CampbellReith
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79 Redington Road, London NW3 7RR

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12727-77
Revision: F1

June 2018

Campbell Reith Hill LLP
Friars Bridge Court
41-45 Blackfriars Road
London
SE1 8NZ

T:+44 (0)20 7340 1700
E:london@campbellreith.com
W:www.campbellreith.com

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Project Partner	E M Brown, BSc MSc CGeol FGS
Project Number	12727-77
Project Name	79 Redington Road, London NW3 7RR
Planning Reference	2018/1697/P

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Contents

Appendix

1.0 NON-TECHNICAL SUMMARY

1.1. CampbellReith was instructed by London Borough of Camden, (LBC) to carry out an audit on the Basement Impact Assessment submitted as part of the Planning Submission documentation for 79 Redington Road, London NW3 7RR (planning reference 2018/1697/P). The basement is considered to fall within Category B as defined by the Terms of Reference.

1.2. The Audit reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development in accordance with LBC's policies and technical procedures.

1.3. CampbellReith was able to access LBC's Planning Portal and gain access to the latest revision of submitted documentation and reviewed it against an agreed audit check list.

1.4. The BIA and supplemented Ground Investigation have been prepared by firms of engineering consultants using individuals who possess suitable qualifications.

1.5. The basement proposal neither involved a listed building nor was adjacent to listed building.

1.6. The BIA submissions include land Stability, Hydrogeology and Hydrology screening and relevant site investigations.

1.7. A new ground floor extension is proposed at the rear of the Flat A of four-storey detached property, deepen the existing basement and extend the basement at the rear of the property. The proposals also include the construction of a lightwell.

1.8. An appropriate site specific SI has been carried out.

1.9. The proposed basement is to be founded in the Bagshot Formation.

1.10. It is accepted that the excavation level is unlikely to be below groundwater and that the basement will not adversely impact on the wider groundwater regime.

1.11. An appropriate construction methodology has been proposed which indicates the basement is to be constructed in accordance with good practise construction principles using common techniques.

1.12. Appropriate structural details of the proposal have been provided.

1.13. It has been demonstrated that the impact on the neighbouring detached property will be no worse than damage category 1. The attached property has not been considered for damage assessment as it has been confirmed that the property is owned by the applicant.

1.14. An outline works programme indicating the main phases and anticipated durations of work has been submitted.

1.15. Permeable paving and a new buried soakaway are proposed as part of the SUDs strategy.

1.16. An Arboricultural Report has been submitted, which describes the impact of the development on the trees located within the influence zone. The proposed construction should be reviewed by LBC's Landscape Officer in regards to potential tree protection requirements.

1.17. It is accepted that nearby rail assets are outside of the zone of influence of the proposed site.

1.18. It is accepted that the development will not impact on the wider hydrogeology of the area and is not in an area subject to flooding.

1.19. It is accepted that stability to the surrounding slopes to the site can maintain stability during construction and should be considered further during the detailed design.

1.20. It can be confirmed that the proposal adheres to the requirements of CPG Basements.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 8th May 2018 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 79 Redington Road, London NW3 7RR (planning reference 2018/1697/P).

2.2. The Audit was carried out in accordance with the Terms of Reference set by LBC. It reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development.

2.3. A BIA is required for all planning applications with basements in Camden in general accordance with policies and technical procedures contained within

- Guidance for Subterranean Development (GSD). Issue 01. November 2010. Ove Arup & Partners.
- Camden Planning Guidance Basements: Basements and Lightwells.
- Camden Development Policy (DP) 27: Basements and Lightwells.
- Camden Development Policy (DP) 23: Water.
- Local Plan Policy A5 Basements.

2.4. The BIA should demonstrate that schemes:

a) maintain the structural stability of the building and neighbouring properties;

b) avoid adversely affecting drainage and run off or causing other damage to the water environment;

c) avoid cumulative impacts upon structural stability or the water environment in the local area, and;

evaluate the impacts of the proposed basement considering the issues of hydrology, hydrogeology and land stability via the process described by the GSD and to make recommendations for the detailed design.

LBC's Audit Instruction described the planning proposal as;

"Extension of basement to include open lightwells to front and rear, demolition of rear conservatory and erection of single storey rear extension, alterations to landscape to include repaving, gate on south side, bins and cycling stores on north side, all in relation to Flat A (Class C3)."

2.5. The Audit Instruction also confirmed 79 Redington Road involved, or was a neighbour to, listed buildings.

2.6. CampbellReith accessed LBC's Planning Portal on and gained access on 22nd May 2018 to the following relevant documents for audit purposes:

- Basement Impact Assessment Report (BIA) by Ingleton Wood, dated April 2018, Job No. 811365
- BIA Appendix B - Drawings
- BIA Appendix C - Calculations
- BIA Appendix D - Site Investigation Report
- Flood Risk Assessment and Drainage Strategy by Ingleton Wood, dated 6th April 2018, Job No. 811365
- BIA Appendix G - Screening Responses by Ingleton Wood, dated April 2018
- Daylight and Sunlight Assessment
- Design and Access Statement by XUL Architecture, dated 6th April 2018
- Final Tree Report by John Cromar's Arboricultural Company Limited, dated 6th April 2018, dated 1-38-4321/3
- Heritage Statement by cgms heritage, dated March 2018, ref: JCH00363
- Planning Statement, dated April 2018
- Thames Water response, dated 24th April 2018
- Planning Application Drawings prepared by Ingleton Wood, dated 05/04/2018 and consisting of
    - Proposed Foundation GA
    - Ground Floor Steelwork GA
    - First Floor Steelwork
    - Proposed Drainage Layout and Drainage Schematic
- 180321_17028_EX-00 to EX-07 Existing Drawings by XUL Architecture, dated March 2018
- 180321_17028_LP-01 Existing Site Plan by XUL Architecture dated March 2018
- 180321_17028_PA-00 to PA-09 Proposed Drawings by XUL Architecture, dated March 2018

2.7. Prior to the F1 issue of this audit the following additional information was received from the applicant by email and has been included in appendix 3 of this audit.

- Preliminary project programme
- External sections drawing
- Structural Design Calculations
- Letter – Basement Impact Assessment Audit Response, 5/6/18

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	Supplementary Groundwater Report has been issued by Listers Geo (individuals holds suitable hydrogeological qualification)
Is data required by Cl.233 of the GSD presented?	Yes	
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	Structural drawings have been provided in Appendix B
Are suitable plan/maps included?	Yes	Environmental Agency flood map for the property is present in the 'Flood Risk Assessment and Drainage Strategy'
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Partially	No justification has been provided for 'No' answers;
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Partially	No justification has been provided for 'No' answers;
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Partially	No justification has been provided for 'No' answers;
Is a conceptual model presented?	Yes	
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	No	No scoping has been brought forward as part of the screening process.
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	No	No scoping has been brought forward as part of the screening process. The site is within a catchment of Historic watercourses and it should be considered in the scoping process if required.

Item	Yes/No/NA	Comment
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	No	No scoping has been brought forward as part of the screening process.
Is factual ground investigation data provided?	Yes	
Is monitoring data presented?	Yes	Ground water monitoring has been carried out, results are present in BIA section 4.0.
Is the ground investigation informed by a desk study?	Yes	Refer to BIA Appendix D Part 1
Has a site walkover been undertaken?	Yes	Refer to BIA Appendix D Part 1
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	Nearby basements have been identified in the 'Design and Access Statement'. Those have been identified to 63,38,37,31,29,14,12,14A,35,58B and 58A Redington Road
Is a geotechnical interpretation presented?	Yes	Refer to BIA Appendix D Part; Section: Geotechnical Engineering Conclusion
Does the geotechnical interpretation include information on retaining wall design?	Yes	Retaining Wall Design Parameters have been provided.
Are reports on other investigations required by screening and scoping presented?	No	However Flood Risk Assessment and Tree Report forms part of the submission
Are the baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	Yes	
Is an Impact Assessment provided?	Yes	
Are estimates of ground movement and structural impact presented?	Yes	Structural impact has been considered by inspection
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	No	No mitigations have been considered

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Item	Yes/No/NA	Comment
Has the need for monitoring during construction been considered?	No	
Have the residual (after mitigation) impacts been clearly identified?	No	No residual impacts have been identified.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	Refer to Flood Risk Assessment and Drainage Strategy
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	
Does report state that damage to surrounding buildings will be no worse than Burland Category 1?	Yes	The ground movement assessment concludes that no worse than damage category 0 will occur to the neighbouring properties.
Are non-technical summaries provided?	No	

4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) has been carried out by a firm of engineering consultants, Ingleton Wood and the individuals concerned in its production have suitable engineering qualifications. The supplementary Ground Investigation Report has been carried out by Listers Geotechnical Consultants Ltd, and individuals have suitable geotechnical qualifications as required by CPG Basements.

4.2. The BIA submissions include land Stability, Hydrogeology and Hydrology screening and relevant site investigations as defined and required in the LBC Planning Guidance document CPG Basements.

4.3. The LBC Instruction to proceed with the audit identified that the basement proposal neither involved a listed building nor was adjacent to listed building.

4.4. The property is situated within the Redington/Frognal Conservation Area and consists of 20th century four- storey detached property, including a basement, ground floor, first floor and top floor built into pitched roof. The existing property is dwelling containing 4 self-contained flats.

4.5. A new ground floor extension is proposed at the rear of the Flat A property, deepen the existing basement by approximately 1.00m and extend the basement at the rear of the property beneath the new extension. The proposals also include the construction of a lightwell.

4.6. It is proposed to construct the basement in hit and miss sequence with the pins being constructed at a maximum of 1.2m width. The basement L shaped base and wall pin will be constructed to a depth of around 1.5m, which will provide a finished floor level of 1.0m below the existing level. A written construction method is provided, and it is accepted that the applicant has demonstrated feasibility of the construction of the proposal.

4.7. A site walkover has been carried out on the 14th September 2017. Number of properties were identified as having front lightwells and basements along the Redington Road.

4.8. A site specific ground investigation has been carried out on the 14th and 15th September 2017 and consists of three foundation excavation pits and two continuous tube sample boreholes with stem auger follow-on boreholes. The exploratory work has proven Topsoil or Made Ground to a depth of between 0.95m to 1.31m bgl, overlying the Bagshot Formation to the depths between 7.50m and 8.50m (98.95AOD and 102.15m AOD). Claygate Member has been found as the lowest strata to the base of the boreholes at 12.0m bgl (95.45m and 97.65m AOD).

4.9. Groundwater monitoring has been undertaken during two site visits on the 22nd September and 19th October 2017 and revealed seepages and standing levels during ground investigation. The long term monitoring has resulted in 103.50m to 103.60m AOD, which is 6m below street level or approximately 2.50m below the base of the proposed basement.

4.10. The proposed basement is to be constructed in the Bagshot Formation, which is understood to be a suitable bearing stratum for conventional shallow foundation at not less than 1.00m below existing ground level or 0.2m into the top of the formation. The raft foundation to be constructed at the depth of 106.45m AOD, which corresponds to 3.20m below existing garden level, and 1.00m below the existing basement level. The allowable ground bearing pressure is recommended to be 125 kPa at this depth.

4.11. Outline structural calculations for the basement wall and ground bearing slab have been provided, which adequately demonstrate the feasibility of the structural proposal in the permanent case.

4.12. Given the determined ground water level a significant water ingress during construction is not anticipated. However it is stated that ground water entry may occur during wetter months, and therefore dewatering is suggested by use of conventional pumping from sump.

4.13. Retaining wall design parameters have been presented for both temporary and permanent retaining structures at the side wall and the basement based on the site specific SI.

4.14. Heave protection is proposed to the external faces of the pins and to the underside of the slab in form of Clay board or Cellcore. It is accepted that heave forces have been adequately considered and that the long term stability of the proposal has been demonstrated.

4.15. The nearest surface watercourse is the Leg of Mutton Pond, which is approximately 462m to the north of the site, however the location of the site does not fall into the catchment area of the Hampstead Heath Pond Chain.

4.16. There are no current surface water abstraction licences located within 1000m of the site and it is outside of any Source Protection Zone (SPZ).

4.17. The applicant has not provided evidence of correspondence with London Underground, however it is accepted that due to shallow excavation and the proximity of the closest underground lines the development will not affect the London Underground Infrastructure.

4.18. An outline works programme indicating the main phases and anticipated durations of work has not been provided. This is to be submitted.

4.19. It has been confirmed that the attached neighbouring building is under the ownership of the applicant, and therefore has not been assessed for structural impact. Sections have been provided through the anticipated foundations to the detached neighbouring building's garage and garden wall, with a Burland category of 0 indicated for all sections considered. The Burland category has been determined by inspection, given that the foundations to the neighbouring property are anticipated to be founded at depths which would take them either outside of, or only on the edge of, the influence zone of ground movements. It is accepted that the applicant has adequately demonstrated the low risk of damage potential to the detached neighbouring property in respect of the proposal.

4.20. An Arboricultural Report has been submitted, which describes the impact of the development on the trees located within the influence zone. The proposed construction should be reviewed by LBC's Landscape Officer in regards to potential tree protection requirements.

4.21. SUDs proposal have been presented as part of the `Flood Risk Assessment and Drainage Strategy'. Porous type paving is suggested to promote shallow infiltration and reduce the sizing of a proposed buried soakaway. It is accepted that the SUDs proposal sufficiently demonstrates the feasibility of the proposal to achieve the requirements of the London Plan.

4.22. The applicant has not identified that the site is located within an area containing slopes of greater than 7degress in the screening process. However, BIA states, that the general topography of the area is flat lying, excluding the gradient down to the exposed basement, which is believed to be man-made cutting. While the GSD plans do indicate that the site is on the edge of an area of slopes greater than 7°, it is accepted that the risk of wider slope instability is low, however the presence of nearby slopes should be accounted for in the detailed design and construction method to ensure stability is maintained at all times.

4.23. An outline works programme has been provided.

4.24. The property is located in Flood Zone 1, and the site has a very low flooding risk from surface water and sewer, reservoirs and fluvial/tidal watercourses. It has been suggested by Thames Water that non-return valve or other suitable device to be installed to avoid the risk of backflow.

5.0 CONCLUSIONS

5.1. The BIA and supplemented Ground Investigation Report have been carried out by firms of engineering and geotechnical consultants using individuals who possess suitable qualifications.

5.2. The BIA submissions include land Stability, Hydrogeology and Hydrology screening and relevant site investigations.

5.3. The basement proposal neither involved a listed building nor was adjacent to listed building.

5.4. The property is a four-storey detached property, including a basement and consists of 4 self-contained flats. A new ground floor extension is proposed at the rear of the Flat A property, deepen the existing basement by approximately 1.00m and extend the basement at the rear of the property beneath the new extension. The proposals also include the construction of a lightwell.

5.5. An appropriate site specific SI has been carried out consisting of three trial pits and two boreholes.

5.6. The proposed basement is to be constructed in the Bagshot Formation and groundwater ingress is not anticipated during construction of the basement.

5.7. It is proposed to construct the basement in a hit and miss sequence of an L shaped pins constructed to a depth of around 1.5m, which will provide a finished floor level of 1.0m below the existing level.

5.8. Outline structural calculations have been produced.

5.9. Heave protection is proposed by way of compressible material beneath the basement slab.

5.10. It is accepted that nearby rail assets are outside of the zone of influence of the proposed site.

5.11. It is accepted that the presence of nearby slopes can be incorporated into the detailed design to allow stability to be maintained during construction.

5.12. An outline works programme indicating the main phases and anticipated durations of work has been submitted.

5.13. It has been concluded that the damage potential to the neighbouring detached property is no worse than category 1, which has been concluded by inspection based on the site geometry and the anticipated depths of the neighbouring foundations.

5.14. An Arboricultural Report has been submitted, which describes the impact of the development on the trees located within the influence zone. The proposed construction should be reviewed by LBC's Landscape Officer in regards to potential tree protection requirements.

5.15. Permeable paving and a new buried soakaway are proposed as part of the SUDs strategy.

5.16. It is accepted that the development will not impact on the wider hydrogeology of the area and is not in an area subject to flooding.

