jc.Structural Solutions

Providing Structural Inspections and Calculations for the Building and Construction Industry

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Designs for: Buildings, Foundations, Basements, Retaining walls, Floors, Roofs, Removal of walls, Reinforced Concrete, Brickwork, Steelwork, Timber, Steel Beams, Dormer & Loft Conversions, Pile Foundations, Raft Foundations, Floor Slabs, Structural Inspection & Surveys.

STRUCTURAL CALCULATIONS & DETAILS

FOR

PROPOSED UNDERPINNING
BASEMENT RETAINING WALLS
& STEEL BEAMS,

AT

PROPOSED BASEMENT & REAR EXTENSION,
81 FORDWYCH ROAD,
WEST HAMPSTEAD,
LONDON.

Reference: Architectural Drawing Numbers: 31/14/EX01 & EX12

Date of Calculations : 21/05/15 (For Local Authority Approval)

Project Number : J54/7805

TERMS & CONDITIONS:

All calculations, details & Proposals must be fully checked and approved (by the Building Control Engineer / Inspector) prior to starting any work or ordering any materials. The calculations must be checked so that any errors or discrepancies can be brought to the attention of JC Structural Solutions Limited so that adjustments can be made prior to construction.

Any work that starts before full written approval (of these calculations) has been given from the Local Authority Building Control Department is at the contractors own risk.

JCSS LTD. Liability is limited to the cost of the work covered by this design (ie: the cost of the proposed structural work). Use of these calculations is limited to this term and condition.

All setting out and structural requirements must be checked on site by the builder before commencement, any discrepancies should be brought to the attention of the Engineer so that adjustments can be made.

The Builder must ensure that existing structures remain adequately supported and stable whilst the work is being undertaken.

Where new steel beams are supported on existing walls the Builder must check the existing wall & foundations are adequate.

The Building Regulations drawings must be checked by the Structural Engineer prior to submission for Local Authority Approvals to ensure the information within these calculations has been correctly indicated on the drawings. If the drawings have not been checked by the Engineer, then construction must not start.

Use of these calculations/Document indicates acceptance of the above terms.

STRUCTURAL CALCULATIONS FOR

J/5/7805
MAY 2015

(1) BASEMENT RETAINING WALLS (NEW WORKS)
(2) STEEL BEAMS (KNOCK THROUGH TO EXISTING)
(3) UNDERPINNING EXISTING WALLS TO FORM NEW BASEMENT UNDER EXISTING PROPERTY

AT: 81 FORDWYCH ROAD
WEST HAMPSTEAD
LONDON.

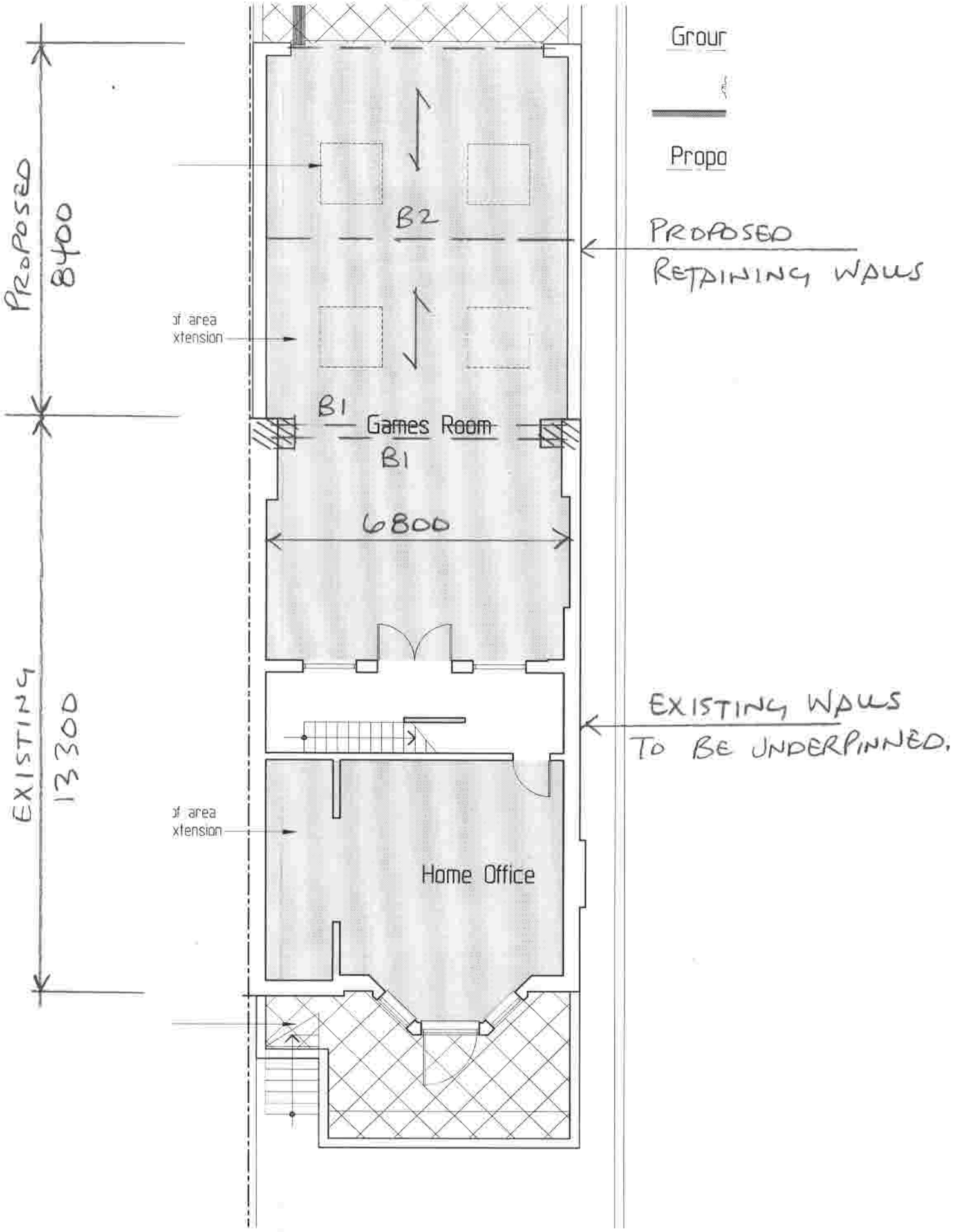
REF: ARCHITECTS DRAWINGS: 31/14/EX01 & EX12

