WE ARE SYMMETRYS

ADDENDUM TO THE STRUCTURAL CALCULATION PACKAGE

43A REDINGTON ROAD
LONDON NW3 7RA

REF: 21141

SYMMETRYS
STRUCTURAL / CIVIL ENGINEERS

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Symmetrys
Unit 6 The Courtyard
Lynton Road
London N8 8SL

Revision History

Revision	Description	Date	By	Checked
A	Issue	14.01.22	SB	DS

Refer to Architects drawings for all setting out details

The contractor shall be responsible for the design, installation and sequencing of all temporary works and must ensure that stability of the structure is not compromised during the works

Legend

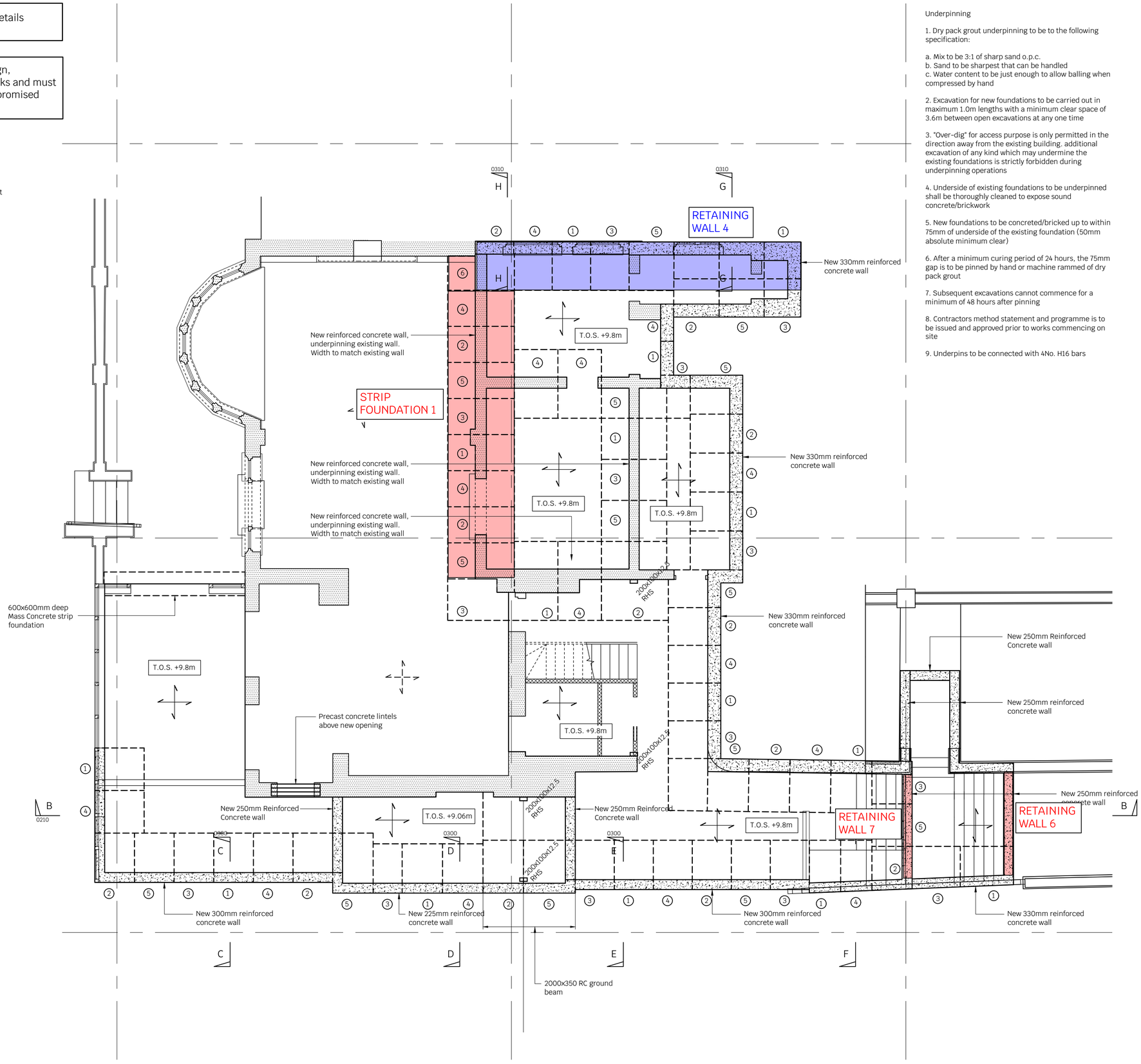
- Denotes existing masonry or timber structure
- Denotes new non load bearing stud wall by Architect
- Denotes existing slab to be retained
- Denotes new 250mm thick RC Slab
- T.O.S. +9.8m — Denotes top of slab (T.O.S.) level

Contractor/Specialist design element

1. All temporary works
2. All tanking details
3. All reinforcement drawings and bar bending schedules
4. Design of all steelwork connections. The fabricator will have to submit their calculations to building control for approval
5. Steel fabrication drawings
6. Design of all staircases, balustrades, glazing and secondary steel

Notes

- All steelwork in the external walls is to be galvanised (85 microns)
- All steelwork to be encased in concrete is to be un-painted
- Location of existing and proposed drain runs are to be confirmed by the Service Engineer
- Please refer to Architects drawings for all setting out details, insulation and ventilation details, damp proof courses and all tanking details
- For all fire work protection to steelwork refer to the Architects drawings
- Contractor should also review Architect's drawings for exact location of service penetration and confirm these with the Structural Engineer prior to cutting



Underpinning

1. Dry pack grout underpinning to be to the following specification:

a. Mix to be 3:1 of sharp sand o.p.c.
b. Sand to be sharpest that can be handled
c. Water content to be just enough to allow balling when compressed by hand

2. Excavation for new foundations to be carried out in maximum 1.0m lengths with a minimum clear space of 3.6m between open excavations at any one time

