Scale 1:1250

0 10 20 30 40 50 60 70 80 90 100 m

Projection: British National Grid
12 November 2025 15:45

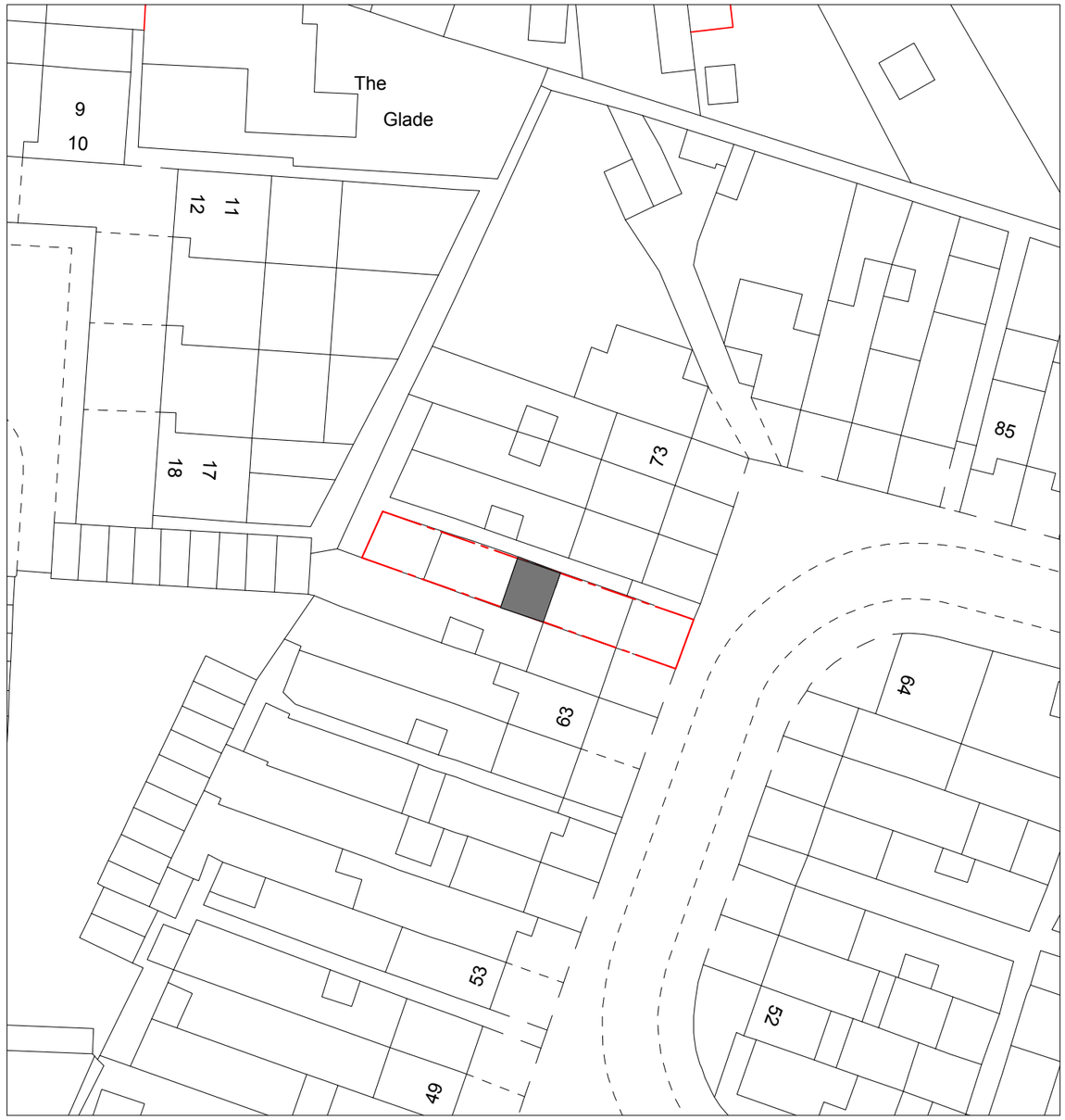
SITE LOCATION PLAN

Notes:
Contractors must verify all dimensions on site before commencing any work or shop drawings. This drawing must not be scaled. Use figured dimensions only. Subject to statutory approvals and survey.

Proposal

Boundary

Existing Block Plan (1:500)



Proposed Block Plan (1:500)

0 10 20 30 40 50m

SCALE: 1/ 500 @ A3

This is a '**Scheme Level Drawing**' and is intended to illustrate the general arrangement of the project proposals. As it stands this drawing does not include all of the detail necessary for a full plans building regulations application.

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Further detailed design / dwgs may be needed for this section.

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You may need to consult a Party Wall Surveyor for this section.

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Revisions: 1
a. date. 14/03/2025

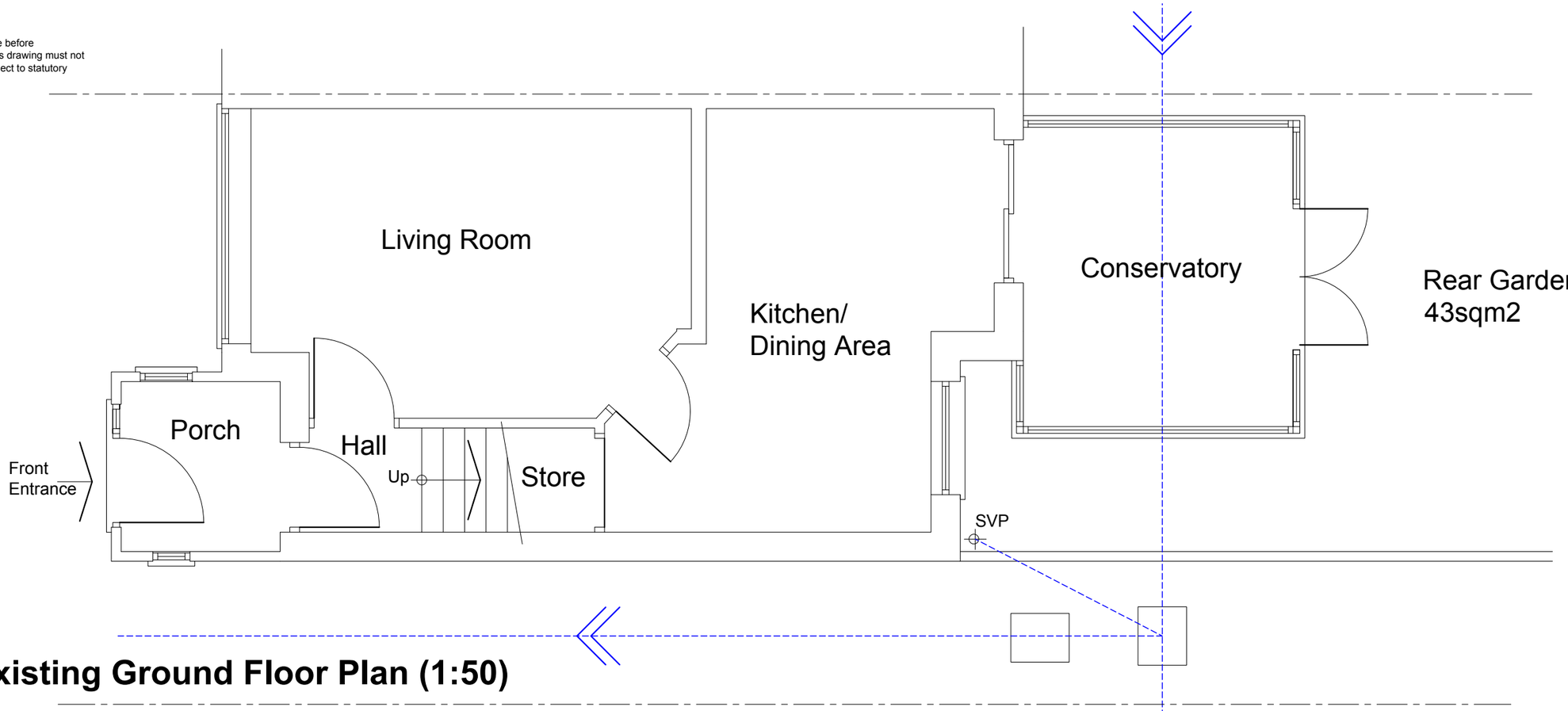
All dimensions are in millimetres
All dimensions to be checked on site

