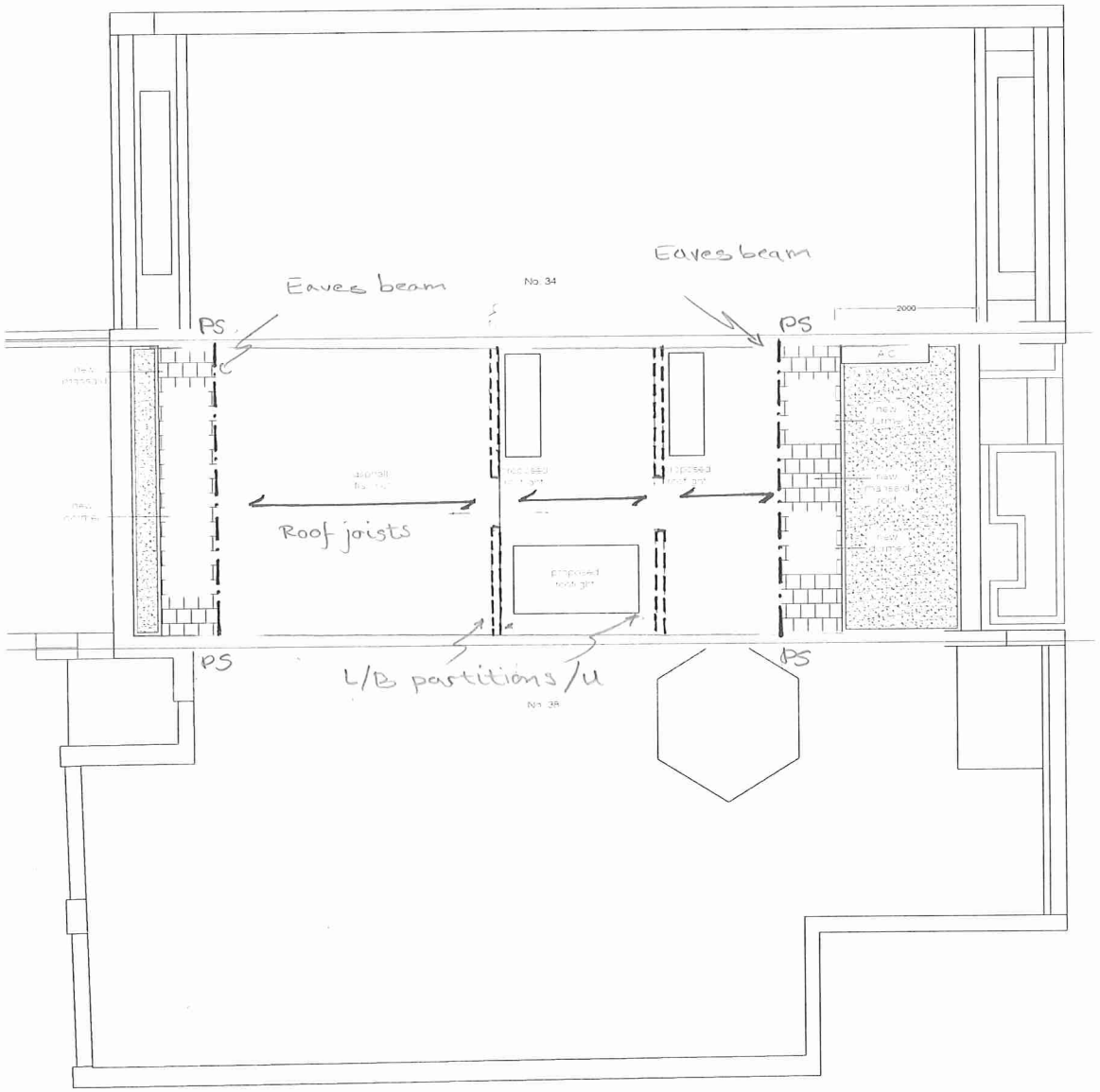
Appendix G - Structural Scheme Calculations