LOADING INFORMATION:-

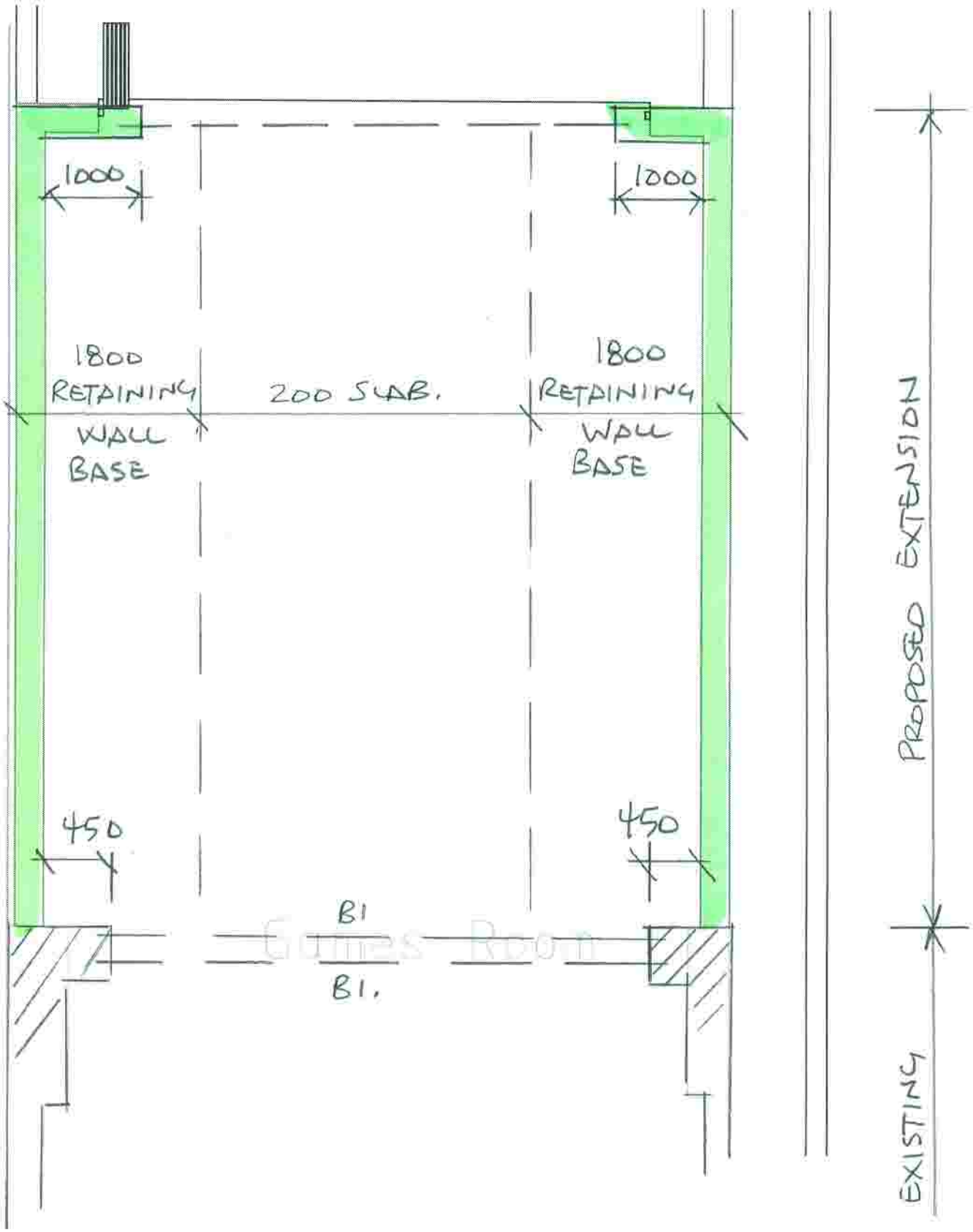
ROOF DL	=	1.3	KN/m²
ROOF IL	=	0.6	"
FLOOR DL	=	0.6	" (TIMBER JOISTS)
FLOOR IL	=	1.5	"
MASONRY WALLS	=	4.5	" (300 CAVITY WALLS)