3. "Over-dig" for access purpose is only permitted in the direction away from the existing building. additional excavation of any kind which may undermine the existing foundations is strictly forbidden during underpinning operations

4. Underside of existing foundations to be underpinned shall be thoroughly cleaned to expose sound concrete/brickwork

5. New foundations to be concreted/bricked up to within 75mm of underside of the existing foundation (50mm absolute minimum clear)

6. After a minimum curing period of 24 hours, the 75mm gap is to be pinned by hand or machine rammed of dry pack grout

7. Subsequent excavations cannot commence for a minimum of 48 hours after pinning

8. Contractors method statement and programme is to be issued and approved prior to works commencing on site

9. Underpins to be connected with 4No. H16 bars

Notes

1. This drawing is to be read in conjunction with all relevant Architects & Engineers drawings and specifications
2. Do not scale from this drawing

General Propping Notes

1. The contractor will be responsible for all temporary works and will be responsible for the stability of entire structure during the works
2. Our plans and section show a possible solution for the temporary works
3. All party wall notices are to be agreed
4. Install needles and props above the locations of the proposed beams
5. Ensure all props are laterally restrained and install all necessary bracing
6. Install any channel required across the head of the needles
7. If required ensure all temporary works are dry packed into place
8. Ensure no heavy materials are stored on the floors that are being propped
9. Break out the load bearing walls in question
10. Install new substructures
11. Install new steel frames and ensure that the are fully dry-packed into place in order to take the permanent loads
12. Once dry pack is set and approved by the building control officer strike the temporary props

    Make good all areas of brickwork where needles where inserted

Rev	Date	Drwn	Chkd	Amendments
P1	00.08.21	JNS	XX	Preliminary Issue

Drawing Status PRELIMINARY

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Job Title
43A REDINGTON ROAD
LONDON, NW3

Drawing Title
ADDENDUM KEY PLAN

Project	Company	Zones	Level	Type	Role	Number
21141	SYM	XX	XX	DR	S	0080

Scale: 1:50 AT A1
Date: AUG 2021
Drawn By: JNS
Checked By: SB
Revision : P1

Company No. 5873122 VAT Registration No. 894 2993 61 Registered In England And Wales

SYMMETRYS
STRUCTURAL / CIVIL ENGINEERS

Job No.	Sheet No.	Revision
21141		

Job Title 43a REDINGTON ROAD, LONDON NW3

Date	Made By	Checked By
14.1.22	SB	DS

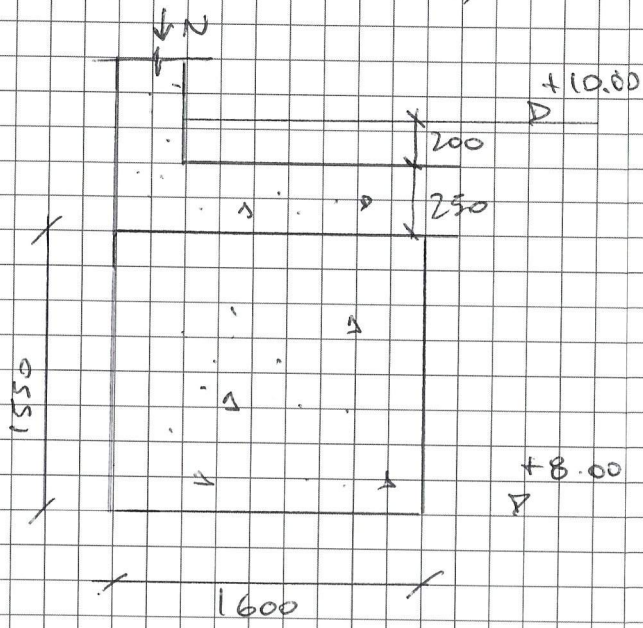
Section RET. WALL R.W. 04 (PART 2)

DATA (FROM TEDDS)

PRESSURE FROM RET. WALL ANALYSIS (LATERAL LOAD ONLY) = 17,2 KN/m²

DESIGN ASSUMPTION

THE SLAB HAS SUFFICIENT INHERENT STIFFNESS TO BE CAPABLE OF TRANFERRING THE VERTICAL LOADS UNIFORMLY.



STRIP FOUNDATION MATERIAL DENSITY:

$\gamma_{CONCRETE} - \gamma_{SOIL} = 24 - 19 = 5\ KN/m^3$

⇒ STRIP FOUNDATION SELF WEIGHT = 5 · 1,6 · 1,550 · 1 = 12,4 KN

N = 71,1 + 13,9 = 85 KN

TOTAL VERTICAL LOAD = 85 + 12,4 = 97,4 KN

GROUND BEARING PRESSURE = $\frac{97,4}{1,6}$ + 17,2 = 78,1 KN/m²

ALLOWABLE BEARING PRESSURE @ +8.00 = 60 KN/m² ⇒

∴ ADOPT 1,6 x 1,55 m DEEP MASS CONCRETE FOUNDATION BELOW RC RET WALL.

