SOLID GEOMETRY
Structural Engineers

Job No. 00286 Sheet No. Rev. A

Sheet Title. BASEMENT WALLS.

Project Title. 106 KING HENRYS ROAD.

Calc Ref.

Made by DEN. Date 26/2/18. Chd.

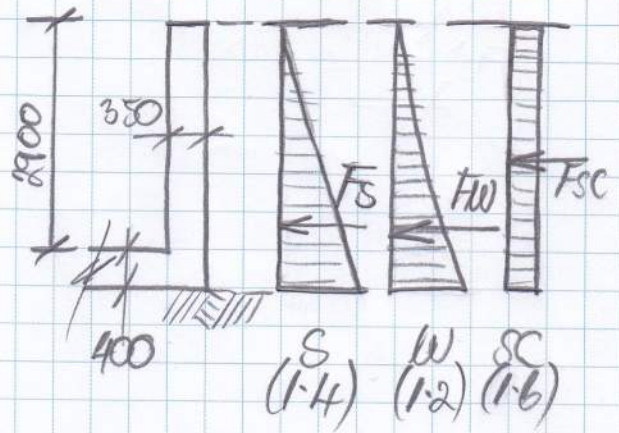
106 KING HENRY'S ROAD - PRELIMINARY CALCULATIONS FOR BIA SUBMISSION.

BASEMENT WALLS.

CHECK CONSERVATIVELY AS CANTILEVERING FROM THE BASEMENT SLAB. THIS IS THE WORST CASE SCENARIO.

FROM SOILTECHNICS' GROUND INVESTIGATION REPORT:
- WATER TABLE IS BELOW BASEMENT.
- ANGLE OF SHEARING RESISTANCE = 22°
- BULK DENSITY OF SOIL (UNSATURATED) = 18 kN/m³.
- $K_A = 0.5$, $K_0 = 1.0$ (ASSUME INTERPOLATED AT 0.7)
- DESIGN BEARING CAPACITY = 125 kN/m².

ASSUME CONSERVATIVE FLOODING SCENARIO WITH WATER UP TO GROUND LEVEL AROUND BASEMENT.



EFFECTIVE HEIGHT OF CANTILEVER = 2.9 + 0.2 = 3.1 M.

$F_S = 1.4(18-9.81) \times \frac{3.1^2}{2} \times 0.7 = 39\text{kN}$

$F_W = 1.2(9.81)\left(\frac{3.1^2}{2}\right) = 57$ "

$F_{SC} = 1.6(1.5)(3.1) \times 0.7 = 5$ "

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ULS BM ON WALL :-

$(39 \times 3 \cdot 1/3) + (57 \times 3 \cdot 1/3) + (5 \times 3 \cdot 1/2) = 107 \text{ kNM/m}.$

TRY T20@150 EF VERTICALLY. ($A_s = 2090 \text{ mm}^2/\text{m}$)

ASSUME 50 COVER TO MAIN STEEL.

$d = 350 - 50 - 20/2 = 290 \text{ mm}.$

$K = M/bd^2 f_{cu} = 107E6/1000(290)^2 40 = 0.03$

$z = 290 \text{ mm}$

$A_s \text{ REQ} = M/0.95 f_y z = 107E6/0.95(460)(290) = 875 \text{ mm}^2/\text{m}.$ ($\ll 2090$ ∴ OK)

CHECK δ :—

ACTUAL $l/d = 3100/290 = 10.7$

$M/bd^2 = 1.27$ } → TEN. MOD = 1.85.

$f_s = 127$ }

$100 A_s'/bd = 0.72$ → TEN. MOD = 1.19.

→ Allow. $l/d = 7 \times 1.85 \times 1.19 = 15.4 \; (> 10.7)$

→ WALL SECTION EASILY OK UNDER CONSERVATIVE SPAN CONFIGURATION (CANTILEVER), CONSERVATIVE LOADING (WATER @ G.L) USING NORMAL WEIGHT REBAR (T20@150%).

SOLID GEOMETRY
Structural Engineers

Job No. 00286. Sheet No. Rev. A

Sheet Title. BASEMENT SLAB.

Project Title. 106 KING HENRY'S ROAD.

Calc Ref.

Made by DSN. Date 26/2/16. Chd.

BASEMENT SLAB.