GG ARCHITECTURE
and Designs

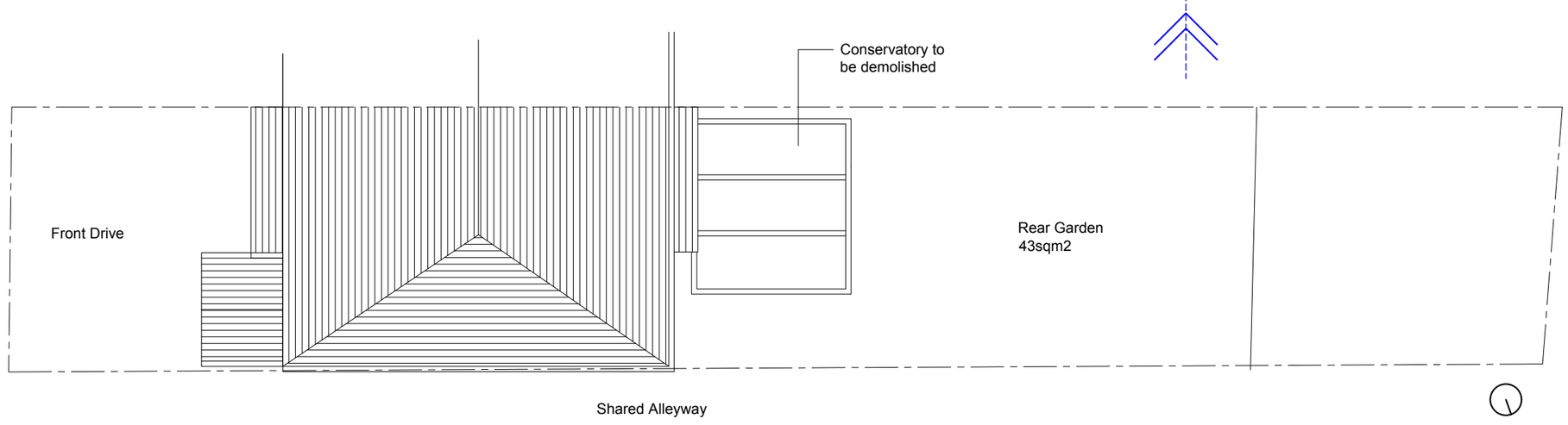
Tel: 07305302583
Email: Info@gg-architecture.co.uk

Drawing name: Existing & Proposed Block Plan			
	Job no: **AH 735**	Drawing no: **01**	Revision: **-**
	Scale: **1/500 @ A3**	Date: **12/11/2025**	Drawn by: **GG**
Project name: **67 Woodstock Garden, Hayes, UB4 8AH**			

Notes:
Contractors must verify all dimensions on site before commencing any work or shop drawings. This drawing must not be scaled. Use figured dimensions only. Subject to statutory approvals and survey.



Existing Ground Floor Plan (1:50)



Existing Site/Roof Plan (1:100)

0 1 2 3 4 5m
SCALE: 1/ 50 @ A3
0 2 4 6 8 10m
SCALE: 1/ 100 @ A3

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Revisions:
a. date.

All dimensions are in millimetres
All dimensions to be checked on site

GG ARCHITECTURE
and Designs

Tel: 07305302583
Email: Info@gg-architecture.co.uk

Drawing name: **Existing Plans**			
Job no: **AH 735**	Drawing no: **02**	Revision: **-**	
Scale: **1/100 @ A3**	Date: **12/11/2025**	Drawn by: **GG**	
Project name: **67 Woodstock Garden, Hayes, UB4 8AH**			

Notes:
Contractors must verify all dimensions on site before commencing any work or shop drawings. This drawing must not be scaled. Use figured dimensions only. Subject to statutory approvals and survey.

ALL DRAWINGS 735/01-06,
AND ENGINEER'S DETAILS TO BE READ TOGETHER

All electrical works will be designed, installed, inspected and tested in accordance BS 7671:2001 and certified by a NIC EIC registered electrician.

Switch (900 to 1100mm above floor) & socket outlet (450 above floor) heights to comply with Part M 4.30

Installers Electrical Installation Test Certificate to be provided to Local Authority and owner on completion

New External wall Type E1
silicone/ or sand and cement external render
100mm external blockwork
150mm cavity with full fill mineral wool insulation
100mm Aerated blockwork rated to 3.6N inner leaf
12.5mm plasterboard with 3.5mm skim finish.
Skins to be tied together with 300mm
stainless steel double triangular wall ties spaced 450mm vertically and 900mm horizontally.
U-Value = 0.18 W/m2K

New Doors:

Half Hour rated fire doors and frames; solidly into partitions: 4 panel doors - 198x762x44mm with 32 linings and 13 stops; fix ironmongery
- 1.5 pairs 100 s/s rising butt hinges

Floor Type F1:

New concrete slab
excavate to form new floor
On 150mm MOT Type II
50 mm sand blinding,
Polythene sheet 1200g guage DPM membrane above slab, lay 150mm concrete groundbearing slab, 100mm FF4000 insulation by Celotex, all joints tight butted and taped 70mm screed 15mm floor finish (TBC)
Target U Value 0.16W/m2 K

Note:
All drains to be checked and tested before casting new floor.
All unnecessary connections to be removed Offset footings and provide lintel over drain depth to be the same as or below existing drain. Drains to be tested fro water tightness using either an air or water test designed and installed to retain water seals in water traps under working conditions. All points discharging into system fitted with traps. All traps to be min 75 deep boxing in & packing voids with mineral wool Rodding eyes at changes in direction

Note:
All new drains connections drawn as preliminary before confirming layout of existing drainage system. Subject to on site conformation of existing layout and depth of the drains.

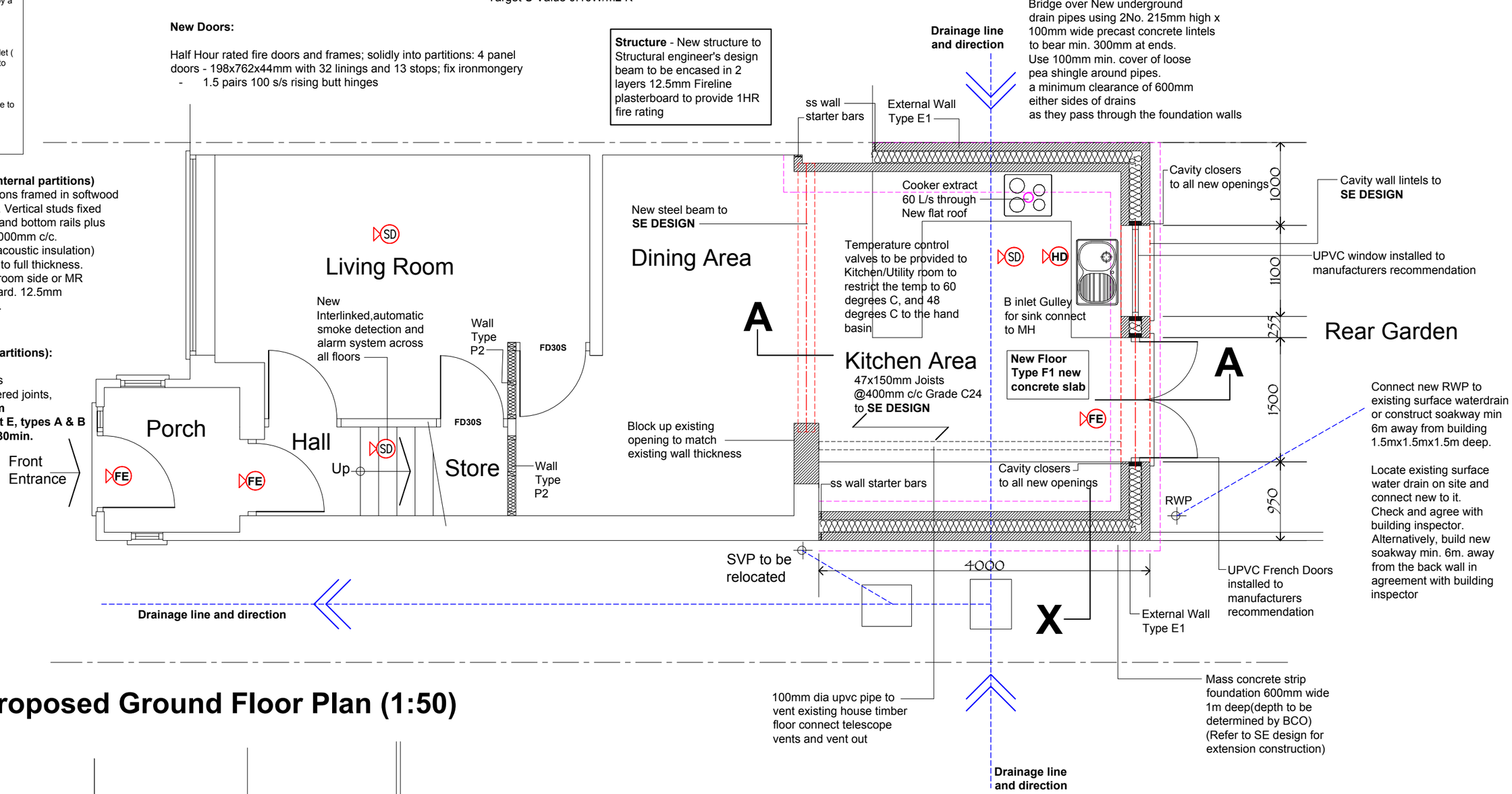
Above ground and rainwater drainage details including runs, connections and discharging points are to be agreed with BCO on site.