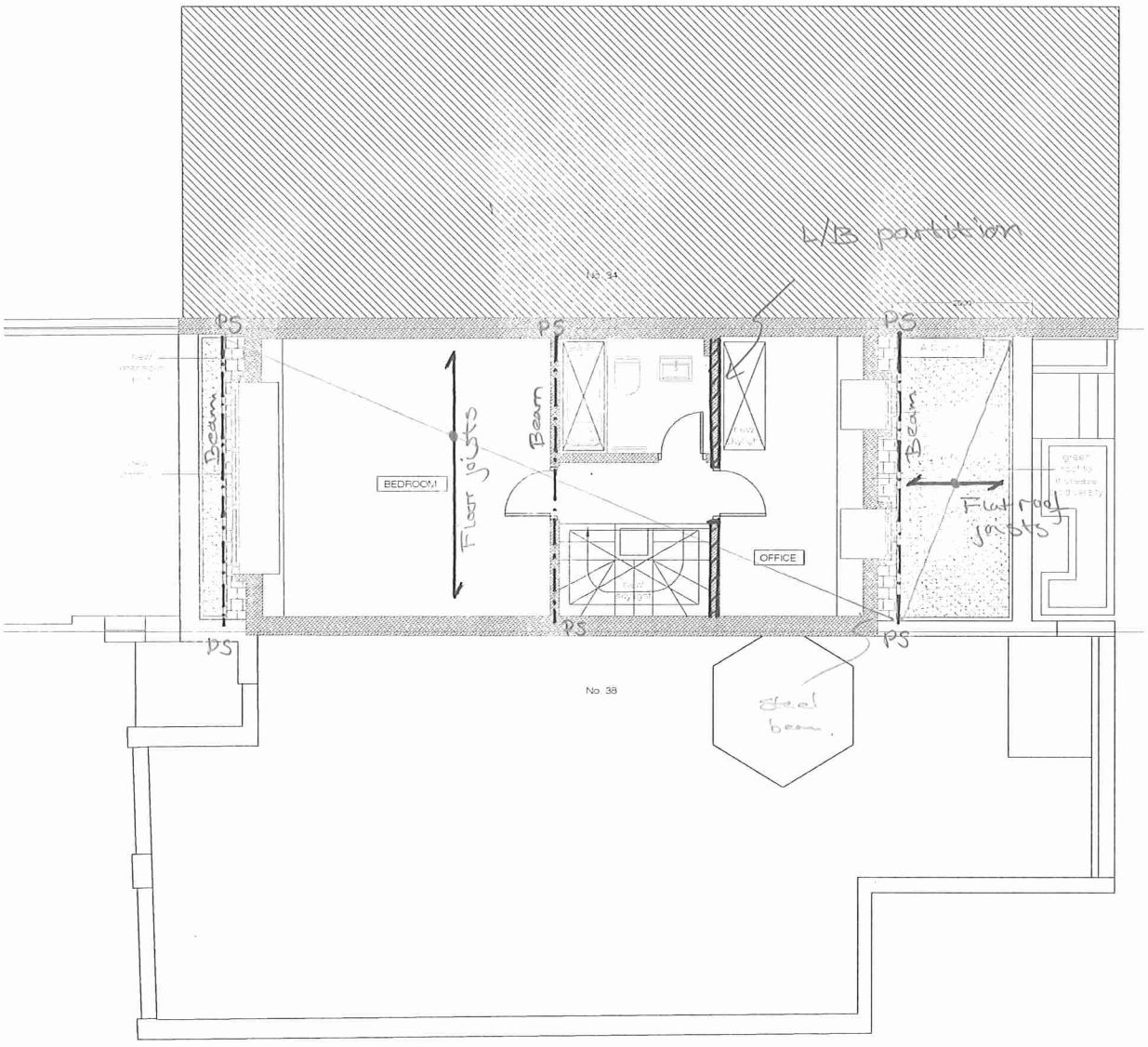
The structural scheme calculations accounts for the additional loading associated with the proposed roof extension. Also, the effect of proposed changes to the existing layout of partitions and floors on the transmission of loads to the ground have been accounted for in the revised scheme design.

1. Structural Layout
2. Load take down
    a. Wind loading
    b. Transmission of applied lateral load
    c. Gravity loading – Party walls
    d. Gravity loading – Front elevation
    e. Gravity loading – Rear elevation
3. Foundations
4. Waling beam
5. RC retaining walls
6. Central frame
7. Box frame supporting front elevation
8. Flotation/Heave
9. RC basement slab

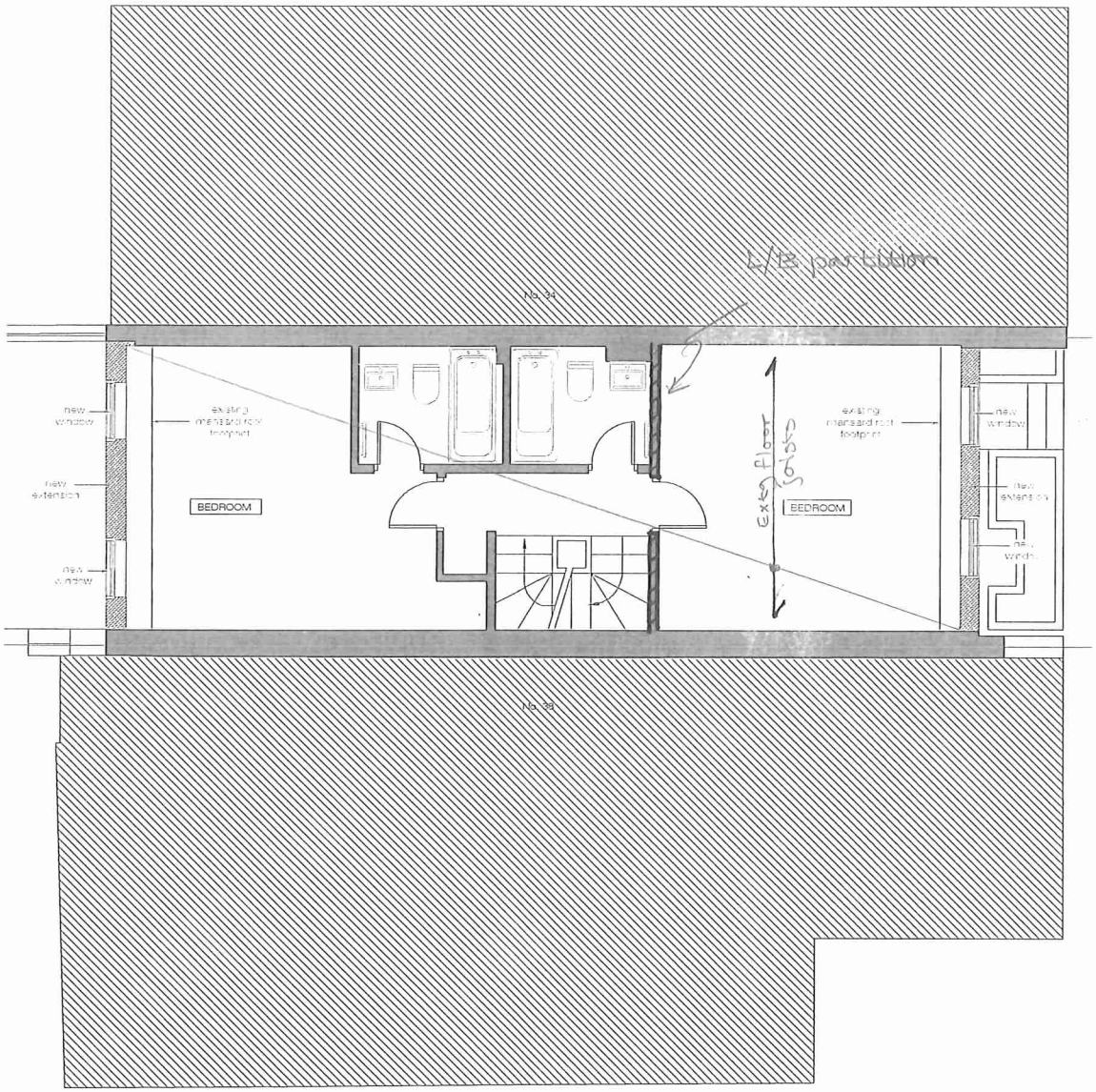
STRUCTURAL LAYOUT.