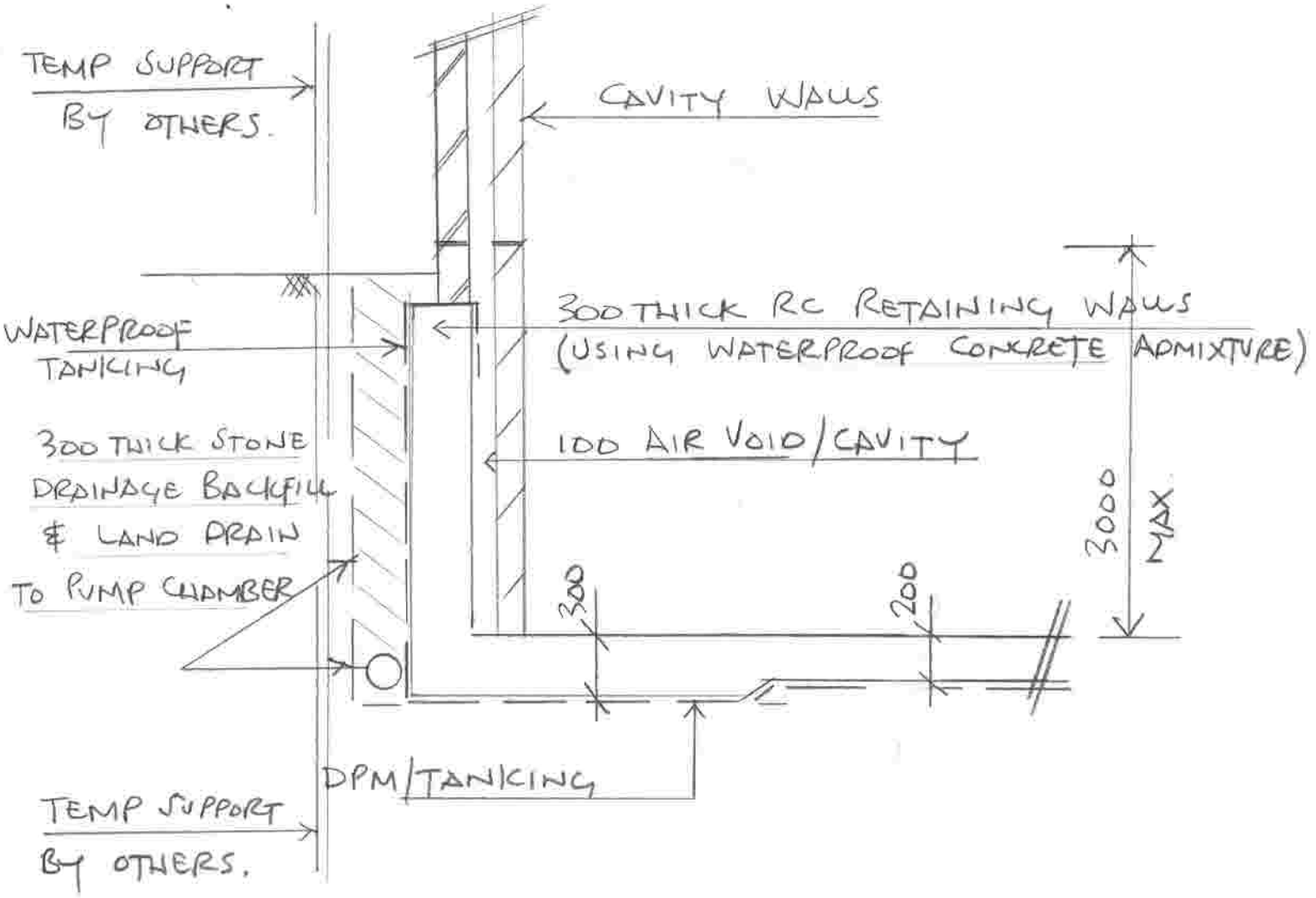
SKETCH LAYOUT :-

SEE NEXT PAGE



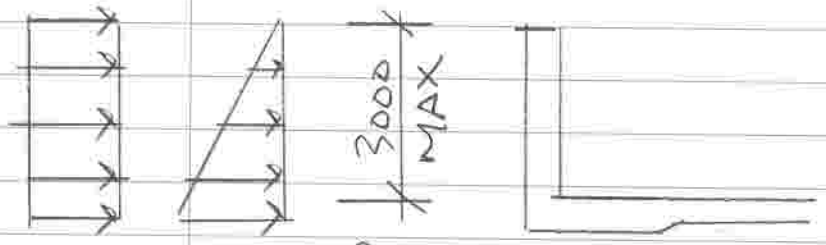
Proposed Lower Ground Floor Plan


1000
1000
1800
RETAINING
WALL
BASE
200 SLAB.
1800
RETAINING
WALL
BASE
450
450
B1
B1.
PROPOSED EXTENSION
EXISTING



X SECTION THROUGH RETAINING WALLS
(TO PROPOSED EXTENSION)

(1) BASEMENT RETAINING WALLS (NEW EXTENSION)



SURCHARGE + SOIL PRESSURE

$\gamma_b = 18\ KN/m^3$
$K_a = 0.35$

	→ F	ℓ_a	(SLS) BM	(ULT) BM
SOIL $= 0.35 \times 18 \times 3.0m^2/2$	28.4	1.0	28.4	40.0
SURCHARGE $= 0.35 \times 10 \times 3.0$	10.5	1.5	15.8	25.0
Σ	38.9			65.0
	KN	M		KN.M

(ULS) 57.0 KN/M

RETAINING WALL STEM REBARS :-

$H = 300mm$ $\quad d = 300 - 50 - 10 - 16/2 = 232mm$ (230)
$f_{cu} = 40N$

$$K = \frac{65 \times 10^6}{40 \times 1000 \times 230^2} = 0.03 < 0.156 \therefore OK$$

↓ $$A_s = \frac{65 \times 10^6}{0.95 \times 460 \times 0.95 \times 230} = 601 mm^2/m$$

↔ $A_{s(MIN)} = 0.13\% \times 1000 \times 300 = 390 mm^2/m^2$

CHECK SHEAR AT BASE :-

$V = 57.0\ KN/m$

$$v = \frac{57 \times 10^3}{1000 \times 230} = 0.25\ N/mm^2 < V_c \quad \therefore OK$$

