



28 Parliament Hill


London Borough of Camden

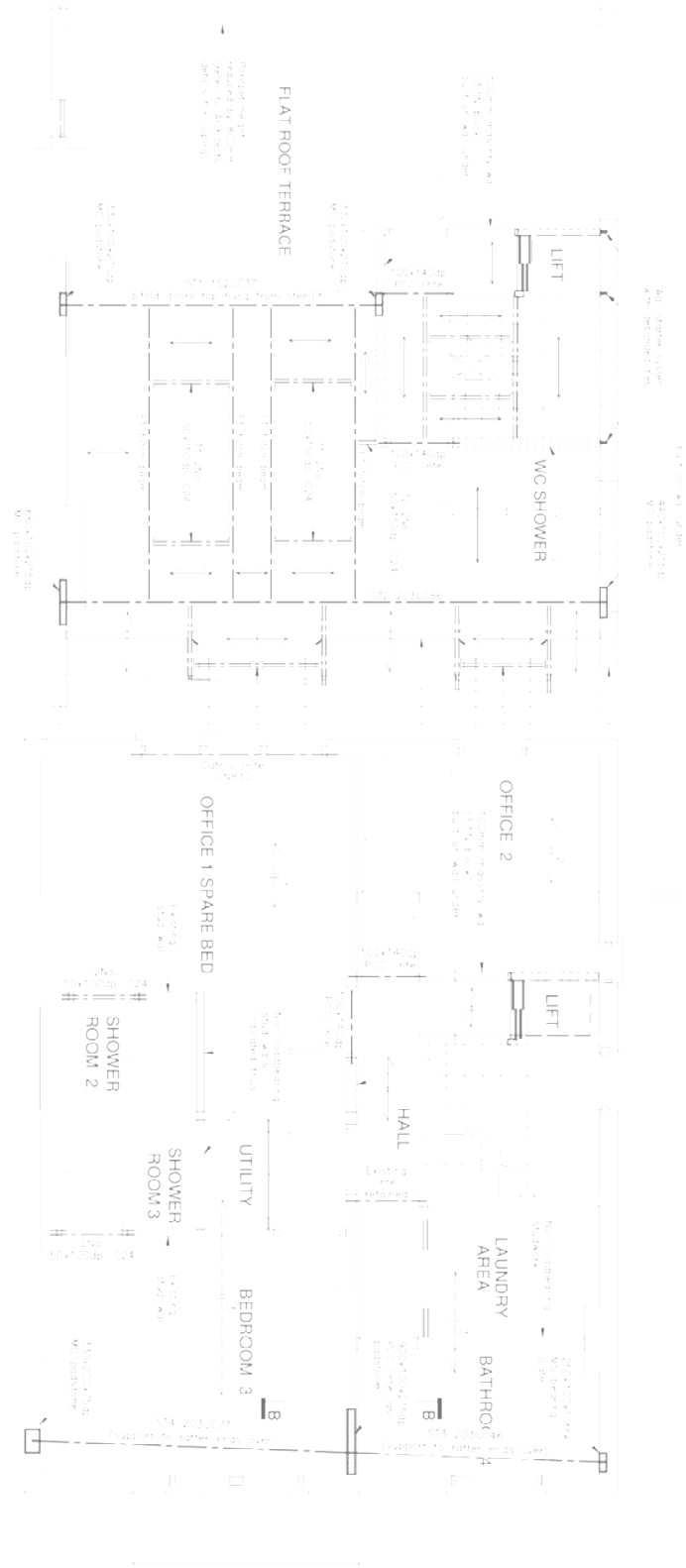
NW3 2TN


Structural Design Package

November 2023

20230153

| | | | | |
|---|--|-----------------------|----------------------|-------|
|  | Project 28 Parliament Hill | | Job Ref. 20230153 | |
| | Drawing Ref. | Calculations by AS | Checked by | Sheet |
| | Part of Structure Steel IDs -Roof/3rd floor level | | Date Sep-23 | |



| | | | | |
|--|---|-----------------------|----------------------|-------|
|  <small>GSE STRUCTURAL ENGINEERING</small> | Project 28 Parliament Hill | | Job Ref. 20230153 | |
| | Drawing Ref. | Calculations by AS | Checked by | Sheet |
| | Part of Structure Roof/3rd floor steel beams reactions | | Date Sep-23 | |

Superstructure design has been undertaken by HLS Structural Engineers LTD.
For the purpose of the lower ground floor design, GSE has used HLS's design
and steel beam reactions, as follows:

Roof/3rd floor steel beams reactions:

ST1 (roof)

| Reactions (unfactored): | Vertical (LHS) [kN] | Vertical (RHS) [kN] |
|-------------------------|---------------------|---------------------|
| Dead | 11.1 | 13.7 |
| Imposed | 4.2 | 6.1 |

ST2 (roof)


| Reactions (unfactored): | Vertical (LHS) [kN] | Vertical (RHS) [kN] |
|-------------------------|---------------------|---------------------|
| Dead | 19.2 | 16.6 |
| Imposed | 10.6 | 8.2 |