5.17. It can be confirmed that the proposal confirms to the requirements of CPG Basements.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Lough	95 Regington Road	18/04/18	Impact on groundwater	Applicant has demonstrated adequately an impact of the development on hydrogeology

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Programme	An outline works programme indicating the main phases and anticipated durations of work to be submitted.	Closed	06/06/18
2	Stability	Impact Assessment on the neighbouring properties and/or below ground services to be assessed by way of formal ground movement assessment.	Closed	06/06/18
3	Stability	Consistency is required between the structural design as presented in the drawings and the structural design calculations.	Closed	06/06/18

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Appendix 3: Supplementary Supporting Documents

811365- 79 Redington Road, Structural Calculations- Rev B
811365-IW-XX-XX-DWG-S-7030 P1
L001 to Robert Morley - 050618
Redington Road Programme

Ingleton Wood

Billericay
Cambridge
Colchester
Hertford
London
Norwich

www.ingletonwood.co.uk

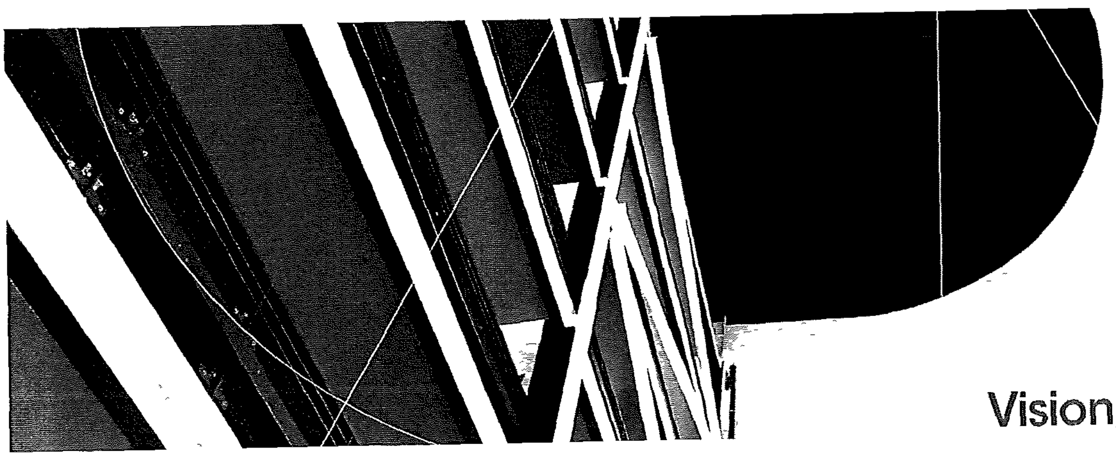
79 Redington Road

Mr & Mrs Tarn

Job No. 811365

Structural Design Calculations

Author	[Adrian J Wong]
Checked by	[Andrew Wright]
Date	[06/02/18]
Status	[Preliminary]



architecture
building surveying
building services
planning
[illegible]
sustainability
civil and structural
quantity surveying
project management
CDM and H&S services

Vision, form and function

Ingleton Wood	Project: 79 Relington Road	Project Number: 811365
	Calculation	Calc sheet no: 1 Rev: -
	Drawing ref / Calc by: AW / Date: JAN 18	Check by / Date

Ref	Calculations	Output

ROOF LOADS Pitched Roof 45°

TILES : 0.64

BATTENS & RAFTERS : 0.21

FELT & INSULATION : 0.06

$0.91 \times \frac{1}{\cos 45°}$

ON SLOPE : 1.29

CEILING JOISTS : 0.12

INSULATION : 0.06

PLASTERBOARD : 0.17

1.64 kN/m²

LIVE : 0.75 kN/m²

FLOOR LOADS

BOARDS & SERVICES : 0.35

JOISTS : 0.15

PLASTERBOARD & SKIM : 0.17

0.67 kN/m²

LIVE + PARTITIONS : 2.50 kN/m²

MASONRY LOADS

320mm BRICKWALL : 6.95

PLASTERWORK : 0.25

7.20 kN/m²

215mm BRICKWORK : 4.53

PLASTERWORK : 0.50

5.03

Ingleton Wood	Project: 79 Redington Road			Project Number: 8/1365	
	Calculation:			Calc sheet no: 1	Rev: -
	Drawing ref:	Calc by: AW	Date: JAN 14.	Check by:	Date:

Ref	Calculations	Output
	<u>FLAT ROOF LOADS</u>	
	FELT : 0.17	
	OSB BOARDS : 0.12	
	FIRRINGS : 0.1	
	JOISTS : 0.15	
	INSULATION : 0.06	
	PLASTERBOARD & SKIM : 0.17	
	0.77 kN/m²	
	LIVE : 0.75 kN/m²	
	<u>CONCRETE SLAB</u> (SUSPENDED BL) METAL DECK ??	
	200 mm THK : 4.8	
	INSULATION : 0.06	
	FINISHES 75mm screed : 1.8	
	6.7 kN/m²	
	LIVE + PARTITIONS 2.50 kN/m²	
	<u>METAL DECK</u> (RIB DECK 60)	
	METAL DECK : 0.20	
	150mm CONCRETE : 3.60	
	FINISHES : 0.50	
	4.30 kN/m²	
	LIVE + PARTITIONS 2.50 kN/m²	

Ingleton Wood	Project 79 Redington Road			Project ref. 811365		
	Part of Structure EXISTING WALL LINE LOADS			Sheet no. 1		Rev.
	Drawing ref.	Calc by AW	Date Jan-18	Check by	Date	Date

Project 79 Readington Road

Loadings All weights from BS 648 1964 Schedule of Weights for Building Materials
Live Loads based on BS 6399 Pt 1 1984

Element Loads

	Live Load (kN/m^2)	Dead Load (kN/m^2)
Pitched Truss Roof		
Tiles		0 65
Boards/Felt		0 25
Truss & Battens		0 35
Ceiling & Services		0 40
Ceiling Imposed		
Rafter Imposed	0 75	
	0 75	**1 65**
Second Floor		
Boards & Services		0 35
Joists		0 15
Plasterboard & Skim		0 17
Imposed	1 50	
Partitions	0 50	
	2.00	**0 67**
First Floor		
Boards & Services		0 35
Joists		0 15
Plasterboard & Skim		0 17
Imposed	1 50	
Partitions	0 50	
	2.00	**0.67**
Ground Floor		
Boards & Services		0 35
Joists		0 15
Plasterboard & Skim		0 17
Imposed	1 50	
Partitions	0 50	
	2.00	**0.67**
330mm Solid Wall		
Masonry		6 90
Plaster		0 25
		7.15
Internal Wall		
215mm THK Blockwork		4 53
Plaster both sides		0 50
		5.03
	6 75	**15.84**

Ingleton Wood	Project			Project ref.		
	79 Redington Road			811365		
	Part of Structure			Sheet no.		Rev.
	EXISTING WALL LINE LOADS			2		
	Drawing ref.	Calc by	Date	Check by	Date	Date
		AW	Jan-18			

Project 79 Readington Road

LINE LOADS **Refer to Load case Plan**

Load Case **Wall A**

Grid Ref			Service Load (kN/m run) Live Load	Dead Load
Pitched Truss Roof	2 3	m^2/m	1 73	3 80
Second Floor	2 4	m^2/m	4 80	1 61
First Floor	2 4	m^2/m	4 80	1 61
Ground Floor	2 4	m^2/m	4 80	1 61
330mm Solid Wall	8	m		57 60
Internal Wall		m		
		m		
		m		
		m		
Beam Self Weight		kN/m		
			16.13	**66.22**

Design Service Load = 82 34 kN/m

Design Ultimate Load = 118 51 kN/m

Load Case **Wall B**

Grid Ref			Service Load (kN/m run) Live Load	Dead Load
Pitched Truss Roof	5	m^2/m	3 75	8 25
Second Floor	5 4	m^2/m	10 80	3 62
First Floor	5 4	m^2/m	10 80	3 62
Ground Floor	5 4	m^2/m	10 80	3 62
330mm Solid Wall		m		
Internal Wall	8	m		40 24
		m		
		m		
		m		
Beam Self Weight		kN/m		
			36 15	**59 34**

Design Service Load = 95 49 kN/m

Design Ultimate Load = 140 92 kN/m

Load Case **Wall C**

Grid Ref			Service Load (kN/m run) Live Load	Dead Load
Pitched Truss Roof	2 7	m^2/m	2 03	4 46
Second Floor	2 7	m^2/m	5 40	1 81
First Floor	2 7	m^2/m	5 40	1 81
Ground Floor	2 7	m^2/m	5 40	1 81
330mm Solid Wall	8	m		57 60
Internal Wall		m		
		m		
		m		
		m		
Beam Self Weight		kN/m		
			18 23	**67 48**

Design Service Load = 85 71 kN/m

Design Ultimate Load = 123 63 kN/m

Load Case **Wall D**

Grid Ref			Service Load (kN/m run) Live Load	Dead Load
Pitched Truss Roof	2 75	m^2/m	2 06	
Second Floor	2 75	m^2/m	5 50	1 84
First Floor	2 75	m^2/m	5 50	1 84
Ground Floor	2 75	m^2/m	5 50	1 84
330mm Solid Wall	8	m		57 60
Internal Wall		m		
		m		
		m		
Beam Self Weight		kN/m		
			18 56	**63 13**

Design Service Load = 81 69 kN/m

Design Ultimate Load = 118 08 kN/m

Ingleton Wood	Project: 79 Redington Road		Project ref: 811365		
	Part of Structure: EXISTING WALL LINE LOADS		Sheet no.: 3		Rev.
	Drawing ref	Calc by: AW	Date: Jan-18	Check by	Date	Date

Project 79 Readington Road

LINE LOADS **Refer to Load case Plan**

Load Case **All other external walls**

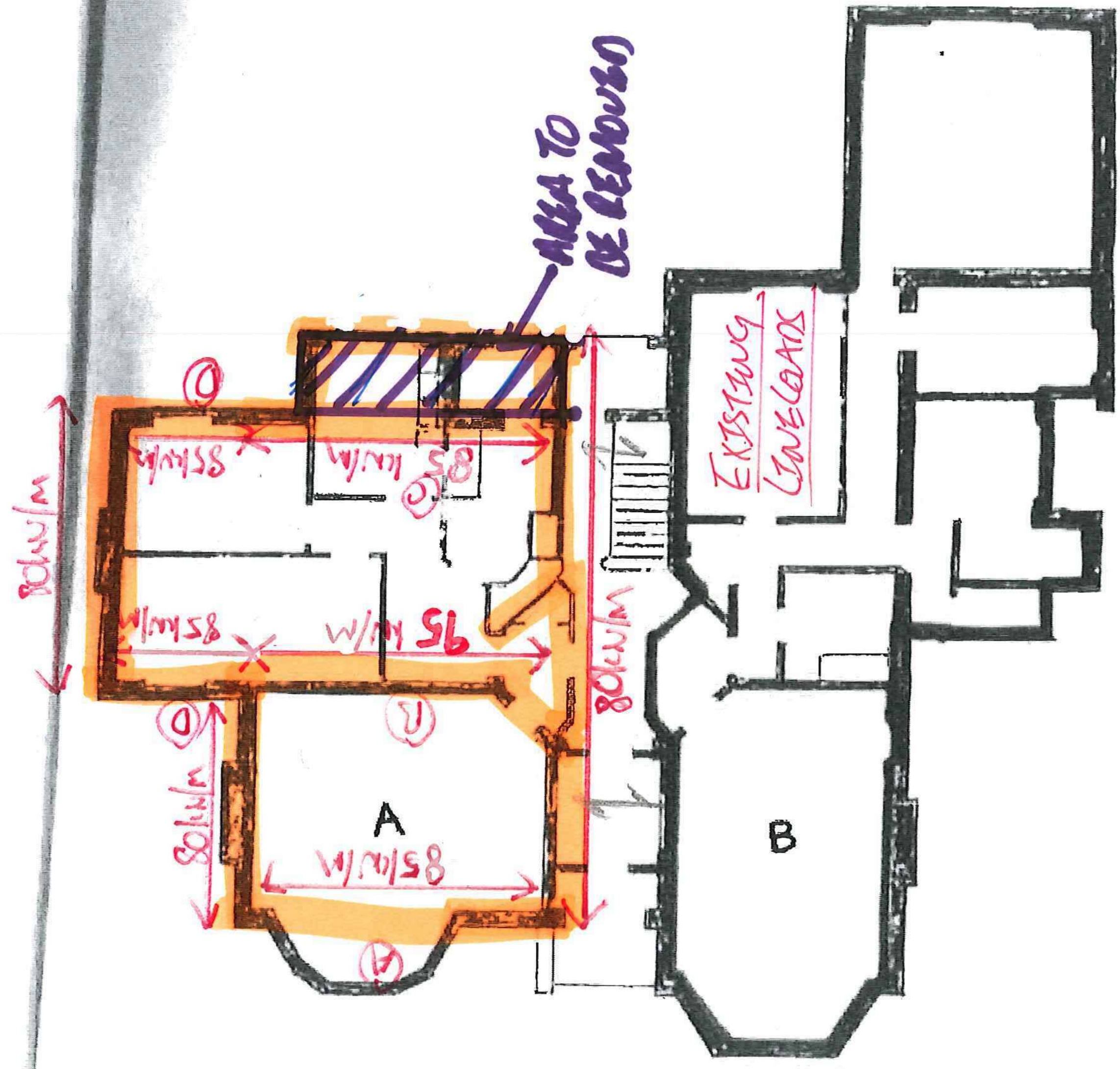
Grid Ref.

			Service Load (kN/m run) Live Load	Dead Load
Pitched Truss Roof		m^2/m		
Second Floor		m^2/m		
First Floor		m^2/m		
Ground Floor		m^2/m		
330mm Solid Wall	10 7	m		77 04
Internal Wall		m		
		m		
		m		
		m		
Beam Self Weight		kN/m		
				77 04

Design Service Load = **77.04** **kN/m**

Design Ultimate Load = **107 86** **kN/m**

'B'



No 79 REDINGTON ROAD NW3

GROUND FLOOR

Sheila Sunshine

Ingleton Wood

Project	Project Number
79 Redriston Road.	811365

Calculation	Calc sheet no	Rev
	1	-

Drawing ref	Calc by	Date	Check by	Date
	AW	JAN 18		

Ref	Calculations	Output

PROPOSED WALL LINELOADS

EXTERNAL LIGHTWELL WALL

WALL UDL D - 7.2 x 3 = 25 kN/m

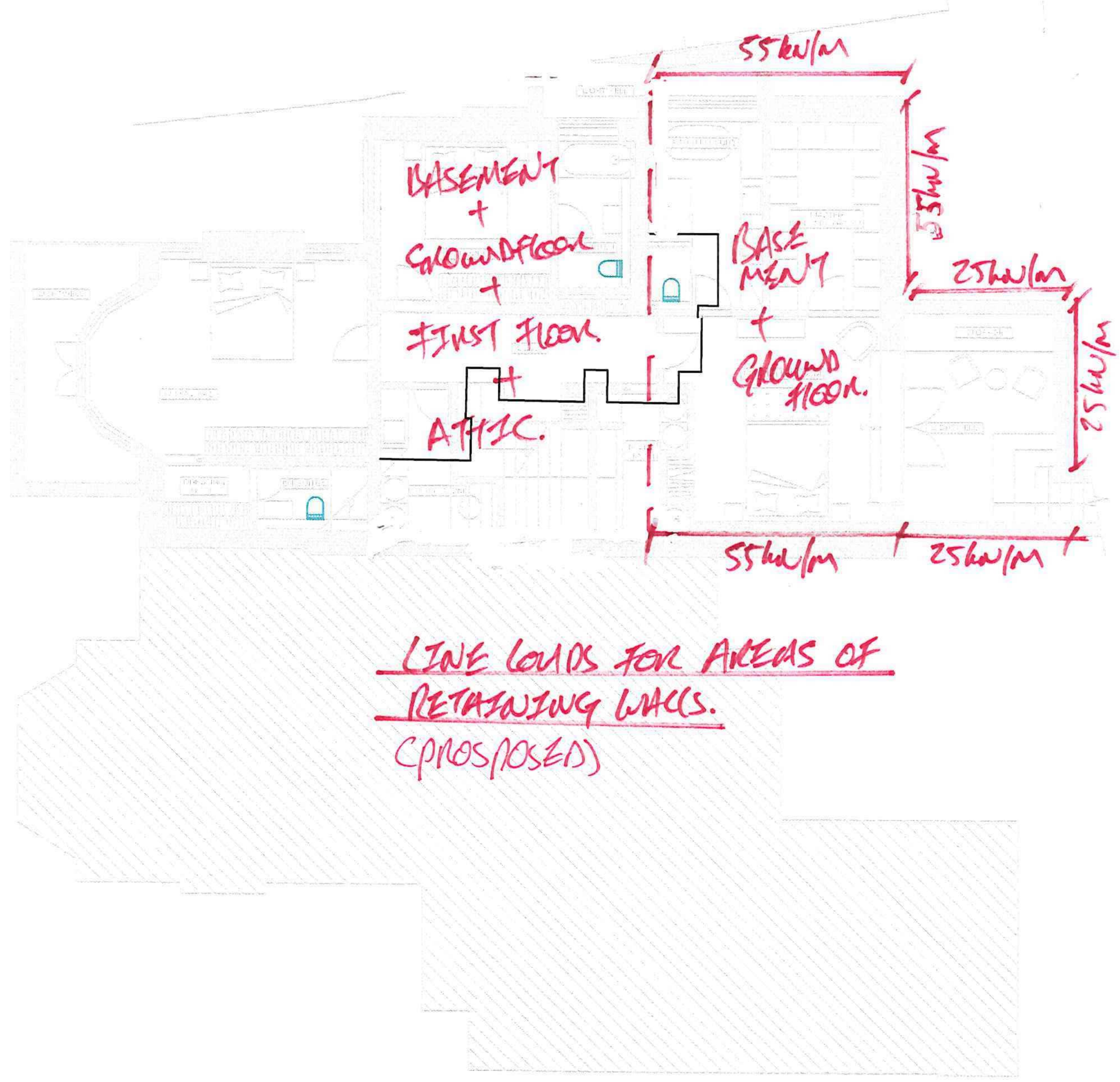
WALL LOADS (SINGLE STOREY).

WALL UDL D - 7.2 x 6.0 = 43.2

FLOOR UDL D - 0.43 x 2.2 = 0.95
L - 2.50 x 2.2 = 5.5

ROOF UDL D - 1.64 x 2.2 = 3.6
L - 1.00 x 2.2 = 2.2

55 kN/m


55kN/m
55kN/m
25kN/m
25kN/m
55kN/m
25kN/m
BASEMENT + GROUNDFLOOR + FIRST FLOOR + ATTIC.
BASEMENT + GROUND FLOOR.
LINE LOADS FOR AREAS OF RETAINING WALLS.
(PROPOSED)

Ingleton Wood

Project	79 Redington Road	Project Number	811365
Calculation	BEAM 1	Calc sheet no	1
		Rev	-
Drawing ref		Check by	
Calc by	AW	Date	
Date	JAN 18		

Ref	Calculations	Output

(B1) - Design existing condition. (SPAN 5m)

Roof wall
$D - 1.64 \times 2.7 = 4.43 \times 1.4 = 6.2$
$L - 0.75 \times 2.7 = 2.03 \times 1.6 = 3.25$
$6.5 \qquad 9.5$

2ND FLOOR
$D - 0.67 \times 2.7 = 1.81 \times 1.4 = 2.53$
$L - 2.50 \times 2.7 = 6.75 \times 1.6 = 10.80$
$8.56 \qquad 13.33$

1ST FLOOR
$D - 0.67 \times 2.7 = 1.81 \times 1.4 = 2.53$
$L - 2.50 \times 2.7 = 6.75 \times 1.6 = 10.80$
$8.56 \qquad 13.33$

WALL (330)
$D - 7.20 \times 2.8 = 20.2 \times 1.4 = 28.3$

44 kN/m   64.5 kN/m

Output: D - 28 kN/m, L - 10.23

$M - \frac{64.5 \times 5^2}{8} = 202$ kN.m

Deflection limit - 5mm (D + 0.5L)

I_{xx} REQ - $\frac{5 \times (28 + 15/2) \times 5000^4}{384 \times 205 \times 10^5 \times 5 \times 10^4} = 28185$ cm⁴

∴ PROVIDE 305×305UC137 (M - 597 kN.m, I_{xx} - 27700 cm⁴)

(B1) - Design proposed condition (span 5m)

B3 PL
$D - 3.8 \times 4.8 = 18.24 \times 1.4 = 26$
$L - 1.7 \times 4.8 = 8.16 \times 1.6 = 13.1$
26.4 kN 39.1 kN.

