Ref: 23/54121
Date: Nov' 2023
Prepared by: T.Garrod

CLIENT: -
Leconfield Property Group,
21-23 Ives Street,
Chelsea,
London,
SW3 2ND

PROJECT: -
34 Belgrave Mews South
Belgravia
London
SW1X 8BT

Structural Engineering Notes Including Construction Method Statement

LECONFIELD
Property Group

D S A

Consulting Structural & Civil Engineers

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Contents

1.0 Introduction

David Smith Associates Consulting Structural & Civil Engineers have been commissioned by Leconfield Property Group on behalf of the property owners to carry out a construction method statement for the redevelopment of 34 Belgrave Mews South, Belgravia, London, SW1X 8BT.

This report has been developed with reference to The City of Westminster Basement Policy CM28.1 and Supplementary Pre-Planning Document to ensure that the key structural engineering planning considerations are addressed.

This report forms part of the application for planning permission for the proposed subterranean works to this property.

1.1 Statement of Objectives

This study provides research and analysis of the existing structure for the proposed single storey basement. Whilst the study identifies the existing site's capacity for the new construction there are two primary objectives of the study.

- How the proposed basement structure is to be constructed? This includes proposed construction materials, layout of the proposed temporary structural framework and the temporary sequence of works.
- How the proposed superstructure is to be constructed? This includes proposed construction materials, layout of the proposed structural framework, allowable loadings and temporary works.

1.2 Overview of Research

DSA have attended site to ascertain the existing structural format of the property, including the existing foundation details and bearing stratum on site. The above site investigations, including the recommendations given in the Geotechnical Report, form the basis of our design proposal.

This documentation focused on the proposed method of construction and method of works for the basement structure including small elements of architectural information. In addition to this, we have reviewed the preliminary geotechnical report and currently base our designs on the data within the document.

This document is based upon the planning drawings produced by the Architect, Lewis Stroud Architects Ltd and should be read in conjunction with their current drawings and documentation.

1.3 Structural Appraisal

British Standards and relevant Codes of Practice have been used in the preparation of our structural analysis. The codes of practice used within the assessment listed in the below table.

Loadings	[BS 6399 - Part 1:1996, Part 2:1997, Part 3:1988] [BS 648:1964]
Concrete	[BS 8110 - Part 1:1997, Part 3:1985] [BS 8007: 1987]
Foundations	[BS 8004:1986] [BS 8002: 1994]
Timber	[BS 5268 - Part 2:2002]
Masonry	[BS 5628 - Part 1:2005, Part 2:2005, Part 3:2005]
Steelwork	[BS 5950 - Part 1:2000, Part 3:1990, Part 5:1987, Part 8:1990] [BS 2853:1957]
Temporary Works	[BS 5975: 2019]

2.0 Research/Building Appraisal

2.1 Site Location

34 Belgrave Mews south is located centrally on Belgrave Mews leading off Belgrave place to the South-West and Upper Belgrave Street to the North-East. The property has no front gardens but has a small rear garden.

The property is adjoined to its neighbours, 32 & 36 Belgrave Mews South with 11 Eaton Place Crescent to the rear. The neighbouring properties on Belgrave Mews South are of comparable footprint and height. The age of the properties and its neighbours' date to the early 19^{h} Century.