RETAINING WALL ANALYSIS

In accordance with EN1997-1:2004 incorporating Corrigendum dated February 2009 and the UK National Annex incorporating Corrigendum No.1

Tedds calculation version 2.9.12

Retaining wall details

Stem type	Cantilever
Stem height	h_{stem} = **1200** mm
Stem thickness	t_{stem} = **250** mm
Angle to rear face of stem	α = **90** deg
Stem density	γ_{stem} = **25** kN/m^3
Toe length	l_{toe} = **2560** mm
Base thickness	t_{base} = **250** mm
Base density	γ_{base} = **25** kN/m^3
Height of retained soil	h_{ret} = **1200** mm
Angle of soil surface	β = **6** deg
Depth of cover	d_{cover} = **0** mm

Retained soil properties

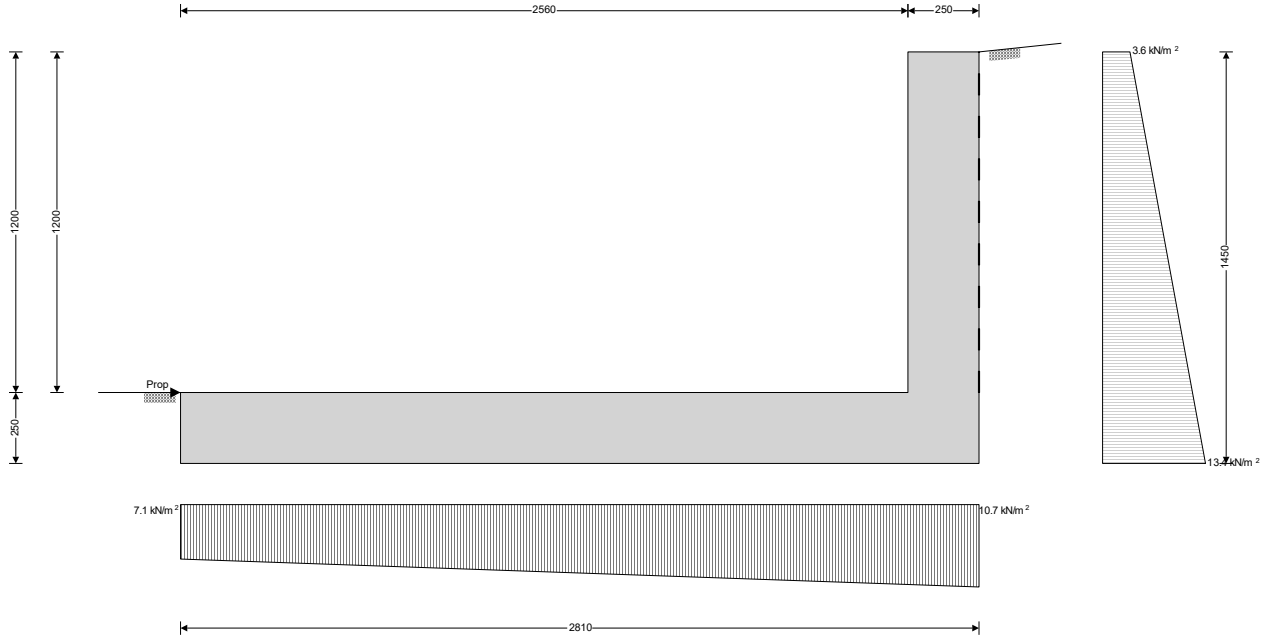
Soil type	Firm clay
Moist density	γ_{mr} = **19** kN/m^3
Saturated density	γ_{sr} = **19** kN/m^3
Characteristic effective shear resistance angle	$\phi'_{r.k}$ = **27** deg
Characteristic wall friction angle	$\delta_{r.k}$ = **13.5** deg

Base soil properties

Soil type	Firm clay
Soil density	γ_b = **19** kN/m^3
Characteristic effective shear resistance angle	$\phi'_{b.k}$ = **27** deg
Characteristic wall friction angle	$\delta_{b.k}$ = **13.5** deg
Characteristic base friction angle	$\delta_{bb.k}$ = **18** deg
Presumed bearing capacity	$P_{bearing}$ = **60** kN/m^2

Loading details

Variable surcharge load	$Surcharge_Q$ = **10** kN/m^2



General arrangement

Calculate retaining wall geometry

Base length	$l_{base} = l_{toe} + t_{stem}$ = **2810** mm
Moist soil height	$h_{moist} = h_{soil}$ = **1200** mm
Length of surcharge load	$l_{sur} = l_{heel}$ = **0** mm
- Distance to vertical component	$x_{sur\_v} = l_{base} - l_{heel} / 2$ = **2810** mm
Effective height of wall	$h_{eff} = h_{base} + d_{cover} + h_{ret} + l_{sur} \times \tan(\beta)$ = **1450** mm
- Distance to horizontal component	$x_{sur\_h} = h_{eff} / 2$ = **725** mm
Area of wall stem	$A_{stem} = h_{stem} \times t_{stem}$ = **0.3** m²
- Distance to vertical component	$x_{stem} = l_{toe} + t_{stem} / 2$ = **2685** mm
Area of wall base	$A_{base} = l_{base} \times t_{base}$ = **0.703** m²
- Distance to vertical component	$x_{base} = l_{base} / 2$ = **1405** mm

Using Coulomb theory

Active pressure coefficient	$K_A = \sin(\alpha + \phi'_{r.k})^2 / (\sin(\alpha)^2 \times \sin(\alpha - \delta_{r.k}) \times [1 + \sqrt{[\sin(\phi'_{r.k} + \delta_{r.k}) \times \sin(\phi'_{r.k} - \beta) / (\sin(\alpha - \delta_{r.k}) \times \sin(\alpha + \beta))]]^2})$ = **0.367**
Passive pressure coefficient	$K_P = \sin(90 - \phi'_{b.k})^2 / (\sin(90 + \delta_{b.k}) \times [1 - \sqrt{[\sin(\phi'_{b.k} + \delta_{b.k}) \times \sin(\phi'_{b.k}) / (\sin(90 + \delta_{b.k}))]]^2})$ = **4.044**

Bearing pressure check

Vertical forces on wall

Wall stem	$F_{stem} = A_{stem} \times \gamma_{stem}$ = **7.5** kN/m
Wall base	$F_{base} = A_{base} \times \gamma_{base}$ = **17.6** kN/m
Total	$F_{total\_v} = F_{stem} + F_{base}$ = **25.1** kN/m

Horizontal forces on wall

Surcharge load	$F_{sur\_h} = K_A \times \cos(\delta_{r.k}) \times Surcharge_Q \times h_{eff}$ = **5.2** kN/m

