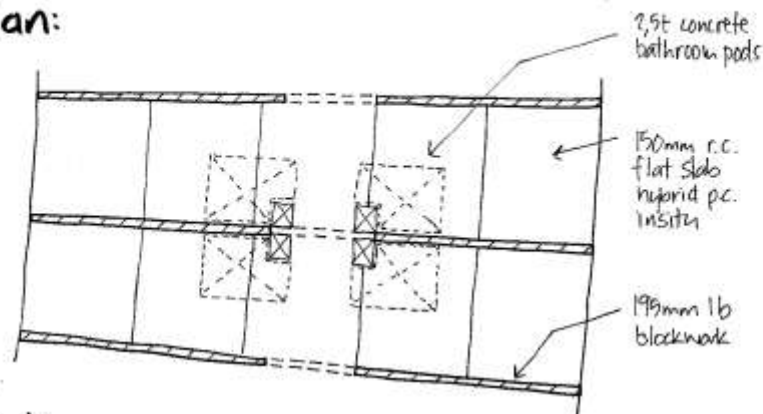
tel +44 (0)1223 369 220 fax +44 (0)1223 356 215  
email cambridge@whitby-bird.co.uk www.whitbybird.com

UEA Central Library Extension

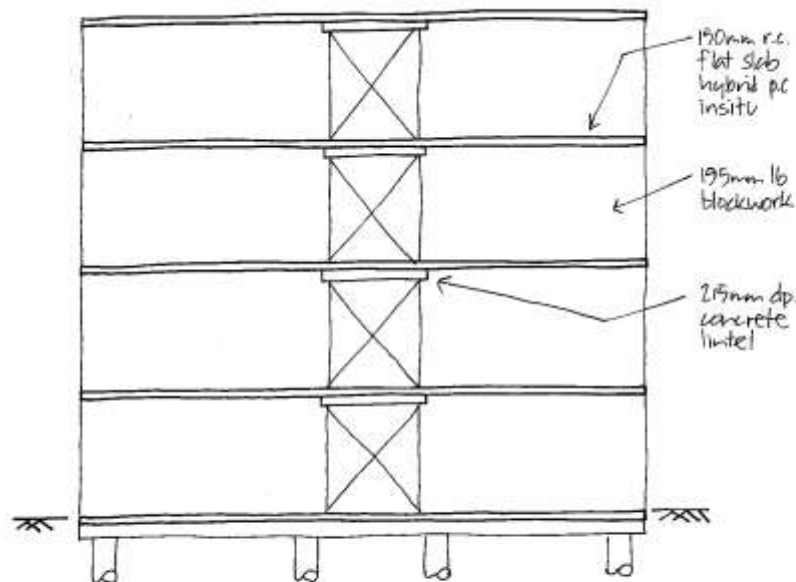
Structural Frame Options 7.2 x 7.2m grid

Rev	Description	Date	By	CHK			
Scale:	n.t.s.	Date:	Jan 03	Drawn:	SS	Checked:	
Drawing No.: 2960/SK/001						Rev:	

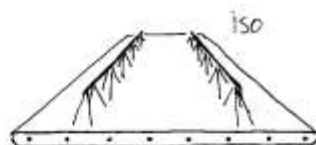
## Plan:



## Section:



## Floor:



The floor comprises precast concrete permanent formwork and insitu concrete topping. This forms a flat slab.

Info available at [www.omnider.co.uk](http://www.omnider.co.uk)  
tel. 0191 4170066

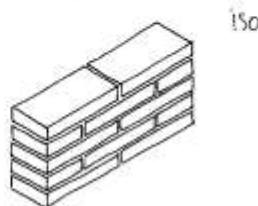
A 50mm concrete panel 2.4m wide is cast with rebar lattice girder at 600mm centres. The required bottom rebar is also cast into the panel.

Typically panels can span 2.5m without the need for temporary propping, here we would work with the suppliers to span 3.1m without temporary propping.

Advantages are:

- faster than formwork road
- can meet A3 building regs (disproportionate collapse)
- safe working platform

## Walls:



Load bearing masonry cross walls, using proprietary party wall blocks.

Tarmac SPW block - 195mm wall  
(440x65x195mm)

Tarmac prestressed concrete lintel road over corridor zone to support floor (tarmac beam lintel 215mm dp.)