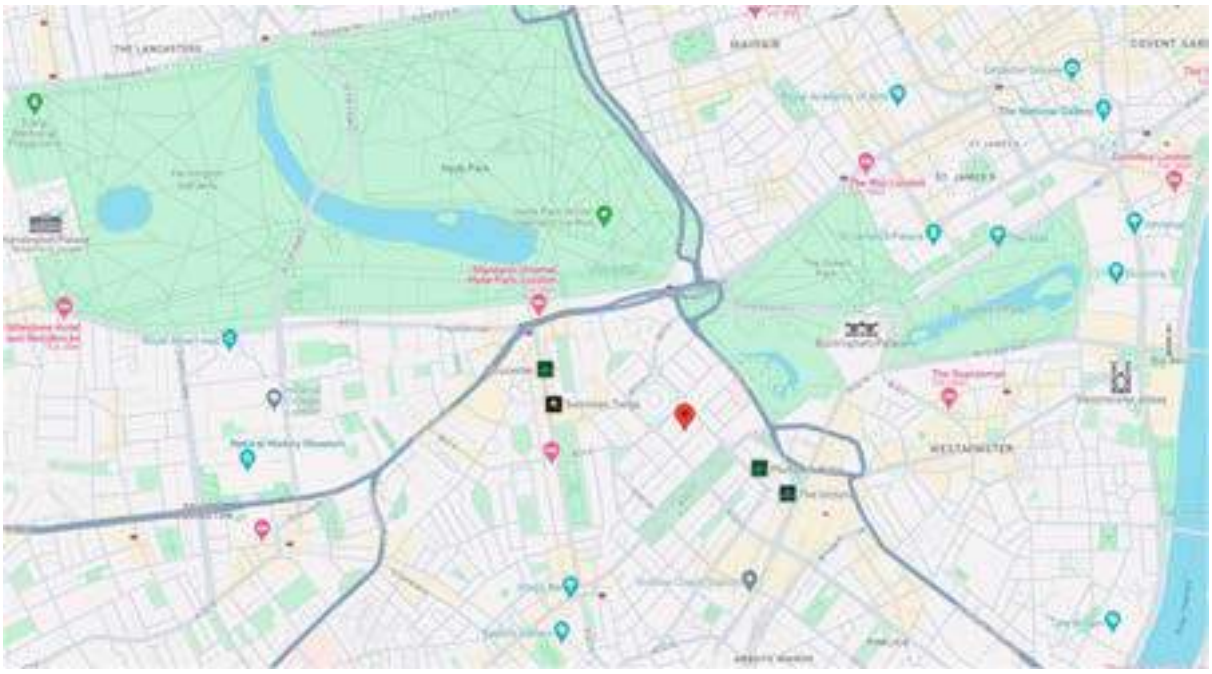


Figure 1 from Google Maps – 34 Belgrave Mews South

London Tube maps indicate that the property is approximately 500m on plan from the Piccadilly Line, 600m from the Victoria Line and 470m from the Circle Line.