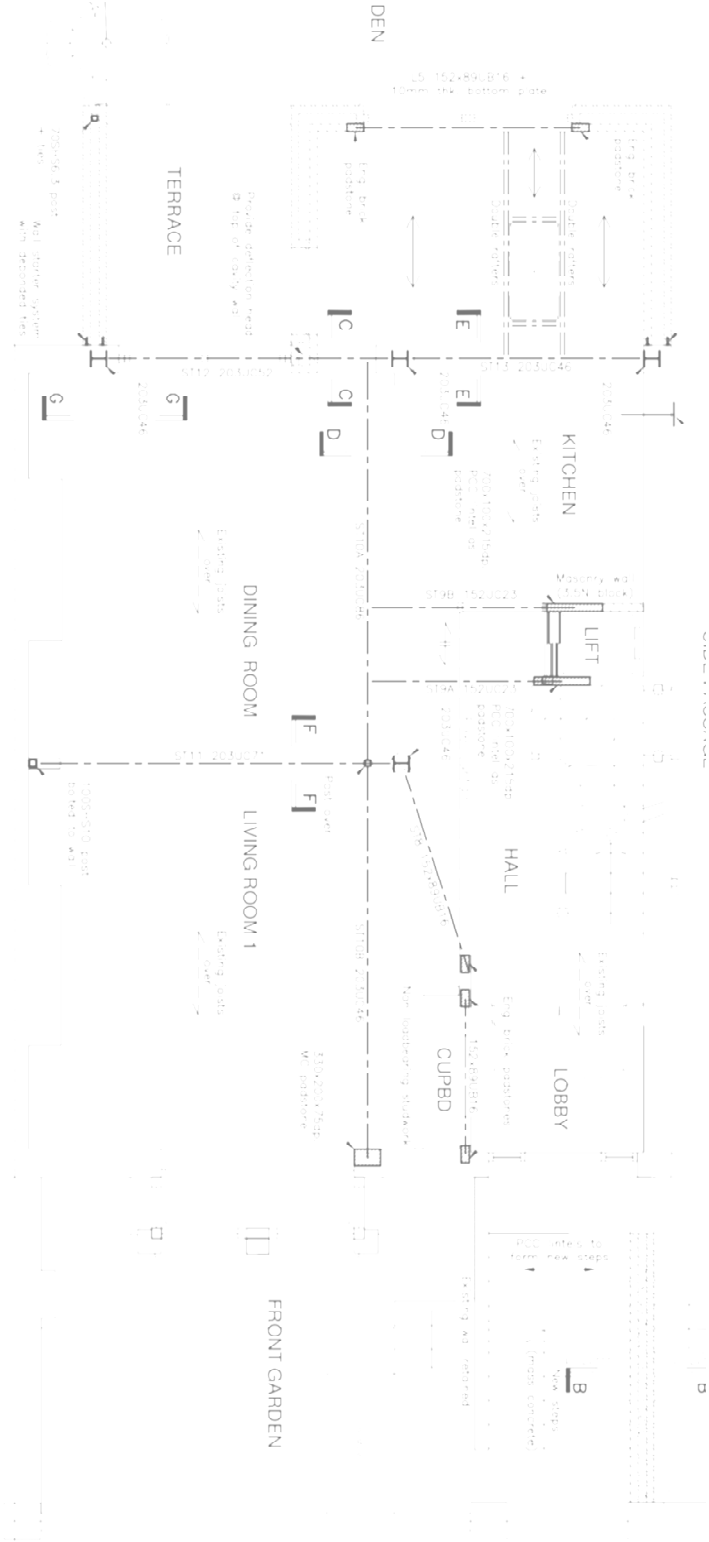
ST3 (3rd floor)


| Reactions (unfactored): | Vertical (LHS) [kN] | Vertical (RHS) [kN] |
|-------------------------|---------------------|---------------------|
| Dead | 5.1 | 5.1 |
| Imposed | 6 | 6 |

ST4 (3rd floor)

| Reactions (unfactored): | Vertical (LHS) [kN] | Vertical (RHS) [kN] |
|-------------------------|---------------------|---------------------|
| Dead | 14 | 14 |
| Imposed | 17 | 17 |

| | | | | |
|---|--|-----------------------|----------------------|-------|
|  | Project 28 Parliament Hill | | Job Ref. 20230153 | |
| | Drawing Ref. | Calculations by AS | Checked by | Sheet |
| | Part of Structure Steel IDs - First floor level | | Date Sep-23 | |



| | | | | |
|--|--|-----------------------|----------------------|-------|
|  GSE CIVIL STRUCTURAL ENGINEERING | Project 28 Parliament Hill | | Job Ref. 20230153 | |
| | Drawing Ref. | Calculations by AS | Checked by | Sheet |
| | Part of Structure First floor steel beams reactions | | Date Sep-23 | |

Superstructure design has been undertaken by HLS Structural Engineers LTD.
For the purpose of the lower ground floor design, GSE has used HLS's design
and steel beam reactions, as follows:

First floor steel beams reactions:

ST8

| Reactions (unfactored): | Vertical (LHS) [kN] | Vertical (RHS) [kN] |
|-------------------------|---------------------|---------------------|
| Dead | 2.9 | 2.9 |
| Imposed | 6.9 | 6.9 |