\+

ANALYSE WITH LOADS ABOVE

Refer to TEDDS DESIGN

Deflection LIMIT - 13.9mm (LIVE)

∴ PROVIDE 305×305UC137

WORSTCASE LOADING ABOVE

Ingleton Wood	Project: 79 Redleston Road			Project Number: 811365	
	Calculation: Beam 2			Calc sheet no: 1	Rev: -
	Drawing ref	Calc by: A.D	Date: 3 Jan 18	Check by	Date

Ref	Calculations	Output
	(B2) – Span 3.8m (Proposed Loading)	
	Use same loads as Beam (1)	
	Existing UDL ✓ D – 28 × 1.4 = 39.2	
	L – 15.0 × 1.6 = 24.0	
	43 kN/m 63.2 kN/m	
	New Flatroof UDL D – 0.77 × 2.3 = 1.8 × 1.4 = 2.52	
	L – 0.75 × 2.3 = 1.7 × 1.6 = 2.72	
	3.5 kN/m 5.24 kN/m	
	Moment = 123 kN.m Total UDL 47 kN/m 68.44 kN/m	
	Defl: Span/250 = 15.2mm I_{xx} req = $\frac{5 \times 47 \times 3800^4}{384 \times 2.05 \times 10^5 \times 15.2 \times 10^4}$ = 4095	cm⁴
	(B2) – Span 3.8m (Existing loading)	
	Use same loads as Beam (1) D – 28 × 1.4 = 39.2	
	L – 15 × 1.6 = 24	
	43 kN/m 63.2 kN/m	
	Moment – 114 kN.m (Deflection limit 5mm) D + 0.5L	
	I_{xx} req – $\frac{5 \times (28 + 15.0/2) \times 3800^4}{384 \times 2.05 \times 10^5 \times 5 \times 10^4}$ = 9403 cm⁴.	
	∴ Provide 254 × 254 UC 89 (M_c – 380 kN.m, I_{xx} – 14300 cm⁴)	

	Project: 79 Redington Road			Project Number: 81365	
Ingleton Wood	Calculation			Calc sheet no: /	Rev: -
	Drawing ref	Calc by: AW	Date: 5 Jan 19	Check by	Date

Ref	Calculations	Output

(B3) – SPAN 4.8M

Pitched UDL Roof

D – 1.64 x 2.3 = 3.8 x 1.4 = 5.32
L – 0.75 x 2.3 = 1.7 x 1.6 = 2.72
5.5 kN/m   8.04 kN/m

M – 23.2 kN.m

Deflection Limit – 4800/360 = 13.3mm

I_{xx} req – $\frac{5 \times 5.5 \times 4800^4}{384 \times 2.05 \times 10^5 \times 13.3 \times 10^4} = 1394 cm^4$

∴ provide 203x133x30 UB (M – 55 kN.m, Ixx – 2900 cm⁴)

B4/B5. SPAN 3.3M

Beam 5. Worst case

Flat Roof UDL.

D – 0.77 x 2.3 = 1.78 x 1.4 = 2.5
L – 0.75 x 2.3 = 1.73 x 1.6 = 2.8
3.51 kN/m   5.3 kN/m

Moment – 7.5 kN.m   Deflection Limit – 10mm

I_{xx} req – $\frac{5 \times 3.51 \times 3300^4}{384 \times 2.05 \times 10^5 \times 10 \times 10^4} = 264.4 cm^4$

∴ provide 178x102x19 UB (M – 36 kN.m, Ixx – 1360 cm⁴)

Ingleton Wood	Project: 79 Redington Road	Project Number: 811365
	Calculation:	Calc sheet no: 1 Rev: -
	Drawing ref:	Calc by: AW Date: JAN 18	Check by: Date:

Ref	Calculations	Output

B6 – SPAN 2.5m

Pitched Roof W/C — D – 1.64 × 5 = 8.2 × 1.4 = 11.5
L – 0.75 × 5 = 3.75 × 1.6 = 6

2nd Floor — D – 0.67 × 5.4 = 3.62 × 1.4 = 5.1
L – 1.50 × 5.4 = 8.10 × 1.6 = 13

1st Floor — D – 0.67 × 5.4 = 3.62 × 1.4 = 5.1
L – 1.50 × 5.4 = 8.10 × 1.6 = 13

Wall (215) — D – 5.03 × 6 = 30.18 × 1.4 = 42
66 kN/m   96 kN/m

Output: D – 46, L – 20

B7 + B8 (Blockwork) PL — D – 6.3 × 2.5 = 15.8 × 1.4 = 22
15.8 kN   22 kN

Refer to Tedd's design UC 254 × 254 × 71

B7/B8 – SPAN 2.5m

2nd Floor — D – 0.67 × 2.1 = 1.41 × 1.4 = 1.97
L – 1.50 × 2.1 = 3.2 × 1.6 = 5.12

1st Floor — D – 0.67 × 2.1 = 1.41 × 1.4 = 1.97
L – 1.50 × 2.1 = 3.15 × 1.6 = 5.12

Blockwork + plaster — D – 2.1 × 3 = 6.3 × 1.4 = 8.82
16 kN/m   23 kN/m

Moment – 18 kN.m   Deflection limit – 5mm (D+0.5L)

$$I_{req} = \frac{5 \times (9.12 + 6.4/2) \times 2500^4}{384 \times 2.05 \times 10^5 \times 5 \times 10^4} = 611 cm^4$$

Output: D – 9.12, L – 6.40

Provide 203 × 102 × 23 UB (M_c – 56 kN.m, I_{xx} – 2340 cm⁴)

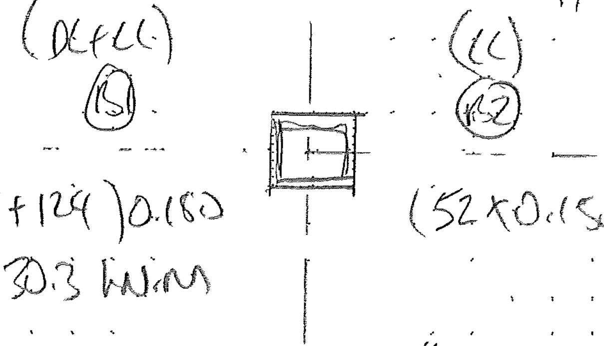
Ingleton Wood	Project: 79 Hedingham Road			Project Number: C11365	
	Calculation			Calc sheet no: 1	Rev: -
	Drawing ref	Calc by: AW	Date: JAN 18	Check by	Date

Ref	Calculations	Output

P1 - POST DESIGN

B1 - Proposed loading   D - 55.4 x 1.4 = 78 kN
L - 77.2 x 1.6 = 124 kN

B2 - Proposed LOADING   D - 30 x 3.8m = 114/2 x 1.4 = 80 kN
L - 17 x 3.8m = 64.6/2 x 1.6 = 52 kN



(78+124) 0.150
= 30.3 kN.m

(52 x 0.150) = 7.8 kN.m

NOTIONAL MOMENT (30.3 - 7.8) = 22.5 kN.m

TOTAL AXIAL FORCE (78+124+80+52) = 334 kN

Refer to TEDDS Design - PROVIDE 120x120x10 SHS

First Floor - Pitched Roof Rafters.

∴ 50x150 Dp C24 Rafters @ 600 centers

Refer to TEDDS Design.

First Floor - FLAT ROOF JOISTS.

∴ 50x200 Dp C24 JOISTS @ 450 centers

Refer to TEDDS DESIGN.

Ingleton Wood	Project: 79 Redington Road	Project Number: 81365
	Calculation:	Calc sheet no: 1 Rev: -
	Drawing ref: / Calc by: IAW / Date: JAN 18	Check by: / Date:

Ref	Calculations	Output

BASEMENT BEAM (1) - SPAN 4.8m

EXISTING FLOOR UDL
D - 0.67 x 2.9 = 1.94 x 1.4 = 2.72 kN/m
L - 2.50 x 2.9 = 7.3 x 1.6 = 11.7 kN/m

METAL DECK
D - 4.30 x 2.65 = 11.4 x 1.4 = 16 kN/m
L - 2.50 x 2.65 = 6.6 x 1.6 = 10.6 kN/m
27.2 kN/m   41 kN/m

PL POST (1) @ 3.8m
D - 55 + 57 = 112 (unfactored).
L - 77 + 32 = 109

Refer to TEAMS DESIGN, provide UC 254 x 254 x 107 (355)

BASEMENT BEAM (2) - SPAN 3.3m

NEW FLAT ROOF UDL
D - 0.77 x 2.3 = 1.8 x 1.4 = 2.53 kN/m
L - 0.75 x 2.3 = 1.7 x 1.6 = 2.72 kN/m

330mm WALL ABOVE
D - 7.20 x 6.0 = 43.2 x 1.4 = 60.5 kN/m
47 kN/m   66 kN/m.

MOMENT - 90 kN.m

10mm Limit Deflection. (FACING ROOM)

$$I_{xx\,req} = \frac{5 \times 47 \times 3300^4}{384 \times 2.05 \times 10^5 \times 10 \times 10^4} = 3540\,cm^4$$

∴ provide 254 x 146 x 31 UB (M_c - 101 kN.m, I_{xx} - 4410 cm⁴)

BASEMENT BEAM (3) - SPAN 4.9m

Timber Floor UDL
D - 0.77 x 3 = 2.31 x 1.4 = 3.23
L - 2.50 x 3 = 7.50 x 1.6 = 12

Refer to TEAMS DESIGN

∴ provide 254 x 146 UB 31

Ingleton Wood	Project 79 Readington Road			Project Number 811365	
	Calculation			Calc sheet no 1	Rev -
	Drawing ref	Calc by AW	Date JAN 18	Check by	Date

Ref	Calculations	Output

BASEMENT PADSTONES

BB1 U/S – 370kN

Used masonry – 7.5 N/mm²

Material factor – 3.5

$$\frac{370 \times 10^3}{1.5(2.5/3.6)} = 355200\ mm^2$$

∴ Provide 2no 150 x 1200 x 215 Dp concrete lintel padstone.

BB1 U/S – 177kN

Used masonry – 2.5 N/mm²

Material factor – 3.5

$$\frac{177 \times 10^3}{1.5(2.5/3.6)} = 169920\ mm^2$$

∴ Provide 200 x 900 x 215 Dp concrete lintel padstone

BB2 U/S – 109kN

New masonry – 3.6 N/mm²

Material factor – 3.5

$$\frac{109 \times 10^3}{1.5(3.6/3.5)} = 70648\ mm^2$$

∴ Provide 200 x 440 x 215 concrete lintel padstone

FLOOR JOISTS @ G/F

50 x 200 Dp C24 @ 400 centres

∴ Refer to TEAMS DESIGN

Ingleton Wood	Project: 79 Redington Road			Project Number: 811365	
	Calculation			Calc sheet no: 1	Rev: -
	Drawing ref	Calc by: AW	Date: Jan 14	Check by	Date

Ref	Calculations	Output

BASEMENT SLAB DESIGN (suspended). 4.7m - SPAN

DL : 6.7 x 1 = 6.7 x 1.4 = 9.4
LL : 2.5 x 1 = 2.5 x 1.6 = 4.0
9.2 kN/m   13.4 kN/m   per metre width

HYDROSTATIC WATER PRESSURE (wp) (2m Dp). : 20 x 1 = 20 x 1.6 = 32 kN/m.

LOADCASE 1 (DL+LL) TENSION BOT

- MOMENT - $\frac{13.4 \times 4.7^2}{8}$ = 37 kN.M/M
- S.F - $\frac{13.4 \times 4.7}{2}$ = 31 kN/M

LOADCASE 2 (wp - DL). TENSION TOP UPLIFT

- MOMENT - $\frac{(32-9.4) \times 4.7^2}{8}$ = 62.4 kN.M/m
- S.F - $\frac{(32-9.4) \times 4.7}{2}$ = 53 kN/m

REFER TO TEDDS DESIGN.
PROVIDE 275mm RC SLAB
B785 MESH TOP & BOT

Ingleton Wood	Project: 79 Redington Road.			Project Number: 811368.	
	Calculation			Calc sheet no: 1	Rev: -
	Drawing ref	Calc by: A.W	Date: JAN18	Check by	Date

Ref	Calculations	Output

RETAINING WALL DESIGN

SECTION 2-2, underpinning from BASEMENT LEVEL.

Vertical LOAD – 80kN/m

Horizontal LOAD @ TOP OF WALL.

- Active pressure $\frac{1}{3} \times 19 \times 2 = 12.7 kN/m^2$
- Surcharge $\frac{1}{3} \times 10 \times 2 = 6.6 kN/m^2$

Force $0.5 \times 19.4 \times 2 = 19.4 kN$

Refer TO TEDDS DESIGN.

SECTION 1-1, underpinning from G.F LEVEL.

Vertical LOAD – 55kN/m

Horizontal LOAD @ TOP OF WALL

- Active pressure $\frac{1}{3} \times 19 \times 1 = 6.3$
- Surcharge $\frac{1}{3} \times 10 \times 1 = 3.3$

Force $0.5 \times 9.6 \times 1 = 4.8 kN$

Refer TO TEDDS DESIGN

SECTION 3-3, Underpinning from BASEMENT LEVEL (WITH TOE).

- Vertical LOAD – 85 kN/m

NO horizontal LOAD, JUST surcharge on plan.

Refer TO TEDDS Design.

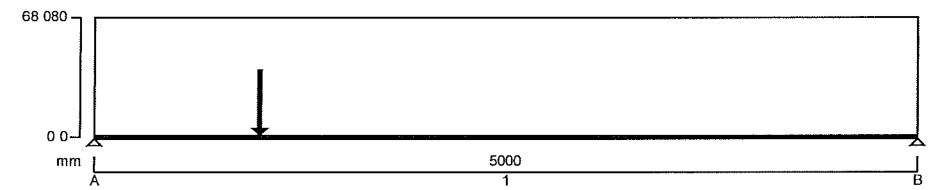
Ingleton Wood Ingleton Wood 1 Alie Street London	Project 79 Redington Road				Job no 811365	
	Calcs for Beam 1- Proposed Loading				Start page no /Revision 1	
	Calcs by A W	Calcs date 05/04/2018	Checked by	Checked date	Approved by	Approved date

STEEL BEAM ANALYSIS & DESIGN (BS5950)

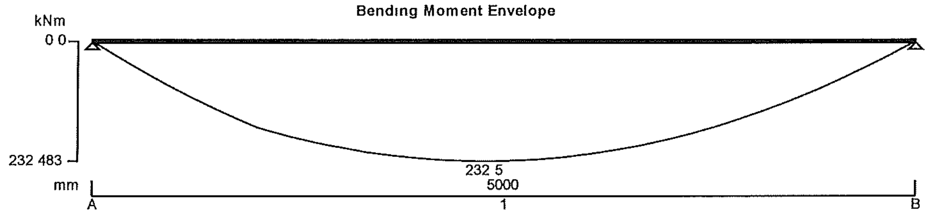
In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3 0 05

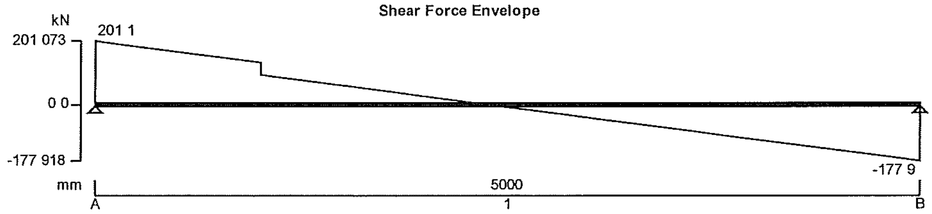
Load Envelope - Combination 1



Bending Moment Envelope



Shear Force Envelope



Support conditions

Support A	Vertically restrained Rotationally free
Support B	Vertically restrained Rotationally free

Applied loading

Beam loads	Dead point load 18 24 kN at 1000 mm Imposed point load 8 16 kN at 1000 mm Imposed full UDL 28 25 kN/m Dead full UDL 15 kN/m Dead self weight of beam × 1

Load combinations

Load combination 1	Support A	Dead × 1 40 Imposed × 1 60
	Span 1	Dead × 1 40 Imposed × 1 60
	Support B	Dead × 1 40

Ingleton Wood 1 Alie Street London	Project: 79 Redington Road				Job no: 811365	
	Calcs for: Beam 1- Proposed Loading				Start page no /Revision: 2	
	Calcs by: A W	Calcs date: 05/04/2018	Checked by	Checked date	Approved by	Approved date

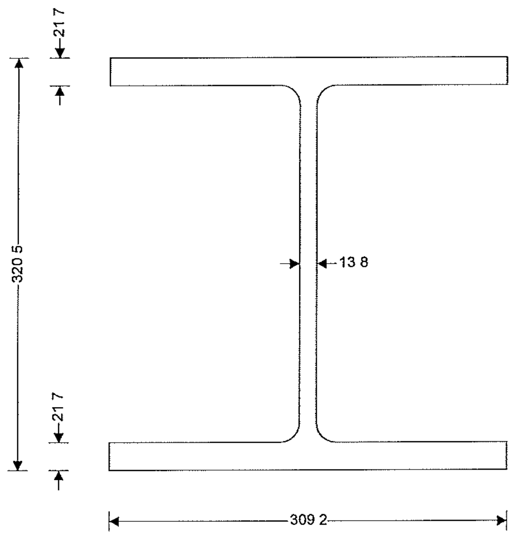
Imposed × 1 60

Analysis results

Maximum moment	M_{max} = **232.5** kNm	M_{min} = **0** kNm
Maximum shear	V_{max} = **201 1** kN	V_{min} = **-177.9** kN
Deflection	δ_{max} = **3.6** mm	δ_{min} = **0** mm
Maximum reaction at support A	R_{A_max} = **201.1** kN	R_{A_min} = **201.1** kN
Unfactored dead load reaction at support A	R_{A_Dead} = **55.4** kN	
Unfactored imposed load reaction at support A	$R_{A\_Imposed}$ = **77.2** kN	
Maximum reaction at support B	R_{B_max} = **177.9** kN	R_{B_min} = **177.9** kN
Unfactored dead load reaction at support B	R_{B_Dead} = **44 5** kN	
Unfactored imposed load reaction at support B	$R_{B\_Imposed}$ = **72.3** kN	

Section details

Section type **UC 305x305x137 (BS4-1)** Steel grade **S275**



Classification of cross sections - Section 3.5

Tensile strain coefficient ε = **1.02** Section classification **Plastic**

Shear capacity - Section 4.2.3

Design shear force F_v = **201.1** kN Design shear resistance P_v = **703.2** kN

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment M = **232 5** kNm Moment capacity low shear M_c = **608.6** kNm

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment M_b = **513 3** kNm M_b / m_{LT} = **513.3** kNm