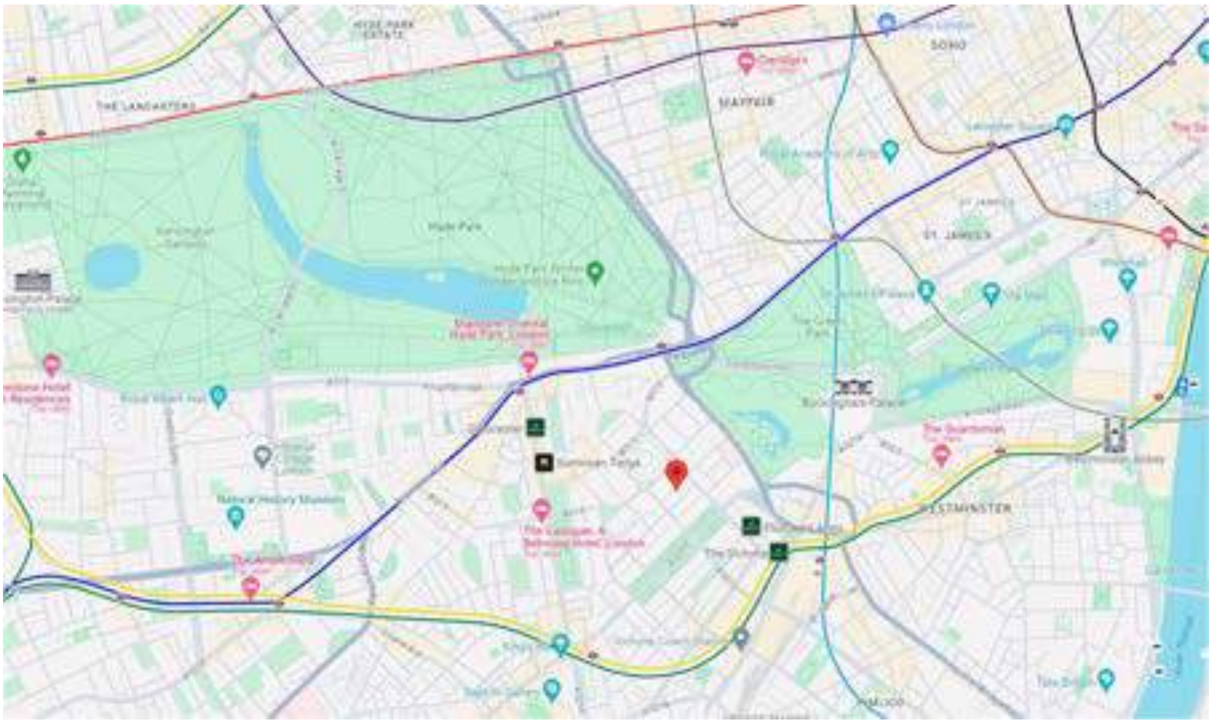


Figure 2 from Google Maps – Proximity of Tube Lines

2.2 Existing Structure Summary

The properties on Belgrave South Mews were constructed during the early to mid 19th Century during the development of the area by Richard Grosvenor who constructed a number of cottage and stable buildings along the narrow street.

Given the age and type of property, it can be reasonably assumed that the structure is of traditional construction with load-bearing masonry walls supporting floors and cut timber / concrete roof. The house is currently two storeys.

The existing properties are of a loadbearing masonry construction to external and party walls with a combination of masonry and timber internal walls. Floor structures are of a timber construction generally with a timber cut roof.

The existing foundations are a combination of shallow stepped brick corbels and concrete footings which were formed during the development of the basements to 32 Belgrave Mews south. The original foundations are founded into the band of made ground at a depth of 500 to 1250mm below ground levels. Refer Ground & Water Report for details.

The stability of the existing structure is provided by the partially terraced nature, with floors and roofs acting as diaphragms to transfer any horizontal forces into the masonry walls. The roof and floor structure help to laterally restrain the front and rear walls to the property.

To the side of the property, 32 Belgrave Mews South has a basement structure of a similar depth to that proposed for 34 Belgrave Mews. Therefore, only minor works are required at this location, as the existing underpinning is sufficient to act as a party wall between the two structures.

Existing architectural drawings indicate the layout of the existing structures.

The existing structure is generally in adequate structural condition and has been left unoccupied for several years. Trial pits were dug on the walls to be underpinned as part of the proposed alterations; this is to determine the detail of the existing foundations.

3.0 Proposed Structure

3.1 Structural Proposals

The principle elements to the proposed re-development of the property is the construction of a new single storey basement, and remodelling of the internal layout.

The basement structure approximately reflects the footprint of the existing property and is approximately 60m² in area at basement level and 160m^3 in volume. The formation level for the proposed structure is at basement level, which is approximately 4.0m below the existing external levels to the front of the property.

The new development will comprise of a four-storey structure including the new basement structure. The existing roof structure and internal layouts are to be modified.

The new roof structure to the house will be constructed from a combination of timber and steel frame structure to replicate the current roof arrangement to surrounding properties. The steel frame will be supported from party and external walls. Timber cut roof members will span between the principle steel roof beams to create the roof structure.

The roof structure has been designed in such a way that it will act as an independent structure not relying on the neighbouring properties for lateral stability.

The new basement structure will be constructed using traditional reinforced concrete retaining walls to the existing loadbearing masonry walls. This construction will aid in keeping the excavated basement area dry during the construction process.

A reinforced concrete shell will be constructed as the permeant basement structure. The basement structure floor will be constructed using a traditional concrete slab. The slab assists in propping the base of the concrete walls between elevations to assist in the prevention of sliding and overturning.

The basement structure will form a watertight enclosure by using a combination of water resistant slurry to the face and between sections of retaining wall. Additionally, an internal waterproof drainage system (Delta Membrane Systems) will be used to prevent the ingress of water.