NO SHEAR BARS REQUIRED

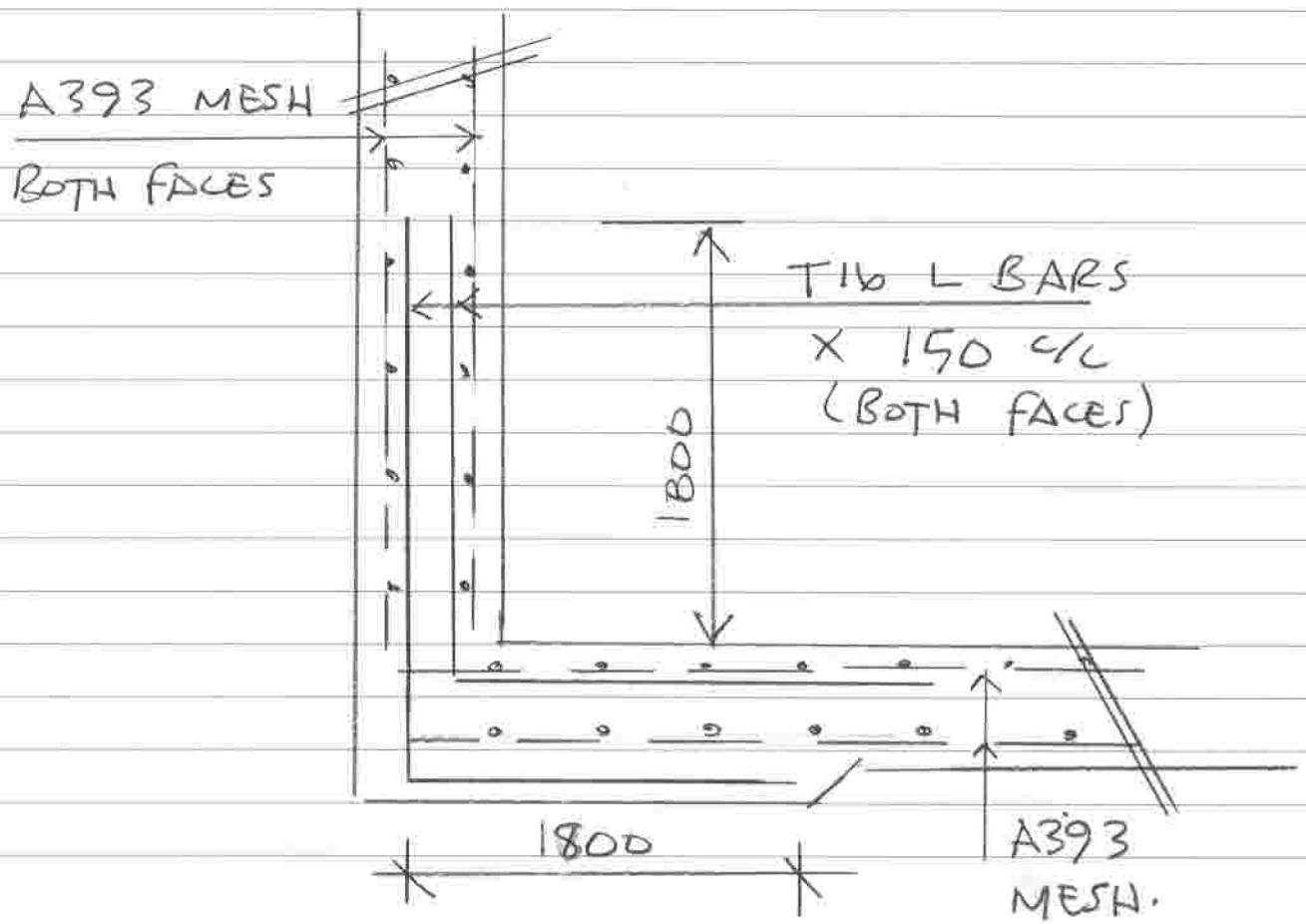
CHECK TENSION BARS AT 1.5M HIGH :-

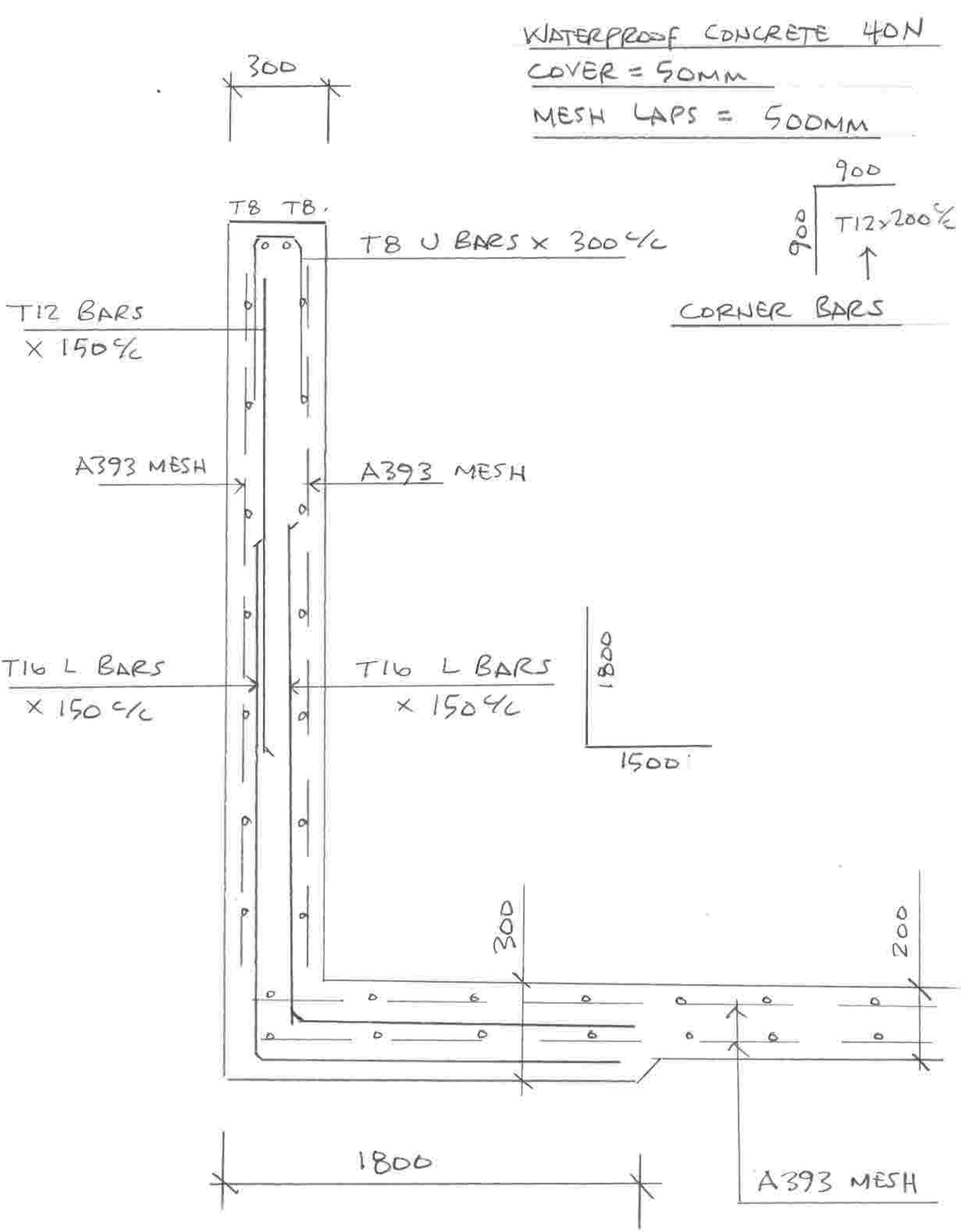
$$BM = \left(0.35 \times 18 \times \frac{1.5^3}{6}\right) \times 1.4 + \left(0.35 \times 10 \times \frac{1.5^2}{2}\right) \times 1.6$$

$$= 11.5\ KN.m$$

$$A_s\ (\text{REQUIRED}) = \frac{11.5 \times 10^6}{0.95 \times 460 \times 0.95 \times 230} = 120\ mm^2$$

$\therefore$ CURTAIL AT 1.5M HIGH TO A393 MESH.





BASEMENT RETAINING WALL (EXTENSION)

X SECTION

2) STEEL BEAMS TO SUPPORT OPENINGS (REAR ELEVATION)

APPROX SPAN = 6400.

(B1) GROUND FLOOR BEAM (BASEMENT CEILING)

				γ_f	kN/m
FLOOR DL	= 0·6	× 4·0	= 2·4	× 1·4	= 3·4
FLOOR IL	= 1·5	× 4·0	= 6·0	× 1·6	= 9·6
WALL	= 4·0	× 0·5	= 2·0	× 1·4	= 2·8
BEAM	= 0·5		= 0·5	× 1·4	= 0·7
		Σ	10·9 kN/m		16·5

$BM = 16·5 \times 6·4^2 \times 0·125 = 84·5$ kN.m

$R = 16·5 \times 6·4 \times 0·5 = 52·8$ kN

$l_e = 0·8 \times 6·4 = 5·1$ m

FLOOR JOIST RESTRAIN BEAM $l_e = 0·8L$

(B1) USE: 305 × 165 × 46 UB (M_b = 95 kN.m)

$$DEFLECTION = \frac{5 \times 10·9 \times 6·4^4 \times 10^5}{384 \times 205 \times 9950} = 11·6mm$$

∴ OK

PADSTONE/SPREADER: 665 × 100 × 215 Deep
20N

FLOOR BEAM B2 :-

(B2) BY INSPECTION FLOOR BEAM B2

= 305 × 165 × 46 UB.

UNDERPINING

1) The Contractor is responsible for safety & stability.
2) All Underpinning must be done in a safe manner & sequence.
3) The Contractor must ensure the existing walls are adequately propped & supported until the underpinning is complete.
4) It is recommended that existing floor joists, lintels & beams are propped to unload the walls to be excavated / underpinned
5) The Underpinning sequences should be carried out in a way to ensure at least 24 hours concrete curing is allowed between adjacent excavations / underpins. This may mean 48 hours is required between each stage of excavation.
6) All underpins must be propped until the concrete is set.
7) At each stage / sequence the Contractor should examine the joints between the top of the underpin and the underside of the existing walls / foundations. These joints may require dry packed or resin injected if gaps or shrinkage occurs in this interface joint. This should be done as soon as possible each day of the works.
8) The contractor must ensure the base of the excavated underpin has a suitable, firm formation ground bearing capacity of at least 125KN/m2.
9) It is recommended that the underpinning is installed with waterproof concrete.
10) The contractor install adequate waterproof tanking and vapor barriers with a positive drainage system. The drainage may require to be channeled to a sump / pump chamber.
11) All works must be supervised by a competent person with proven experience in underpinning.
12) All proposals must be approved by the Building Inspector prior to commencement.
13) The Building Inspector must be allowed to inspect & Approve each stage.