PASS - Buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 2 5.2

Consider deflection due to imposed loads

Limiting deflection δ_{lim} = **13.889** mm Maximum deflection δ = **3.597** mm

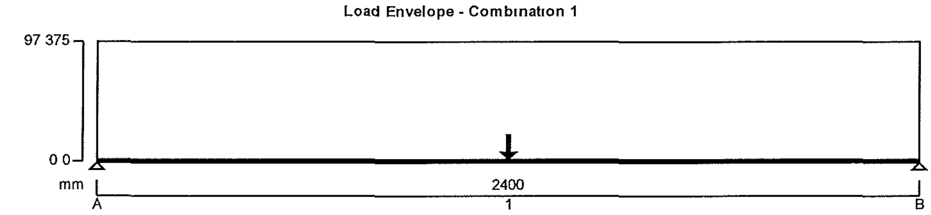
PASS - Maximum deflection does not exceed deflection limit

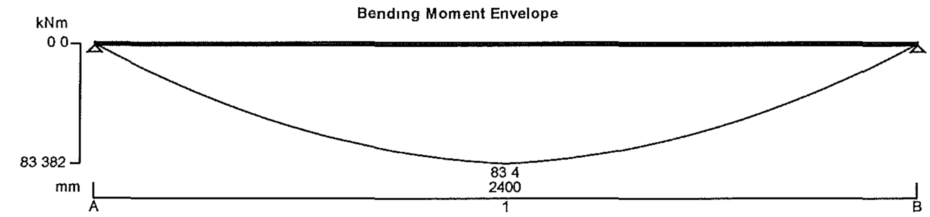
Ingleton Wood 1 Alie Street London	Project 79 Redington Road				Job no 811365	
	Calcs for Beam 6- Existing Loading				Start page no /Revision 1	
	Calcs by A W	Calcs date 02/02/2018	Checked by	Checked date	Approved by	Approved date

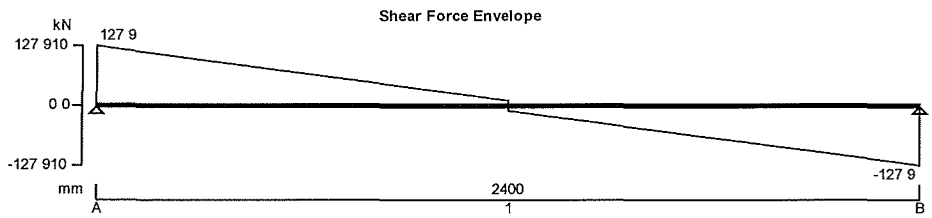
STEEL BEAM ANALYSIS & DESIGN (BS5950)

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3 0 05







Support conditions

Support A	Vertically restrained	
	Rotationally free	
Support B	Vertically restrained	
	Rotationally free	

Applied loading

Beam loads	Dead point load 15 8 kN at 1200 mm
	Imposed full UDL 20 kN/m
	Dead full UDL 46 kN/m
	Dead self weight of beam × 1

Load combinations

Load combination 1	Support A	Dead × 1 40
		Imposed × 1 60
	Span 1	Dead × 1 40
		Imposed × 1 60
	Support B	Dead × 1 40
		Imposed × 1 60

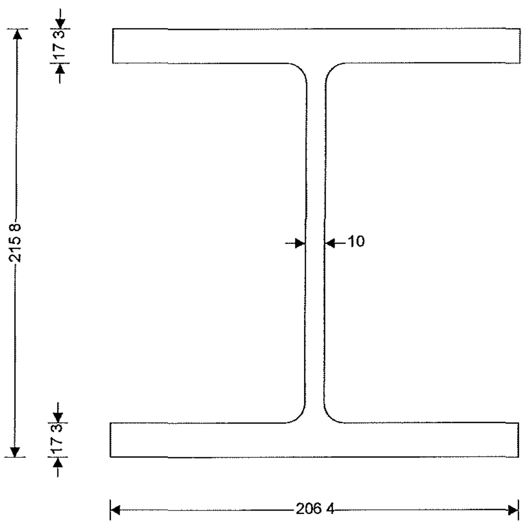
Ingleton Wood 1 Alie Street London	Project 79 Redington Road				Job no 811365	
	Calcs for Beam 6- Existing Loading				Start page no /Revision 2	
	Calcs by A W	Calcs date 02/02/2018	Checked by	Checked date	Approved by	Approved date

Analysis results

Maximum moment	M_{max} = **83.4** kNm	M_{min} = **0** kNm
Maximum shear	V_{max} = **127.9** kN	V_{min} = **-127 9** kN
Deflection	δ_{max} = **2 1** mm	δ_{min} = **0** mm
Maximum reaction at support A	R_{A_max} = **127.9** kN	R_{A_min} = **127.9** kN
Unfactored dead load reaction at support A	R_{A_Dead} = **63 9** kN	
Unfactored imposed load reaction at support A	$R_{A\_Imposed}$ = **24** kN	
Maximum reaction at support B	R_{B_max} = **127.9** kN	R_{B_min} = **127.9** kN
Unfactored dead load reaction at support B	R_{B_Dead} = **63.9** kN	
Unfactored imposed load reaction at support B	$R_{B\_Imposed}$ = **24** kN	

Section details

Section type **UC 203x203x71 (BS4-1)** Steel grade **S275**



Classification of cross sections - Section 3.5

Tensile strain coefficient ε = **1 02** Section classification **Plastic**

Shear capacity - Section 4.2.3

Design shear force F_v = **127.9** kN Design shear resistance P_v = **343.1** kN

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment M = **83.4** kNm Moment capacity low shear M_c = **211.7** kNm

Buckling resistance moment - Section 4.3 6.4

Buckling resistance moment M_b = **202.1** kNm M_b / m_{LT} = **202.1** kNm

PASS - Buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to dead and imposed loads

Limiting deflection δ_{lim} = **5** mm Maximum deflection δ = **2 136** mm

PASS - Maximum deflection does not exceed deflection limit

Ingleton Wood 1 Alie Street London	Project 79 Redington Road				Job no 811365	
	Calcs for Post 1				Start page no /Revision 1	
	Calcs by A W	Calcs date 05/04/2018	Checked by	Checked date	Approved by	Approved date

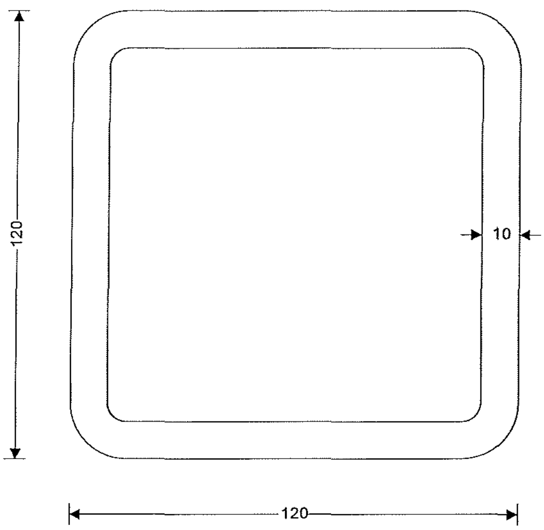
STEEL MEMBER DESIGN (BS5950)

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3 0 05

Section details

Section type **SHS 120x120x10 0 (Tata Steel Celsius)** Steel grade **S275**



Classification of cross sections - Section 3.5

Tensile strain coefficient ε = **1 00** Section classification **Semi-compact**

Moment capacity - Section 4.2.5

Design bending moment M = **22.5** kNm Moment capacity low shear M_c = **46 9** kNm

PASS - Moment capacity exceeds design bending moment

Compression members - Section 4.7

Design compression force F_c = **334** kN Compression resistance P_{cx} = **979.4** kN

PASS - Compression resistance exceeds design compression force

Compression members with moments - Section 4.8.3

Comp and bending check $F_c / (A \times p_y) + M / M_c$ = **0 763**

PASS - Combined bending and compression check is satisfied

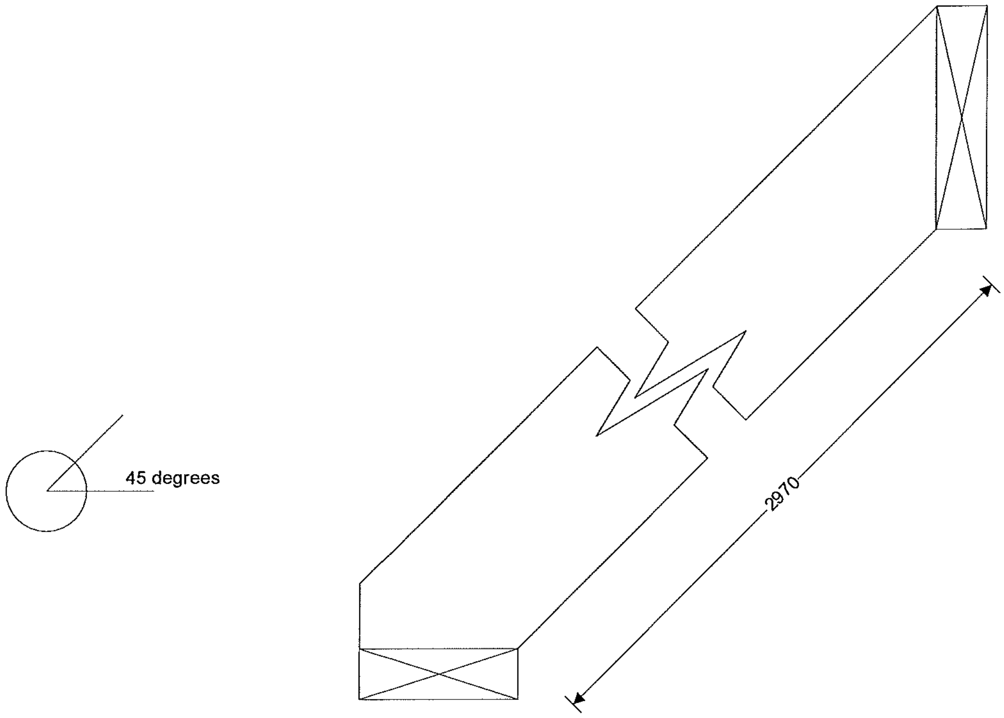
Member buckling resistance - cl.4.8.3.3.3

Buckling resistance check $F_c / P_{cx} + m_x \times M / M_c \times (1 + 0\ 5 \times F_c / P_{cx})$ = **0.903**

PASS - Member buckling resistance checks are satisfied

TIMBER RAFTER DESIGN (BS5268-2.2002)

TEDDS calculation version 1 0 03



Rafter details

Breadth of timber sections b = **47** mm
Depth of timber sections h = **147** mm
Rafter spacing s = **600** mm
Rafter span **Single span**
Clear length of span on slope L_{cl} = **2970** mm
Rafter slope α = **45.0** deg
Timber strength class **C24**

Section properties

Cross sectional area of rafter A = **6909** mm^2
Section modulus Z = **169270** mm^3
Radius of gyration r = **42** mm
Second moment of area I = **12441382** mm^4

Loading details

Rafter self weight F_j = **0.02** kN/m
Dead load on slope F_d = **1.20** kN/m^2
Imposed snow load on plan F_u = **0.75** kN/m^2
Imposed point load F_p = **0.90** kN

Modification factors

Section depth factor K_7 = **1.08**
Load sharing factor K_8 = **1.10**

Consider long term load condition

Load duration factor K_3 = **1.00**
Total UDL perp to rafter F = **0.526** kN/m
Notional bearing length L_b = **6** mm
Effective span L_{eff} = **2976** mm

Check bending stress

Permissible bending stress σ_{m_adm} = **8.923** N/mm^2
Applied bending stress σ_{m_max} = **3.440** N/mm^2

PASS - Applied bending stress within permissible limits

Check compressive stress parallel to grain

Permissible comp stress σ_{c_adm} = **5.161** N/mm^2
Applied compressive stress σ_{c_max} = **0.453** N/mm^2

PASS - Applied compressive stress within permissible limits

Check combined bending and compressive stress parallel to grain

Combined loading check **0 484 < 1**

PASS - Combined compressive and bending stresses are within permissible limits

Check shear stress

Permissible shear stress τ_{adm} = **0 781** N/mm^2 Applied shear stress τ_{max} = **0.170** N/mm^2

PASS - Applied shear stress within permissible limits

Check deflection

Permissible deflection δ_{adm} = **8.929** mm Total deflection δ_{max} = **4.148** mm

PASS - Total deflection within permissible limits

Consider medium term load condition

Load duration factor K_3 = **1.25** Total UDL perp to rafter F = **0.751** kN/m

Notional bearing length L_b = **9** mm Effective span L_{eff} = **2979** mm

Check bending stress

Permissible bending stress σ_{m_adm} = **11.154** N/mm^2 Applied bending stress σ_{m_max} = **4.921** N/mm^2

PASS - Applied bending stress within permissible limits

Check compressive stress parallel to grain

Permissible comp stress σ_{c_adm} = **5.998** N/mm^2 Applied compressive stress σ_{c_max} = **0.648** N/mm^2

PASS - Applied compressive stress within permissible limits

Check combined bending and compressive stress parallel to grain

Combined loading check **0.566 < 1**

PASS - Combined compressive and bending stresses are within permissible limits

Check shear stress

Permissible shear stress τ_{adm} = **0.976** N/mm^2 Applied shear stress τ_{max} = **0.243** N/mm^2

PASS - Applied shear stress within permissible limits

Check deflection

Permissible deflection δ_{adm} = **8.937** mm Total deflection δ_{max} = **5.944** mm

PASS - Total deflection within permissible limits

Consider short term load condition

Load duration factor K_3 = **1.50** Total UDL perp to rafter F = **0 526** kN/m

Notional bearing length L_b = **9** mm Effective span L_{eff} = **2979** mm

Check bending stress

Permissible bending stress σ_{m_adm} = **13.385** N/mm^2 Applied bending stress σ_{m_max} = **6.246** N/mm^2

PASS - Applied bending stress within permissible limits

Check compressive stress parallel to grain

Permissible comp stress σ_{c_adm} = **6 677** N/mm^2 Applied compressive stress σ_{c_max} = **0.546** N/mm^2

PASS - Applied compressive stress within permissible limits

Check combined bending and compressive stress parallel to grain

Combined loading check **0.562 < 1**

PASS - Combined compressive and bending stresses are within permissible limits

Check shear stress

Permissible shear stress τ_{adm} = **1.172** N/mm^2 Applied shear stress τ_{max} = **0 308** N/mm^2

PASS - Applied shear stress within permissible limits

Ingleton Wood 1 Alie Street London	Project 79 Redington Road				Job no 811365	
	Calcs for Pitched roof rafters				Start page no /Revision 3	
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Check deflection

Permissible deflection δ_{adm} = **8.936** mm

Total deflection δ_{max} = **6.892** mm

PASS - Total deflection within permissible limits

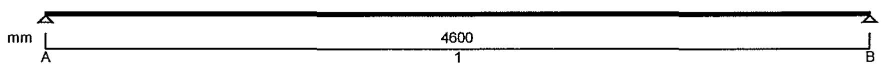
Ingleton Wood Ingleton Wood 1 Alie Street London	Project 79 Reddington road				Job no 811365	
	Calcs for Flat Roof Timber Joists				Start page no /Revision 1	
	Calcs by A W	Calcs date 02/02/2018	Checked by	Checked date	Approved by	Approved date

TIMBER JOIST DESIGN (BS5268-2.2002)

Tedds calculation version 1 1 04

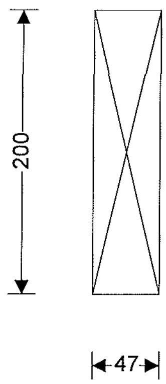
Joist details

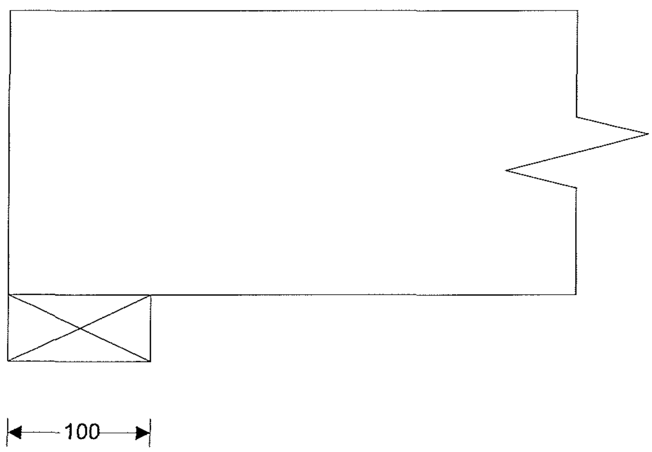
Joist breadth	b = **47** mm	Joist depth	h = **200** mm
Joist spacing	s = **450** mm	Service class of timber	**1**
Timber strength class	**C24**		



Span details

Number of spans	N_{span} = **1**	Length of bearing	L_b = **100** mm
Clear length of span	L_{s1} = **4600** mm		





Section properties

Second moment of area	I = **31333333** mm^4	Section modulus	Z = **313333** mm^3

Loading details

Joist self weight	F_{swt} = **0.03** kN/m	Dead load	F_{d_udl} = **0.77** kN/m^2
Imposed UDL(Medium term)	F_{i_udl} = **0.60** kN/m^2		
Imposed point load (Short)	F_{i_pt} = **0.90** kN		

Consider medium term loads

Design bending moment	M = **1.716** kNm	Design shear force	V = **1.492** kN
Design support reaction	R = **1.492** kN	Design deflection	δ = **11.502** mm

Check bending stress

Permissible bending stress	σ_{m_adm} = **10.783** N/mm^2	Applied bending stress	σ_{m_max} = **5.477** N/mm^2

PASS - Applied bending stress within permissible limits

Check shear stress

Permissible shear stress	τ_{adm} = **0.976** N/mm^2	Applied shear stress	τ_{max} = **0.238** N/mm^2

Ingleton Wood 1 Alie Street London	Project 79 Reddington road				Job no 811365	
	Calcs for Flat Roof Timber Joists				Start page no /Revision 2	
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PASS - Applied shear stress within permissible limits

Check bearing stress

Permissible bearing stress σ_{c_adm} = **3.300** N/mm^2 Applied bearing stress σ_{c_max} = **0.317** N/mm^2

PASS - Applied bearing stress within permissible limits

Check deflection

Permissible deflection δ_{adm} = **13.800** mm Actual deflection δ = **11.502** mm