New steel framework will be provided at floor levels to provide adequate support to the proposed new walls and floor structures during the new construction. These steel frames will be supported from external party walls with some intermediate support.

New internal partitions and external walls will be constructed in masonry and lightweight stud to ensure that additional dead loadings are minimised. Structural walls to staircases, and service risers will be constructed in traditional blockwork construction.

We confirm that the provision of the reinforced concrete retaining walls and special foundations will be suitable for the proposed basement extension. The vertical and horizontal loadings from the structures above will be transferred down the underpinning and the load distributed beneath. This distribution of load will help spread the increased loads from the vertical extension. The construction of the reinforced concrete retaining walls is cast in a sequenced bay formation which will reduce the risk of movement to party walls. This is an accepted method of construction and we see no problems with the structural proposals.

3.2 Loadings

The assessment of the existing building has been based on the following proposed Imposed Loadings.

Typical Residential	1.5kN/m²
Toilets/stairs/corridors/landings	1.5kN/m²
Lightweight Partitions	1.0kN/m²
Gym	5.0kN/ m²

Proposed Dead Loadings are as specified within BS648 Schedule of weights of Building materials.

3.3 Impact of the Proposed Development on Existing Trees

There are no trees present on the application site or surrounding area. Therefore, no trees are affected during the proposed basement work and we confirm a detailed Arboricultural report is not required.

4.0 Ground Conditions

4.1 Ground Conditions

The site lies in a residential area and is currently occupied by a two-storey mews terraced house. The site is generally flat lying and surrounded by residential developments of similar age and style.

Ground & Waters Ground Investigation Report No. GWPR5680, confirms Made Ground to depths of 0.70 – 1.1m, overlying Kempton Park Gravel Member.

The made ground comprised dark orange / brown / slightly silty gravelly
sand to clayey silty sandy gravel. Sand is fine to coarse grained. Gravel is fine to medium, angular to rub-rounded flint, brick, concrete, ceramic tile and chalk inclusions. The made ground is overlain by a concrete ground bearing slab.

The Kempton Park Gravels are encountered at depth of 0.7m in Borehole Logs 1 and extended to depths in excess of 4.10m. The Kempton Park Gravels are considered a suitable bearing stratum for the proposed basement construction, with an allowable ground bearing pressure of 200kPa at depths of 3.0m – 4.0m bgl. Refer to Appendix for the full geotechnical summary.

Refer to the Appendix for the ground investigation report.

4.2 Heave and Settlement

The excavation for the basement structure is likely to be limited to within the Kempton Park Gravel formation.

The excavation of soils generally cause a net stress unloading resulting in potential long-term heave. The magnitude of potential heave is determined by a number of factors such as thickness of soil removed, the floor slab stiffness, construction programme, and the restraining effects of any foundations.

The size of the basement structure is such that the pressure exerted on the ground by the structure is greater than any anticipated heave pressure.

Refer to the Appendix for the ground investigation report.

4.3 Site Hydrology/Groundwater

It is considered that the flow of ground water around the basement will not be affected by the new construction. The relatively small size of the basement's footprint combined with the small extent of depth affected compared with the approximate zone of gravels indicates that the flow of water should not be impeded.

In general, the "natural" trend in groundwater flow directions within the Secondary Upper Aquifer would originally have tended to be towards the old river courses incised in the River Terrace Deposits which have largely been culverted.

4.4 Contamination/Radon

Following a review of the report undertaken by Ground and Water we confirm that there are no elevated levels of contamination within the made ground present on site. Therefore, we confirm that the made ground is suitable for its intended use.

We confirm that the site does not lie within an area where mandatory radon measures are required. However, radon resistant waterproofing and the thickness of concrete will sever any pathway for the transmission of any radon levels present. Should it be required radon monitoring can be undertaken following the successful completion of the basement to confirm any active levels on radon. Based on the above we see no need for any radon protection.