Structure - New structure to Structural engineer's design beam to be encased in 2 layers 12.5mm Fireline plasterboard to provide 1HR fire rating

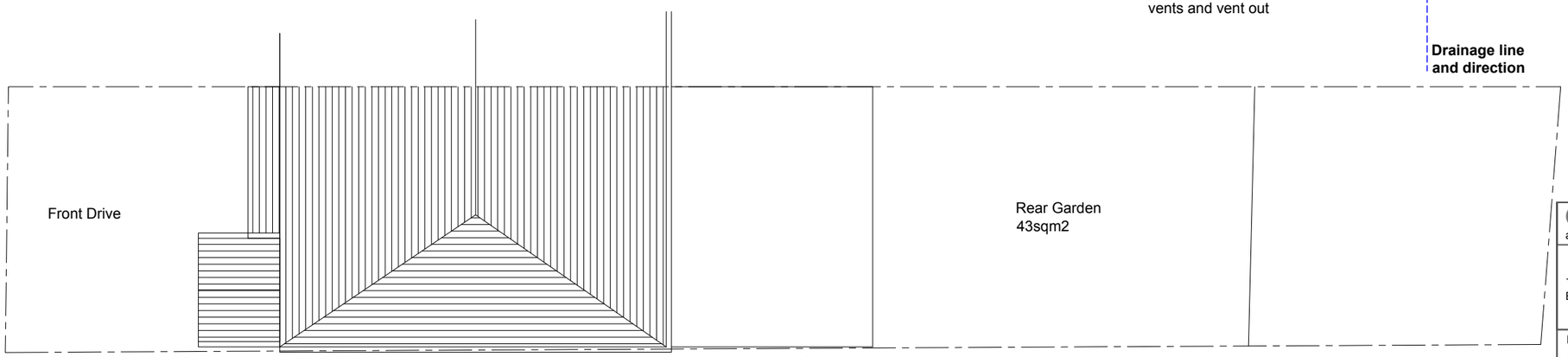
Internal Wall type P1: (internal partitions)
Internal timber stud partitions framed in softwood 50x100mm as SE design. Vertical studs fixed @ max. 400mm c/c. Top and bottom rails plus horizontal noggins max 1000mm c/c.
Mineral wool insulation/ (acoustic insulation) fitted tight between studs to full thickness.
Tile backer board to bathroom side or MR grade gypsum plasterboard. 12.5mm gypsum board elsewhere.

Internal Wall type P2
(Fire resisting internal partitions):

As above but with 2 layers
9mm plasterboard, staggered joints,
Thickness 120 or 145mm
Sound resistance to part E, types A & B
Part B - Fire resistance 30min.
Fire spread Class O



Proposed Ground Floor Plan (1:50)



Proposed Site/Roof Plan (1:100)

0 1 2 3 4 5m
SCALE: 1/ 50 @ A3

GG ARCHITECTURE and Designs	Drawing name: **Proposed Ground Floor Plan**		
Tel: 07305302583 Email: Info@gg-architecture.co.uk	Job no: **AH 735**	Drawing no: **03**	Revision: **-**
	Scale: **1/50 @ A3**	Date: **12/11/2025**	Drawn by: **GG**
Project name: **67 Woodstock Garden, Hayes, UB4 8AH**			

Notes:
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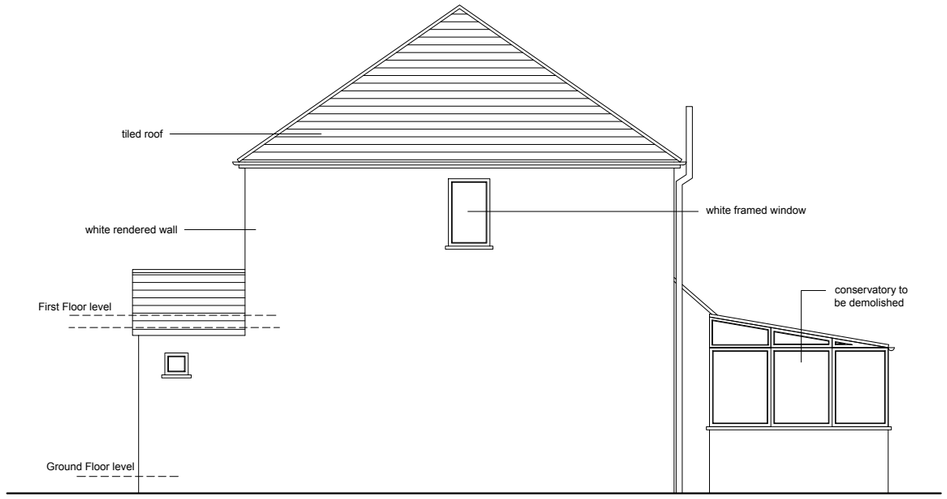
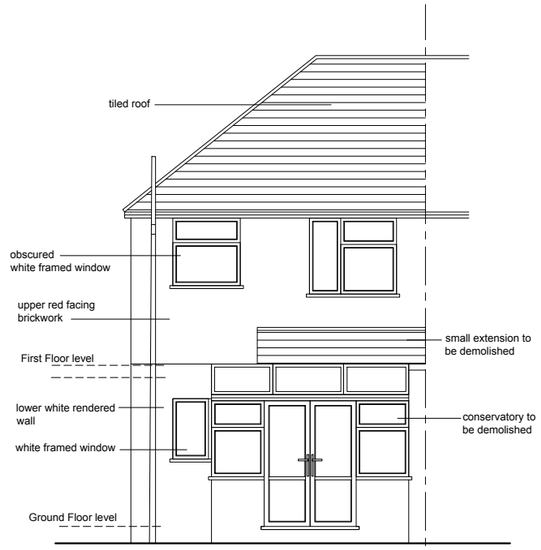
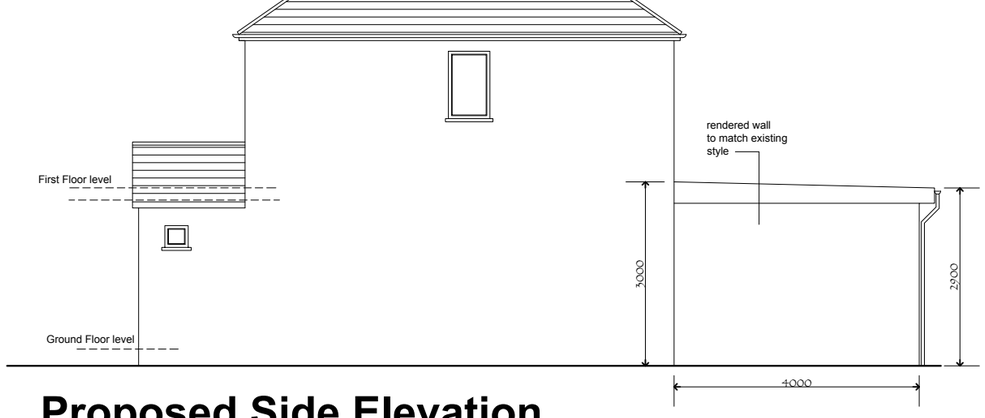