ST10A

| Reactions (unfactored): | Vertical (LHS) [kN] | Vertical (RHS) [kN] |
|-------------------------|---------------------|---------------------|
| Dead | 62.3 | 80.2 |
| Imposed | 5.7 | 12.3 |

ST10B

| Reactions (unfactored): | Vertical (LHS) [kN] | Vertical (RHS) [kN] |
|-------------------------|---------------------|---------------------|
| Dead | 17.5 | 18.8 |
| Imposed | 7.8 | 8.3 |

ST11


| Reactions (unfactored): | Vertical (LHS) [kN] | Vertical (RHS) [kN] |
|-------------------------|---------------------|---------------------|
| Dead | 52 | 134.2 |
| Imposed | 44.2 | 61.1 |

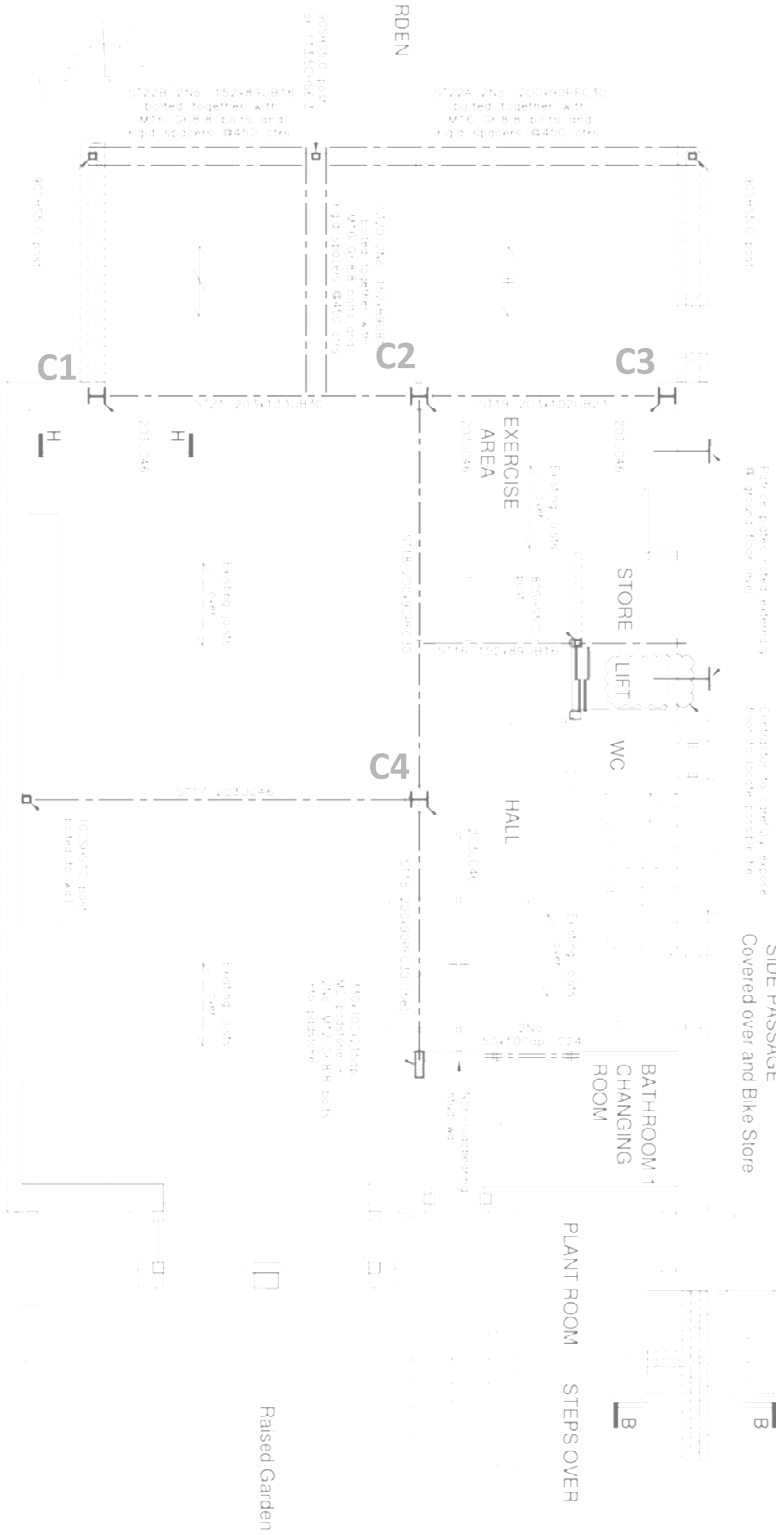
ST12


| Reactions (unfactored): | Vertical (LHS) [kN] | Vertical (RHS) [kN] |
|-------------------------|---------------------|---------------------|
| Dead | 75.6 | 127 |
| Imposed | 19.8 | 24.5 |