5.0 Movement Assessment

5.1 Ground Movement Assessment

All structural alterations, including excavations and underpinning, alter the way buildings transfer loads to the ground. This can cause minor movements or settlements within the main building and neighbouring properties.

By detailed planning and precautions, movements during the construction process will be minimised. However, it is required to observe such movements as they occur, and it is assumed that a dilapidation and photographic survey of the existing buildings and adjoining buildings will be carried out prior to commencement of construction works.

All materials, workmanship and practice shall comply in general with the requirements of the relevant standards. However, the particular requirements of the engineering drawings and specification, including those related to structural movement and tolerances shall take precedence over other standards.

Following a detailed review of the permanent and temporary works we confirm that the works are estimated to fall within damage Category 1. We confirm that this is satisfactory. Monitoring will need to be carried out to assist in recording any movement.

The temporary works design associated with the construction and associated temporary works will assist in minimising the effects of the Works on the existing buildings, but we cannot guarantee that movements will not occur.

5.2 Movement Monitoring Method

Fixed monitoring retro reflective targets are to be affixed to the neighbouring party walls to No 32 & 36 Belgrave Mews South and to the rear wall of 11 Eaton Place. Targets will be installed as close to the desired location as safe access will allow.

Targets will be measured two weeks prior to the commencement of building works and at weekly and then fortnightly intervals as the work progresses to assess whether there is movement of the structure.

A report will be supplied after each visit determining any measured movement.

Target Installation

Reflective reference targets will be placed around the worksite outside the zone of influence. The reference & monitoring targets on the buildings will be retro reflective targets affixed with a strong yet ultimately removable adhesive. This is an economical and effective solution for measurement at this level. Where required some targets will be mounted on small plastic brackets to allow tangential observation.

It is assumed that safe access at height will be provided by the client, and that they will arrange all third-party agreements to install the targets on neighbouring properties.

Observation Stations

A site grid will be set up with the referenced retro targets fixed to stable structures outside the area of influence. These reference datum points will be observed prior to each observation session. A minimal total station traverse will be used to observe the internal targets. All the initial observations will be related to OS datum via GPS observations.

Observation Equipment

The observations will be made on each occasion with a Leica TS30 which is capable of sub second and sub millimetre measurement. It is an instrument designed particularly for this type of task.

Accuracy of Measurement

We would expect that the relative accuracy would be +/-1.0mm to the retros. The absolute accuracy between all targets is more likely to be +/-2mm. The accuracy generally depends on the accessibility of the measurement position. Ideally, we would wish to minimise any transferring of control position (traversing), but this depends on the site activity at the time and therefore the sightlines to targets that are possible.

Trigger Values

Amber - Cumulative movement of more than +/-5mm.

Red - Cumulative movement of more than +/-8mm.

Trigger Actions

Amber - All parties will be information that the amber trigger level has been reached/exceeded. The sequence of works and methodology will be reviewed by interested parties.

Red - All interested parties will be informed that the red trigger level has been reached/exceeded.

Works in the affected area will be made safe and suspended.
A meeting will be held on site with all interested parties to review the sequence of works and the methodology and agree on any revisions to procedures which may be considered necessary.

At code red monitoring should be increased to alternative days (i.e., 3 / 4 times weekly).

The monitoring frequency will be reviewed commensurate with the rate at which movements develop.

6.0 Construction Method

6.1 Proposed Demolition and Construction

A significant factor affecting the choice of structural solution for the basement works includes preventing movement, settlement and the risk of collapse of existing structures when the current permanent horizontal support provided by the ground is removed.

The permanent works will need to be constructed in a manner that ensures that the existing masonry structures are continuously supported both vertically and horizontally without undue movement both during the construction works and in the final state.

The immediately adjoining properties will be monitored for movement and damage during the initial installation of the underpinning, excavation, construction and initial transfer of loads to the permanent floors and walls. All measures will be subject to agreement with the owners and occupiers of these premises under the Party Wall Act.