Class (ii) mortar to BS5628

## Foundations:

- CFA piles into chalk thp. per cross wall grid line with r.c. ground beam supporting suspended ground slab.
- possible alternative of strip footings requiring further S.I.

## Notes:

design loads

live load accommodation areas 1.5 kN/m<sup>2</sup>  
corridors etc. 3.0 kN/m<sup>2</sup>

dead load finishes 2.1 kN/m<sup>2</sup>  
concrete bathroom pods 2.5 kN

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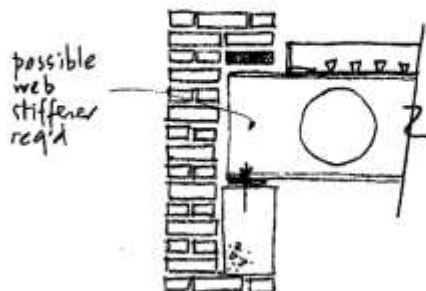
tel +44 (0)1223 369 220 fax +44 (0)1223 366 215  
email: [cambridge@whitby-bird.co.uk](mailto:cambridge@whitby-bird.co.uk) [www.whitbybird.com](http://www.whitbybird.com)

UEA Residential Accommodation

Review of Structure (sheet 2)

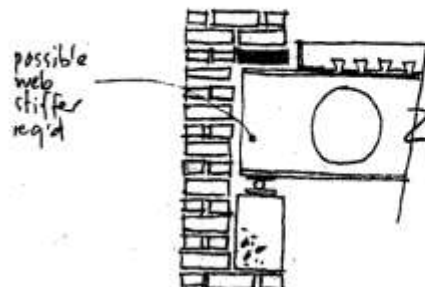
Rev	Description	Date	By	Chk
Scale:	1:100 @ A3	Date:	April 2003	Drawing:
Drawing No:	UEA res / SK / 002	Checked:		Rev:

## Typical Baseplate



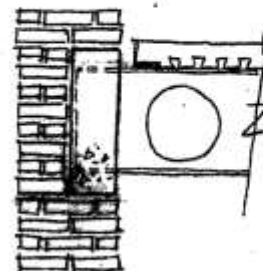
accommodates rotation X  
 minimise eccentricity X  
 robust detail ✓ (with cast in bolts)  
 low maintenance ✓  
 buildability ✓  
 cost ✓

## Fabricated Pin



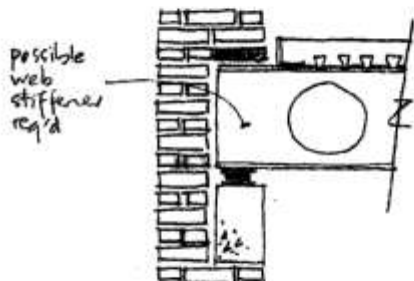
accommodates rotation ✓  
 minimise eccentricity ✓  
 robust detail ✓  
 low maintenance X  
 buildability ✓  
 cost ✓

## Cast-in detail



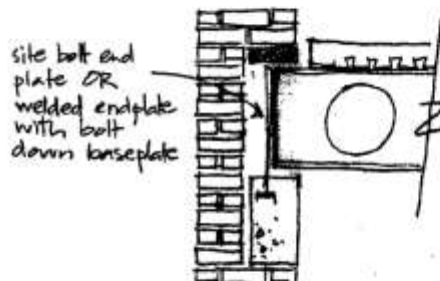
accommodate rotation X  
 minimise eccentricity X  
 robust detail ✓  
 low maintenance X (not maintainable)  
 buildability ✓  
 cost ✓

## Proprietary Bearing



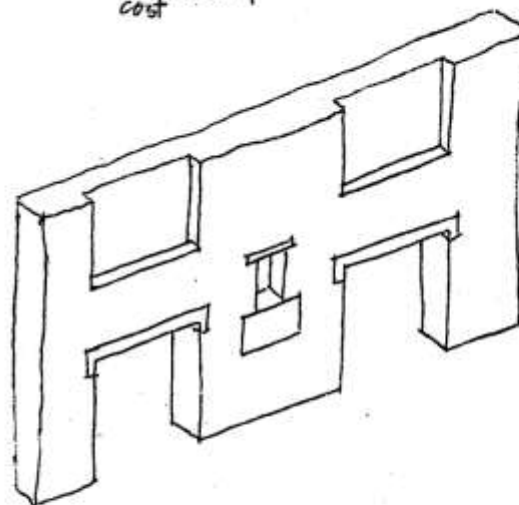
accommodate rotation ✓  
 minimise eccentricity X  
 robust detail X  
 low maintenance X  
 buildability ✓  
 cost ✓