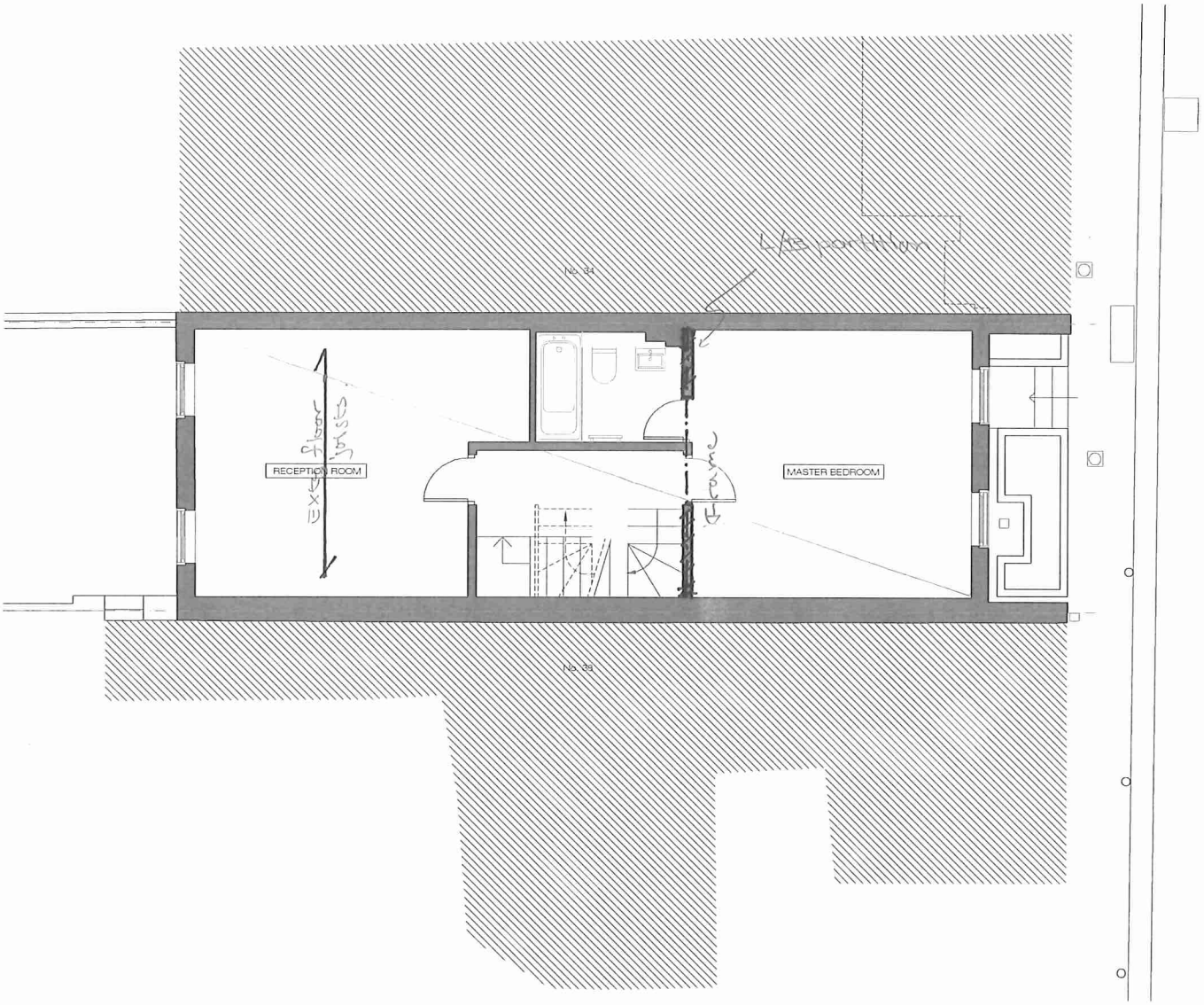
Roof


No. 34
L/B partition
PS
PS
PS
Beam
Beam
Beams
BEDROOM
Floor joists
OFFICE
Flat roof joists
PS
PS
PS
No. 38
Steel beam.