APPROX. WEIGHT OF BUILDING :-

ROOF 1·5 KN/M² (SLS)
1ST FLOOR. 2·5 " "
GROUND FLOOR. 6 " "
BASEMENT SLAB. 13 " "

23 " " (FROM FLOORS & ROOF)

EXTERNAL WALLS 2·5 KN/M² × 6·5M = 16·3 KN/M AROUND EDGE
+ 30 KN/M FROM BASEMENT WALLS.

47 KN/M (SLS) LINE LOAD AROUND PERIMETER.

INTERNAL WALLS, SAY 1·5 KN/M² (SLS).

TOTAL WEIGHT ≈ 24·5 × (12M × 10M) = 2940 KN.
+ 47 × (2 × (10+12) = 2068 KN.

5000 KN. (SLS).

UPLIFT FROM WATER APPROX. 30 × (10×12) = 3600 KN. (× 5000 : 1 F.O.S. ON BUOYANCY (FRICTION IGNORED VERY LARGE).

SOLID GEOMETRY
Structural Engineers

Job No. 0028B | Sheet No. | Rev. A

Sheet Title. BASEMENT SLAB.

Project Title. 106 KING HENRY'S ROAD.

Calc Ref.

Made by DSN | Date 26/2/18 | Chd.

CHECK BENDING & DEFLECTION OF SLAB :—

WATER PRESSURE ↑, SAY 30KN/M² (SLS)

DEAD LD. ↓

SLAB & SCREED = 0.475 × 24 = 11.4 KN/M²

INTERNAL WALLS = 1.5KN/M² × 3 = 4.5 "

FLOOR PLATES, SAY D/L = 5.1

21 KN/M². (SLS).

NET ULS UPWARD FORCE = 1.2(30) − 21 = 15KN/M².

SPAN OF SLAB = 10M.

BM = $wl^2/10$ SAY = 150KNM/M.

TRY T20 @ 150 c/c (A_s = 2090 MM²/M).

d = 400 − 50 − 10 = 340 MM.

$K = M/bd^2f_{cu} = 150E6/1000(340)^2(40) = 0.032$

Z = 327MM. → A_s REQ = 150E6/0.95(460)(327) = 1049 MM²/M.

(<< 2090 ∴ OK).

CHECK δ :—

ACTUAL l/d = 10000/340 = 29.

M/bd² = 1.29, f_s = 152N/MM² → TEN. MOD = 1.79.

100 A_s'/bd = 0.61 → COMP. MOD = 1.16

ALLOWABLE l/d = 23 SAY, × 1.79 × 1.16 = 47 (>> 29. OK)

SOLID GEOMETRY
Structural Engineers

Job No. 00286 Sheet No. Rev.

Sheet Title. BEARING PRESSURES.

Project Title. 106 KING HENRY'S ROAD.

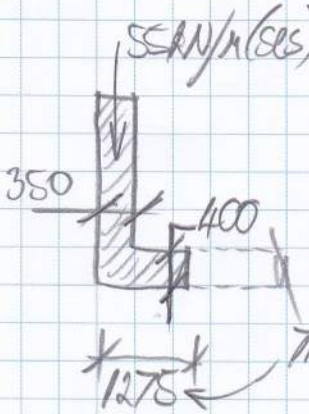
Calc Ref.

Made by DSN Date 9/6/18 Chd.

BEARING PRESSURES.

APPROX. BUILDING WEIGHTS HAVE BEEN ASSESSED PREVIOUSLY, BUT A MORE ACCURATE BREAKDOWN FOR THE KEY SHORT TERM & LONG TERM STAGES FOR USE IN SETTLEMENT CALCULATIONS IS AS FOLLOWS:

SHORT TERM PERIMETER LOADS ON UNDERPINS ONLY = MAX. 55kN/m RUN FOR WORST CASE PARTY WALL.



TEMP. SHORT TERM GBP BENEATH UNDERPIN TOE = $55 / 1.275 = 43 kN/m^2$ APPROX.

"SHORT TERM" MAY BE AROUND 3 MONTHS, BEFORE MAIN BASEMENT SLAB IS CAST.

LONG TERM PRESSURE BENEATH FOOTPRINT BASEMENT SLAB ASSUMING ALL LOADS DISTRIBUTED = $35 kN/m^2$ APPROX. (ON A 10M x 12M BASEMENT)