ST13

| Reactions (unfactored): | Vertical (LHS) [kN] | Vertical (RHS) [kN] |
|-------------------------|---------------------|---------------------|
| Dead | 70.2 | 70.2 |
| Imposed | 11.8 | 11.8 |

| | | | | |
|---|---|-----------------------|----------------------|-------|
|  | Project 28 Parliament Hill | | Job Ref. 20230153 | |
| | Drawing Ref. | Calculations by AS | Checked by | Sheet |
| | Part of Structure Steel IDs - Ground floor level | | Date Sep-23 | |



| | | | | |
|--|---|-----------------------|----------------------|-------|
|  GSE CIVIL STRUCTURAL ENGINEERING | Project 28 Parliament Hill | | Job Ref. 20230153 | |
| | Drawing Ref. | Calculations by AS | Checked by | Sheet |
| | Part of Structure Ground floor steel beams reactions | | Date Sep-23 | |

Superstructure design has been undertaken by HLS Structural Engineers LTD.
 For the purpose of the lower ground floor design, GSE has used HLS's design
 and steel beam reactions, as follows:

Ground floor steel beams reactions:


| | | |
|-------------------------|---------------------|---------------------|
| ST15 | | |
| Reactions (unfactored): | Vertical (LHS) [kN] | Vertical (RHS) [kN] |
| Dead | 2.5 | 2.5 |
| Imposed | 3.7 | 3.7 |

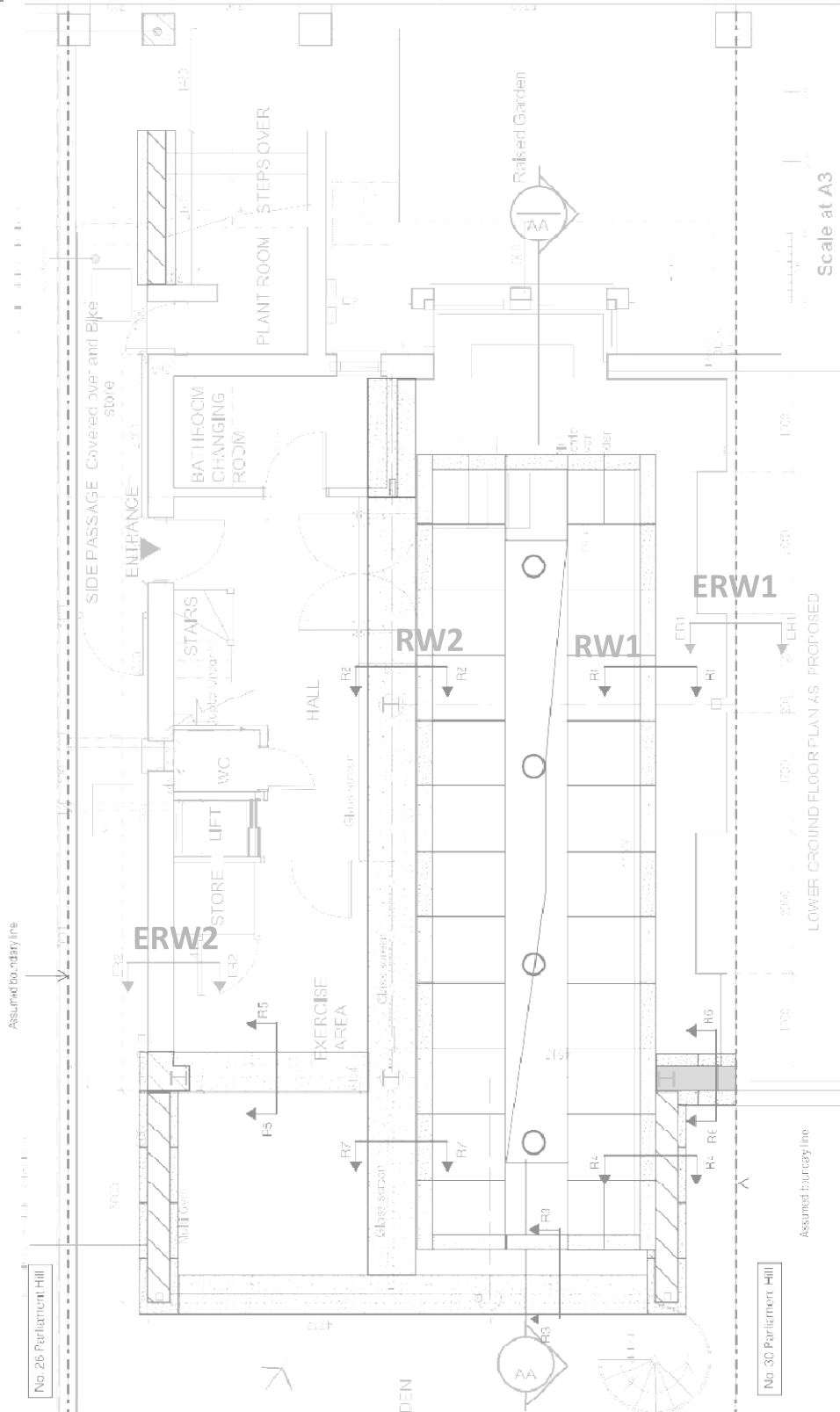
| | | |
|-------------------------|---------------------|---------------------|
| ST17 | | |
| Reactions (unfactored): | Vertical (LHS) [kN] | Vertical (RHS) [kN] |
| Dead | 7.4 | 7.4 |
| Imposed | 15.6 | 15.6 |