PASS - Actual deflection within permissible limits

Consider short term loads

Design bending moment M = **2.037** kNm Design shear force V = **1.771** kN

Design support reaction R = **1.771** kN Design deflection δ = **12 304** mm

Check bending stress

Permissible bending stress σ_{m_adm} = **12.939** N/mm^2 Applied bending stress σ_{m_max} = **6.501** N/mm^2

PASS - Applied bending stress within permissible limits

Check shear stress

Permissible shear stress τ_{adm} = **1.172** N/mm^2 Applied shear stress τ_{max} = **0.283** N/mm^2

PASS - Applied shear stress within permissible limits

Check bearing stress

Permissible bearing stress σ_{c_adm} = **3 960** N/mm^2 Applied bearing stress σ_{c_max} = **0.377** N/mm^2

PASS - Applied bearing stress within permissible limits

Check deflection

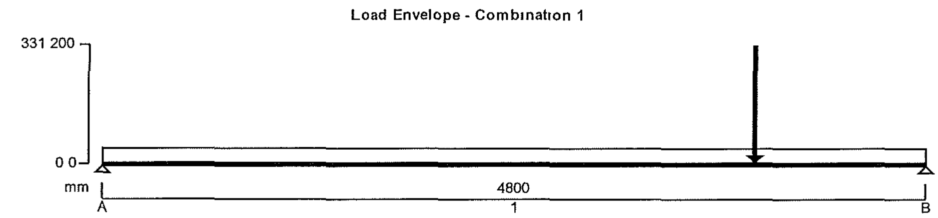
Permissible deflection δ_{adm} = **13.800** mm Actual deflection δ = **12 304** mm

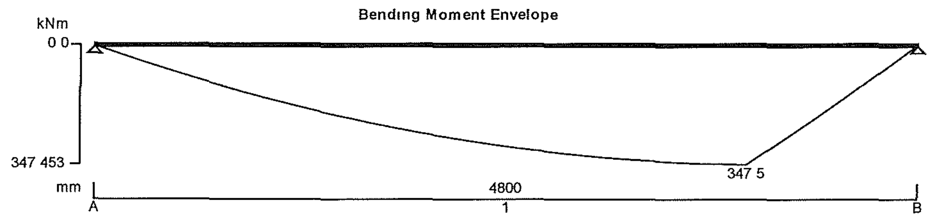
PASS - Actual deflection within permissible limits

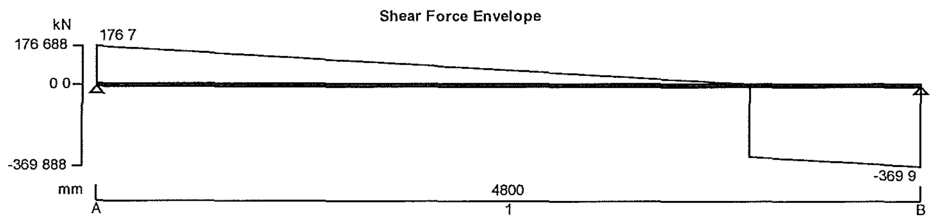
STEEL BEAM ANALYSIS & DESIGN (BS5950)

In accordance with BS5950-1·2000 incorporating Corrigendum No 1

TEDDS calculation version 3 0 05







Support conditions

Support A	Vertically restrained
	Rotationally free
Support B	Vertically restrained
	Rotationally free

Applied loading

Beam loads	Dead point load 112 kN at 3800 mm
	Imposed point load 109 kN at 3800 mm
	Imposed full UDL 14 kN/m
	Dead full UDL 15 kN/m
	Dead self weight of beam × 1

Load combinations

Load combination 1	Support A	Dead × 1 40
		Imposed × 1 60
	Span 1	Dead × 1 40
		Imposed × 1 60
	Support B	Dead × 1 40

Ingleton Wood 1 Alie Street London	Project 79 Readington Road				Job no 811365	
	Calcs for Basement Beam 1				Start page no /Revision 2	
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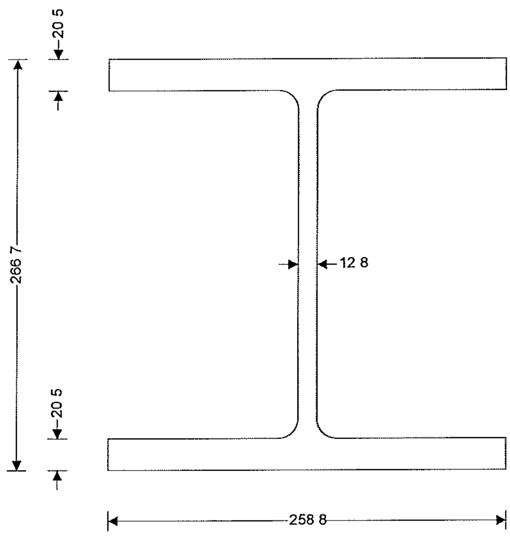
Imposed × 1 60

Analysis results

Maximum moment	M_{max} = **347.5** kNm	M_{min} = **0** kNm
Maximum shear	V_{max} = **176 7** kN	V_{min} = **-369 9** kN
Deflection	δ_{max} = **6.9** mm	δ_{min} = **0** mm
Maximum reaction at support A	R_{A_max} = **176.7** kN	R_{A_min} = **176.7** kN
Unfactored dead load reaction at support A	R_{A_Dead} = **61.9** kN	
Unfactored imposed load reaction at support A	$R_{A\_Imposed}$ = **56.3** kN	
Maximum reaction at support B	R_{B_max} = **369.9** kN	R_{B_min} = **369.9** kN
Unfactored dead load reaction at support B	R_{B_Dead} = **127.2** kN	
Unfactored imposed load reaction at support B	$R_{B\_Imposed}$ = **119.9** kN	

Section details

Section type **UC 254x254x107 (BS4-1)** Steel grade **S355**



Classification of cross sections - Section 3.5

Tensile strain coefficient ε = **0.89** Section classification **Plastic**

Shear capacity - Section 4.2.3

Design shear force F_v = **369.9** kN Design shear resistance P_v = **706.6** kN

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment M = **347.5** kNm Moment capacity low shear M_c = **512.1** kNm

PASS - Moment capacity exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to imposed loads

Limiting deflection δ_{lim} = **13.333** mm Maximum deflection δ = **6 862** mm

PASS - Maximum deflection does not exceed deflection limit

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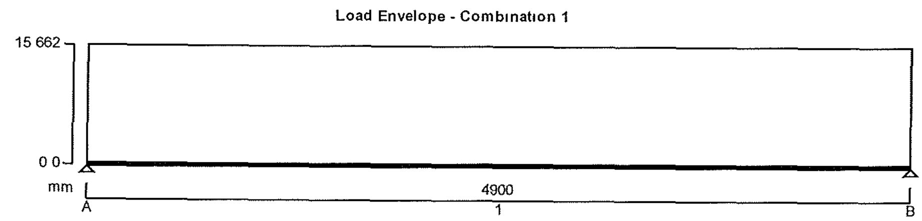
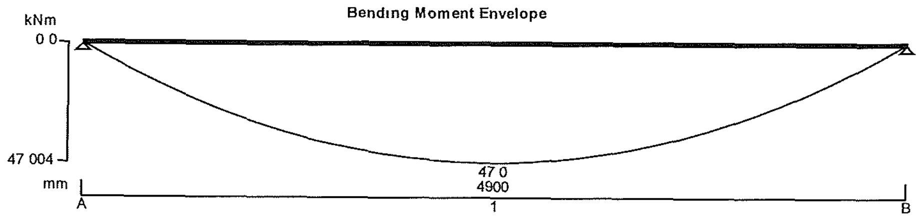
	Calcs by: A W	Calcs date: 05/04/2018	Checked by	Checked date	Approved by	Approved date

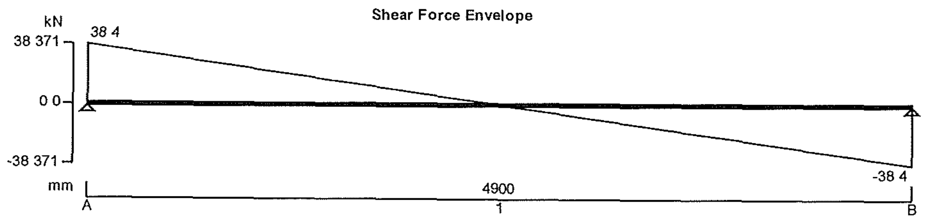
STEEL BEAM ANALYSIS & DESIGN (BS5950)

In accordance with BS5950-1:2000 incorporating Corrigendum No.1

TEDDS calculation version 3 0 05







Support conditions

Support A	Vertically restrained Rotationally free
Support B	Vertically restrained Rotationally free

Applied loading

Beam loads	Imposed full UDL 7 5 kN/m Dead full UDL 2 31 kN/m Dead self weight of beam × 1

Load combinations

Load combination 1	Support A	Dead × 1 40 Imposed × 1 60
	Span 1	Dead × 1 40 Imposed × 1 60
	Support B	Dead × 1 40 Imposed × 1 60

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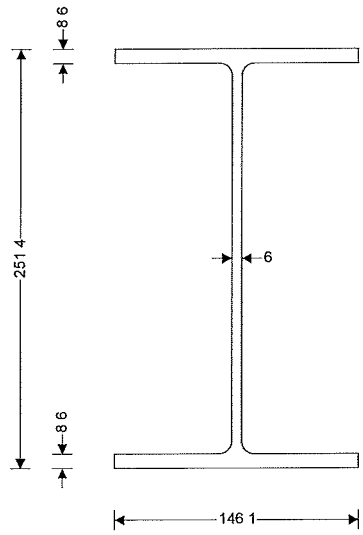
Analysis results

Maximum moment	M_{max} = **47** kNm	M_{min} = **0** kNm
Maximum moment span 1 segment 1	$M_{s1\_seg1\_max}$ = **47** kNm	$M_{s1\_seg1\_min}$ = **0** kNm
Maximum moment span 1 segment 2	$M_{s1\_seg2\_max}$ = **47** kNm	$M_{s1\_seg2\_min}$ = **0** kNm
Maximum shear	V_{max} = **38.4** kN	V_{min} = **-38.4** kN
Maximum shear span 1 segment 1	$V_{s1\_seg1\_max}$ = **38.4** kN	$V_{s1\_seg1\_min}$ = **0** kN
Maximum shear span 1 segment 2	$V_{s1\_seg2\_max}$ = **0** kN	$V_{s1\_seg2\_min}$ = **-38.4** kN
Deflection segment 3	δ_{max} = **6.2** mm	δ_{min} = **0** mm
Maximum reaction at support A	R_{A_max} = **38.4** kN	R_{A_min} = **38.4** kN
Unfactored dead load reaction at support A	R_{A_Dead} = **6.4** kN	
Unfactored imposed load reaction at support A	$R_{A\_Imposed}$ = **18.4** kN	
Maximum reaction at support B	R_{B_max} = **38.4** kN	R_{B_min} = **38.4** kN
Unfactored dead load reaction at support B	R_{B_Dead} = **6.4** kN	
Unfactored imposed load reaction at support B	$R_{B\_Imposed}$ = **18.4** kN	

Section details

Section type **UB 254x146x31 (BS4-1)** Steel grade **S275**



Classification of cross sections - Section 3 5

Tensile strain coefficient ε = **1.00** Section classification **Plastic**

Shear capacity - Section 4 2 3

Design shear force F_v = **38.4** kN Design shear resistance P_v = **248 9** kN

PASS - Design shear resistance exceeds design shear force

Moment capacity at span 1 segment 1 - Section 4.2 5

Design bending moment M = **47** kNm Moment capacity low shear M_c = **108.1** kNm

Buckling resistance moment - Section 4.3 6 4

Buckling resistance moment M_b = **64.7** kNm M_b / m_{LT} = **64.7** kNm

PASS - Buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 2.5 2

Consider deflection due to imposed loads

Limiting deflection δ_{lim} = **13.611** mm Maximum deflection δ = **6 222** mm

PASS - Maximum deflection does not exceed deflection limit

RC SLAB DESIGN (BS8110:PART1.1997)

TEDDS calculation version 1 0 04

CONCRETE SLAB DESIGN (CL 3 5.3 & 4)

SIMPLE ONE WAY SPANNING SLAB DEFINITION

Overall depth of slab h = **275** mm

Cover to tension reinforcement resisting sagging c_b = **40** mm

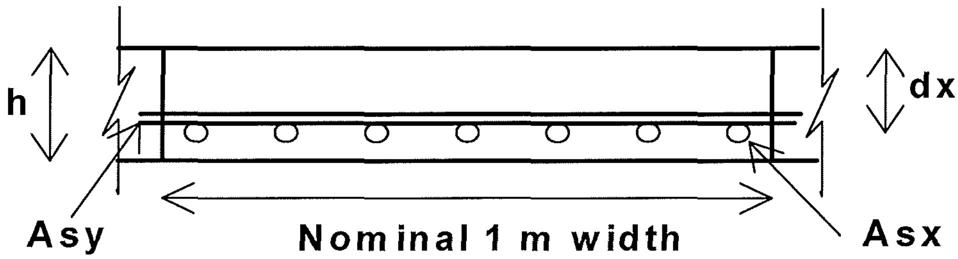
Trial bar diameter D_{tryx} = ***16*** *mm*

Depth to tension steel (resisting sagging)

$d_x = h - c_b - D_{tryx}/2$ = **227** mm

Characteristic strength of reinforcement f_y = **500** N/mm^2

Characteristic strength of concrete f_{cu} = **35** N/mm^2



One-way spanning slab
(simple)

ONE WAY SPANNING SLAB (CL 3.5.4)

MAXIMUM DESIGN MOMENTS IN SPAN

Design sagging moment (per m width of slab) m_{sx} = **62 4** kNm/m

CONCRETE SLAB DESIGN – SAGGING – OUTER LAYER OF STEEL (CL 3.5 4)

Design sagging moment (per m width of slab) m_{sx} = **62 4** kNm/m

Moment Redistribution Factor β_{bx} = **1.0**

Area of reinforcement required

$K_x = abs(m_{sx}) / (d_x^2 \times f_{cu})$ = **0.035**

$K'_x = min (0 156 , (0 402 \times (\beta_{bx} - 0 4)) - (0 18 \times (\beta_{bx} - 0 4)^2))$ = **0 156**

Outer compression steel not required to resist sagging

One-way Spanning Slab requiring tension steel only (sagging) - mesh

$z_x = min ((0 95 \times d_x),(d_x \times (0 5+\sqrt{(0 25-K_x/0 9)})))$ = **216** mm

Neutral axis depth $x_x = (d_x - z_x) / 0 45$ = **25** mm

Area of tension steel required

A_{sx_req} = abs(m_{sx}) / (1/γ_{ms} × f_y × z_x) = **666** mm²/m

Tension steel

Use B785 Mesh

A_{sx_prov} = A_{sl} = **785** mm²/m A_{sy_prov} = A_{st} = **252** mm²/m

D_x = d_{sl} = **10** mm D_y = d_{st} = **8** mm

Area of tension steel provided sufficient to resist sagging

Check min and max areas of steel resisting sagging

Total area of concrete A_c = h = **275000** mm²/m

Minimum % reinforcement k = **0.13** %

A_{st_min} = k × A_c = **358** mm²/m

A_{st_max} = 4 % × A_c = **11000** mm²/m

Steel defined

Outer steel resisting sagging A_{sx_prov} = **785** mm²/m

Area of outer steel provided (sagging) OK

Inner steel resisting sagging A_{sy_prov} = **252** mm²/m

Less than min area of inner steel (sagging) FAIL

SHEAR RESISTANCE OF CONCRETE SLABS (CL 3.5.5)

Outer tension steel resisting sagging moments

Depth to tension steel from compression face d_x = **227** mm

Area of tension reinforcement provided (per m width of slab) A_{sx_prov} = **785** mm²/m

Design ultimate shear force (per m width of slab) V_x = **53** kN/m

Characteristic strength of concrete f_{cu} = **35** N/mm²

Applied shear stress

v_x = V_x / d_x = **0 23** N/mm²

Check shear stress to clause 3.5.5 2

$v_{allowable}$ = min ((0 8 $N^{1/2}$/mm) × √(f_{cu}), 5 N/mm²) = **4 73** N/mm²

Shear stress - OK

Shear stresses to clause 3.5.5.3

Design shear stress

f_{cu_ratio} = if (f_{cu} > 40 N/mm² , 40/25 , f_{cu}/(25 N/mm²)) = **1 400**

v_{cx} = 0 79 N/mm² × min(3,100 × A_{sx_prov} / d_x)$^{1/3}$ × max(0 67,(400 mm / d_x)$^{1/4}$) / 1 25 × $f_{cu\_ratio}^{1/3}$

v_{cx} = **0.57** N/mm²

Applied shear stress

v_x = **0.23** N/mm²

No shear reinforcement required

Ingleton Wood Ingleton Wood 1 Alie Street London	Project 79 Reddington Road				Job no 811365	
	Calcs for Basement Floor Slab				Start page no /Revision 3	
	Calcs by A W	Calcs date 05/04/2018	Checked by	Checked date	Approved by	Approved date

CONCRETE SLAB DEFLECTION CHECK (CL 3.5.7)

Slab span length l_x = **4.600** m

Design ultimate moment in shorter span per m width m_{sx} = **62** kNm/m

Depth to outer tension steel d_x = **227** mm

Tension steel

Area of outer tension reinforcement provided A_{sx_prov} = **785** mm^2/m

Area of tension reinforcement required A_{sx_req} = **666** mm^2/m

Moment Redistribution Factor β_{bx} = **1.00**

Modification Factors

Basic span / effective depth ratio (Table 3 9) $ratio_{span\_depth}$ = **20**

The modification factor for spans in excess of 10m (ref cl 3 4 6 4) has not been included

$f_s = 2 \times f_y \times A_{sx\_req} / (3 \times A_{sx\_prov} \times \beta_{bx})$ = **282.6** N/mm^2

$factor_{tens} = \min(2, 0\ 55 + (477\ N/mm^2 - f_s) / (120 \times (0\ 9\ N/mm^2 + m_{sx} / d_x^2)))$ = **1.317**

Calculate Maximum Span

This is a simplified approach and further attention should be given where special circumstances exist Refer to clauses 3 4 6 4 and 3 4 6 7

Maximum span $l_{max} = ratio_{span\_depth} \times factor_{tens} \times d_x$ = **5.98** m

Check the actual beam span

Actual span/depth ratio l_x / d_x = **20.26**

Span depth limit $ratio_{span\_depth} \times factor_{tens}$ = **26.35**

Span/Depth ratio check satisfied

CHECK OF NOMINAL COVER (SAGGING) – (BS8110:PT 1, TABLE 3.4)