Moist retained soil	$F_{moist\_h} = K_A \times \cos(\delta_{r.k}) \times \gamma_{mr} \times h_{eff}^2 / 2 =$ **7.1** kN/m
Base soil	$F_{pass\_h} = -K_P \times \cos(\delta_{b.k}) \times \gamma_b \times (d_{cover} + h_{base})^2 / 2 =$ **-2.3** kN/m
Total	$F_{total\_h} = F_{sur\_h} + F_{moist\_h} + F_{pass\_h} =$ **10** kN/m

Moments on wall

Wall stem	$M_{stem} = F_{stem} \times x_{stem} =$ **20.1** kNm/m
Wall base	$M_{base} = F_{base} \times x_{base} =$ **24.7** kNm/m
Surcharge load	$M_{sur} = -F_{sur\_h} \times x_{sur\_h} =$ **-3.8** kNm/m
Moist retained soil	$M_{moist} = -F_{moist\_h} \times x_{moist\_h} =$ **-3.4** kNm/m
Total	$M_{total} = M_{stem} + M_{base} + M_{sur} + M_{moist} =$ **37.6** kNm/m

Check bearing pressure

Propping force	$F_{prop\_base} = F_{total\_h} =$ **10** kN/m
Distance to reaction	$\bar{x} = M_{total} / F_{total\_v} =$ **1501** mm
Eccentricity of reaction	$e = \bar{x} - l_{base} / 2 =$ **96** mm
Loaded length of base	$l_{load} = l_{base} =$ **2810** mm
Bearing pressure at toe	$q_{toe} = F_{total\_v} / l_{base} \times (1 - 6 \times e / l_{base}) =$ **7.1** kN/m²
Bearing pressure at heel	$q_{heel} = F_{total\_v} / l_{base} \times (1 + 6 \times e / l_{base}) =$ **10.7** kN/m²
Factor of safety	$FoS_{bp} = P_{bearing} / \max(q_{toe}, q_{heel}) =$ **5.587**

PASS - Allowable bearing pressure exceeds maximum applied bearing pressure

RETAINING WALL DESIGN

In accordance with EN1992-1-1:2004 incorporating Corrigendum dated January 2008 and the UK National Annex incorporating National Amendment No.1

Tedds calculation version 2.9.12

Concrete details - Table 3.1 - Strength and deformation characteristics for concrete

Concrete strength class	C30/37
Characteristic compressive cylinder strength	$f_{ck} =$ **30** N/mm²
Characteristic compressive cube strength	$f_{ck,cube} =$ **37** N/mm²
Mean value of compressive cylinder strength	$f_{cm} = f_{ck} + 8$ N/mm² = **38** N/mm²
Mean value of axial tensile strength	$f_{ctm} = 0.3$ N/mm² $\times (f_{ck} / 1$ N/mm²$)^{2/3} =$ **2.9** N/mm²
5% fractile of axial tensile strength	$f_{ctk,0.05} = 0.7 \times f_{ctm} =$ **2.0** N/mm²
Secant modulus of elasticity of concrete	$E_{cm} = 22$ kN/mm² $\times (f_{cm} / 10$ N/mm²$)^{0.3} =$ **32837** N/mm²
Partial factor for concrete - Table 2.1N	$\gamma_C =$ **1.50**
Compressive strength coefficient - cl.3.1.6(1)	$\alpha_{cc} =$ **0.85**
Design compressive concrete strength - exp.3.15	$f_{cd} = \alpha_{cc} \times f_{ck} / \gamma_C =$ **17.0** N/mm²
Maximum aggregate size	$h_{agg} =$ **20** mm
Ultimate strain - Table 3.1	$\varepsilon_{cu2} =$ **0.0035**
Shortening strain - Table 3.1	$\varepsilon_{cu3} =$ **0.0035**
Effective compression zone height factor	$\lambda =$ **0.80**
Effective strength factor	$\eta =$ **1.00**
Bending coefficient k_1	$K_1 =$ **0.40**
Bending coefficient k_2	$K_2 = 1.00 \times (0.6 + 0.0014/\varepsilon_{cu2}) =$ **1.00**
Bending coefficient k_3	$K_3 =$ **0.40**
Bending coefficient k_4	$K_4 = 1.00 \times (0.6 + 0.0014/\varepsilon_{cu2}) =$ **1.00**