| | | |
|-------------------------|---------------------|---------------------|
| ST18 | | |
| Reactions (unfactored): | Vertical (LHS) [kN] | Vertical (RHS) [kN] |
| Dead | 2.5 | 2.5 |
| Imposed | 3.7 | 3.7 |

| | | |
|-------------------------|---------------------|---------------------|
| ST19 | | |
| Reactions (unfactored): | Vertical (LHS) [kN] | Vertical (RHS) [kN] |
| Dead | 3 | 3 |
| Imposed | 6.6 | 6.6 |

| | | |
|-------------------------|---------------------|---------------------|
| ST21 | | |
| Reactions (unfactored): | Vertical (LHS) [kN] | Vertical (RHS) [kN] |
| Dead | 15.8 | 19.7 |
| Imposed | 10.8 | 10.3 |

| | | | | |
|---|---------------------------------------|-----------------------|----------------------|-------|
|  | Project 28 Parliament Hill | | Job Ref. 20230153 | |
| | Drawing Ref. | Calculations by AS | Checked by | Sheet |
| | Part of Structure Wall section IDs | | Date Sep-23 | |



| | | | | |
|---|--|-----------------------|----------------------|-------|
|  | Project 28 Parliament Hill | | Job Ref. 20230153 | |
| | Drawing Ref. | Calculations by AS | Checked by | Sheet |
| | Part of Structure Retaining wall sections | | Date Sep-23 | |

| | |
|---------------------|-------|
| RW1/RW2 | |
| Based on pool spec: | 1.4 m |
| Finishes: | 0.2 m |
| Retained height = | 1.6 m |


| | |
|-----------------------------|-----|
| ERW1/ERW2 | |
| Based on underpinning info: | 3 m |
| Retained height = | 3 m |

| | |
|---|--------------------------------|
| Ground conditions: refer to existing borehole logs until receipt of SI report | |
| "stiff, sandy, very silty clay" | |
| Assumed safe bearing pressure: | 95 kPa *Based on AVZ SI report |

| | |
|---|-------|
| Party wall thickness assumptions (PARTY WALL WITH No.30): | |
| LGF | 440mm |
| GF+1st+2nd+3rd | 330mm |

| | |
|---|-------|
| Party wall thickness assumptions (GARDEN WALL): | |
| LGF+GF+1st+2nd | 330mm |
| 3rd | 215mm |

Assumption: Joists @No..30 Parliament Hill assumed to be spanning front to back, same as the existing joists @No.28 Parliament Hill.

| | | | | |
|---|---|-----------------------|----------------------|----------------|
|  | Project 28 Parliament Hill | | Job Ref. 20230153 | |
| | Drawing Ref. | Calculations by AS | Checked by | Sheet |
| | Part of Structure ERW1 (Party wall with No.30 Parliament Hill) | | | Date Sep-23 |

h = 3 m

The existing retaining wall will be checked for the temporary condition, during the excavation of the pool.

• Case 1 – Minimum vertical forces and maximum horizontal forces: This is the most onerous case for bearing pressures on the toe and overturning. For these the live loads will be removed.

Assumptions:

- Total retained height 3000mm
- Accidental water level not considered for the temporary condition
- Surcharge of 5kN/m² has been taken
- 150Pa safe bearing pressure
- it is assumed that the floor joists span front to back of the property

L_{toe} = 0 m
L_{heel} = 0 m

Loading (w)

Dead Load (G_k):

| | | kN/m ² | m | kN/m |
|--|------|-------------------|------|-------|
| Masonry 440mm (assumed)-LGF | | 9.9 | 2.85 | 28.22 |
| Masonry 330mm (assumed) - GF+1st+2nd+3rd | | 7.4 | 12.7 | 93.98 |
| Beams ST1+ST2 Reactions (roof) | 30.3 | | 10.3 | 2.94 |
| Beam ST4 Reaction (3rd floor) | 14 | | 10.3 | 1.36 |
| | | | | |
| | | | | |

TOTAL LC1 126.50


TOTAL LC2 113.85

Live Load (Q_k):

| | | kN/m ² | m | kN/m |
|--------------------------------|------|-------------------|------|------|
| | | | | |
| surcharge considered | | 10.00 | | |
| Beams ST1+ST2 Reactions (roof) | 14.8 | | 10.3 | 1.44 |
| Beam ST4 Reaction (3rd floor) | 17 | | 10.3 | 1.65 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

TOTAL LC1 3.087

TOTAL LC2 0.00

| | | | | |
|---|---|-----------------------|-------------------|----------------|
|  | Project 28 Parliament Hill | | Job Ref. #REF! | |
| | Drawing Ref. | Calculations by AS | Checked by 0 | Sheet |
| | Part of Structure ERW2 (Garden wall) | | | Date Sep-23 |

h = 3 m

No calcs undertaken for this wall at this point

Assumptions:

- Total retained height 3000mm
- it is assumed that the floor joists span front to back of the property

Ltoe = 0 m
Lheel = 0 m

Loading (w)