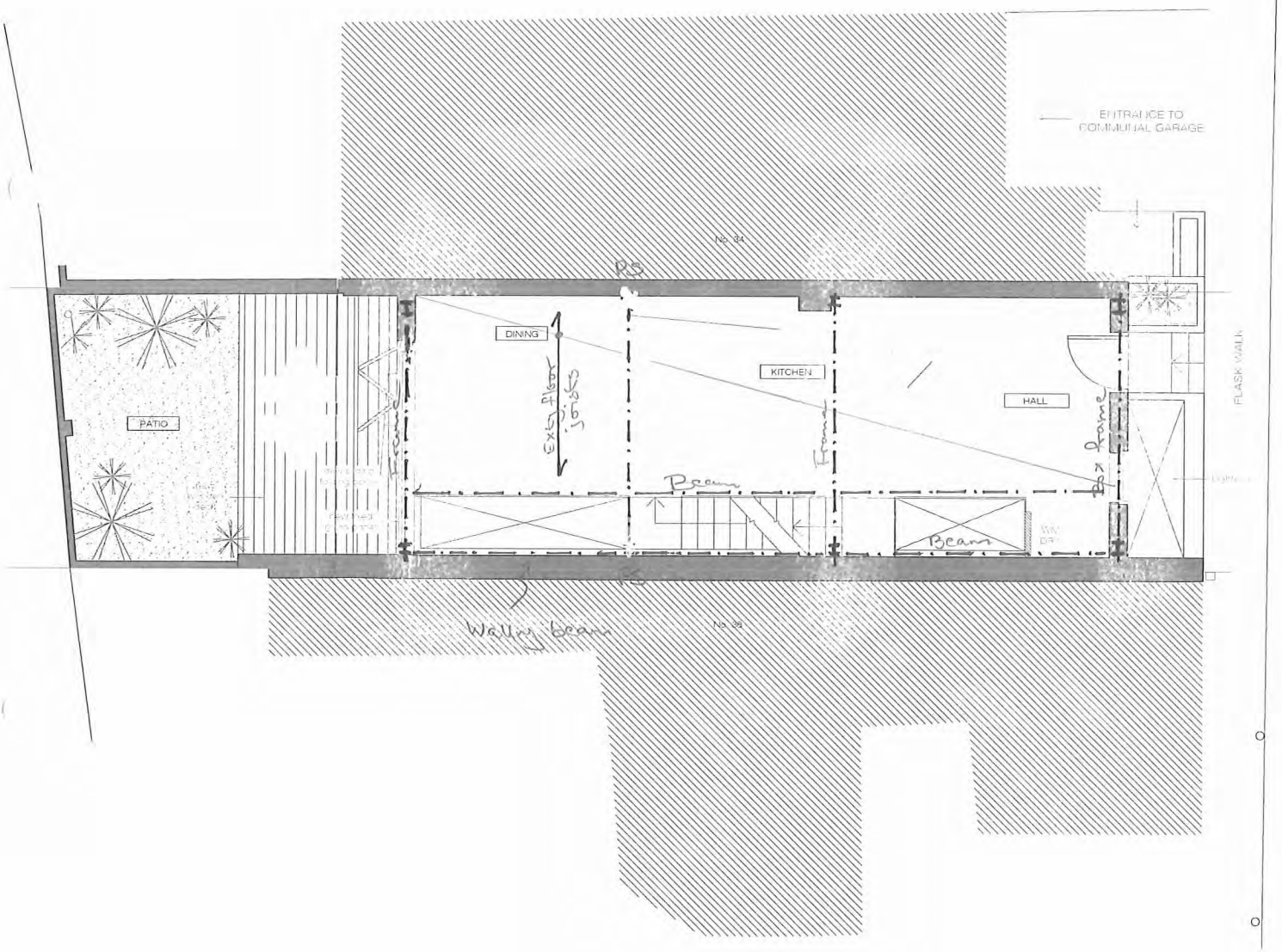
THIRD


L/B partition
No. 34
new window
existing mansard roof footprint
new extension
BEDROOM
new window
existing mansard roof footprint
new window
new extension
new window
BEDROOM
Exty floor joists
No. 38