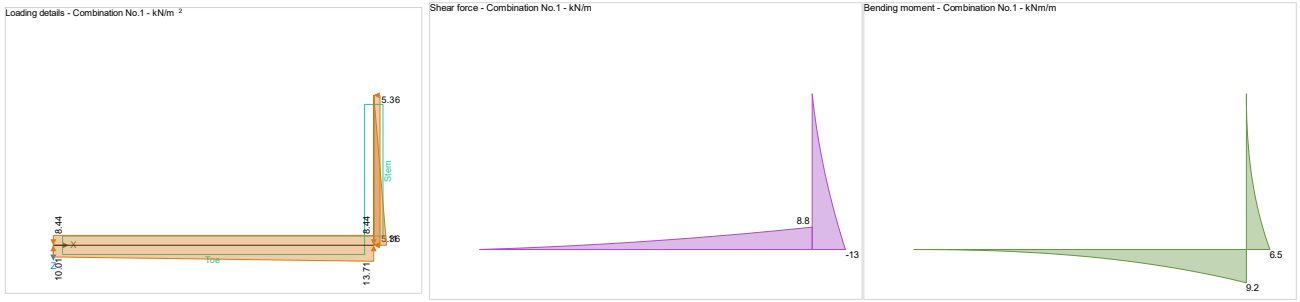
Reinforcement details

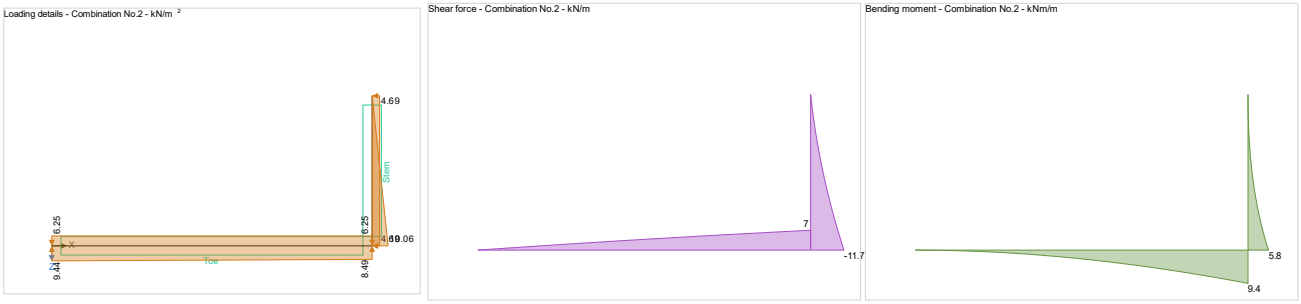
Characteristic yield strength of reinforcement	$f_{yk} =$ **500** N/mm²

Modulus of elasticity of reinforcement	E_s = **200000** N/mm^2
Partial factor for reinforcing steel - Table 2.1N	γ_S = **1.15**
Design yield strength of reinforcement	$f_{yd} = f_{yk} / \gamma_S$ = **435** N/mm^2

Cover to reinforcement

Front face of stem	c_{sf} = **40** mm
Rear face of stem	c_{sr} = **50** mm
Top face of base	c_{bt} = **50** mm
Bottom face of base	c_{bb} = **75** mm





Check stem design at base of stem

Depth of section	h = **250** mm

Rectangular section in flexure - Section 6.1

Design bending moment combination 1	M = **6.5** kNm/m
Depth to tension reinforcement	$d = h - c_{sr} - \phi_{sr} / 2$ = **192** mm
	$K = M / (d^2 \times f_{ck})$ = **0.006**
	$K' = (2 \times \eta \times \alpha_{cc}/\gamma_C) \times (1 - \lambda \times (\delta - K_1)/(2 \times K_2)) \times (\lambda \times (\delta - K_1)/(2 \times K_2))$
	K' = **0.207**
	K' > K - No compression reinforcement is required
Lever arm	$z = \min(0.5 + 0.5 \times (1 - 2 \times K / (\eta \times \alpha_{cc} / \gamma_C))^{0.5}, 0.95) \times d$ = **182** mm
Depth of neutral axis	$x = 2.5 \times (d - z)$ = **24** mm
Area of tension reinforcement required	$A_{sr.req} = M / (f_{yd} \times z)$ = **82** mm^2/m
Tension reinforcement provided	16 dia.bars @ 150 c/c
Area of tension reinforcement provided	$A_{sr.prov} = \pi \times \phi_{sr}^2 / (4 \times s_{sr})$ = **1340** mm^2/m
Minimum area of reinforcement - exp.9.1N	$A_{sr.min} = \max(0.26 \times f_{ctm} / f_{yk}, 0.0013) \times d$ = **289** mm^2/m
Maximum area of reinforcement - cl.9.2.1.1(3)	$A_{sr.max} = 0.04 \times h$ = **10000** mm^2/m
	$\max(A_{sr.req}, A_{sr.min}) / A_{sr.prov}$ = **0.216**
	PASS - Area of reinforcement provided is greater than area of reinforcement required

Library item: Rectangular single output

Deflection control - Section 7.4

Reference reinforcement ratio	$\rho_0 = \sqrt{(f_{ck} / 1\ N/mm^2)} / 1000 =$ **0.005**
Required tension reinforcement ratio	$\rho = A_{sr.req} / d =$ **0.000**
Required compression reinforcement ratio	$\rho' = A_{sr.2.req} / d_2 =$ **0.000**
Structural system factor - Table 7.4N	$K_b =$ **0.4**
Reinforcement factor - exp.7.17	$K_s = \min(500\ N/mm^2 / (f_{yk} \times A_{sr.req} / A_{sr.prov}), 1.5) =$ **1.5**
Limiting span to depth ratio - exp.7.16.a	$\min(K_s \times K_b \times [11 + 1.5 \times \sqrt{(f_{ck} / 1\ N/mm^2)} \times \rho_0 / \rho + 3.2 \times \sqrt{(f_{ck} / 1\ N/mm^2)} \times (\rho_0 / \rho - 1)^{3/2}], 40 \times K_b) =$ **16**
Actual span to depth ratio	$h_{stem} / d =$ **6.3**
	PASS - Span to depth ratio is less than deflection control limit

Crack control - Section 7.3

Limiting crack width	$w_{max} =$ **0.3** mm
Variable load factor - EN1990 – Table A1.1	$\psi_2 =$ **0.6**
Serviceability bending moment	$M_{sls} =$ **3.5** kNm/m
Tensile stress in reinforcement	$\sigma_s = M_{sls} / (A_{sr.prov} \times z) =$ **14.3** N/mm^2
Load duration	Long term
Load duration factor	$k_t =$ **0.4**
Effective area of concrete in tension	$A_{c.eff} = \min(2.5 \times (h - d), (h - x) / 3, h / 2)$
	$A_{c.eff} =$ **75333** mm^2/m
Mean value of concrete tensile strength	$f_{ct.eff} = f_{ctm} =$ **2.9** N/mm^2
Reinforcement ratio	$\rho_{p.eff} = A_{sr.prov} / A_{c.eff} =$ **0.018**
Modular ratio	$\alpha_e = E_s / E_{cm} =$ **6.091**
Bond property coefficient	$k_1 =$ **0.8**
Strain distribution coefficient	$k_2 =$ **0.5**
	$k_3 =$ **3.4**
	$k_4 =$ **0.425**
Maximum crack spacing - exp.7.11	$s_{r.max} = k_3 \times c_{sr} + k_1 \times k_2 \times k_4 \times \phi_{sr} / \rho_{p.eff} =$ **323** mm
Maximum crack width - exp.7.8	$w_k = s_{r.max} \times \max(\sigma_s - k_t \times (f_{ct.eff} / \rho_{p.eff}) \times (1 + \alpha_e \times \rho_{p.eff}), 0.6 \times \sigma_s) / E_s$
	$w_k =$ **0.014** mm
	$w_k / w_{max} =$ **0.046**
	PASS - Maximum crack width is less than limiting crack width