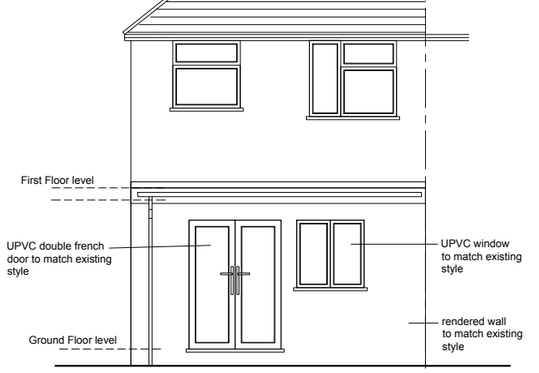
Existing Side Elevation



Existing Rear Elevation



Proposed Side Elevation



Proposed Rear Elevation

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Revisions:
a. date.

All dimensions are in millimetres
All dimensions to be checked on site

0 2 4 6 8 10m

SCALE: 1/ 100 @ A3

GG ARCHITECTURE
and Designs

Tel: 07305302583
Email: Info@gg-architecture.co.uk

Drawing name: Existing & Proposed Elevations			
Job no: **AH 735**	Drawing no: **04**	Revision: **-**	
Scale: **1/100 @ A3**	Date: **12/11/2025**	Drawn by: **GG**	

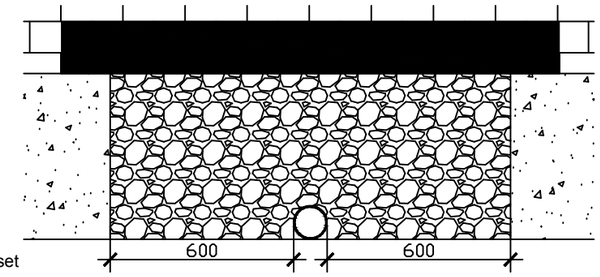
Project name:
67 Woodstock Garden, Hayes, UB4 8AH

Notes:
Contractors must verify all dimensions on site before commencing any work or shop drawings. This drawing must not be scaled. Use figured dimensions only. Subject to statutory approvals and survey.

ALL DRAWINGS 735/01-06,
AND ENGINEER'S DETAILS TO BE READ TOGETHER

Roof type 1 Warm deck flat roof:
grey single ply membrane flat roof or fiberglass roof bonded to 19mm OSB
150mm Roof insulation
on 10mm ply insulation with all joints taped as VCL, ply on firrings to fall 1 /40 on SC3 50x150mm s.w. rafters @ 400cc 12.5mm board and skim.

U-value = 0.11 W/m2K



Masonry over
150x100mm precast concrete lintel spanning over existing drain
150mm granular fill
New/ Existing Drains passing through foundations

Detail of bridging arrangement over Existing drains @ 1:20

Foundation depth to min. pipe invert level

NOTE: Any drains found when excivating and digging foundation. contractor must make a build over agreement with thames water.

All electrical works will be designed, installed, inspected and tested in accordance BS 7671:2001 and certified by a NIC EIC registered electrician.

Switch (900 to 1100mm above floor) & socket outlet (450 above floor) heights to comply with Part M 4.30

Installers Electrical Installation Test Certificate to be provided to Local Authority and owner on completion

SCALE: 1/ 20 @ A3

Structure - New structure to Structural engineer's design beam to be encased in 2 layers 12.5mm Fireline plasterboard to provide 1HR fire rating

Floor Type F1:

New concrete slab
excavate to form new floor
On 150mm MOT Type II
50 mm sand blinding,
Polythene sheet 1200g guage DPM membrane above slab, lay 150mm concrete groundbearing slab, 100mm FF4000 insulation by Celotex, all joints tight butted and taped 70mm screed 15mm floor finish (TBC)
Target U Value 0.16W/m2 K

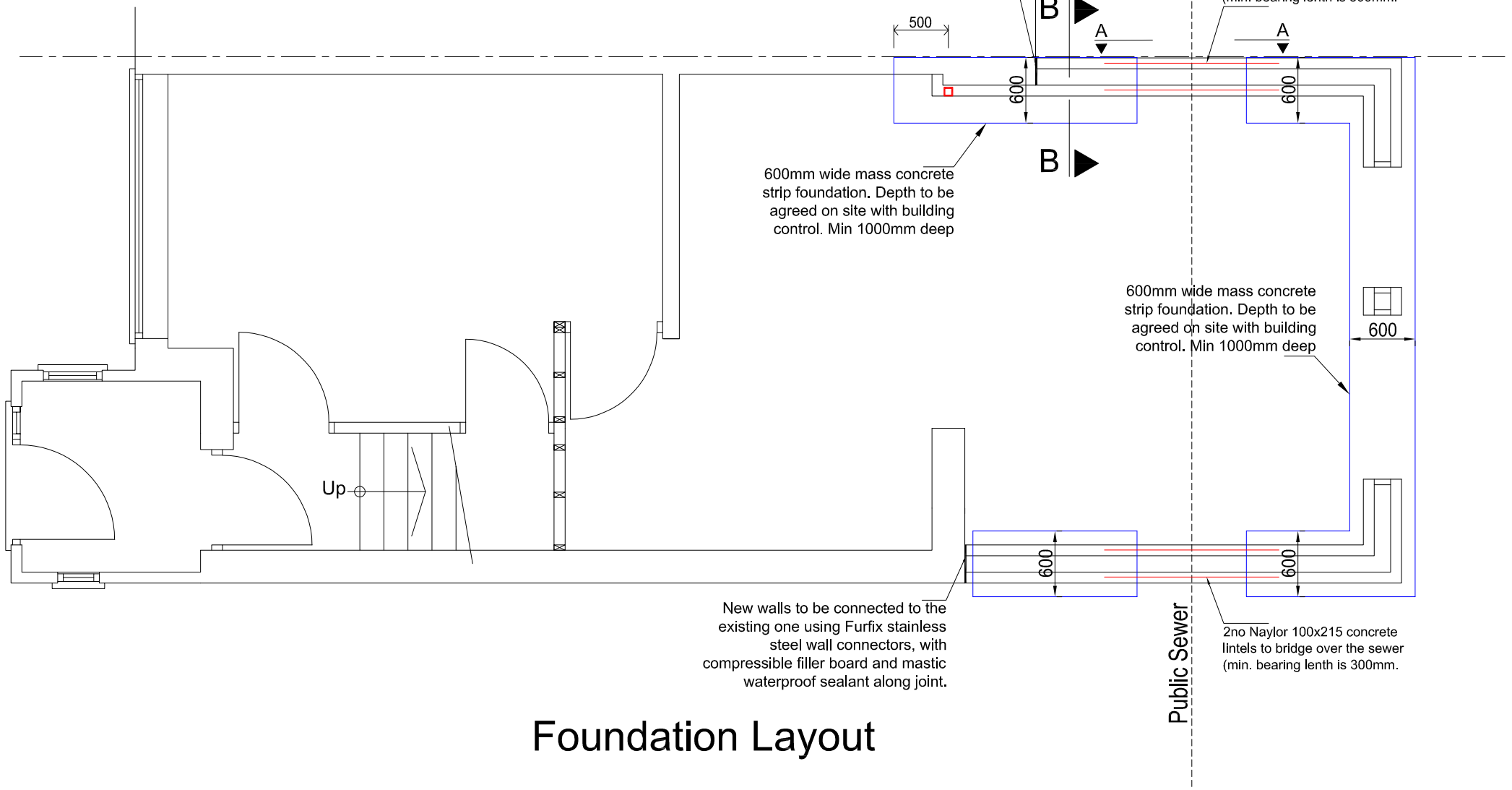
SECTION A-A (1:20)