To maintain structural integrity to the building and allow works to be carried out, a tried and tested method of underpinning is proposed. This involves the ground being excavated in alternate sections underneath the existing walls and reinforced concrete shuttered and poured under the exposed existing foundations. Once the concrete has achieved sufficient strength the same process is then applied to the adjacent sections ensuring uniform structural support at all times, when this is completed the floor level can be lowered to the base of the basement slab and the basement formed from reinforced waterproof concrete. This construction will involve a two stage underpin with maximum 2.5m excavation depths, to in accordance with the latest temporary work guidance.

6.2 Site Set Up

1. Erect Site hoarding to the agreed layout and make site boundaries secure.
2. Set up site office, welfare and toilets to the agreed layout
3. Perform a detailed survey of 34 Belgrave Mews South and adjacent properties to confirm the assumed structure and to determine the size and level of the existing neighbouring foundations.

6.3 Initial Temporary Works/Demolition

1. Soft Strip using appropriate plant and hand tools to remove any non-loadbearing elements, suspended ceilings fixtures and fittings, electrical and mechanical systems skirting's door frames etc.
2. Isolate Existing Services.
3. Starting from the first-floor level the existing roof joists and any associated supporting beams will be removed.
4. Install RMD horizontal props to provide horizontal stability at eaves level and option to install the proposed second floor beams and associated timber joists.
5. Carefully demolish existing first floor internal walls.
6. Remove the existing ground floor joists and any associated supporting beams.
7. Install RMD horizontal props to provide horizontal stability at 300mm above first floor level and option to install the proposed first floor beams and associated timber joists.
8. Carefully demolish existing ground floor internal walls.
9. Install spreader and needle beams to remove rear ground floor wall and install permanent frame. This will leave an open place space at ground floor level whilst ensuring stability to the remaining levels of the structure.
10. All Materials will be safely moved by hand to ground/lower ground floor level to prevent overloading of floor structures. Debris will need to be periodically removed to lower levels to maintain a safe working area.
11. At the end of each day the remaining structure shall be made safe and left in a structurally stable condition.
12. Remove ground floor structural slab
13. Reduce Ground Locally to 500mm below ground floor level or to U/S of footing whichever deeper.
14. All existing internal foundations and drainage to be grubbed out as necessary.
15. Bung existing drainage system at ground floor level within the front drive to prevent backup from existing drainage system

6.4 Reinforced Concrete Underpinning/Basement Construction

Due to the extents and depth of underpinning required, it is likely to necessitate a two-phase underpinning arrangement to the basement structure generally.

1. Excavate down to the base of the underpinning in the sequence provided and cast the reinforced concrete wall and underpinning to the existing walls. (Provide vertical sacrificial props as necessary if underside of existing corbeling is in poor condition) Ensure underpin trench is fully shored using M8 sheet piles and propped horizontally with acrow props. After each section of underpin is cast the working trench should be backfilled with arisings to ground level.
2. Dry Pack to be provided between top of underpinning and underside of existing footing. Snap off corbel as necessary. If existing concrete footings are found dowel bar tie into underpin section vertically.
3. It may be necessary to provide ground water control during the construction works. If soils encountered appear to be unstable, loose or saturated consideration should be given in to splitting the vertical height of the underpin.
4. Once all underpins have been cast the existing ground level is to be excavated to 300mm above the base of the first stage of horizontal props. Wailing beam and horizontal props are to be installed as the excavation progresses to provide adequate support.
5. Repeat stages 4 until second stage underpin level is reached.
6. Repeat stages 1-5 for second stage underpin.
7. Excavate to formation level of basement level.
8. At formation level fix reinforcement and cast the new basement reinforced slab, including new drainage and sump/pump points required for the waterproofing.
9. Install scaffold frame to create working platform from basement formation level.
10. Install new padstones to the proposed ground floor steel beams
11. Install new steelwork at ground floor level and lay ground floor metal deck and reinforcement.

12. Cast and cure new concrete ground floor structure.
13. Install new lining walls and fully tie to top of the new retaining structure to ensure retaining structure is fully propped in the permanent case.
14. Remove the previously installed horizontal temporary props to the underpin sections leaving propping to the levels above
15. Remove all temporary propping as construction progresses when concrete is fully cured.
16. Install waterproofing as necessary.