## Thin Endplate



accommodate rotation ✓  
 minimise eccentricity ✓  
 robust detail ✓  
 low maintenance ✓  
 buildability ✓  
 cost ✓

note: possible lack of lateral restraint to wall



main issues that bearing detail must address:  
 - accommodate support rotation  
 - minimise eccentric loading to wall  
 - provide robust detail (re disproportionate collapse)  
 - low maintenance detail (ventilated bearing)

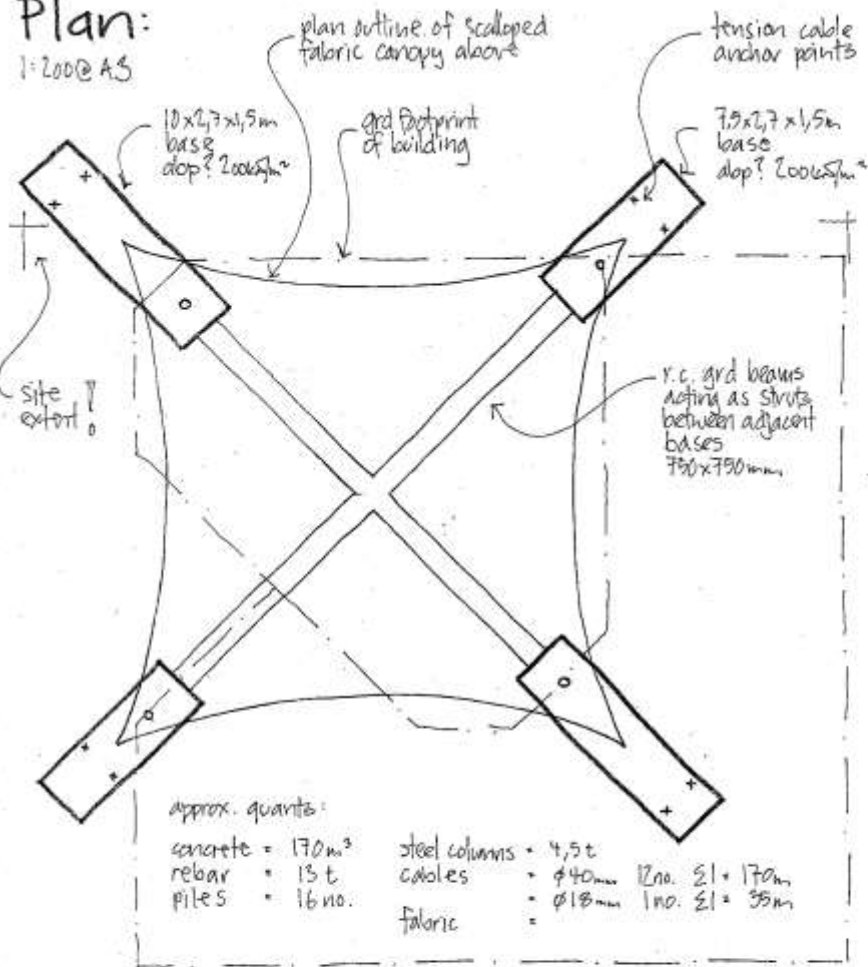
Whitty Bird & Partners  
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20-32 Baker St.  
 Epsom