Dead Load (G_k):

| | | kN/m^2 | m | kN/m |
|--|------|-----------------|------|---------------|
| Masonry 330mm (assumed)-LGF+GF+1st+2nd | | 7.4 | 12 | 88.80 |
| Masonry 215mm - 3rd | | 5.3 | 3 | 15.90 |
| Beam ST2 Reactions (roof) | 16.6 | | 10.3 | 1.61 |
| Beam ST4 Reaction (3rd floor) | 5.1 | | 5 | 1.02 |
| ST13+ST19 / Column 3 Raction (LGF) | 73.2 | | 6 | 12.20 |
| | | | | |


TOTAL LC1 119.53

TOTAL LC2 107.58

| Live Load (Q_k): | | kN/m^2 | m | kN/m |
|------------------------------------|------|-----------------|------|---------------|
| | | | | |
| surcharge considered | | 10.00 | | |
| Beam ST2 Reactions (roof) | 8.2 | | 10.3 | 0.80 |
| Beam ST4 Reaction (3rd floor) | 6 | | 10.3 | 0.58 |
| ST13+ST19 / Column 3 Raction (LGF) | 18.4 | | 6 | 3.07 |
| | | | | |
| | | | | |
| | | | | |

TOTAL LC1 4.445

TOTAL LC2 0.00

| | | | | |
|---|---|-----------------------|----------------------|----------------|
|  | Project 28 Parliament Hill | | Job Ref. 20230153 | |
| | Drawing Ref. | Calculations by AS | Checked by | Sheet |
| | Part of Structure Retaining wall R-2 | | | Date Sep-23 |

h = 1.6 m

The retaining walls will be designed for one load case:

- Case 1 – Maximum vertical forces and minimum horizontal forces: This is the most onerous case for bearing pressures on the heel;
- Case 2 – Minimum vertical forces and maximum horizontal forces: This is the most onerous case for bearing pressures on the toe and overturning. For these the live loads will be removed.

Assumptions:

- Total retained height 1600mm
- Accidental water level assumed at 1mBGL
- Surcharge of 5kN/m² has been considered for the area underneath existing floor
- 125Pa safe bearing pressure

L_{toe} = 1.6 m

L_{heel} = m

Loading (w)

Dead Load (G_k): kN/m² m kN/m

| | | | | |
|-----------------------------|--|--|--|--|
| No vertical load considered | | | | |
| | | | | |

TOTAL LC1 0.00


TOTAL LC2 0.00

Live Load (Q_k): kN/m² m kN/m

| | | | | |
|-----------------------------|--|-------|--|--|
| No vertical load considered | | | | |
| surcharge considered | | 10.00 | | |
| | | | | |

TOTAL LC1 0.000

TOTAL LC2 0.00

| | | | | |
|---|--|-----------------------|----------------------|----------------|
|  | Project 28 Parliament Hill | | Job Ref. 20230153 | |
| | Drawing Ref. | Calculations by AS | Checked by | Sheet |
| | Part of Structure Existing underpin with new colum load - bearing pressure check (Section R2) | | | Date Sep-23 |

h = 3 m

Assumptions:

125Pa safe bearing pressure

Thickness of existing underpin assumed as 440mm

Loading (w)


Dead Load (G_k): kN/m² m kN/m

| | | | | |
|--|-------|------|---|-------|
| | | | | |
| ST13;ST19;ST12;ST21;ST18 - Column 2 Reaction (LGF) | 222.4 | | 8 | 27.80 |
| ST17;ST15;ST18;ST11;ST8 - Column 4 Reaction (LGF) | 149.5 | | 8 | 18.69 |
| | | | | |
| Self weight of existing underpin (440mm) | | 10.6 | 3 | 31.68 |
| | | | | |
| | | | | |
| TOTAL LC1 | | | | 78.17 |
| TOTAL LC2 | | | | 70.35 |

Live Load (Q_k): kN/m² m kN/m

| | | | | |
|--|------|--|---|--------|
| | | | | |
| | | | | |
| | | | | |
| ST13;ST19;ST12;ST21;ST18 - Column 2 Reaction (LGF) | 56.9 | | 8 | 7.11 |
| ST17;ST15;ST18;ST11;ST8 - Column 4 Reaction (LGF) | 91 | | 8 | 11.38 |
| | | | | |
| | | | | |
| TOTAL LC1 | | | | 18.488 |
| TOTAL LC2 | | | | 0.00 |

| | | | | |
|---------------------|---|--------------|------------------------------|------|
| Bearing pressure/m' | = | 219.6705 kPa | existing width of underpin = | 0.44 |
| Bearing pressure/m' | = | 130.6149 kPa | new width of underpin = | 0.74 |

| | | | | |
|---|--|-----------------------|-------------------|----------------|
|  | Project 28 Parliament Hill | | Job Ref. #REF! | |
| | Drawing Ref. | Calculations by AS | Checked by | Sheet |
| | Part of Structure Existing underpin bearing pressure check in existing condition (Section R2) | | | Date Sep-23 |

h = 3 m

Assumptions:

125Pa safe bearing pressure

Thickness of existing underpin assumed as 440mm

Loading (w)