Slab thickness h = **275** mm

Effective depth to bottom outer tension reinforcement d_x = **227.0** mm

Diameter of tension reinforcement D_x = **10** mm

Diameter of links L_{diax} = **0** mm

Cover to outer tension reinforcement

$c_{tenx} = h - d_x - D_x / 2$ = **43.0** mm

Nominal cover to links steel

$c_{nomx} = c_{tenx} - L_{diax}$ = **43.0** mm

Permissable minimum nominal cover to all reinforcement (Table 3 4)

c_{min} = **35** mm

Cover over steel resisting sagging OK

TIMBER JOIST DESIGN (BS5268-2.2002)

Tedds calculation version 1 1 04

Joist details

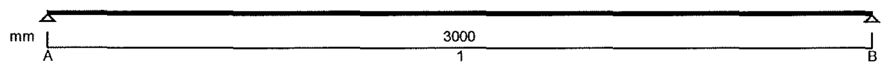
Joist breadth $b = \mathbf{47}$ mm

Joist depth $h = \mathbf{200}$ mm

Joist spacing $s = \mathbf{450}$ mm

Service class of timber **1**

Timber strength class **C24**

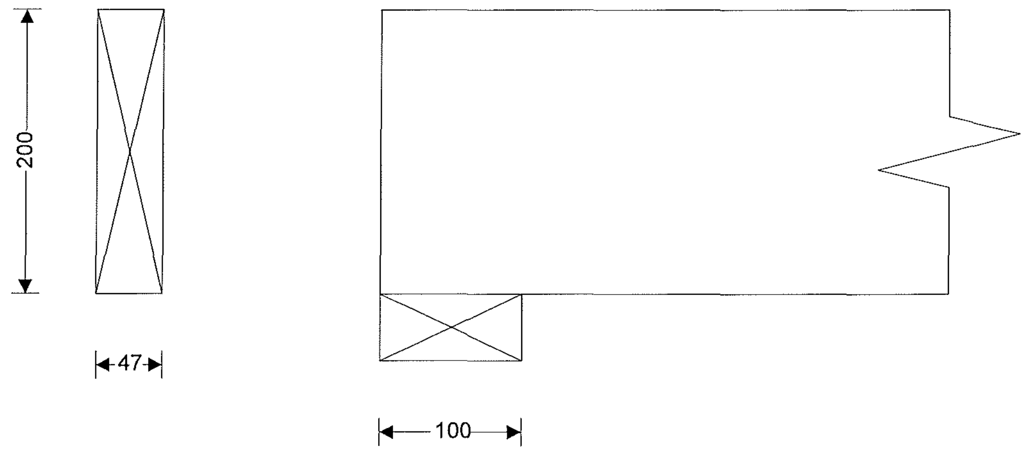


Span details

Number of spans $N_{span} = \mathbf{1}$

Length of bearing $L_b = \mathbf{100}$ mm

Clear length of span $L_{s1} = \mathbf{3000}$ mm



Section properties

Second moment of area $I = \mathbf{31333333}$ mm^4

Section modulus $Z = \mathbf{313333}$ mm^3

Loading details

Joist self weight $F_{swt} = \mathbf{0.03}$ kN/m

Dead load $F_{d\_udl} = \mathbf{0.75}$ kN/m^2

Imposed UDL(Long term) $F_{i\_udl} = \mathbf{2.50}$ kN/m^2

Imposed point load (Medium) $F_{i\_pt} = \mathbf{1.40}$ kN

Consider long term loads

Design bending moment $M = \mathbf{1.682}$ kNm

Design shear force $V = \mathbf{2\ 242}$ kN

Design support reaction $R = \mathbf{2\ 242}$ kN

Design deflection $\delta = \mathbf{4\ 977}$ mm

Check bending stress

Permissible bending stress $\sigma_{m\_adm} = \mathbf{8\ 626}$ N/mm^2

Applied bending stress $\sigma_{m\_max} = \mathbf{5.367}$ N/mm^2

PASS - Applied bending stress within permissible limits

Check shear stress

Permissible shear stress $\tau_{adm} = \mathbf{0.781}$ N/mm^2

Applied shear stress $\tau_{max} = \mathbf{0.358}$ N/mm^2

PASS - Applied shear stress within permissible limits

Check bearing stress

Permissible bearing stress σ_{c_adm} = **2.640** N/mm^2 Applied bearing stress σ_{c_max} = **0 477** N/mm^2

PASS - Applied bearing stress within permissible limits

Check deflection

Permissible deflection δ_{adm} = **9.000** mm Actual deflection δ = **4.977** mm

PASS - Actual deflection within permissible limits

<u>Consider medium term loads</u>

Design bending moment M = **1.466** kNm Design shear force V = **1.955** kN

Design support reaction R = **1 955** kN Design deflection δ = **3 757** mm

Check bending stress

Permissible bending stress σ_{m_adm} = **10.783** N/mm^2 Applied bending stress σ_{m_max} = **4 679** N/mm^2

PASS - Applied bending stress within permissible limits

Check shear stress

Permissible shear stress τ_{adm} = **0.976** N/mm^2 Applied shear stress τ_{max} = **0 312** N/mm^2

PASS - Applied shear stress within permissible limits

Check bearing stress

Permissible bearing stress σ_{c_adm} = **3.300** N/mm^2 Applied bearing stress σ_{c_max} = **0.416** N/mm^2

PASS - Applied bearing stress within permissible limits

Check deflection

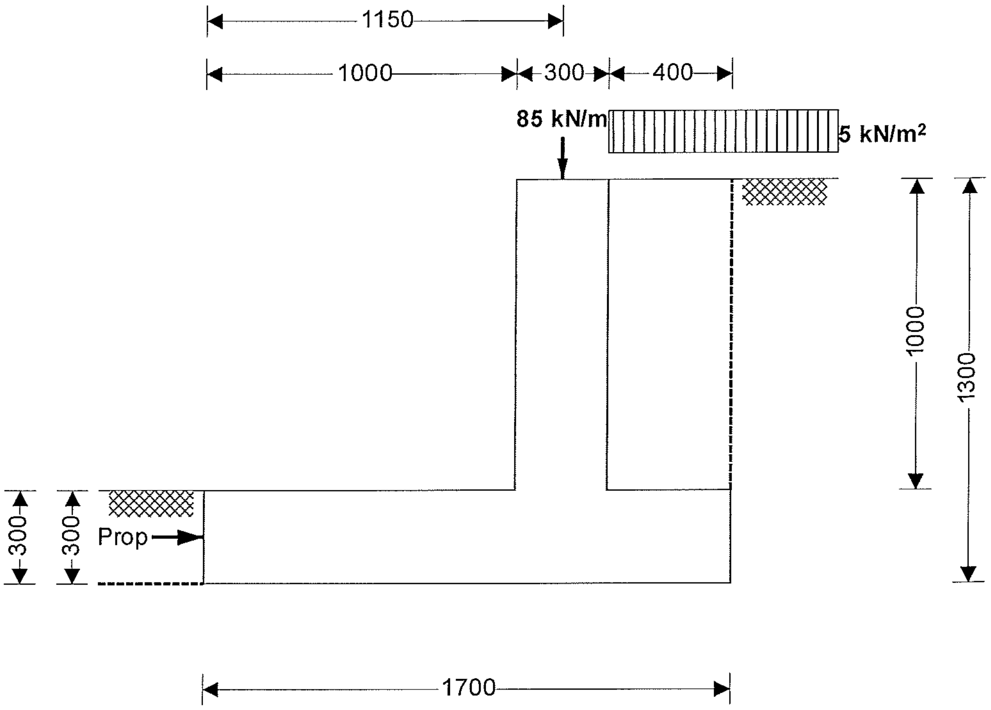
Permissible deflection δ_{adm} = **9.000** mm Actual deflection δ = **3.757** mm

PASS - Actual deflection within permissible limits

Ingleton Wood 1 Alie Street London	Project 79 Redington Road				Job no 811365	
	Calcs for Underpinning section from basement level with toe				Start page no /Revision 1	
	Calcs by A W	Calcs date 06/02/2018	Checked by	Checked date	Approved by	Approved date

RETAINING WALL ANALYSIS (BS 8002:1994)

TEDDS calculation version 1 2 01 06



Wall details

Retaining wall type	**Cantilever**		
Height of wall stem	h_{stem} = **1000** mm	Wall stem thickness	t_{wall} = **300** mm
Length of toe	l_{toe} = **1000** mm	Length of heel	l_{heel} = **400** mm
Overall length of base	l_{base} = **1700** mm	Base thickness	t_{base} = **300** mm
Height of retaining wall	h_{wall} = **1300** mm		
Depth of downstand	d_{ds} = **0** mm	Thickness of downstand	t_{ds} = **300** mm
Position of downstand	l_{ds} = **850** mm		
Depth of cover in front of wall	d_{cover} = **0** mm	Unplanned excavation depth	d_{exc} = **300** mm
Height of ground water	h_{water} = **0** mm	Density of water	γ_{water} = 9 81 kN/m^3
Density of wall construction	γ_{wall} = **23.6** kN/m^3	Density of base construction	γ_{base} = **23.6** kN/m^3
Angle of soil surface	β = **0.0** deg	Effective height at back of wall	h_{eff} = **1300** mm
Mobilisation factor	M = **1 5**		
Moist density	γ_m = **18.0** kN/m^3	Saturated density	γ_s = **21 0** kN/m^3
Design shear strength	ϕ' = **24.2** deg	Angle of wall friction	δ = **18.6** deg
Design shear strength	ϕ'_b = **24 2** deg	Design base friction	δ_b = **18.6** deg
Moist density	γ_{mb} = **18.0** kN/m^3	Allowable bearing	$P_{bearing}$ = **130** kN/m^2

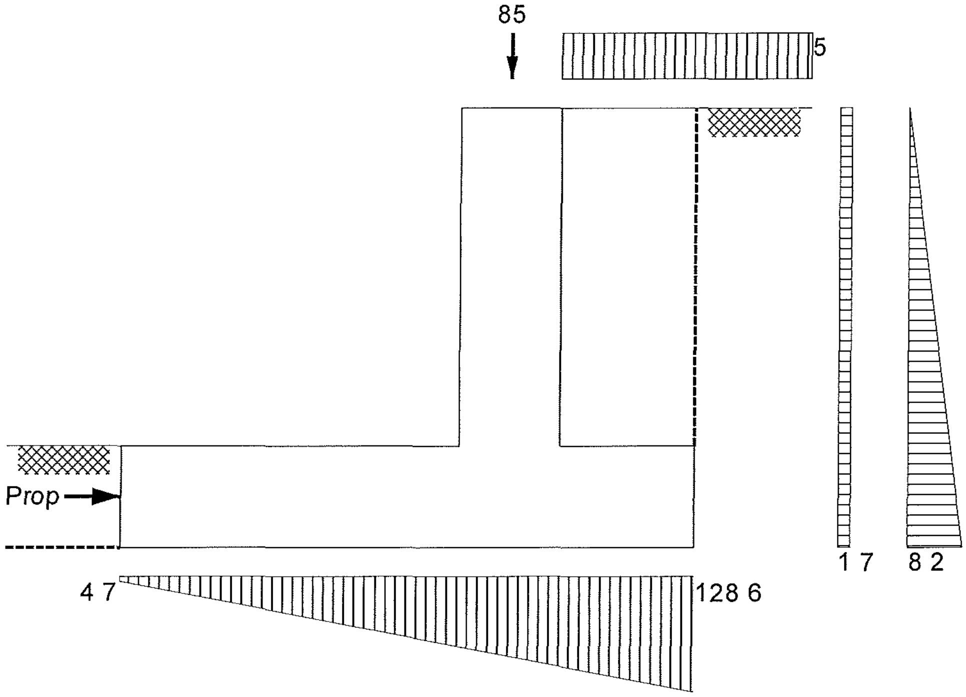
Using Coulomb theory

Active pressure	K_a =**0.369**	Passive pressure	K_p = **4.187**
At-rest pressure	K_0 = **0.590**		

Loading details

Surcharge load	Surcharge = **5.0** kN/m^2		
Vertical dead load	W_{dead} = **75 0** kN/m	Vertical live load	W_{live} = **10.0** kN/m
Horizontal dead load	F_{dead} = **0.0** kN/m	Horizontal live load	F_{live} = **0.0** kN/m

Position of vertical load l_{load} = **1150** mm Height of horizontal load h_{load} = **0** mm



Loads shown in kN/m, pressures shown in kN/m²

Calculate propping force

Propping force F_{prop} = **0 0** kN/m

Check bearing pressure

Total vertical reaction R = **113.3** kN/m Distance to reaction x_{bar} = **1113** mm

Eccentricity of reaction e = **263** mm

Reaction acts within middle third of base

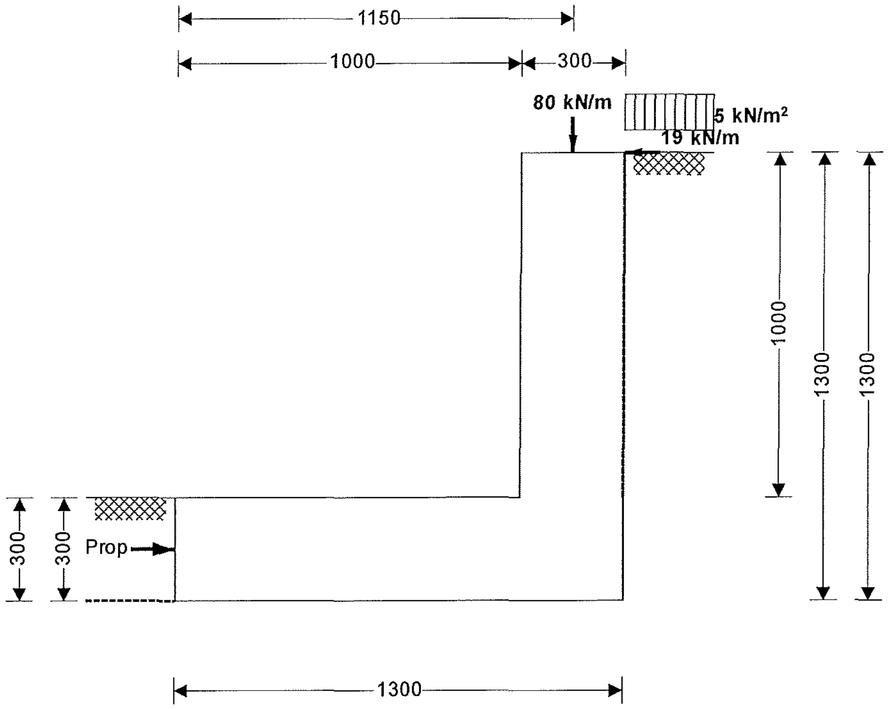
Bearing pressure at toe p_{toe} = **4.7** kN/m² Bearing pressure at heel p_{heel} = **128.6** kN/m²

PASS - Maximum bearing pressure is less than allowable bearing pressure

Ingleton Wood Ingleton Wood 1 Alie Street London	Project 79 Redington Road			Job no 811365	
	Calcs for Underpinning section from Basement Level			Start page no /Revision 1	
	Calcs by A W	Calcs date 06/02/2018	Checked by	Checked date	Approved by	Approved date

RETAINING WALL ANALYSIS (BS 8002:1994)

TEDDS calculation version 1 2 01 06



Wall details

Retaining wall type	**Cantilever**		
Height of wall stem	h_{stem} = **1000** mm	Wall stem thickness	t_{wall} = **300** mm
Length of toe	l_{toe} = **1000** mm	Length of heel	l_{heel} = **0** mm
Overall length of base	l_{base} = **1300** mm	Base thickness	t_{base} = **300** mm
Height of retaining wall	*h_{wall} = **1300** mm*		
Depth of downstand	d_{ds} = **0** mm	Thickness of downstand	t_{ds} = **300** mm
Position of downstand	l_{ds} = **850** mm		
Depth of cover in front of wall	d_{cover} = **0** mm	Unplanned excavation depth	d_{exc} = **300** mm
Height of ground water	h_{water} = **0** mm	Density of water	γ_{water} = 9 81 kN/m^3
Density of wall construction	γ_{wall} = **23.6** kN/m^3	Density of base construction	γ_{base} = **23.6** kN/m^3
Angle of soil surface	β = **0.0** deg	Effective height at back of wall	h_{eff} = **1300** mm
Mobilisation factor	M = **1.5**		
Moist density	γ_m = **18.0** kN/m^3	Saturated density	γ_s = **21.0** kN/m^3
Design shear strength	ϕ' = **24.2** deg	Angle of wall friction	δ = **18.6** deg
Design shear strength	ϕ'_b = **24.2** deg	Design base friction	δ_b = **18.6** deg
Moist density	γ_{mb} = **18 0** kN/m^3	Allowable bearing	$P_{bearing}$ = **130** kN/m^2

Using Coulomb theory

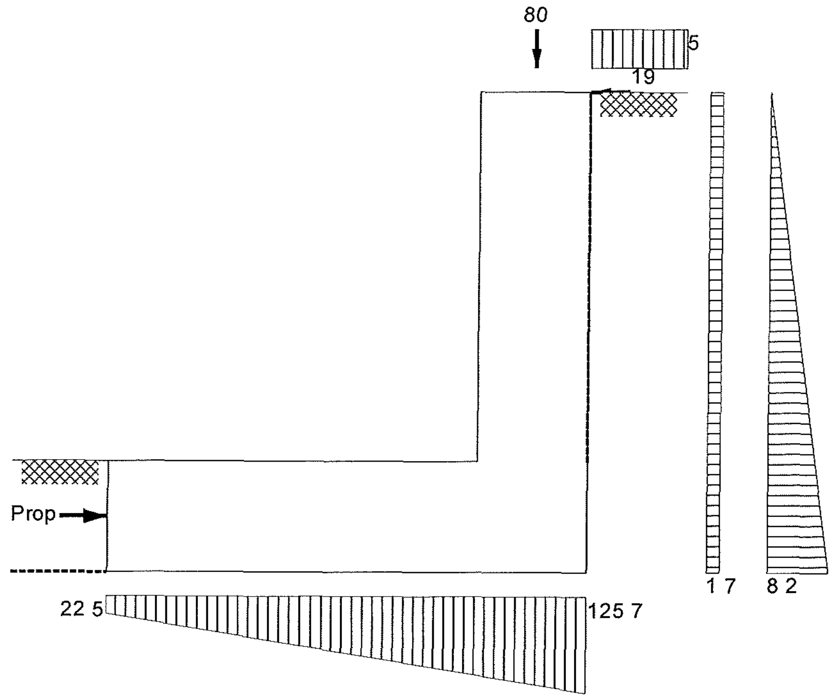
Active pressure	K_a =**0.369**	Passive pressure	K_p = **4.187**
At-rest pressure	K_0 = **0.590**		