19940  
 SK 185  
 12 22

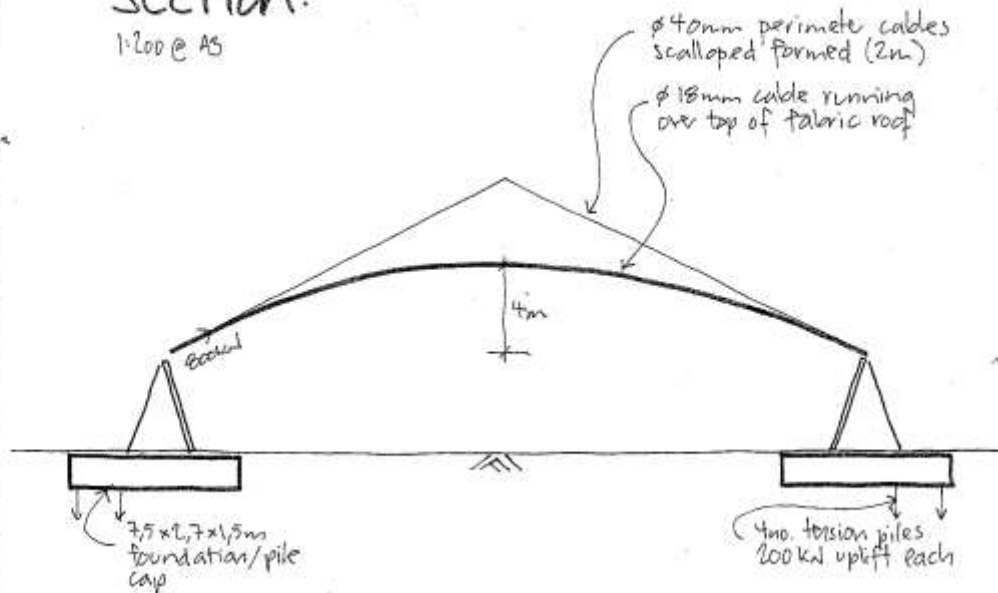
## Plan:

1:200 @ A3



## Section:

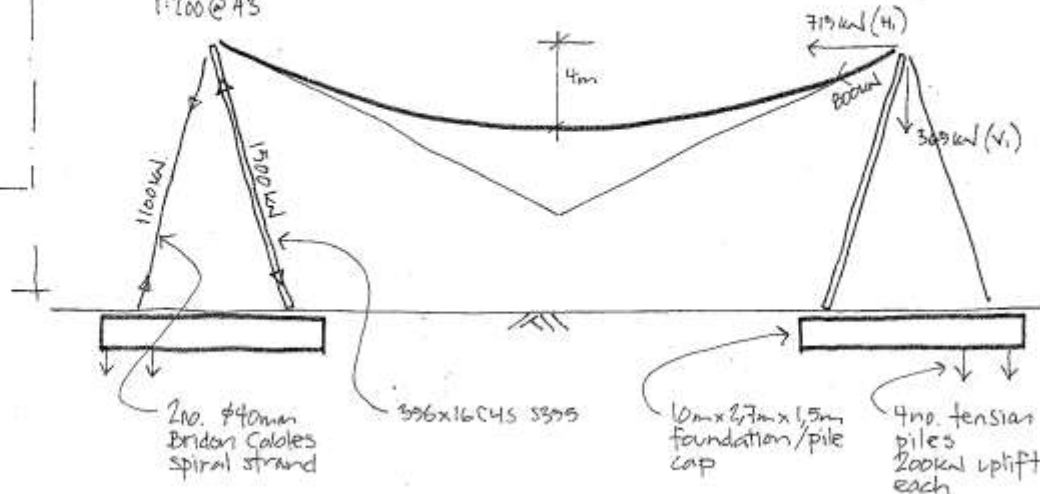
1:200 @ A3



SmartLife  
whitby/bird  
3712/SK/004

## Section:

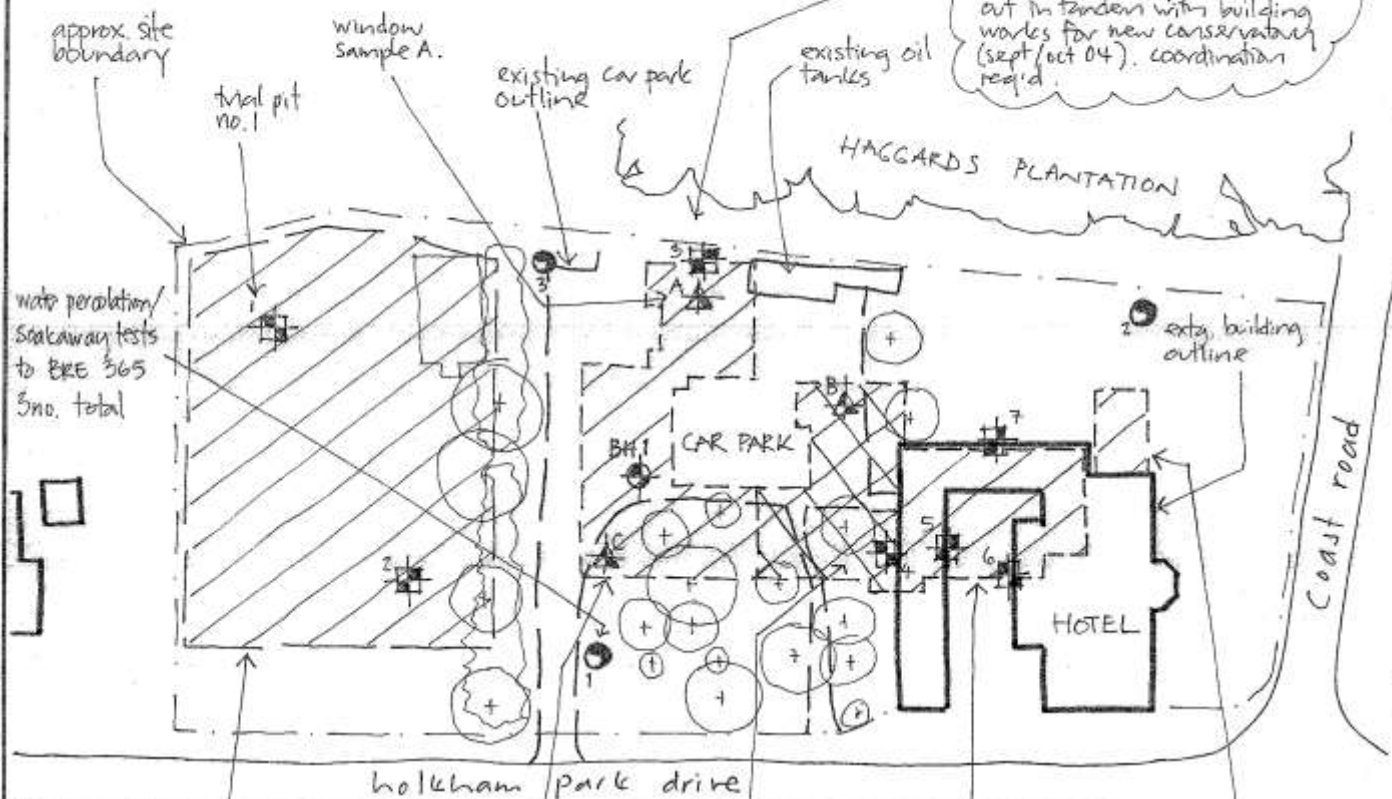
1:200 @ A3



## Notes:

1. Fabric canopy foundations based on working tensile force of 800kN given by Tensys email of 17 Nov 04.
2. Uplift piles to each base with min. 4T16 full length of piles

# Site Plan: 1:500 @ A3



NOTE!  
S.I. works likely to be carried out in tandem with building works for new conservatory (sept/oct 04). coordination req'd.

## S.I. Scope Works:

- 1 trial pit to determine insitu soil & ground water conditions.
- 1, 2 trial pits to min. depth 0.9m with CBR
- 3 trial pit to determine whether tree roots are present
- 4 deep trial pit to determine existing retain wall details and take soil samples
- 5, 6, 7 trial pits to determine existing foundation details

note insitu testing and sampling within trial pits to be agreed with S.I. company.

- 2 window sampling to 3-5m depth to determine insitu ground conditions and take disturbed soil samples. monitor/record ground water if present.

- 3 single borehole to 10m depth to establish soil conditions at depth for possible mini-pile design. monitor/record ground water if present.

\* optional - may not be req'd depending on conditions found, progress made with trial pitting and window sampling

## Scope: (of building works)

- 1 new surface car park on existing green field
- 2 new build single storey extension
- 3 new build 2 storey extension, part basement
- 4 refurb and extension of existing building, part increase to 2 storey
- 5 new conservatory extension

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Site Plan

Rev	Description	Date	By	Chk		
Scale:	1:500 @ A3	Date:	July 04	Drawn:	SSW	Checked:
Drawing No:	3558/SK/002	Rev:				