Dead Load (G_k):

| | | kN/m^2 | m | kN/m |
|--|--|-----------------|-------|---------------|
| | | | | |
| Internal masonry wall (140mm) | | 2.9 | 10.35 | 30.22 |
| Flat roof terrace | | 1.0 | 1.95 | 1.95 |
| | | | | |
| Self weight of existing underpin (440mm) | | 10.6 | 3 | 31.68 |
| | | | | |
| | | | | |
| TOTAL LC1 | | | | 63.85 |
| TOTAL LC2 | | | | 57.47 |

Live Load (Q_k):

| | | kN/m^2 | m | kN/m |
|-------------------|--|-----------------|---|---------------|
| | | | | |
| | | | | |
| | | | | |
| Flat roof terrace | | 1.50 | 3 | 4.50 |
| | | | | |
| | | | | |
| | | | | |
| TOTAL LC1 | | | | 4.500 |
| TOTAL LC2 | | | | 0.00 |

Bearing pressure/ m^1 = 155.3455 kPa existing width of underpin = 0.44

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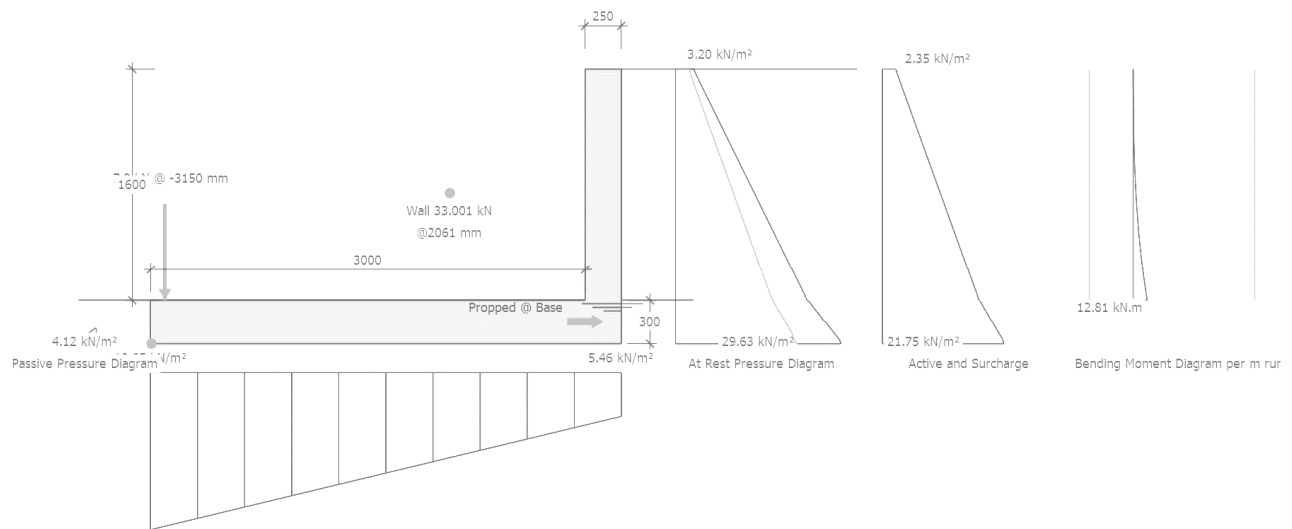
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Job ref : Job Ref
Sheet : Sheet Ref / 4 -
Made By :
Date : 22 Nov 2023/ Version 2015.04
Checked :
Approved :

MASTERKEY : RETAINING WALL DESIGN TO BS 8002 : 1994 AND BS 8110 : 1997

RW2 (LC1)-Perm

Reinforced Concrete Retaining Wall with Reinforced Base

**Summary of Design Data****Notes**

Material Densities (kN/m³)

Concrete grade

Concrete covers (mm)

Reinforcement design

Surcharge and Water Table

Unplanned excavation depth

† The Engineer must satisfy him/herself to the reinforcement detailing requirements of the relevant codes of practice

All dimensions are in mm and all forces are per metre run

Back Soil - Dry 20.00, Saturated 22.00, Submerged 12.00

Front Soil - Dry 18.00, Saturated 20.80, Submerged 10.80, Concrete 24.00

fcu 30 N/mm², Permissible tensile stress 0.250 N/mm²

Wall inner cover 30 mm, Wall outer cover 30 mm, Base cover 50 mm

fy 500 N/mm² designed to BS 8110: 1997

Surcharge 5.00 kN/m², Water table level 0 mm

Front of wall 190 mm

Additional Loads

Wall Propped at Base Level

Vertical Line Load

† Dimensions

Therefore no sliding check is required

7.8 kN/m @ X -3150 mm and Y 1600 mm - Load type Live

Ties, line loads and partial loads are measured from the inner top edge of the wall

Soil Properties

Bearing pressure

Back Soil Friction and Cohesion

Base Friction and Cohesion

Front Soil Friction and Cohesion

Premissable service pressure @ front 95.00 kN/m², @ back 95.00 kN/m²

 $\phi = \text{Atn}(\text{Tan}(25)/1.2) = 21.24^\circ$ $\delta = \text{Atn}(0.75 \times \text{Tan}(\text{Atn}(\text{Tan}(25)/1.2))) = 16.25^\circ$ $\phi = \text{Atn}(\text{Tan}(30)/1.2) = 25.69^\circ$ **Loading Cases**G_{Wall}- Wall & Base Self Weight, F_{VHeel}- Vertical Loads over Heel, P_a- Active Earth Pressure,P_{surcharge}- Earth pressure from surcharge, P_p- Passive Earth Pressure