Rectangular section in shear - Section 6.2

Design shear force	$V =$ **13** kN/m
	$C_{Rd,c} = 0.18 / \gamma_C =$ **0.120**
	$k = \min(1 + \sqrt{(200\ mm / d)}, 2) =$ **2.000**
Longitudinal reinforcement ratio	$\rho_l = \min(A_{sr.prov} / d, 0.02) =$ **0.007**
	$v_{min} = 0.035\ N^{1/2}/mm \times k^{3/2} \times f_{ck}^{0.5} =$ **0.542** N/mm^2
Design shear resistance - exp.6.2a & 6.2b	$V_{Rd.c} = \max(C_{Rd.c} \times k \times (100\ N^2/mm^4 \times \rho_l \times f_{ck})^{1/3}, v_{min}) \times d$
	$V_{Rd.c} =$ **127** kN/m
	$V / V_{Rd.c} =$ **0.103**
	PASS - Design shear resistance exceeds design shear force

Horizontal reinforcement parallel to face of stem - Section 9.6

Minimum area of reinforcement – cl.9.6.3(1)	$A_{sx.req} = \max(0.25 \times A_{sr.prov}, 0.001 \times t_{stem}) =$ **335** mm^2/m
Maximum spacing of reinforcement – cl.9.6.3(2)	$s_{sx\_max} =$ **400** mm
Transverse reinforcement provided	10 dia.bars @ 200 c/c

Area of transverse reinforcement provided	$A_{sx.prov} = \pi \times \phi_{sx}^2 / (4 \times s_{sx})$ = **393** mm²/m

PASS - Area of reinforcement provided is greater than area of reinforcement required

Check base design at toe

Depth of section	h = **250** mm

Rectangular section in flexure - Section 6.1

Design bending moment combination 2	M = **9.4** kNm/m
Depth to tension reinforcement	$d = h - c_{bb} - \phi_{bb} / 2$ = **167** mm
	$K = M / (d^2 \times f_{ck})$ = **0.011**
	$K' = (2 \times \eta \times \alpha_{cc}/\gamma_C)\times(1 - \lambda \times (\delta - K_1)/(2 \times K_2))\times(\lambda \times (\delta - K_1)/(2 \times K_2))$
	K' = **0.207**

K' > K - No compression reinforcement is required

Lever arm	$z = \min(0.5 + 0.5 \times (1 - 2 \times K / (\eta \times \alpha_{cc} / \gamma_C))^{0.5}, 0.95) \times d$ = **159** mm
Depth of neutral axis	$x = 2.5 \times (d - z)$ = **21** mm
Area of tension reinforcement required	$A_{bb.req} = M / (f_{yd} \times z)$ = **136** mm²/m
Tension reinforcement provided	16 dia.bars @ 150 c/c
Area of tension reinforcement provided	$A_{bb.prov} = \pi \times \phi_{bb}^2 / (4 \times s_{bb})$ = **1340** mm²/m
Minimum area of reinforcement - exp.9.1N	$A_{bb.min} = \max(0.26 \times f_{ctm} / f_{yk}, 0.0013) \times d$ = **252** mm²/m
Maximum area of reinforcement - cl.9.2.1.1(3)	$A_{bb.max} = 0.04 \times h$ = **10000** mm²/m
	$\max(A_{bb.req}, A_{bb.min}) / A_{bb.prov}$ = **0.188**

PASS - Area of reinforcement provided is greater than area of reinforcement required

Library item: Rectangular single output

Crack control - Section 7.3

Limiting crack width	w_{max} = **0.3** mm
Variable load factor - EN1990 – Table A1.1	ψ_2 = **0.6**
Serviceability bending moment	M_{sls} = **6.4** kNm/m
Tensile stress in reinforcement	$\sigma_s = M_{sls} / (A_{bb.prov} \times z)$ = **30.1** N/mm²
Load duration	Long term
Load duration factor	k_t = **0.4**
Effective area of concrete in tension	$A_{c.eff} = \min(2.5 \times (h - d), (h - x) / 3, h / 2)$
	$A_{c.eff}$ = **76375** mm²/m
Mean value of concrete tensile strength	$f_{ct.eff} = f_{ctm}$ = **2.9** N/mm²
Reinforcement ratio	$\rho_{p.eff} = A_{bb.prov} / A_{c.eff}$ = **0.018**
Modular ratio	$\alpha_e = E_s / E_{cm}$ = **6.091**
Bond property coefficient	k_1 = **0.8**
Strain distribution coefficient	k_2 = **0.5**
	k_3 = **3.4**
	k_4 = **0.425**
Maximum crack spacing - exp.7.11	$s_{r.max} = k_3 \times c_{bb} + k_1 \times k_2 \times k_4 \times \phi_{bb} / \rho_{p.eff}$ = **410** mm
Maximum crack width - exp.7.8	$w_k = s_{r.max} \times \max(\sigma_s - k_t \times (f_{ct.eff} / \rho_{p.eff}) \times (1 + \alpha_e \times \rho_{p.eff}), 0.6 \times \sigma_s) / E_s$
	w_k = **0.037** mm
	w_k / w_{max} = **0.123**