Loading details

Surcharge load	Surcharge = **5.0** kN/m^2		
Vertical dead load	W_{dead} = **70.0** kN/m	Vertical live load	W_{live} = **10.0** kN/m
Horizontal dead load	F_{dead} = **0.0** kN/m	Horizontal live load	F_{live} = **19.4** kN/m

Ingleton Wood 1 Alie Street London	Project 79 Redington Road				Job no 811365	
	Calcs for Underpinning section from Basement Level				Start page no /Revision 2	
	Calcs by A W	Calcs date 06/02/2018	Checked by	Checked date	Approved by	Approved date

Position of vertical load l_{load} = **1150** mm   Height of horizontal load h_{load} = **1300** mm



Loads shown in kN/m, pressures shown in kN/m²

Calculate propping force

Propping force F_{prop} = **0.0** kN/m

Check bearing pressure

Total vertical reaction R = **96.3** kN/m   Distance to reaction x_{bar} = **801** mm

Eccentricity of reaction e = **151** mm

Reaction acts within middle third of base

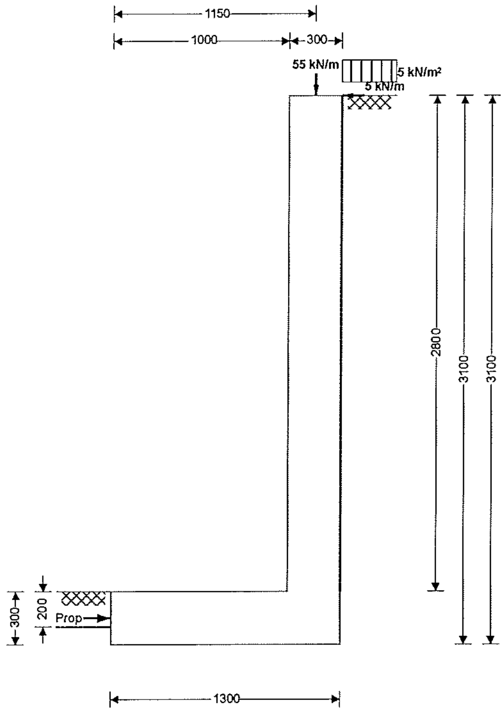
Bearing pressure at toe p_{toe} = **22.5** kN/m^2 Bearing pressure at heel p_{heel} = **125.7** kN/m^2

PASS - Maximum bearing pressure is less than allowable bearing pressure

Ingleton Wood 1 Alie Street London	Project 79 Redington Road				Job no 811365	
	Calcs for Underpinning from GF level				Start page no /Revision 1	
	Calcs by A W	Calcs date 04/06/2018	Checked by	Checked date	Approved by	Approved date

RETAINING WALL ANALYSIS (BS 8002 1994)

TEDDS calculation version 1 2 01 06



Wall details

Retaining wall type	**Cantilever**		
Height of wall stem	h_{stem} = **2800** mm	Wall stem thickness	t_{wall} = **300** mm
Length of toe	l_{toe} = **1000** mm	Length of heel	l_{heel} = **0** mm
Overall length of base	l_{base} = **1300** mm	Base thickness	t_{base} = **300** mm
Height of retaining wall	h_{wall} = **3100** mm		
Depth of downstand	d_{ds} = **0** mm	Thickness of downstand	t_{ds} = **300** mm
Position of downstand	l_{ds} = **850** mm		
Depth of cover in front of wall	d_{cover} = **0** mm	Unplanned excavation depth	d_{exc} = **200** mm
Height of ground water	h_{water} = **0** mm	Density of water	γ_{water} = 9 81 kN/m^3
Density of wall construction	γ_{wall} = **23.6** kN/m^3	Density of base construction	γ_{base} = **23.6** kN/m^3
Angle of soil surface	β = **0.0** deg	Effective height at back of wall	h_{eff} = **3100** mm
Mobilisation factor	M = **1.5**		
Moist density	γ_m = **18.0** kN/m^3	Saturated density	γ_s = **21 0** kN/m^3
Design shear strength	ϕ' = **24.2** deg	Angle of wall friction	δ = **18 6** deg
Design shear strength	ϕ'_b = **24.2** deg	Design base friction	δ_b = **18.6** deg
Moist density	γ_{mb} = **18.0** kN/m^3	Allowable bearing	$P_{bearing}$ = **130** kN/m^2

Using Coulomb theory

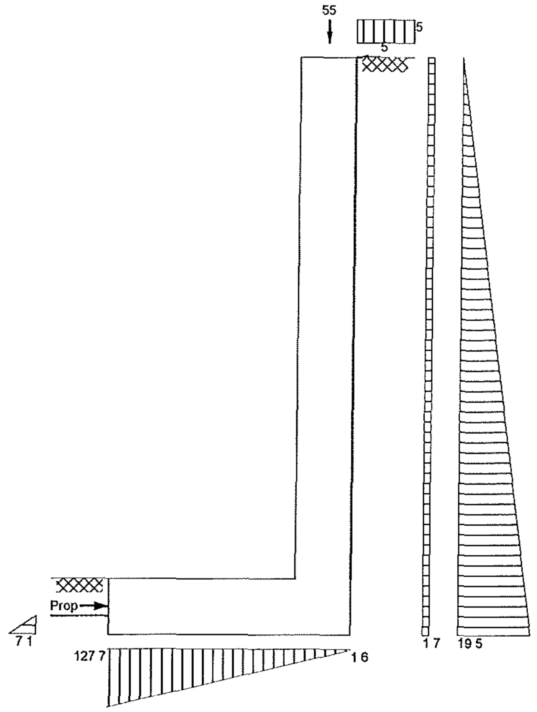
Active pressure	K_a =**0.369**	Passive pressure	K_p = **4 187**
At-rest pressure	K_0 = **0 590**		

Loading details

Surcharge load	Surcharge = **5.0** kN/m^2		
Vertical dead load	W_{dead} = **40.0** kN/m	Vertical live load	W_{live} = **15.0** kN/m
Horizontal dead load	F_{dead} = **0.0** kN/m	Horizontal live load	F_{live} = **5 0** kN/m

Ingleton Wood 1 Alie Street London	Project 79 Redington Road				Job no 811365	
	Calcs for Underpinning from GF level				Start page no /Revision 2	
	Calcs by A W	Calcs date 04/06/2018	Checked by	Checked date	Approved by	Approved date

Position of vertical load l_{load} = **1150** mm Height of horizontal load h_{load} = **3100** mm



Loads shown in kN/m, pressures shown in kN/m²

Calculate propping force

Propping force F_{prop} = **17.1** kN/m

Check bearing pressure

Total vertical reaction R = **84.0** kN/m Distance to reaction x_{bar} = **439** mm

Eccentricity of reaction e = **211** mm

Reaction acts within middle third of base

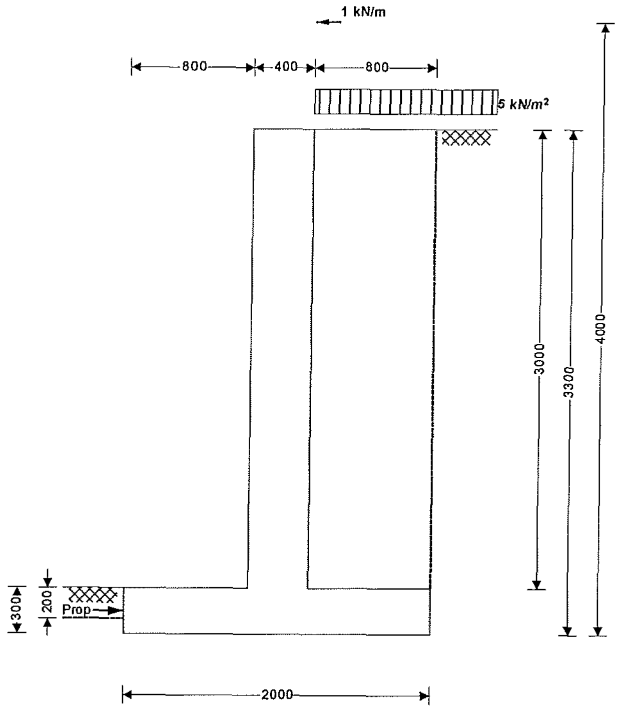
Bearing pressure at toe p_{toe} = **127.7** kN/m² Bearing pressure at heel p_{heel} = **1.6** kN/m²

PASS - Maximum bearing pressure is less than allowable bearing pressure

Ingleton Wood 1 Alie Street London	Project 79 Redington Road				Job no 811365	
	Calcs for External Lightwell Retaining Wall				Start page no /Revision 1	
	Calcs by A W	Calcs date 04/06/2018	Checked by	Checked date	Approved by	Approved date

RETAINING WALL ANALYSIS (BS 8002:1994)

TEDDS calculation version 1.2.01.06



Wall details

Retaining wall type	**Cantilever**		
Height of wall stem	h_{stem} = **3000** mm	Wall stem thickness	t_{wall} = **400** mm
Length of toe	l_{toe} = **800** mm	Length of heel	l_{heel} = **800** mm
Overall length of base	l_{base} = **2000** mm	Base thickness	t_{base} = **300** mm
Height of retaining wall	h_{wall} = **3300** mm		
Depth of downstand	d_{ds} = **0** mm	Thickness of downstand	t_{ds} = **300** mm
Position of downstand	l_{ds} = **850** mm		
Depth of cover in front of wall	d_{cover} = **0** mm	Unplanned excavation depth	d_{exc} = **200** mm
Height of ground water	h_{water} = **0** mm	Density of water	γ_{water} = 9.81 kN/m³
Density of wall construction	γ_{wall} = **23.6** kN/m³	Density of base construction	γ_{base} = **23.6** kN/m³
Angle of soil surface	β = **0.0** deg	Effective height at back of wall	h_{eff} = **3300** mm
Mobilisation factor	M = **1.5**		
Moist density	γ_m = **18.0** kN/m³	Saturated density	γ_s = **21.0** kN/m³
Design shear strength	ϕ' = **24.2** deg	Angle of wall friction	δ = **18.6** deg
Design shear strength	ϕ'_b = **24.2** deg	Design base friction	δ_b = **18.6** deg
Moist density	γ_{mb} = **18.0** kN/m³	Allowable bearing	$P_{bearing}$ = **130** kN/m²

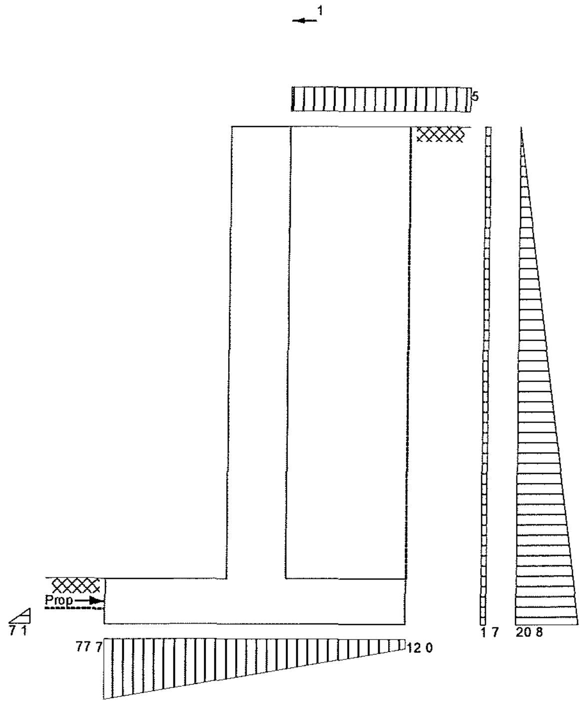
Using Coulomb theory

Active pressure	K_a = **0.369**	Passive pressure	K_p = **4.187**
At-rest pressure	K_0 = **0.590**		

Loading details

Surcharge load	Surcharge = **5.0** kN/m²		
Vertical dead load	W_{dead} = **0.0** kN/m	Vertical live load	W_{live} = **0.0** kN/m
Horizontal dead load	F_{dead} = **0.0** kN/m	Horizontal live load	F_{live} = **0.8** kN/m

Position of vertical load l_{load} = **0** mm Height of horizontal load h_{load} = **4000** mm



Loads shown in kN/m, pressures shown in kN/m²

Calculate propping force

Propping force F_{prop} = **11.6** kN/m

Check bearing pressure

Total vertical reaction R = **89.7** kN/m Distance to reaction x_{bar} = **756** mm

Eccentricity of reaction e = **244** mm

Reaction acts within middle third of base

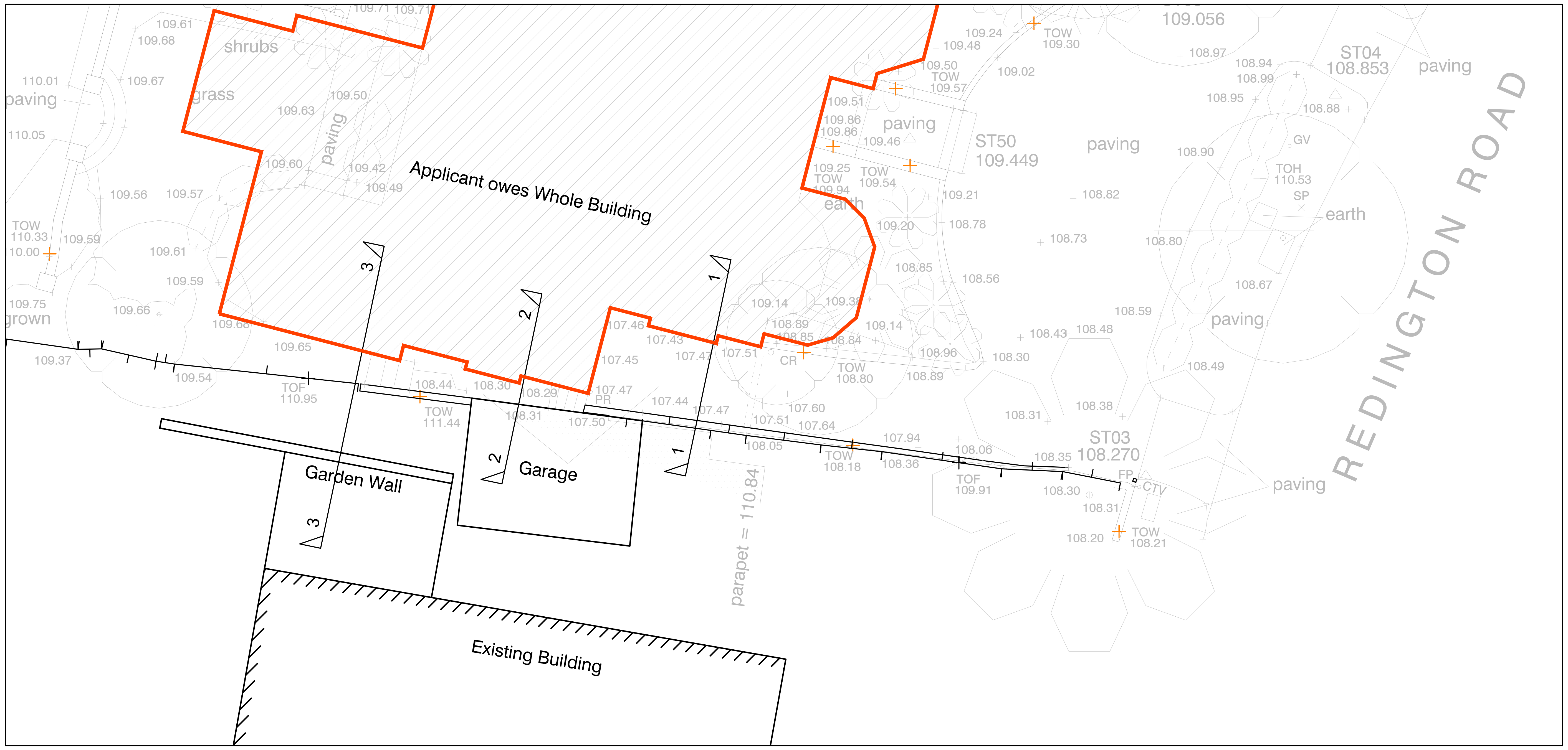
Bearing pressure at toe p_{toe} = **77.7** kN/m² Bearing pressure at heel p_{heel} = **12.0** kN/m²

PASS - Maximum bearing pressure is less than allowable bearing pressure

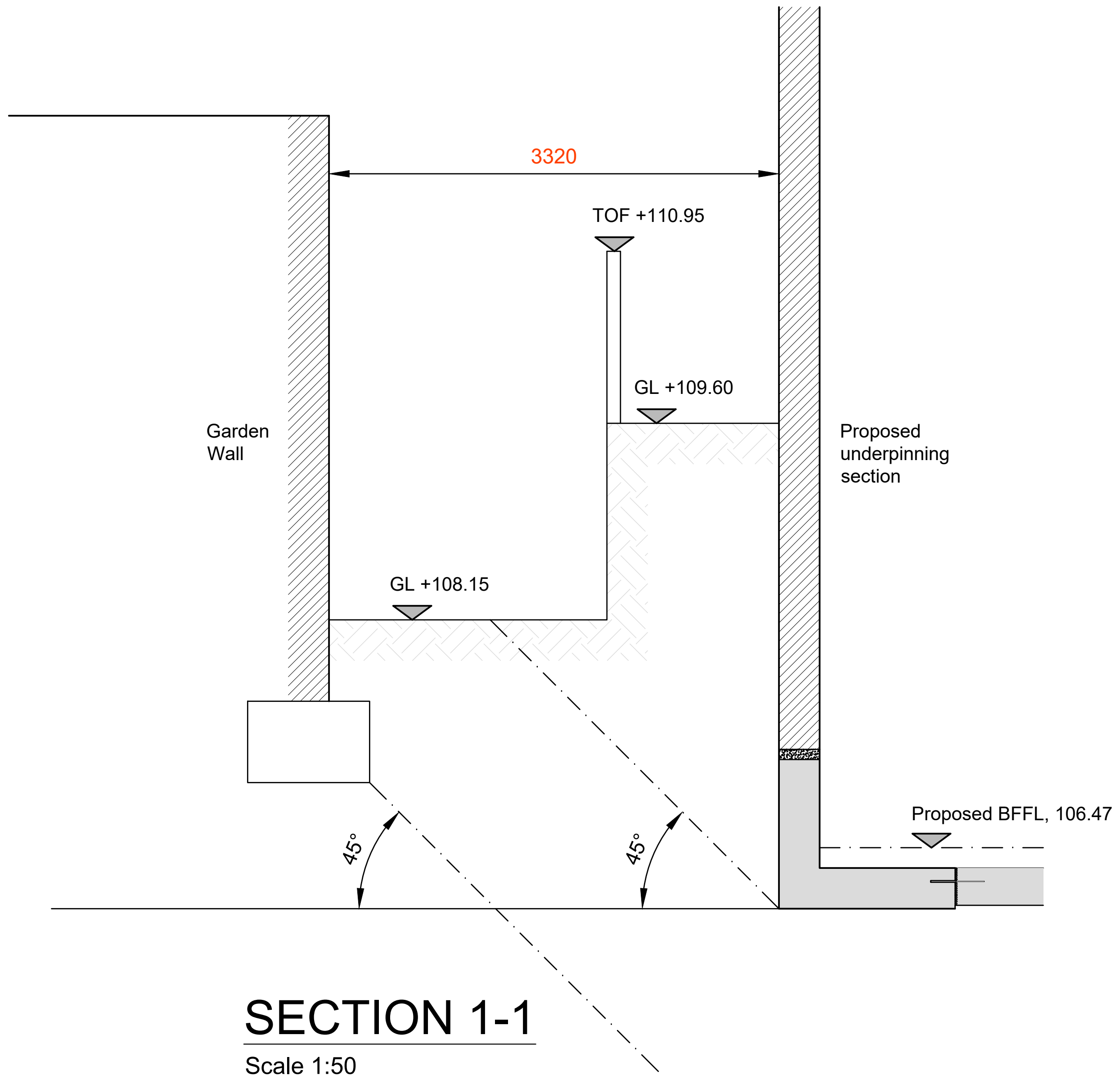
All dimensions are to be checked and verified on-site by the Main Contractor prior to commencement; any discrepancies are to be reported to the Contract Administrator.