GG ARCHITECTURE
and Designs

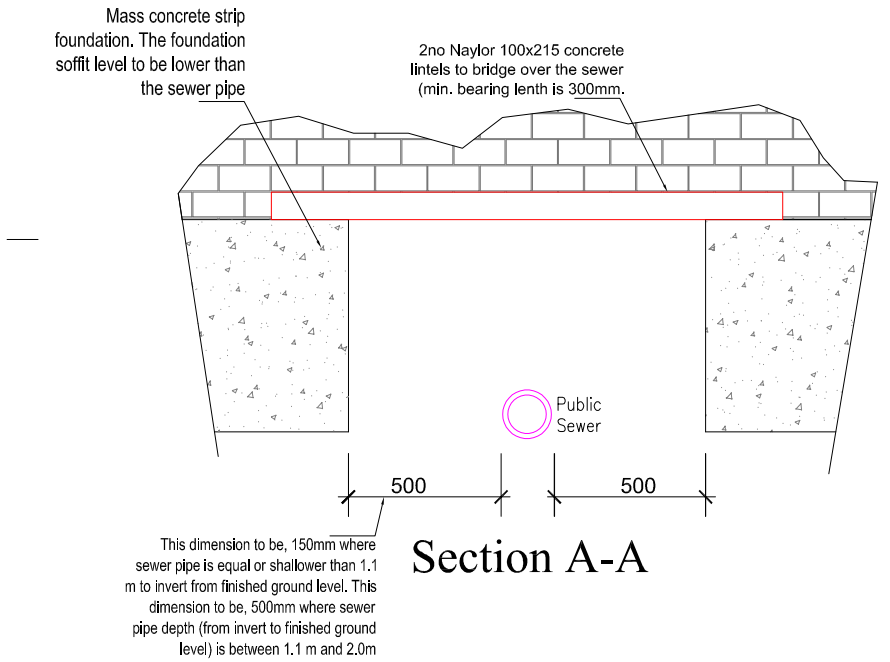
Tel: 07305302583
Email: Info@gg-architecture.co.uk

Drawing name: SECTION A-A			
Job no: AH 735	Drawing no: 05	Revision: -
Scale: 1/20 @ A3	Date: 12/11/2025	Drawn by: GG

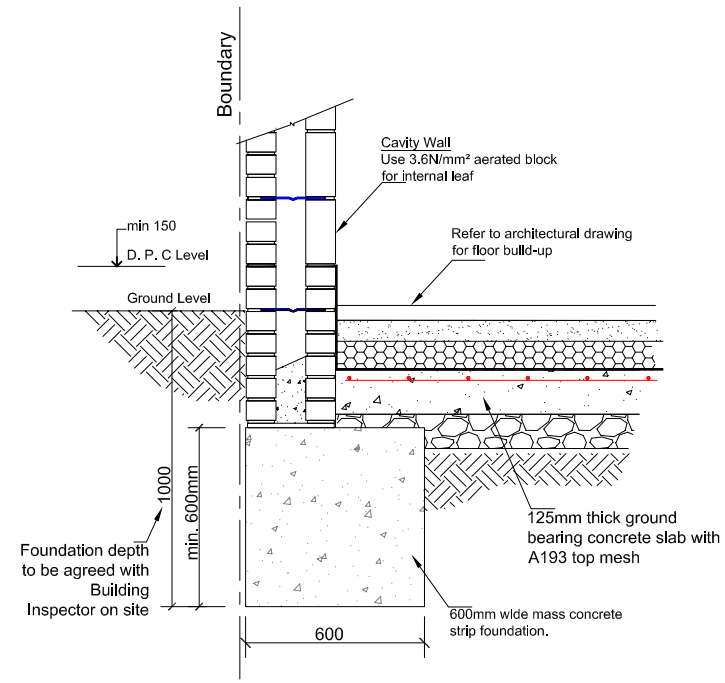
Project name:
67 Woodstock Garden, Hayes, UB4 8AH



Foundation Layout



Section A-A



Section B - B

Notes:

- Building Regulation Approval: The owners of the property are advised that an approval of the calculations and drawings by the Local Authority Building Control should be obtained prior to any ordering of material or fabrication. No liability is accepted for any changes that may be required as a result of work having commenced prior to such an approval having been obtained.

-This drawing remains the copyright of Highest Point Ltd. design and is not to be copied, altered or changed without permission.

- This drawing to be read in conjunction with architects and project specifications.
- Any discrepancy between this drawing and all other project drawings should be brought to the attention of Highest Point Ltd for clarification prior to commencing the works
- Local Authority's building inspector is to be informed by the contractor in writing at least 48 hours prior to the works starting on site and their agreement obtained that work can commence.

Structural Steelwork: All steel members grade to be BS EN 10025 S275 J0 (Hollow sections to be S355). Length of the beams and the columns should be provided by the contractor allowing minimum bearing. DO NOT SCALE THE DRAWING.

Steel Corrosion Protection: Preparation: Shot blast to SA2.5. Shop primer: Zinc phosphate (dft 75 micron)

Fire Protection to steel Beams & columns: Box around all steels with 50 x 50 s.w. framework and 2 layers of 12.5mm Fireline plasterboard with staggered joints and 3.5mm skim finish.

Pad stones: Pad stones to be grade C30 concrete. Beam bearing on padstones to be minimum 100mm unless otherwise noted specified on

Structural Timber: All timber grade C24 unless otherwise stated.Joists may be notched over bearing, maximum depth of notch 1/3 joist depth. Use steel beam with solid timber packing/plates bolted through web of beams M12@500 centres behind joists hangers and for and strap fixing.

Temporary Works: The contractor is to accept full responsibility for the stability and safety of the works during the total construction period. No undermining of existing structure is to be carried out prior to consultation of structural engineer

Highest Point Ltd
Consulting Design Office
3 Lodge Gardens
Beckenham
Kent, BR3 3DP
Tel: 020 3289 8804
ender@hpoint.co.uk