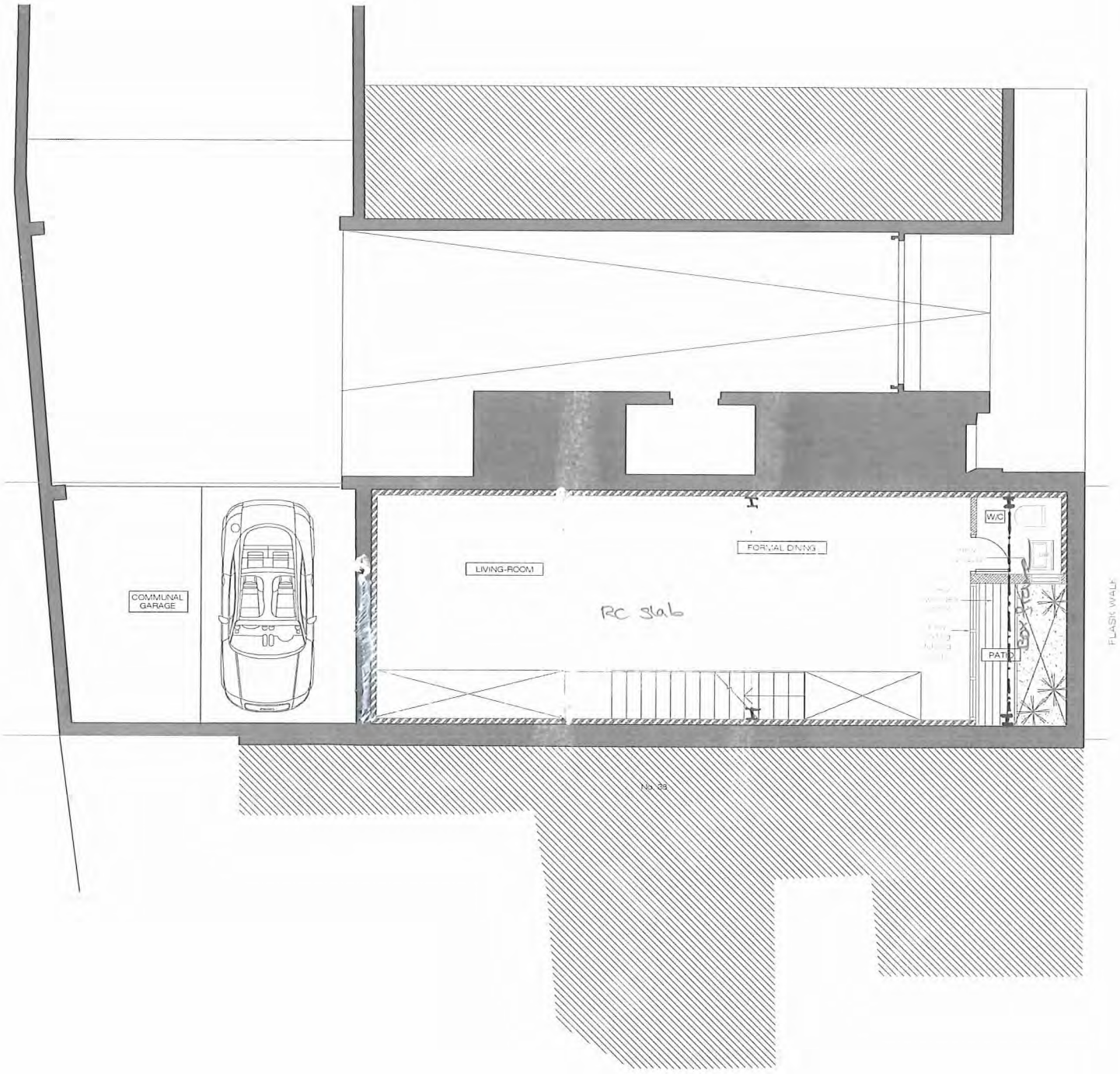
SECOND



FIRST


ENTRANCE TO
COMMUNAL GARAGE
No. 34
PS
DINING
KITCHEN
HALL
PATIO
Frame
Frame
Box frame
Beam
Beam
FLASK WALK
Walling beam
No. 36

GROUND


COMMUNAL GARAGE
LIVING-ROOM
FORMAL DINING
W.C
PATIO
RC slab
No. 38
FLASH WALK

BASEMENT

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36 Flask Walk

WIND LOADING

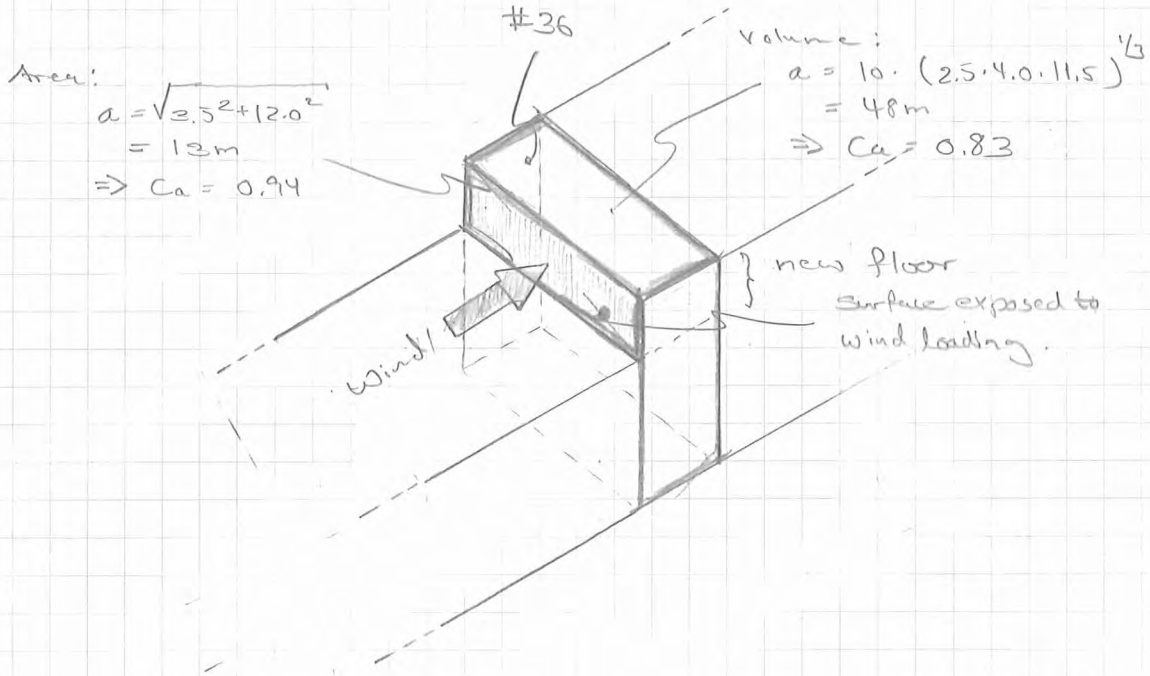
Basic wind speed : $V_b = 20.7$ m/s

Altitude factor : $S_a = 1 + 0.001 \cdot 20 = 1.02$

Terrain and building factor : $S_b = 1.65$

Effective wind speed : $V_e = 1.02 \cdot 20.7 \cdot 1.65 = 34.8$ m/s

Dynamic pressure : $q_s = 0.613 \cdot 34.8^2 = 0.74$ kN/m^2



External surface pressure : $D/H \geq 4$.

$P_e = 0.74 \cdot 0.60 \cdot 0.94 = 0.42$ kN/m^2

Internal surface pressure : $P_i = -0.74 \cdot 0.30 \cdot 0.83 = -0.18$ kN/m^2

Net surface pressure : $P = 0.42 + 0.18 = 0.60$ kN/m^2

Overall loads : $P = 0.85 \cdot (3.5 \cdot 12.0 \cdot 0.60) \cdot (1 + 0.02) = \underline{21.8 \text{ kN}}$.