This drawing is to be read in conjunction with all other relevant drawings and specifications

Do Not Scale

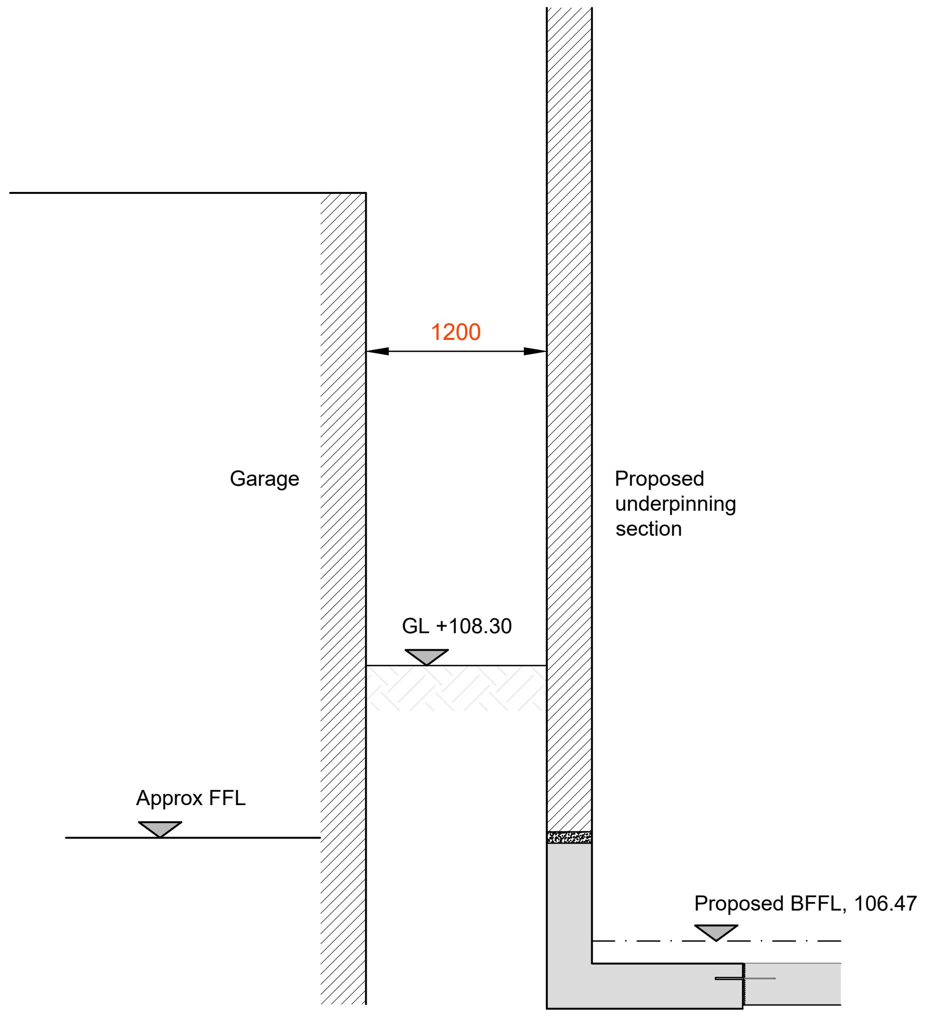


SITE PLAN



SECTION 1-1

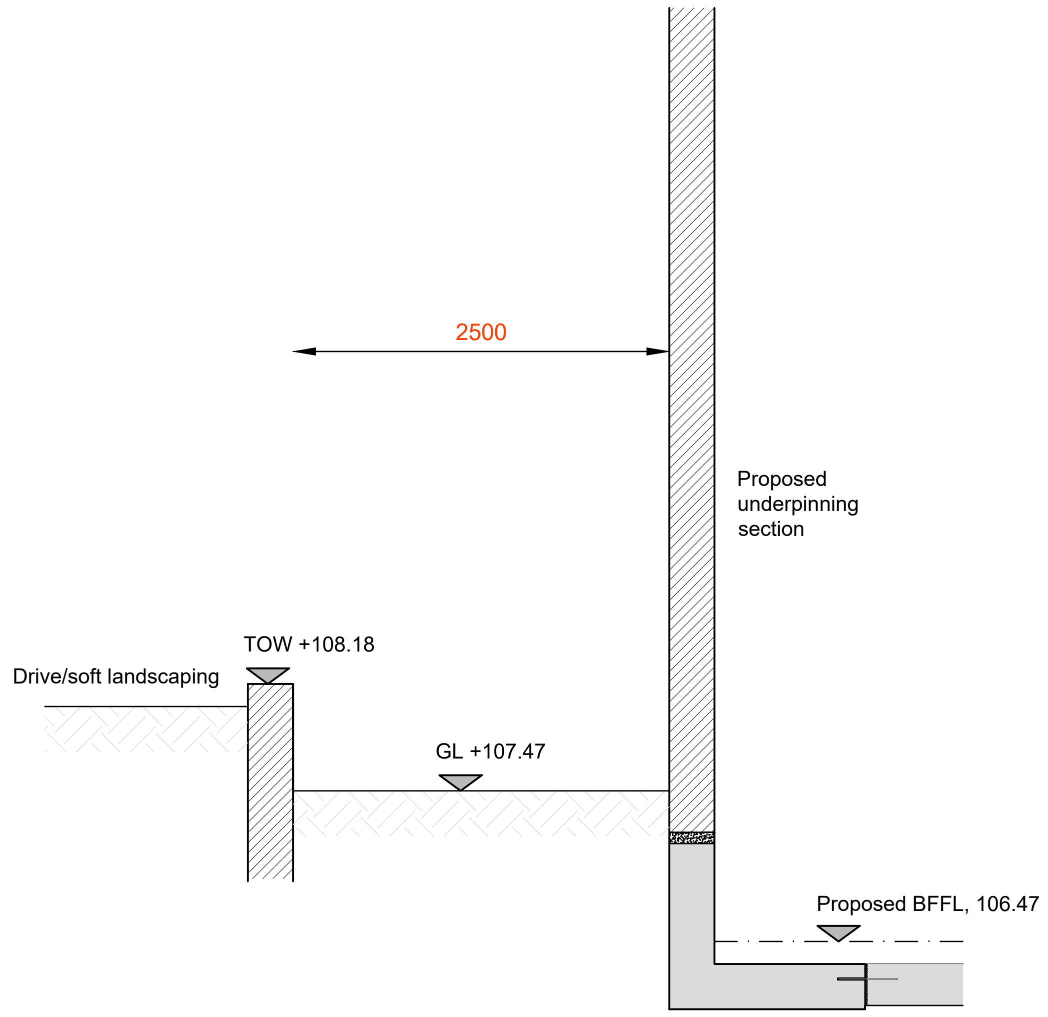
Scale 1:50



TP1 terminates at 106.050 foundation deeper than this

SECTION 2-2

Scale 1:50



SECTION 3-3

Scale 1:50

Rev	Description	Date	Chk	Apr
P1	-Issue for Information	04/06/18	AJW	ABW

Project No:	Scale @ A2:	Drawn By:
811365	As Indicated	A.J.W

Ingleton Wood

Property and Construction Consultants

Issuing office: London
T: 020 7680 4400
www.ingletonwood.co.uk

Vision, form and function

Project:
79 Redington Road
London
NW3 7RR

Client:
Mr & Mrs Tarn

Title:
External Sections

Drawing Number:
811365- IW - XX - XX - DR - S - 7030

Status:	Purpose of Issue:	Revision:
S2	Information	P1

Ingleton Wood

Billericay
Cambridge
Colchester
Hertford
London
Norwich

London
1 Alie Street
London E1 8DE
T: 020 7680 4400

www.ingletonwood.co.uk

Mr Robert Morley
Campbell Reith Consultant Engineers
Friars Bridge Court
41-45 Blackfriars Road
London SE1 8NZ

Our ref: 811365/AW/nf

5th June 2018

Dear Robert

79 Redington Road – Basement Impact Assessment Audit Response

Thank you for the audit dated June 2018 with regards to our proposals for the above address. Please accept this letter as our formal response to the queries detailed in Appendix 2 of your audit report.

Query No. 1 – Programme

Please find enclosed an outline works programme indicating the main phases and anticipated durations of work.

Query No. 2 – Stability

Please find attached our drawing 811365-IW-XX-XX-DR-S-7030 Rev P1 for your information.

This drawing details sections through the boundary of the site, 77 Redington Road, which is the only neighbouring property affected by the proposed works.

The sections clearly show that the adjacent structures will not be undermined by the proposed basement and therefore will be unaffected by the works.

Furthermore, we have calculated that, owing to the relatively shallow depths of excavation required for the proposals, 77 Redington Road will be outside the zone of influence of the excavations as detailed by CIRIA Report 760.

The structures that are within this zone, but not undermined by the proposed excavation, are a garden wall and a garage.

We have undertaken an assessment of these the structures in accordance with the Burland Categories as required by CPG Basements. We would summarise our conclusions as follows:-

Wall Reference	Burland Category
Section 1-1	Burland Category 0 (by inspection)
Section 2-2	Burland Category 0 (by inspection)
Section 3-3	Burland Category 0 (by inspection)

Query No. 3 – Stability

We have undertaken a review of your comments and consider that the dimensions taken by your check relate to the slab thickness and the tow of the retaining wall base. Please find attached our drawing 811365-7000-Rev P2 which demonstrates that the wall stem and base are in accordance with the calculations.

We also attach a further calculation, for clarification purposes only, which details the design for the external lightwell retaining wall, which has a 400mm thick wall.

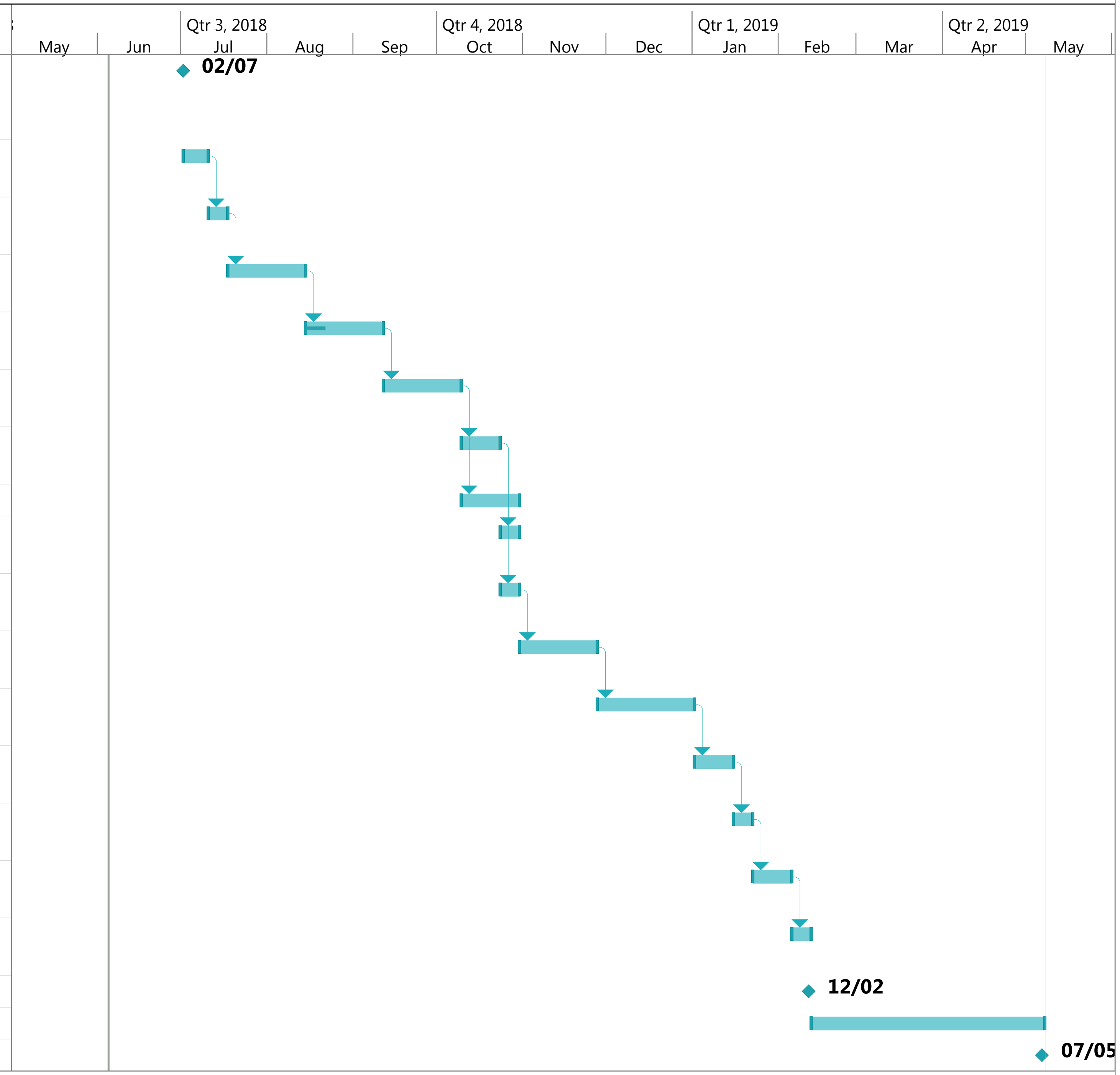
I trust that the above provides an acceptable response to your queries, and that the BIA does now meet the requirements of CPG Basements.

Yours sincerely

Andrew Wright BEng (Hons) CEng MICE MIStructE
Senior Associate
Ingleton Wood LLP
Andrew.wright@ingletonwood.co.uk

Enc.

ID		Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1			Possible Project start (subject to planning and statutory approvals)	0 wks	Mon 02/07/18	Mon 02/07/18		
2			Mobilisation and site set up	7 days	Mon 02/07/18	Tue 10/07/18		
3			Strip out and prepare for excavations	1 wk	Wed 11/07/18	Tue 17/07/18	2	
4			Underpin West elevation (boundary)	4 wks	Wed 18/07/18	Tue 14/08/18	3	
5			Underpin front and rear elevations	4 wks	Wed 15/08/18	Tue 11/09/18	4	
6			Underpin internal side wall	4 wks	Wed 12/09/18	Tue 09/10/18	5	
7			Underpin internal walls	2 wks	Wed 10/10/18	Tue 23/10/18	6	
8			Construct lightwell	3 wks	Wed 10/10/1	Tue 30/10/1ξ	6	
9			Construct basement drainage	1 wk	Wed 24/10/18	Tue 30/10/18	7	
10			Construct basement slabs	1 wk	Wed 24/10/18	Tue 30/10/18	7	
11			Construct ground floor	4 wks	Wed 31/10/18	Tue 27/11/18	10	
12			Construct rear extension	5 wks	Wed 28/11/18	Tue 01/01/19	11	
13			Prepare internal walls for new openings	2 wks	Wed 02/01/19	Tue 15/01/19	12	
14			Form openings for new internal walls	1 wk	Wed 16/01/19	Tue 22/01/19	13	
15			Prepare rear elevation for new openings	2 wks	Wed 23/01/19	Tue 05/02/19	14	
16			Form openings in rear elevaton	1 wk	Wed 06/02/19	Tue 12/02/19	15	
17			Structure complete	0 wks	Tue 12/02/1ξ	Tue 12/02/1ξ		
18			Fit out and finishes	12 wks	Wed 13/02/1	Tue 07/05/1ξ		
19			Project Complete	0 wks	Tue 07/05/1ξ	Tue 07/05/1ξ		



London

Friars Bridge Court
41- 45 Blackfriars Road
London, SE1 8NZ

T: +44 (0)20 7340 1700
E: london@campbellreith.com

Birmingham

Chantry House
High Street, Coleshill
Birmingham B46 3BP

T: +44 (0)1675 467 484
E: birmingham@campbellreith.com

Surrey

Raven House
29 Linkfield Lane, Redhill
Surrey RH1 1SS

T: +44 (0)1737 784 500
E: surrey@campbellreith.com

Manchester

No. 1 Marsden Street
Manchester
M2 1HW

T: +44 (0)161 819 3060
E: manchester@campbellreith.com

Bristol

Wessex House
Pixash Lane, Keynsham
Bristol BS31 1TP

T: +44 (0)117 916 1066
E: bristol@campbellreith.com

UAE

Office 705, Warsan Building
Hessa Street (East)
PO Box 28064, Dubai, UAE

T: +971 4 453 4735
E: uae@campbellreith.com

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A list of Members is available at our Registered Office at: Friars Bridge Court, 41- 45 Blackfriars Road, London SE1 8NZ
VAT No 974 8892 43