PROJECT:
67 Woodstock Gardens
Hayes, UB4 8AH

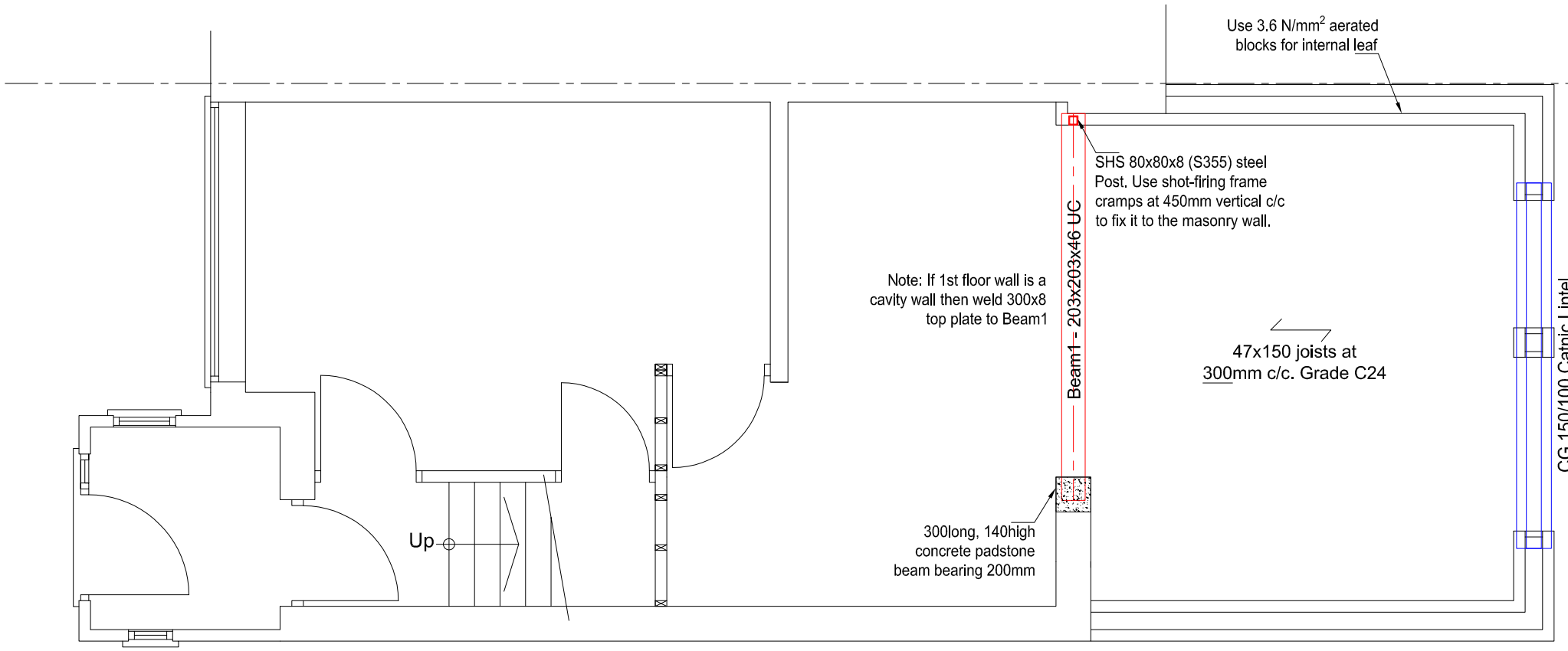
DRAWING:
Foundation

SCALE: 1:50 @ A3

DATE: 27 / 11 / 2025

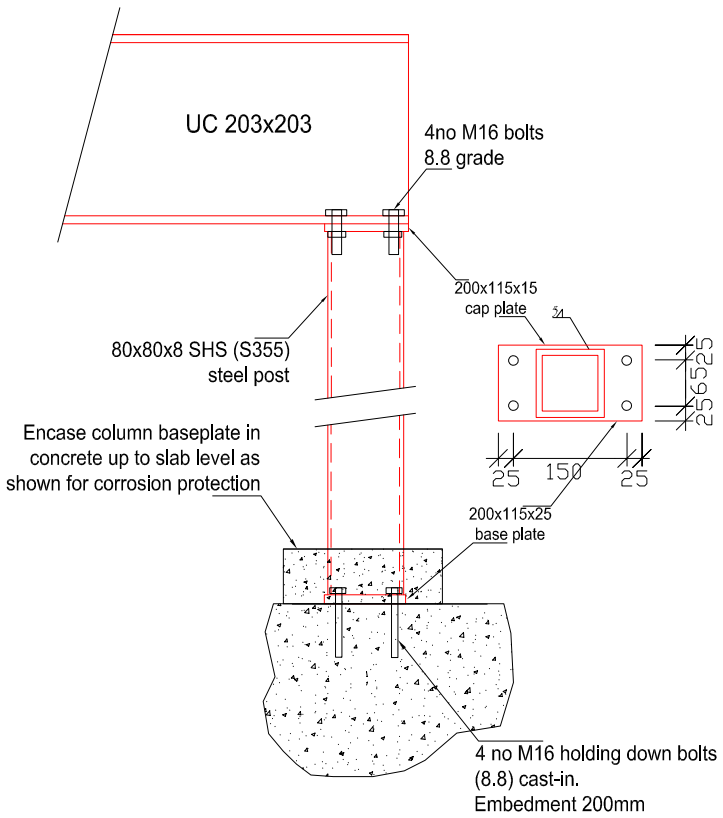
DWG NO. HP3104-STR/001

REV NO. C0



Ground Floor Ceiling Level Framing Layout

SHS Post Connection Details



Highest Point Ltd
Consulting Design Office
3 Lodge Gardens
Beckenham
Kent, BR3 3DP
Tel: 020 3289 8804
ender@hpoint.co.uk

PROJECT:
67 Woodstock Gardens
Hayes, UB4 8AH

DRAWING:
Ground Floor

SCALE: 1:50 @ A3

DATE: 27 / 11 / 2025

DWG NO. HP3104-STR/002

REV NO. C0

Notes:

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Structural Steelwork: All steel members grade to be BS EN 10025 S275 J0 (Hollow sections to be S355). Length of the beams and the columns should be provided by the contractor allowing minimum bearing. DO NOT SCALE THE DRAWING.

Steel Corrosion Protection: Preparation: Shot blast to SA2.5. Shop primer: Zinc phosphate (dft 75 micron)

Fire Protection to steel Beams & columns: Box around all steels with 50 x 50 s.w. framework and 2 layers of 12.5mm Fireline plasterboard with staggered joints and 3.5mm skim finish.

Pad stones: Pad stones to be grade C30 concrete. Beam bearing on padstones to be minimum 100mm unless otherwise noted specified on

Structural Timber: All timber grade C24 unless otherwise stated.Joists may be notched over bearing, maximum depth of notch 1/3 joist depth. Use steel beam with solid timber packing/plates bolted through web of beams M12@500 centres behind joists hangers and for and strap fixing.

Temporary Works: The contractor is to accept full responsibility for the stability and safety of the works during the total construction period. No undermining of existing structure is to be carried out prior to consultation of structural engineer

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3 Lodge Gardens
Beckenham
Kent, BR3 3DP
Tel: 020 3289 8804

STRUCTURAL CALCULATION

FOR

67 WOODSTOCK GARDENS, HAYES, UB4 8AH

Prepared By:
Ender Targan (structural engineer)
A member of Institution of Structural Engineers
(member No: 078372953)

Job Title: 67 Woodstock Gardens, Hayes, UB4 8AH
Proposed Project: Design of a rear extension.
Documents: Calculations and structural drawings,
Prepared by: Highest Point ltd, Mr Ender Targan
Date: 27 November 2025

Refer to engineering drawings HP3104- STR/001 and 002

1.0 DESIGN STATEMENT

1.1 INTRODUCTION

The following calculation submission report demonstrates the Structural Engineering principals used in the design 67 Woodstock Gardens project with *The Building Regulations 2000 Structure – Approved Document A*.

1.2 CODES OF PRACTICE

The design of the structure will be carried out in accordance with the following codes of practice:

Loading	BS6399	Part 1 (1996) Dead & Live Loads Part 3 (1988) Imposed Roof Loads
Concrete	BS8110	
Timber	BS5268	
Steelwork	BS5950	
Masonry	BS5628	

1.2 DESIGN PHILOSOPHY

All structural members are to be designed to be capable of withstanding all the applied loadings during construction, operation and maintenance of the building without any distress, failure, loss of function, damage or durability problems. They are to support the most onerous combinations of dead and imposed loads tending to produce either maximum ultimate stresses or deflection.

2.0 LOADS

Dead Loads
To be calculated as required.
Densities of typical materials are as follows:

Concrete	2400 kg/m^3
Steel	7850 kg/m^3
Masonry	2200 kg/m^3

Superimposed and Imposed Loads
Imposed loads
Floor = 1.50 kN/m^2
Roof (no access) = 0.60 kN/m^2

Dead Load
Timber Floor = 0.50 kN/m^2
Timber Floor with partitions = 0.8 kN/m^2
Roof (with tiles) = 0.80 kN/m^2
Roof (flat roof) = 0.60 kN/m^2

LOADING DETAILS

FLAT ROOF (Dead Load)

3 layers bitumen roofing felt	0.15 kN/m^2
Timber frame + 19mm plywood	0.20 kN/m^2
Ceiling finish	0.17 kN/m^2
100mm thick hard insulation	0.08 kN/m^2
Total	**0.60 kN/m^2**

PITCHED ROOF (Dead Load)

Roof tiles	0.40 kN/m^2
Timber frame + battens	0.20 kN/m^2
Plasterboard finish + insulation	0.20 kN/m^2
Total	**0.80 kN/m^2**

TIMBER FLOOR (Dead Load)

Finishes	0.10 kN/m^2
Timber frame + 19mm plywood	0.20 kN/m^2
Plasterboard finish + insulation	0.20 kN/m^2
Total	**0.50 kN/m^2**

Load Combinations

Loads are combined in all valid combinations of adverse and beneficial effects to obtain the most onerous load condition. The load combinations used are summarised below.