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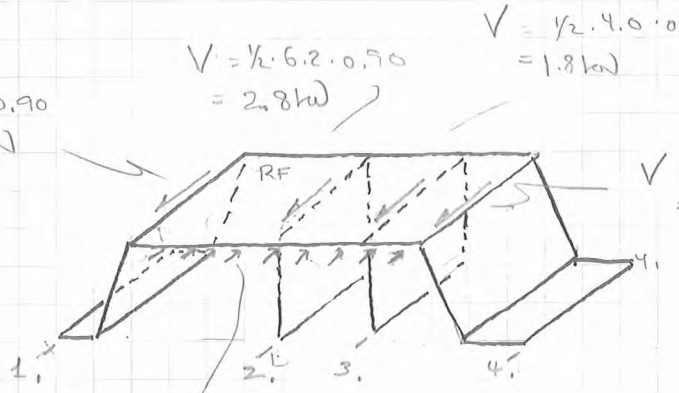
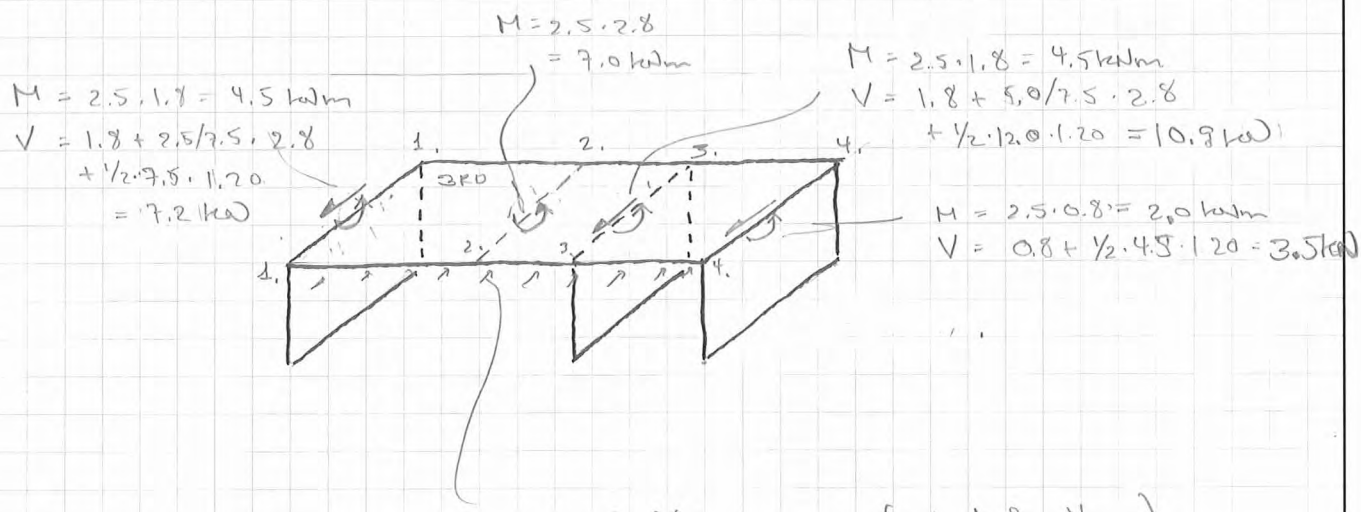
36 Flask Walk

TRANSMISSION OF APPLIED LATERAL LOAD:

Shear - planes



(wind loading)



(wind loading)

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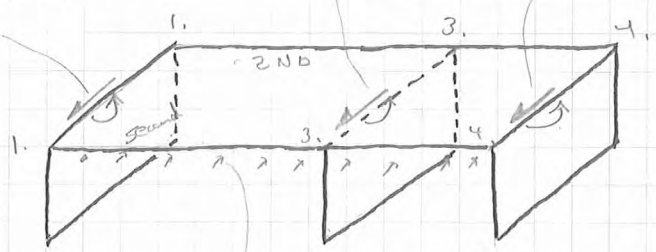
[illegible]	05/11/15	

36 Frank Walter

$M = 2.0 + 2.7 \cdot 3.5 = 11.5$ kNm
$V = 3.5 + \frac{1}{2} \cdot 4.5 \cdot 0.70$
$= 5.1$ kN

$M = 4.5 + 2.7 \cdot 10.9 = 33.9$ kNm
$V = 10.9 + \frac{1}{2} \cdot 12.0 \cdot 0.70$
$= 15.1$ kN

$M = 4.5 + 2.7 \cdot 7.2 = 23.9$ kNm
$V = 7.2 + \frac{1}{2} \cdot 7.5 \cdot 0.70$
$= 9.8$ kN

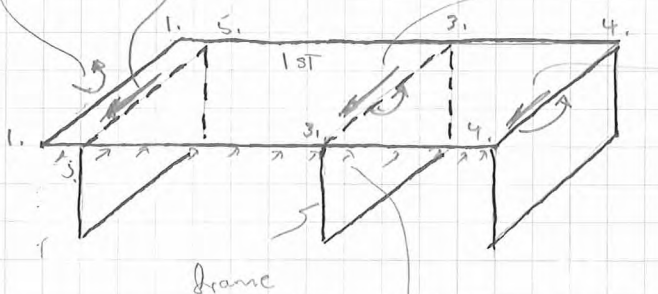


$p = 0.015 \cdot (118.6 + 123.2) / 14.0 \cdot 2.7$
$= 0.70$ kN/m (nominal load)

