

Project No: S-2930 Calc By: BC

Project: 161 ARLINGTON ROAD, LONDON NW1 7ET

Date: 1 Nov 24 Rev: Rev 01


Title: Structural Calculations for Proposed Refurbishment of 161 Arlington Road
Section 5 New Extension - Basement

(ABP=138kN/m² @ 3m bgl)

Moment based on average load = $wl^2/8 = 16.686$ kNm

D = 300 mm d = D - 50 - 10 = 240 mm b = 1000 mm
 f_{cu} = 35 N/mm²
 f_y = 500 MN/mm²

K = 0.0083
 z = 0.99 d > 0.95 d limit, gives z = 228 mm
 A_s = 168.24 mm²/m
 Use H16 @ 200, A_{sprov} = 1010 mm²/m



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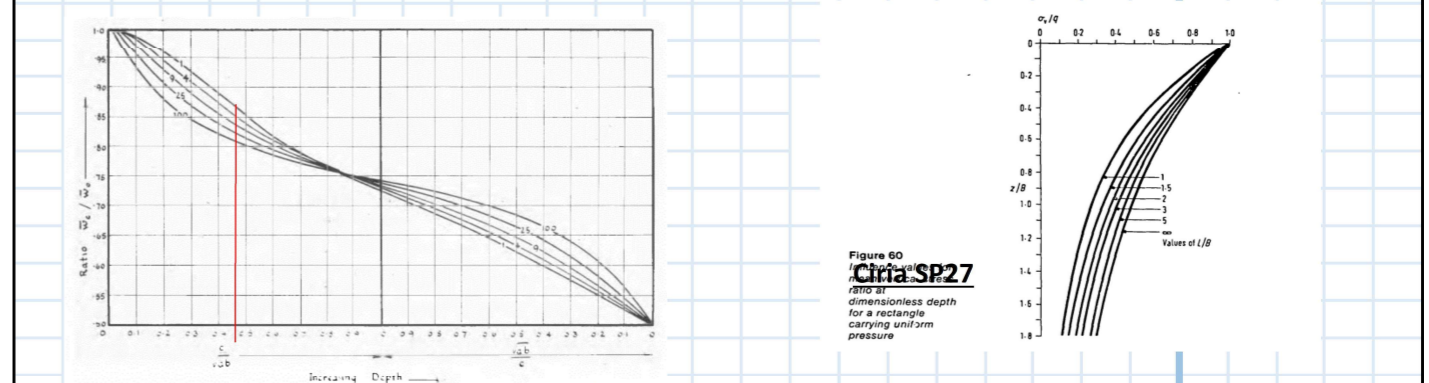
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Title: Structural Calculations for Proposed Refurbishment of 161 Arlington Road
Section 6 Settlement of basement

Total Long Term Settlement

Using Terzaghi 1D settlement method to calculate total long term settlement

Average loading, q = 10.3 kN/m²
 Length L = 3.60 m L/B = 1.00
 Width B = 3.60 m B/L = 1
 Depth D = 1.00 m



$D/(BL)^{0.5} = 0.2778$ Graph gives FCF = 0.95

CIRIA SP27 (fig 60) - and taking limit $\sigma_v = 0.2q$


$\sigma_v/q = 0.2$ give $z/B = 1.3$ Use layers = 0.2B = 0.72 m
 to depth 1.3B = 4.68 m

Limiting σ_v/q to 0.2 gives $z/B = 1.3$

0.2B = 0.72 m 1m deep layers
 1.3B = 4.68 m 6No layers

Layer	Thickness Δz	Depth of middle of layer z (middle of layer)	z/B	Stress Influence Factor Δσ _v /q (Fig 60)	Stress Increment Δσ _v	Exsting Vertical Stress σ _v	mv at stress level	Change in Layer Thickness Δσ _v . M _v . Δz
1	1	0.5	0.139	0.85	8.76	10	0.05	0.44
2	1	1.5	0.417	0.61	6.28	30	0.05	0.31
3	1	2.5	0.694	0.46	4.74	50	0.05	0.24
4	1	3.5	0.972	0.34	3.50	70	0.05	0.18
5	1	4.5	1.250	0.30	3.09	90	0.05	0.15
6	1	5.5	1.528	0.20	2.06	110	0.05	0.10
Σ Δ								1.42
Σ Δ x FCF								1.35


= Total long term settlement



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Immediate settlement

Based on Giroud & Burland

$$s_i = \mu_0 \mu_1 \frac{qB}{E}$$

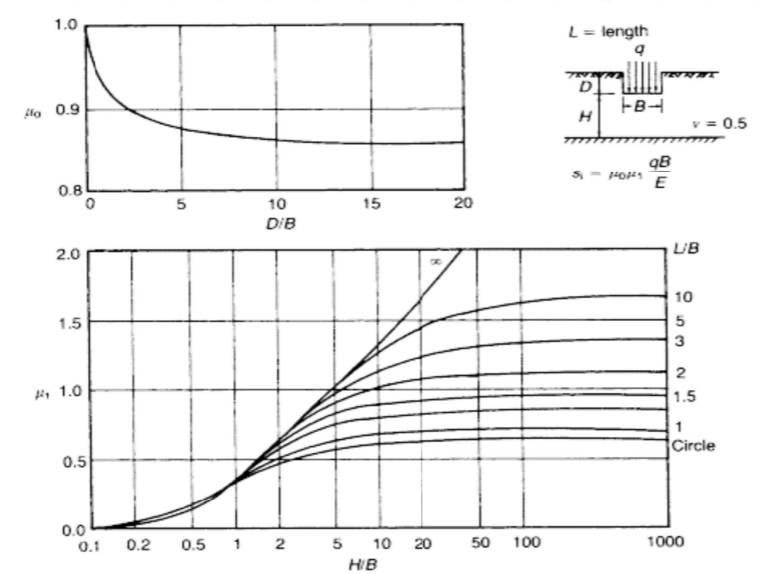
D/B = 0.2778 $\mu_0 = 0.95$

Based on 33m to base of London Clay (Camden Town borehole) and 3m difference in level
 H=33+3 = 36m

H = 33 m
 H/B = 9.17 $\mu_1 = 0.70$

Eu = 50000 kN/m²

si = **0.49 mm** = Immediate settlement



Summary construction settlements

Total long term settlement =	1.35 mm
Immediate settlement =	0.49 mm
Consolidation settlement =	0.86 mm

Check Heave at rear of basement

2.8m of soil removed	-56
Average load applied	10.3
Net pressure =	-45.7

	Δz	z/B	$\Delta\sigma$	σ_v	mv	$\Delta\sigma_v \cdot Mv$		
1	1	0.5	0.139	0.85	-38.85	10	0.05	-1.94
2	1	1.5	0.417	0.61	-27.88	30	0.05	-1.39
3	1	2.5	0.694	0.46	-21.02	50	0.05	-1.05
4	1	3.5	0.972	0.34	-15.54	70	0.05	-0.78
5	1	4.5	1.250	0.30	-13.71	90	0.05	-0.69
6	1	5.5	1.528	0.20	-9.14	110	0.05	-0.46
							$\Sigma \Delta$	-6.31
							$\Sigma \Delta \times FCF$	-5.99

si = **-2.19 mm** = Immediate settlement

Summary heave settlements @ garden side

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	Heave	Const	Net Settlement
Total long term settlement =	-5.99	1.35	-4.64 mm heave
Immediate settlement =	-2.19	0.49	-1.69 mm heave
Consolidation settlement =	-3.80	0.86	-2.95 mm heave