1.4 DL + 1.6 LL
1.2 DL + 1.2 LL + 1.2 WL
0.9 DL + 1.4 WL

Building Regulation Approval

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Important Notes for Builder

- **Beam spans shown within this document are to be used for calculation purposes only unless they are part of an instruction. Do not order steelwork based on these dimensions.**
- All span dimensions shown within this document have been taken from information supplied by the architect or client. We trust this information to be correct, but all span dimensions should be checked on-site by the contractor/fabricator prior to construction. Any discrepancies are to be reported to the engineer.
- These calculations are to be used in conjunction with all relevant architects and engineers drawings and specifications.
- The planning and installation of all temporary works and the stability of the structure during construction is the sole responsibility of the contractor.
- Where cranked beams are specified the joints are to be full-strength butt weld.

STEEL BEAM ANALYSIS & DESIGN (BS5950)

BEAM 1 (1 no 203x203x46 UC)

Dead Load

Masonry Wall	2.8m x 5.0kN/m^2 = 14.0 kN/m
Extension Roof	1.9m x 0.6kN/m^2 = 1.1 kN/m
First Floor Frame	1.2m x 0.8kN/m^2 = 1.0 kN/m
Roof Frame	2.4m x 0.8kN/m^2 = 1.9 kN/m

Live Load

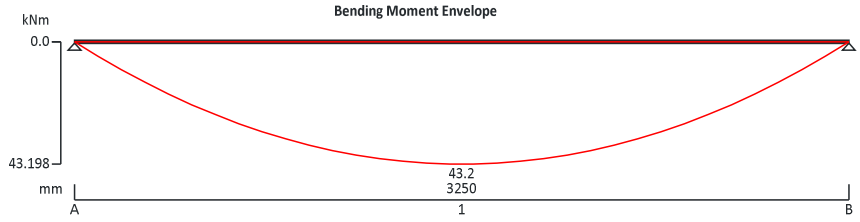
Extension Roof	1.9m x 0.6kN/m^2 = 1.1 kN/m
First Floor Frame	1.2m x 1.5kN/m^2 = 1.8 kN/m
Roof Frame	1.9m x 0.75kN/m^2 = 1.4 kN/m

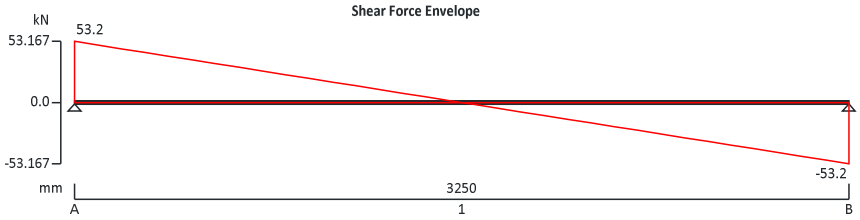
BEAM1 DESIGN (BS5950)

STEEL BEAM ANALYSIS & DESIGN (BS5950)

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

TEDDS calculation version 3.0.08





Support conditions

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

Applied loading

Beam loads — Dead self weight of beam × 1; Dead full UDL 18 kN/m; Imposed full UDL 4.3 kN/m

Load combinations

Load combination 1	Support A	Dead × 1.40
		Imposed × 1.60
		Dead × 1.40
		Imposed × 1.60
	Support B	Dead × 1.40
		Imposed × 1.60

Analysis results

Maximum moment	M_{max} = **43.2** kNm	M_{min} = **0** kNm
Maximum shear	V_{max} = **53.2** kN	V_{min} = **-53.2** kN
Deflection	δ_{max} = **3.5** mm	δ_{min} = **0** mm
Maximum reaction at support A	R_{A_max} = **53.2** kN	R_{A_min} = **53.2** kN
Unfactored dead load reaction at support A	R_{A_Dead} = **30** kN	
Unfactored imposed load reaction at support A	$R_{A\_Imposed}$ = **7** kN	
Maximum reaction at support B	R_{B_max} = **53.2** kN	R_{B_min} = **53.2** kN
Unfactored dead load reaction at support B	R_{B_Dead} = **30** kN	
Unfactored imposed load reaction at support B	$R_{B\_Imposed}$ = **7** kN	

Section details

Section type **UC 203x203x46 (British Steel Section Range 2022 (BS4-1))** Steel grade **S275**

Classification of cross sections - Section 3.5

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

Shear capacity - Section 4.2.3

Design shear force F_v = **53.2** kN Design shear resistance P_v = **241.4** kN

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment M = **43.2** kNm Moment capacity low shear M_c = **138** kNm

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment M_b = **100.8** kNm M_b / m_{LT} = **100.8** 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} = **13** mm Maximum deflection δ = **3.502** mm

PASS - Maximum deflection does not exceed deflection limit

300LONG, 140HIGH CONCRETE PADSTONE DESIGN (BS5628)

MASONRY BEARING DESIGN TO BS5628-1:2005

TEDDS calculation version 1.0.08

Masonry details

Masonry type	**Aggregate concrete blocks (25% or less formed voids)**		
Compressive strength	p_{unit} = **5.0** N/mm^2	Mortar designation	**iii**
Least horiz dim of units	l_{unit} = **100** mm	Height of units	h_{unit} = **215** mm
Masonry units	**Category II**	Construction control	**Normal**
Partial safety factor	γ_m = **3.5**	Characteristic strength	f_k = **4.8** N/mm^2
Leaf thickness	t = **215** mm	Effective wall thickness	t_{ef} = **215** mm
Wall height	h = **2600** mm	Effective height of wall	h_{ef} = **2600** mm

Bearing details

Beam spanning out of plane of wall

Width of bearing	B = **100** mm	Length of bearing	l_b = **100** mm
Edge distance	x_{edge} = **1000** mm		

Loading details

Concentrated dead load	G_k = **30** kN	Concentrated imposed load	Q_k = **7** kN
Design concentrated load	F = **52.9** kN		
Distributed dead load	g_k = **0.0** kN/m	Distributed imposed load	q_k = **0.0** kN/m
Design distributed load	f = **0.0** kN/m		

Masonry bearing type

Bearing type	**Type 2**	Bearing safety factor	γ_{bear} = **1.50**

Check design bearing without a spreader

Design bearing stress f_{ca} = **5.292** N/mm^2 Allowable bearing stress f_{cp} = **2.063** N/mm^2

FAIL - Design bearing stress exceeds allowable bearing stress, use a spreader

Spreader details

Length of spreader l_s = **300** mm Depth of spreader h_s = **100** mm

Edge distance s_{edge} = **900** mm

Spreader bearing type

Bearing type **Type 2** Bearing safety factor γ_{bear} = **1.50**

Check design bearing with a spreader

Loading acts at midpoint of spreader

Design bearing stress f_{ca} = **0.820** N/mm^2 Allowable bearing stress f_{cp} = **2.063** N/mm^2

PASS - Allowable bearing stress exceeds design bearing stress

Check design bearing at 0.4 × h below the bearing level

Design bearing stress f_{ca} = **0.115** N/mm^2 Allowable bearing stress f_{cp} = **0.469** N/mm^2

PASS - Allowable bearing stress at 0.4 × h below bearing level exceeds design bearing stress

47X150 JOIST DESIGN (BS5268)

TIMBER JOIST DESIGN (BS5268-2:2002)

Tedds calculation version 1.1.04

Joist details

Joist breadth b = **47** mm Joist depth h = **150** mm

Joist spacing s = **300** 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} = **3750** mm

Section properties

Second moment of area I = **13218750** mm^4 Section modulus Z = **176250** mm^3

Loading details

Joist self weight F_{swt} = **0.02** kN/m Dead load F_{d_udl} = **0.60** 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 = **0.675** kNm Design shear force V = **0.720** kN

Design support reaction R = **0.720** kN Design deflection δ = **7.100** mm

Check bending stress

Permissible bending stress σ_{m_adm} = **11.130** N/mm^2 Applied bending stress σ_{m_max} = **3.832** 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} = **0.153** 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} = **0.153** N/mm^2

PASS - Applied bearing stress within permissible limits

Check deflection

Permissible deflection δ_{adm} = **11.250** mm Actual deflection δ = **7.100** mm

PASS - Actual deflection within permissible limits

Consider short term loads

Design bending moment M = **1.203** kNm Design shear force V = **1.283** kN

Design support reaction R = **1.283** kN Design deflection δ = **10.912** mm

Check bending stress

Permissible bending stress σ_{m_adm} = **13.355** N/mm^2 Applied bending stress σ_{m_max} = **6.824** 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} = **0.273** 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} = **0.273** N/mm^2