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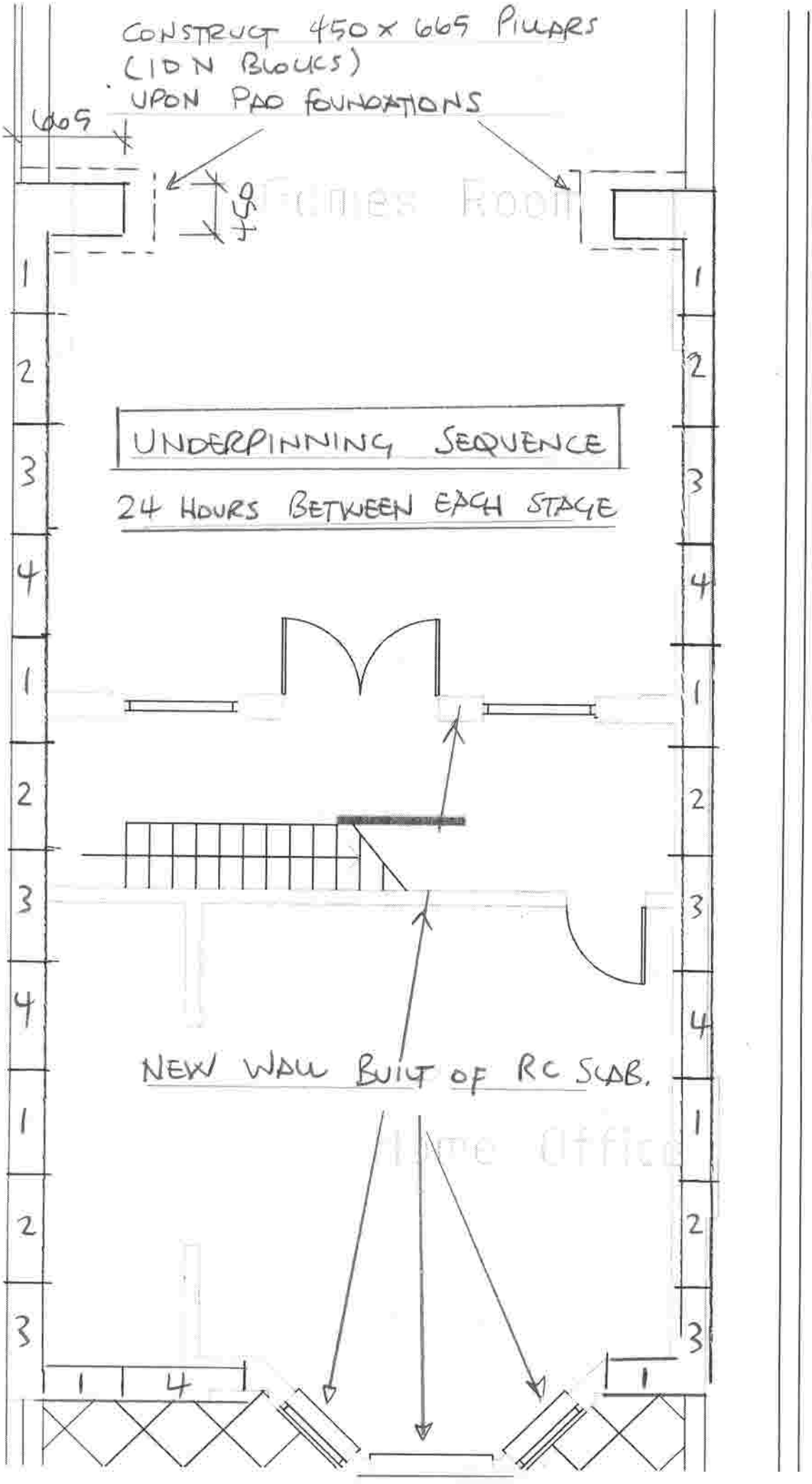