$M = 23.9 + 2.7 \cdot 9.8$
$= 50.4$ kNm

$V = 9.8 + (1.0 + \frac{1}{2} \cdot 6.5) \cdot 0.70$
$= 12.8$ kN

$M = 33.9 + 2.7 \cdot 15.1 = 74.7$ kNm
$V = 15.1 + \frac{1}{2} \cdot 11.0 \cdot 0.70 = 19.0$ kN



frame

$M = 11.5 + 2.7 \cdot 5.1$
$= 25.3$ kNm
$V = 5.1 + \frac{1}{2} \cdot 4.5 \cdot 0.70$
$= 6.7$ kN

$p = 0.70$ kN/m (nominal load)

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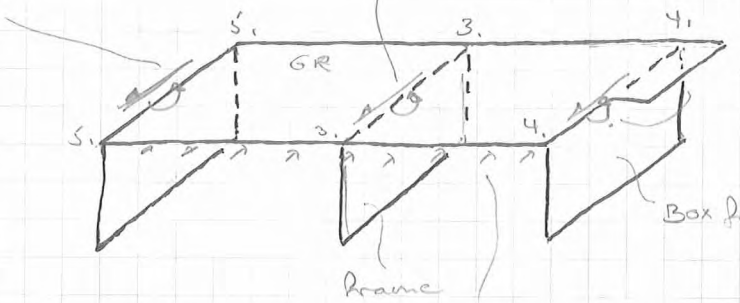
36 Flask Walk

$M = 2.7 \cdot 12.7 = 34.6$ kNm
$V = 12.7 + \frac{1}{2} \cdot 6.5 \cdot 0.70$
$= 15.1$ kN

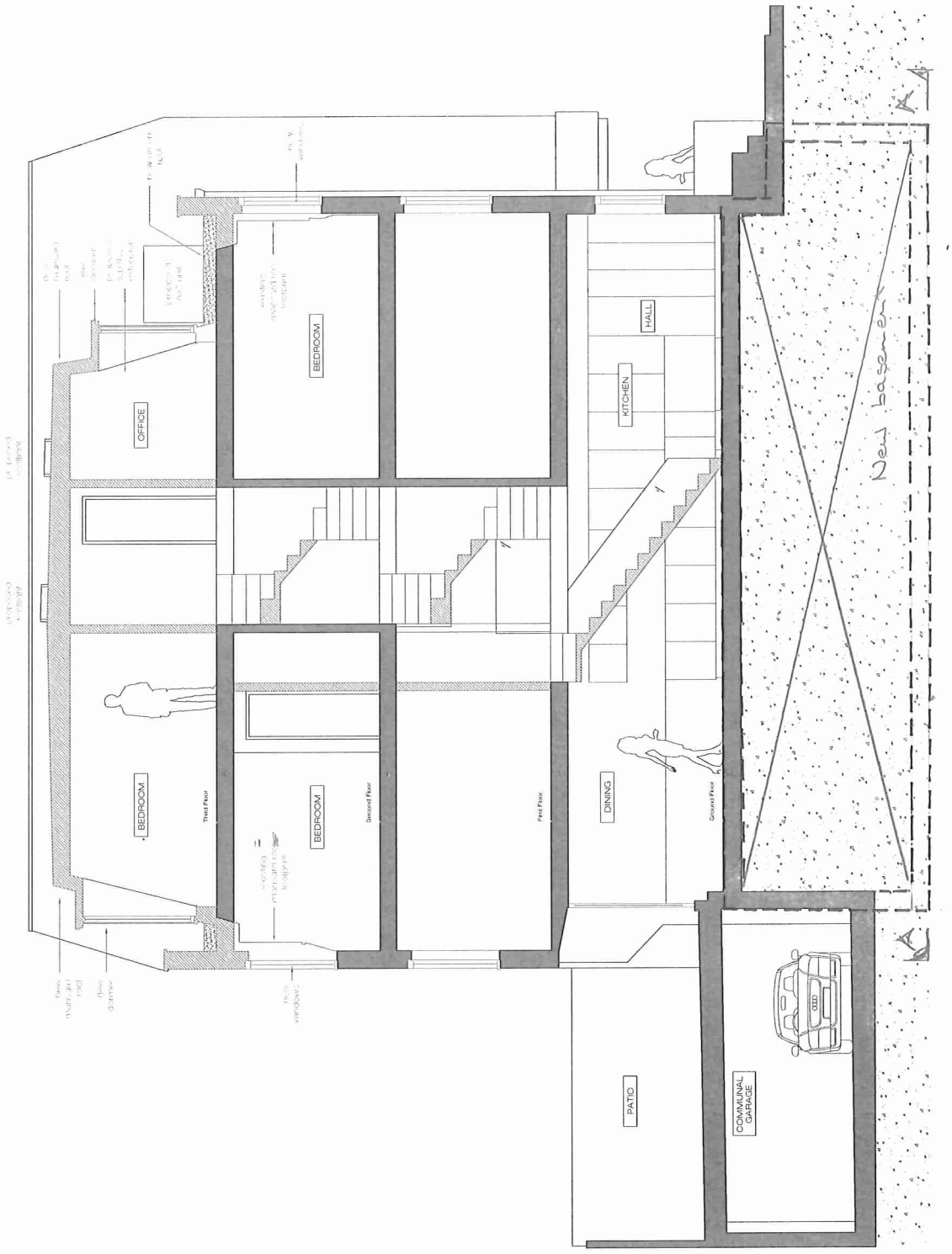
$M = 74.7 + 2.7 \cdot 19.0 = 126.0$ kNm
$V = 19.0 + \frac{1}{2} \cdot 11.0 \cdot 0.70 = 22.9$ kN

$M = 25.3 + 2.7 \cdot 6.7$
$= 43.4$ kNm
$V = 6.7 + \frac{1}{2} \cdot 4.5 \cdot 0.70$
$= 8.3$ kN



$p = 0.70$ kN/m (nominal load)

GRAVITY LOADING - PARTY WALLS.