PASS - Applied bearing stress within permissible limits

Check deflection

Permissible deflection δ_{adm} = **11.250** mm Actual deflection δ = **10.912** mm

PASS - Actual deflection within permissible limits

SHS 80X80X8 POST POST DESIGN (BS5950)

STEEL MEMBER DESIGN (BS5950)

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

TEDDS calculation version 3.0.08

Section details

Section type	**SHS 80x80x8.0 (Tata Steel Celsius (Gr355 Gr420))**
Steel grade	**S355**

From table 9: Design strength p_y

Thickness of element	t = **8.0** mm
Design strength	p_y = **355** N/mm^2
Modulus of elasticity	E = **205000** N/mm^2

Lateral restraint

Distance between major axis restraints L_x = **2800** mm

Distance between minor axis restraints L_y = **2800** mm

Effective length factors

Effective length factor in major axis K_x = **1.00**

Effective length factor in minor axis K_y = **1.00**

Effective length factor for lateral-torsional buckling K_{LT} = **1.00**

Classification of cross sections - Section 3.5

$\varepsilon = \sqrt{[275\ N/mm^2 / p_y]}$ = **0.88**

Web - major axis - Table 12

Depth of section $d = D - 3 \times t$ = **56** mm

Stress ratios $r1 = \min(F_c / (2 \times d \times t \times p_{yw}), 1)$ = **0.167**

$r2 = F_c / (A \times p_{yw})$ = **0.067**

$d / t = 8.0 \times \varepsilon <= \max(64 \times \varepsilon / (1 + r1), 40 \times \varepsilon)$ Class 1 plastic

Flange - major axis - Table 12

Width of section $b = B - 3 \times t$ = **56** mm

$b / t = 8.0 \times \varepsilon <= 40 \times \varepsilon$ Class 3 semi-compact

Section is class 3 semi-compact

Moment capacity - Section 4.2.5

Design bending moment M = **5.3** kNm

Effective plastic modulus - Section 3.5.6

Limiting value for class 2 compact flange $\beta_{2f} = \min(32 \times \varepsilon, 62 \times \varepsilon - 0.5 \times d / t)$ = **28.165**

Limiting value for class 3 semi-compact flange $\beta_{3f} = 40 \times \varepsilon$ = **35.206**

Limiting value for class 2 compact web $\beta_{2w} = \max(80 \times \varepsilon / (1 + r1), 40 \times \varepsilon)$ = **60.355**

Limiting value for class 3 semi-compact web $\beta_{3w} = \max(120 \times \varepsilon / (1 + 2 \times r2), 40 \times \varepsilon)$ = **93.171**

Effective plastic modulus - cl.3.5.6.3

$S_{eff} = \min(Z + (S - Z) \times \min([(\beta_{3w} / (d / t) - 1) / (\beta_{3w} / \beta_{2w} - 1)], [(\beta_{3f} / (b / t) - 1) / (\beta_{3f} / \beta_{2f} - 1)]), S)$ = **59511** mm^3

Moment capacity low shear - cl.4.2.5.2 $M_c = \min(p_y \times S_{eff}, 1.2 \times p_y \times Z)$ = **20.2** kNm

Effective length for lateral-torsional buckling - Section 4.3.5

Effective length for lateral torsional buckling $L_E = 1.0 \times L_y$ = **2800** mm

Slenderness ratio $\lambda = L_E / r_{yy}$ = **96.224**

Equivalent slenderness - Annex B.2.6.1

Torsion constant — J = **3117202** mm^4

$\gamma_b = (1 - I_{yy} / I_{xx}) \times (1 - J / (2.6 \times I_{xx}))$ = **0.000**

$\phi_b = [S_{xx}^2 \times \gamma_b / (A \times J)]^{0.5}$ = **0.000**

Ratio - cl.4.3.6.9 — $\beta_W = S_{eff} / S_{xx}$ = **1.000**

Equivalent slenderness — $\lambda_{LT} = 2.25 \times \sqrt{[\ \phi_b \times \lambda \times \beta_W]}$ = **0.000**

Limiting slenderness - Annex B.2.2 — $\lambda_{L0} = 0.4 \times (\pi^2 \times E / p_y)^{0.5}$ = **30.198**

$\lambda_{LT} < \lambda_{L0}$ - No allowance need be made for lateral-torsional buckling

Buckling resistance moment - Section 4.3.6.4

Bending strength — $p_b = p_y$ = **355** N/mm^2

Buckling resistance moment — $M_b = p_b \times S_{eff}$ = **21.1** kNm

PASS - Moment capacity exceeds design bending moment

Compression members - Section 4.7

Design compression force — F_c = **53** kN

Effective length for major (x-x) axis buckling - Section 4.7.3

Effective length for buckling — $L_{Ex} = L_x \times K_x$ = **2800** mm

Slenderness ratio - cl.4.7.2 — $\lambda_x = L_{Ex} / r_{xx}$ = **96.224**

Compressive strength - Section 4.7.5

Limiting slenderness — $\lambda_0 = 0.2 \times (\pi^2 \times E / p_y)^{0.5}$ = **15.099**

Strut curve - Table 23 — a

Robertson constant — α_x = **2.0**

Perry factor — $\eta_x = \alpha_x \times (\lambda_x - \lambda_0) / 1000$ = **0.162**

Euler stress — $p_{Ex} = \pi^2 \times E / \lambda_x^2$ = **218.5** N/mm^2

$\phi_x = (p_y + (\eta_x + 1) \times p_{Ex}) / 2$ = **304.5** N/mm^2

Compressive strength - Annex C.1 — $p_{cx} = p_{Ex} \times p_y / (\phi_x + (\phi_x^2 - p_{Ex} \times p_y)^{0.5})$ = **181.4** N/mm^2

Compression resistance - Section 4.7.4

Compression resistance - cl.4.7.4 — $P_{cx} = A \times p_{cx}$ = **405.6** kN

PASS - Compression resistance exceeds design compression force

Effective length for minor (y-y) axis buckling - Section 4.7.3

Effective length for buckling — $L_{Ey} = L_y \times K_y$ = **2800** mm

Slenderness ratio - cl.4.7.2 — $\lambda_y = L_{Ey} / r_{yy}$ = **96.224**

Compressive strength - Section 4.7.5

Limiting slenderness — $\lambda_0 = 0.2 \times (\pi^2 \times E / p_y)^{0.5}$ = **15.099**

Strut curve - Table 23	a
Robertson constant	α_y = **2.0**
Perry factor	$\eta_y = \alpha_y \times (\lambda_y - \lambda_0) / 1000$ = **0.162**
Euler stress	$p_{Ey} = \pi^2 \times E / \lambda_y^2$ = **218.5** N/mm^2
	$\phi_y = (p_y + (\eta_y + 1) \times p_{Ey}) / 2$ = **304.5** N/mm^2
Compressive strength - Annex C.1	$p_{cy} = p_{Ey} \times p_y / (\phi_y + (\phi_y^2 - p_{Ey} \times p_y)^{0.5})$ = **181.4** N/mm^2

Compression resistance - Section 4.7.4

Compression resistance - cl.4.7.4	$P_{cy} = A \times p_{cy}$ = **405.6** kN

PASS - Compression resistance exceeds design compression force

Compression members with moments - Section 4.8.3

Comb.compression & bending check - cl.4.8.3.2	$F_c / (A \times p_y) + M / M_c$ = **0.330**

PASS - Combined bending and compression check is satisfied

Member buckling resistance - Section 4.8.3.3

Max major axis moment governing M_b	$M_{LT} = M_x$ = **5.30** kNm
Equivalent uniform moment factor for major axis flexural buckling	
	m_x = **1.000**
	m_y = **1.000**
Buckling resistance checks - cl.4.8.3.3.3	$F_c / P_{cx} + m_x \times M / M_c \times (1 + 0.5 \times F_c / P_{cx})$ = **0.411**
	$F_c / P_{cy} + 0.5 \times m_{LT} \times M_{LT} / M_{cx}$ = **0.262**

PASS - Member buckling resistance checks are satisfied