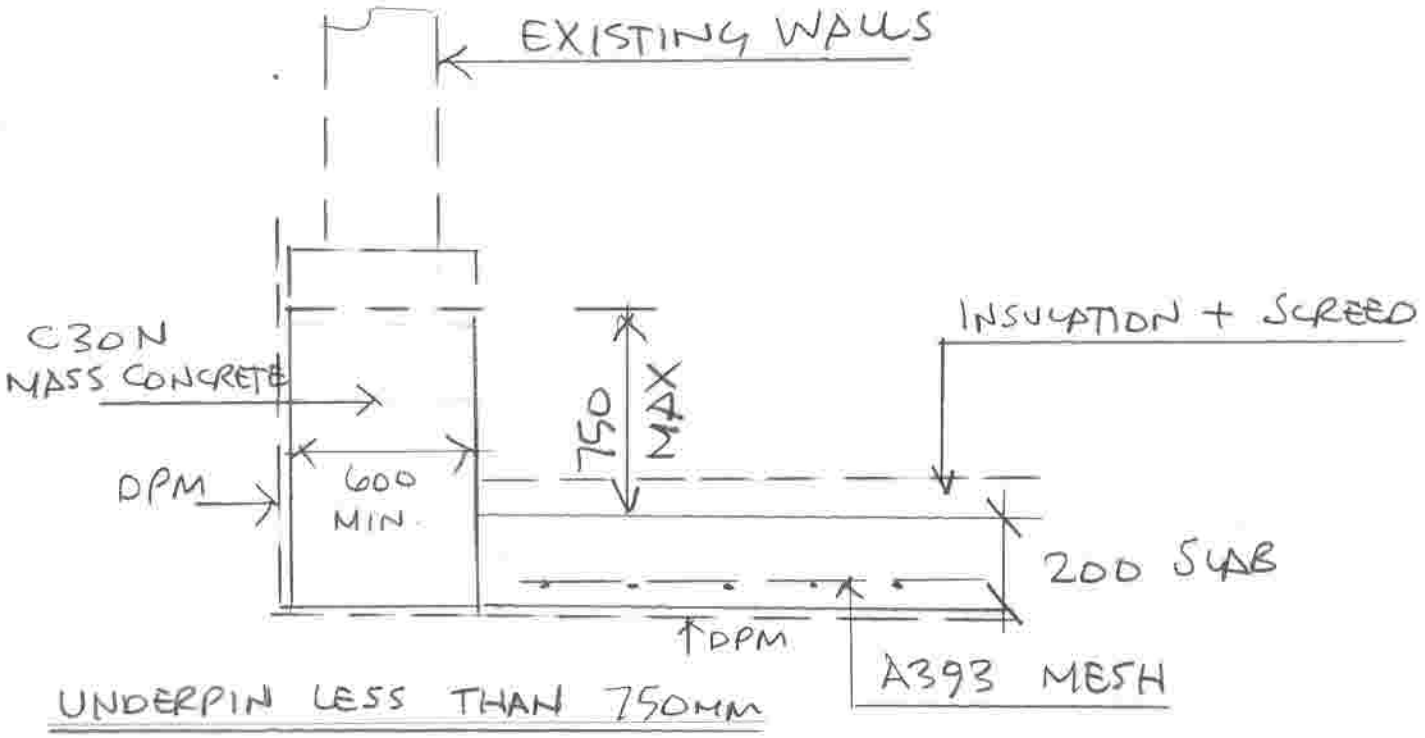
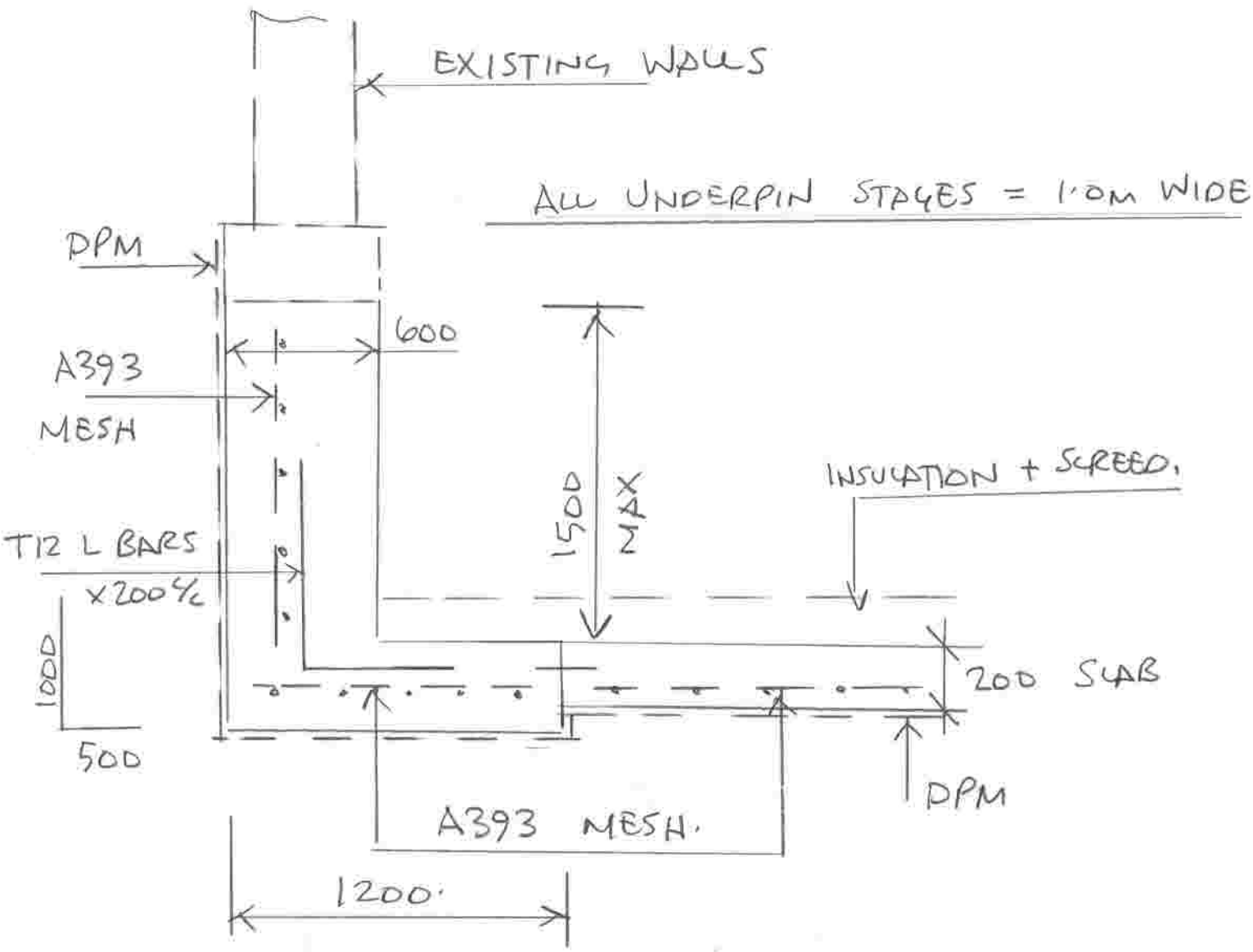
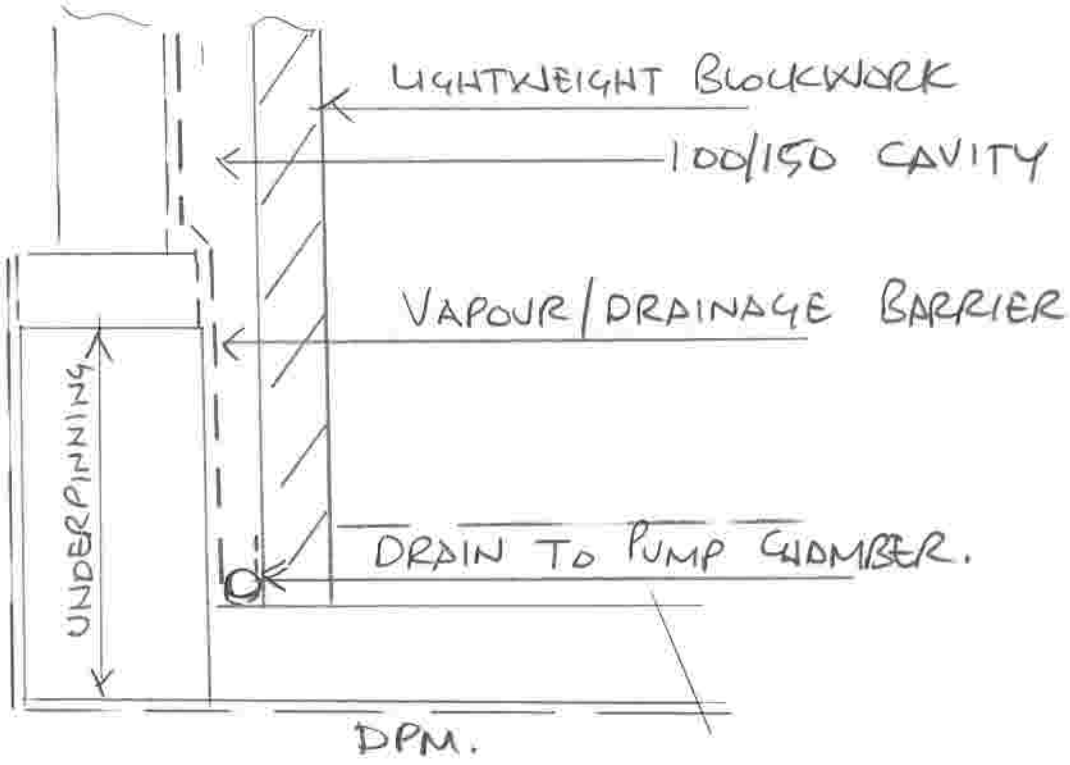