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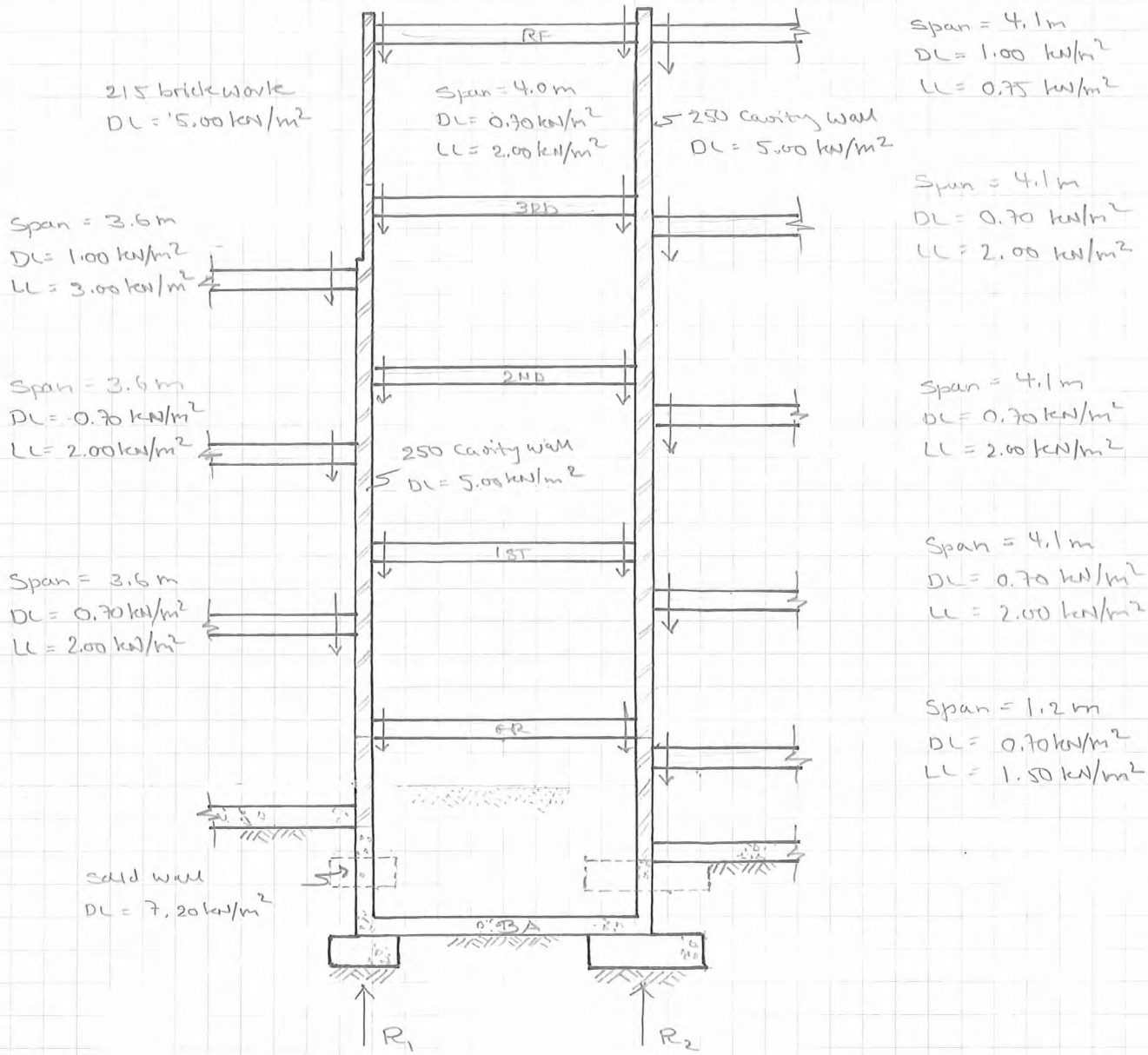
36 Flask Walk

#38 #36 #34



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36 Flask Walk

Party Wall 36/38.

DL + LL:

R_1 = 11.0 · 5.00 + 3.0 · 7.20 = 76.6 kN/m , PW

+ ½ · 4.0 · (1.00 + 0.75) = 3.5 , # 36 roof

+ 4. ½ · 4.0 · (0.70 + 2.00) = 21.6 , # 36 floors

+ ½ · 3.6 · (1.00 + 3.00) = 7.2 , # 38 roof

+ 2. ½ · 3.6 · (0.70 + 2.00) = 9.7 , # 38 floors

118.6 kN/m

Party Wall 36/34:

DL + LL

R_2 = 11.0 · 5.00 + 3.0 · 7.20 = 76.6 , PW

= 3.5 , # 36 roof

= 21.6 , # 36 floors

+ ½ · 4.1 · (1.00 + 0.75) = 3.6 , # 38 roof

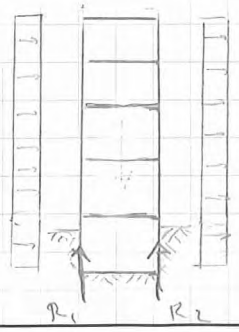
+ 3. ½ · 4.1 · (0.70 + 2.00) = 16.6 , # 38 floors

+ ½ · 1.2 · (0.70 + 1.50) = 1.3 , # 38 floors

123.2 kN/m

Minimum horizontal load (nominal out-of-plane load)

0.015 · 118.6 / 14.0
= 0.13 kN/m²



0.015 · 123.2 / 14.0
= 0.13 kN/m²

GRAVITY LOADING - FRONT ELEVATION