Case 1: Geotechnical Design

1.00 G_{Wall}+1.00 F_{VHeel}+1.00 P_a+1.00 P_{surcharge}+1.00 P_p

Case 2: Structural Ultimate Design

1.40 G_{Wall}+1.60 F_{VHeel}+1.00 P_a+1.00 P_{surcharge}+1.00 P_p**Geotechnical Design****Wall Stability - Virtual Back Pressure**

Case 1 Overturning/Stabilising

14.990/68.807

0.218

OK

Wall Sliding - Virtual Back PressureF_x/(R_xFriction+ R_xPassive)

0.000/(11.891+0.229)

0.000

OK

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Job ref : **Job Ref**
Sheet : **Sheet Ref / 5 -**
Made By :
Date : **22 Nov 2023/ Version 2015.04**
Checked :
Approved :

Prop Reaction Case 2 (Service) 21.6 kN @ Base

Soil Pressure

| | | | |
|--------------------------|--|-------|----|
| Virtual Back (No uplift) | Max(19.646/95, 5.461/95) kN/m ² | 0.207 | OK |
| Wall Back (No uplift) | Max(19.624/95, 5.483/95) kN/m ² | 0.207 | OK |

Structural Design**At Rest Earth Pressure**

| | | |
|---------------------------------------|---|------|
| At rest earth pressures magnification | $(1 + \sin(\phi)) \times \sqrt{\text{OCR}} = (1 + \sin(21.24)) \times \sqrt{1}$ | 1.36 |
|---------------------------------------|---|------|

Prop Reaction

Maximum Prop Reaction (Ultimate) 29.4 kN @ Base

Wall Design (Inner Steel)

| | | | |
|---|--|----------------------|----|
| Critical Section | Critical @ 0 mm from base, Case 2 | | |
| Steel Provided (Cover) | Main H16@150 (30 mm) Dist. H12@175 (46 mm) | 1340 mm ² | OK |
| Compression Steel Provided (Cover) | Main H12@250 (30 mm) Dist. H12@175 (42 mm) | 452 mm ² | |
| Leverarm $z = \text{fn}(d, b, A_s, f_y, F_{cu})$ | 212 mm, 1000 mm, 1340 mm ² , 500 N/mm ² , 30.0 N/mm ² | 190 mm | |
| $M_r = \text{fn}(\text{above}, A_s', d', x, x/d)$ | 452 mm ² , 36 mm, 48 mm, 0.23 | 110.9 kN.m | |
| Moment Capacity Check (M/M_r) | M 12.8 kN.m, M_r 110.9 kN.m | 0.115 | OK |
| Shear Capacity Check | F 21.4 kN, v_c 0.676 N/mm ² , F_{vr} 143.2 kN | 0.15 | OK |

Base Top Steel Design

| | | | |
|---|--|----------------------|----|
| Steel Provided (Cover) | Main H16@150 (50 mm) Dist. H12@175 (66 mm) | 1340 mm ² | OK |
| Compression Steel Provided (Cover) | Main H12@150 (50 mm) Dist. H12@175 (62 mm) | 754 mm ² | |
| Leverarm $z = \text{fn}(d, b, A_s, f_y, F_{cu})$ | 242 mm, 1000 mm, 1340 mm ² , 500 N/mm ² , 30 N/mm ² | 220 mm | |
| $M_r = \text{fn}(\text{above}, A_s', d', x, x/d)$ | 754 mm ² , 56 mm, 48 mm, 0.20 | 128.4 kN.m | |
| Moment Capacity Check (M/M_r) | M 3.3 kN.m, M_r 128.4 kN.m | 0.025 | OK |
| Shear Capacity Check | F 9.7 kN, v_c 0.625 N/mm ² , F_{vr} 151.3 kN | 0.06 | OK |

Base Bottom Steel Design

| | | | |
|---|---|----------------------|----|
| Steel Provided (Cover) | Main H12@150 (50 mm) Dist. H12@175 (62 mm) | 754 mm ² | OK |
| Compression Steel Provided (Cover) | Main H16@150 (50 mm) Dist. H12@175 (66 mm) | 1340 mm ² | |
| Leverarm $z = \text{fn}(d, b, A_s, f_y, F_{cu})$ | 244 mm, 1000 mm, 754 mm ² , 500 N/mm ² , 30 N/mm ² | 232 mm | |
| $M_r = \text{fn}(\text{above}, A_s', d', x, x/d)$ | 1340 mm ² , 58 mm, 27 mm, 0.11 | 76.0 kN.m | |
| Moment Capacity Check (M/M_r) | M 18.6 kN.m, M_r 76.0 kN.m | 0.245 | OK |
| Shear Capacity Check | F 14.1 kN, v_c 0.514 N/mm ² , F_{vr} 125.4 kN | 0.11 | OK |