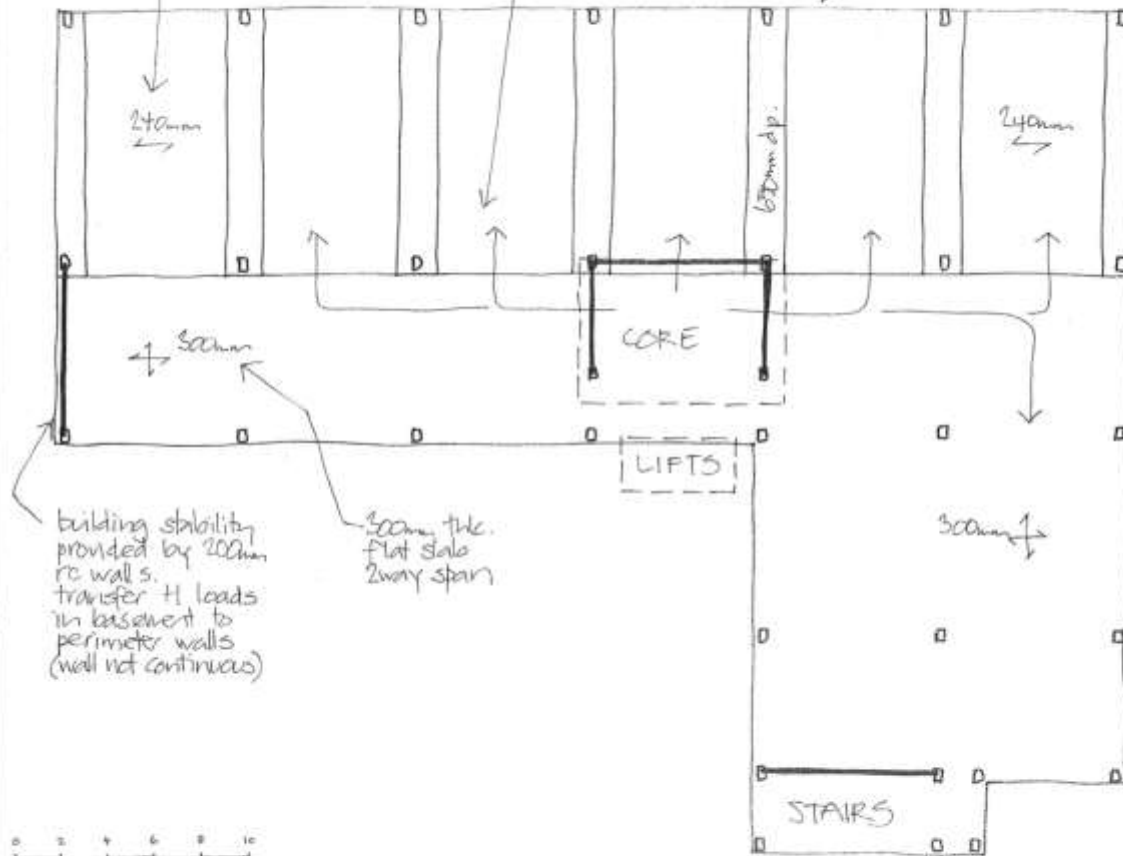
Plan:

1:200

240mm thk. solid rc slab  
one way span onto  
downstand beams

services distribution  
between downstand  
beams

Assume hvt cladding  
system  
check deflection limits  
if edge beam req'd

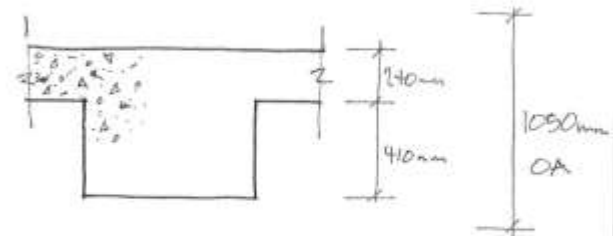


building stability  
provided by 200mm  
rc wall s.  
transfer H loads  
in basement to  
perimeter walls  
(wall not continuous)

300mm thk.  
flat slab  
2way span

Section:

1:20



slab: 240mm and 300mm flat rc slab  
with 150mm wide downstand beams

240mm slab rebar 21 kg/m<sup>2</sup>  
300mm slab rebar 35 kg/m<sup>2</sup>  
DS beam rebar 90 kg/m

walls: 200mm stability walls  
rebar 35 kg/m<sup>2</sup>

columns: 425x425mm  
rebar 55 kg/m

Notes:

1. Materials RC40 and fy 460 rebar

2. Design Loads: floor live load 3+1 kg/m<sup>2</sup>  
raised floor 0.39  
sw. rc slab (+ beam) 7.6  
services + ceiling 0.50  
12.43 s/s  
18.73 u/s

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Phase 1 Commercial RC Scheme

Rev	Description	Date	By	Chk
Scale:	1:200 @ A3	Date:	May 05	Drawn: Sam
Checked:				
Drawing No:	3873/sk/003	Rev:		