PASS - Maximum crack width is less than limiting crack width

Rectangular section in shear - Section 6.2

Design shear force	V = **8.8** kN/m
	$C_{Rd,c} = 0.18 / \gamma_C$ = **0.120**

$k = \min(1 + \sqrt{(200\ mm / d)}, 2) =$ **2.000**

Longitudinal reinforcement ratio: $\rho_l = \min(A_{bb.prov} / d, 0.02) =$ **0.008**

$v_{min} = 0.035\ N^{1/2}/mm \times k^{3/2} \times f_{ck}^{0.5} =$ **0.542** N/mm^2

Design shear resistance - exp.6.2a & 6.2b: $V_{Rd.c} = \max(C_{Rd.c} \times k \times (100\ N^2/mm^4 \times \rho_l \times f_{ck})^{1/3}, v_{min}) \times d$

$V_{Rd.c} =$ **115.7** kN/m

$V / V_{Rd.c} =$ **0.076**

PASS - Design shear resistance exceeds design shear force

Secondary transverse reinforcement to base - Section 9.3

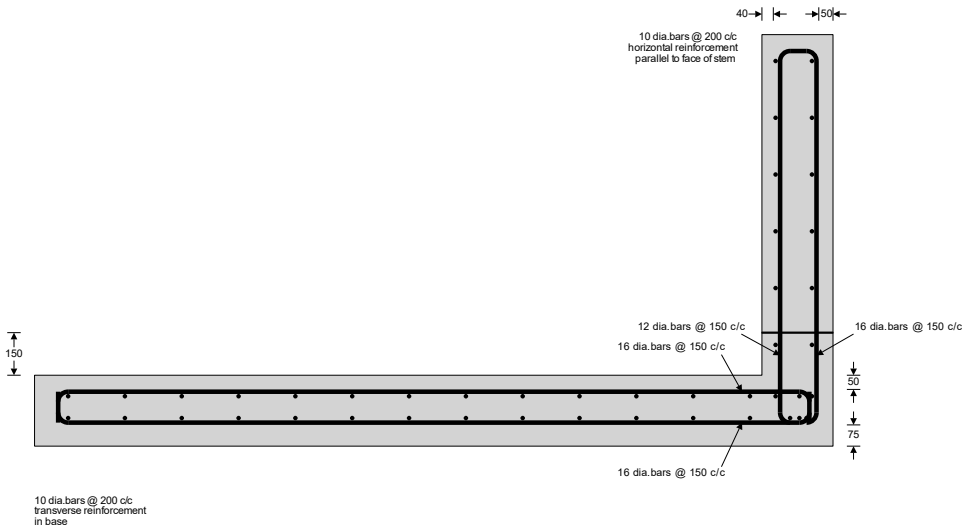
Minimum area of reinforcement – cl.9.3.1.1(2): $A_{bx.req} = 0.2 \times A_{bb.prov} =$ **268** mm^2/m

Maximum spacing of reinforcement – cl.9.3.1.1(3): $s_{bx\_max} =$ **450** mm

Transverse reinforcement provided: 10 dia.bars @ 200 c/c

Area of transverse reinforcement provided: $A_{bx.prov} = \pi \times \phi_{bx}^2 / (4 \times s_{bx}) =$ **393** mm^2/m

PASS - Area of reinforcement provided is greater than area of reinforcement required



Reinforcement details

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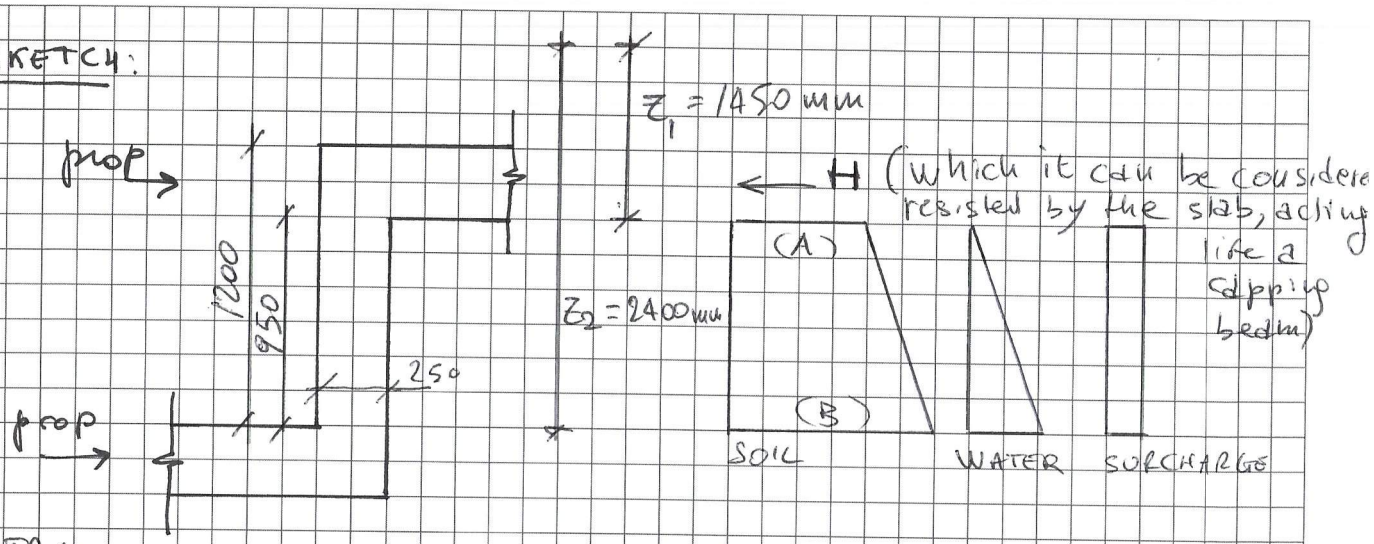
Section B. RET. WALL RW07

SKETCH:



DATA:

$\gamma_{soil} = 19\ kN/m^3$

$K_a = \frac{1-\sin(27)}{1+\sin(27)} = 0,375$

Soil pressure point (A) = $19 \cdot 0,375 \cdot 1,450 = 10\ kN/m^2$

" " " (B) = $19 \cdot 0,375 \cdot 2,4 = 17,1\ kN/m^2$

Water pressure = $10 \cdot 0,95 = 9,5\ kN/m^2$

Surcharge = $10 \cdot 0,375 = 3,75\ kN/m^2$

U.d.l. on WALL (for 1 m length, and conservatively considering the highest value of soil pressure):

$q_d = 1,35 \cdot 17,1 + 1,5(3,75 + 9,5) = 43\ kN/m$

Conservatively assuming simple support condition:

$M_{Ed} = 43 \cdot 0,95^2/8 = 4,9\ kNm/m$

$K = \frac{4,9 \cdot 10^6}{1000 \cdot 210^2 \cdot 30} = 0,0037$

$$z = 210 \cdot \left[0.5 + \sqrt{0.25 - \frac{0.0037}{1.134}}\right] = 0.99 \cdot 210 \rightarrow 0.95 \cdot 210$$

$$A_{s,req} = \frac{4.9 \cdot 10^6}{0.87 \cdot 500 \cdot 0.95 \cdot 210} = 56.5 \text{ mm}^2/\text{m}$$

∴ Use H12 @ 150 mm c/c ($A_{s,prov} = 753 \text{ mm}^2/\text{m} > A_{s,req}$)

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Section: STRIP FOUNDATION 1

Date	Made By	Checked By
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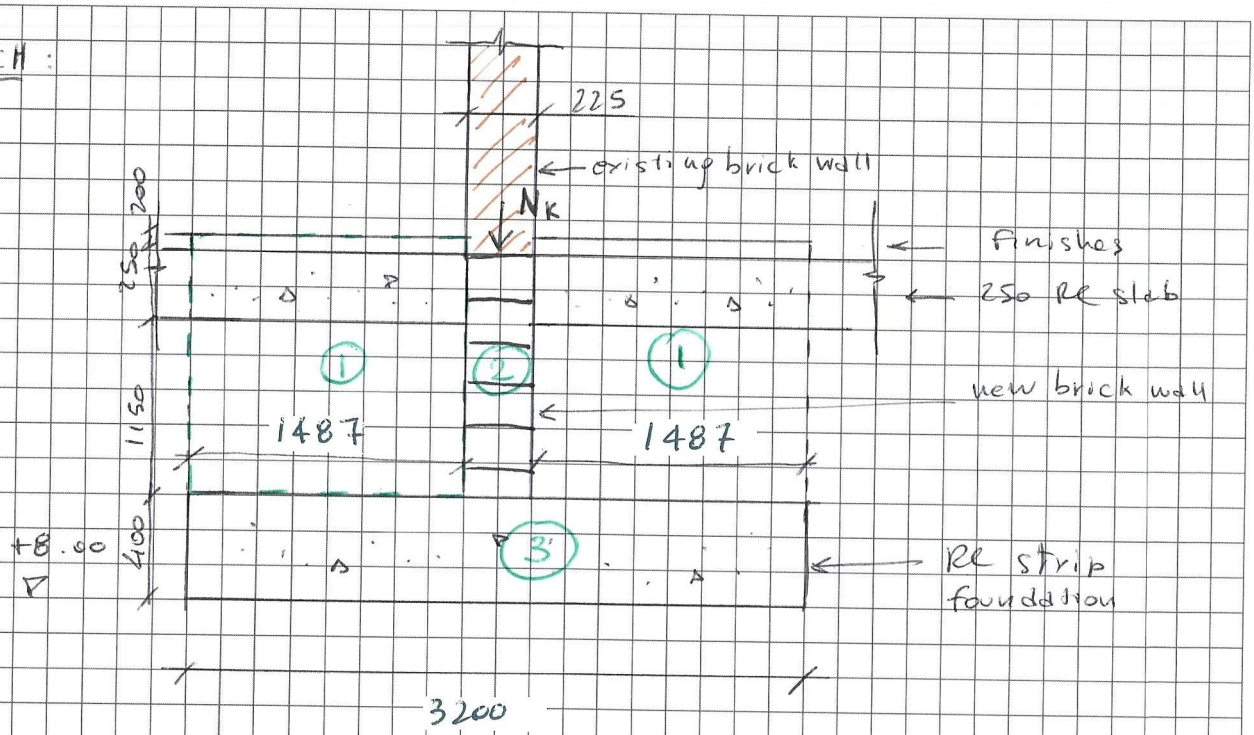
SKETCH:



Load take down:

Area (1):

Soil: $19 \cdot 1,487 \cdot 1,150 \cdot 1 = 32,49$ kN

Slab: $25 \cdot 0,25 \cdot 1,487 \cdot 1 = 9,29$ kN

Finishes: $1 \cdot 1,487 \cdot 1 = 1,487$ kN

IMPOSED LOAD:

$1,5 \cdot 1,487 \cdot 1 = 2,2$ kN

Area (2) (New brick wall):

Wall: $19 \cdot 0,225 \cdot (1,15 + 0,25) = 5,99$ kN

Area (3) (strip foundation):

Foundation: $6 \cdot 3,2 \cdot 0,4 \cdot 1 = 7,7$ kN (*)

$N_K = 87,8 + 40,9 = 128,7$ kN

Σ Vertical load / m = 231,2 kN

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∴ ADOPT 3,2 m STRIP FOUNDATION =>

GROUND BEARING PRESSURE = $\frac{231,2}{3.2}$ = 72,3 KN/m²

ALLOWABLE BEARING PRESSURE @ +8.0 = 80 KN/m² => OK

NOTE:

(X) FOUNDATION MATERIAL DENSITY:

$\gamma_{concrete(RC)} - \gamma_{soil} = 25 - 19 = 6$ KN/m³

CONTINUE THE CONVERSATION

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