CONSTRUCT 450 x 665 PILLARS
(10 N BLOCKS)
UPON PAD FOUNDATIONS
665
450
UNDERPINNING SEQUENCE
24 HOURS BETWEEN EACH STAGE
NEW WALL BUILT OF RC SLAB.
1
2
3
4
1
2
3
4
1
2
3
4
1
2
3
1
4
1

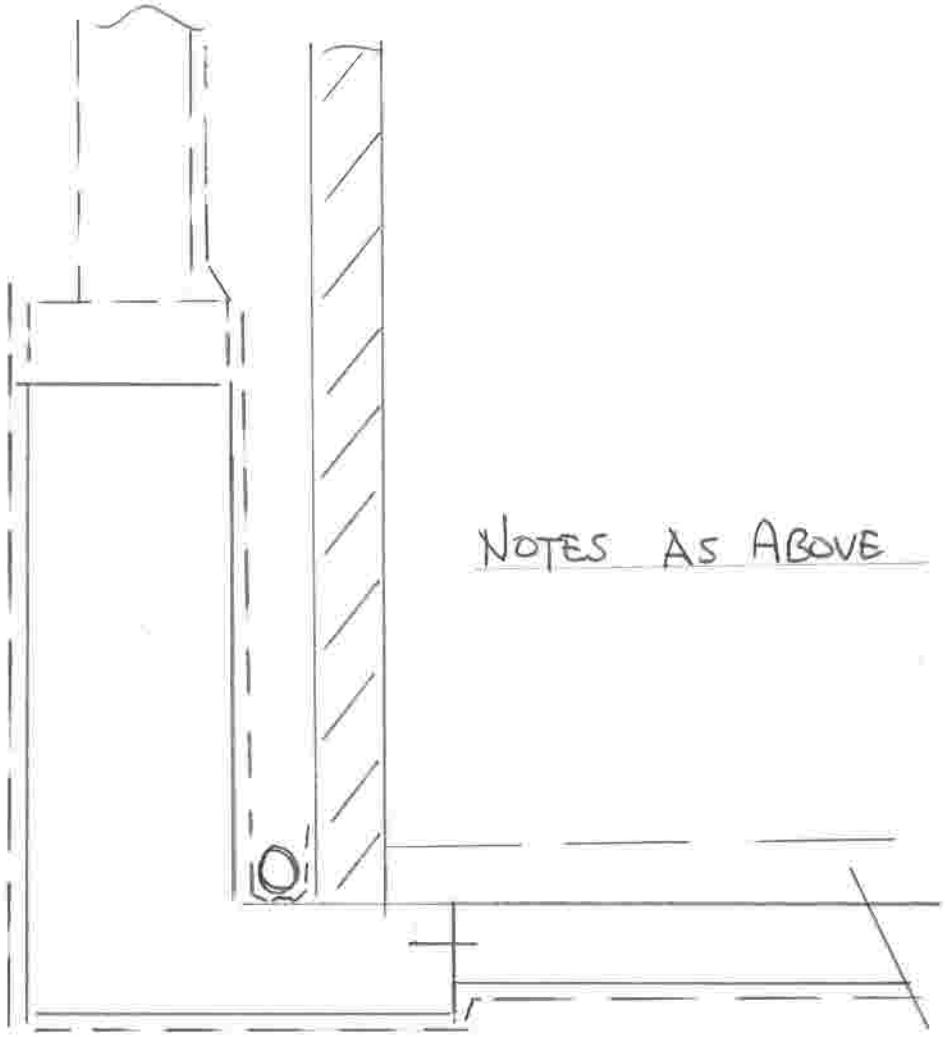


UNDERPIN LESS THAN 750MM



UNDERPIN MORE THAN 750MM (LESS THAN 1500MM).


LIGHTWEIGHT BLOCKWORK
100/150 CAVITY
VAPOUR/DRAINAGE BARRIER
UNDERPINNING
DRAIN TO PUMP CHAMBER.
DPM.


NOTES AS ABOVE