6.5 Superstructure Construction

1. Install new scaffold frame to the perimeter of the proposed property up to the proposed roof level and cover with a tin lid to provide adequate weather protection.
2. Remove existing roof coverings and ensure the adjacent party walls are fully protected against the ingress of water.
3. Install new padstones at roof level
4. Install new steel roof beams and new roof joists and associated finishes
5. Remove all temporary scaffold structures as necessary

6.6 Principal Contractor Responsibilities

The Contractor is entirely responsible for maintaining the stability of all existing buildings and structures, within and adjacent to the works, and of all the works from the date of possession of the site until practical completion of the works.

The contractor shall install and maintain all necessary temporary works and shall produce a Temporary Works Register. The temporary works proposals shall be checked and calculations and signed off by a qualified TWC (Temporary Works Co-Ordinator).

Under no circumstances will any structural alterations be carried out prior to the project structural engineer commenting on the contractor's temporary works proposals.

The contractor is to familiarise himself with the building and its structure so that he is aware of the nature and magnitude of the loads to be supported.

Care is to be taken to ensure that temporary props are regularly inspected and remain adequately seated and tightened so that support to the structure above is not allowed to yield during building operations.

The contractor is to ensure that any temporarily propped structure is adequately wedged, pinned, or packed off the permanent works using suitably sized and spaced steel shims fixed in position prior to removal of any temporary supports.

In addition, the contractor shall ensure that loads are transferred from temporary supports/props to the permanent structure without resulting in excessive deflection/movement of the temporary or permanent structure. The contractor shall assess the need for jacking or pre-deflection of permanent structural members prior to transferring loads from temporary supports/props to ensure that deflections of the permanent structure, when loaded, does not result in excessive deflection due to slack connections or any damage (including cracking) to any of the permanent structures or buildings, etc.

The contractor shall ensure that any completed or partially completed structural element is not overloaded. Details of design loads may be obtained from the structural engineer upon request.

All temporary works to support the sides of excavations for new foundations shall be designed in accordance with BS 8000 part 1: 1989 and any other relevant approved documents.

The designated Temporary Works Co-Ordinator (TWC) should be employed to oversee all temporary works elements during all construction stages. He may be assisted on site by a Temporary Works Supervisor (TWS). If a variation to any Temporary Works Design is required by on site conditions the installation shall be stopped. The variation must then be checked or modified by the Temporary Work Designer (TWD) and approved by the Temporary Works Co-Ordinator prior to continuing with the installation.

6.7 CDM Regulations 2015

This project will require careful consideration by all parties regarding their roles and responsibilities under to the 2015 CDM (Construction and Design Management) Regulations. The particularly onerous requirements will revolve around the permanent design works and temporary design works and installation for the project. There will therefore need to be a carefully controlled process where the procedures and methodologies are detailed and then followed by the appropriate designers and contractors.

The primary concern with this project is the temporary works processes that will need to be managed initially by the design team and subsequently prior to works commencing on site by the Principal Contractor and his Temporary Works Design Team.

This will entail the production of a Temporary Works Register by the Temporary Works Co-Ordinator for the project who will be appointed by the Principal Contractor. The Temporary Works Co-Ordinator will then need to liaise with the Temporary Works Designers as well as the individual sub-contractors. This is to always ensure that the works and adjoining properties are safe from any structural instability or failure. This will then ensure the safety of the site personnel, the adjoining occupiers, and the public. The Principal Designer for the project will also have an obligation to ensure that this is carried through from the design phase through into the construction phase. The Principal Designer will need to liaise with the Temporary Works Designer prior to any temporary works being designed and executed on site. This is to ensure that continuity of any methodologies and understandings of the permanent works are transferred through to the construction phase and any temporary works design requirements.

Therefore, there will be a considerable amount of liaison between the Principal Designer and the Principal Contractor to ensure that this is managed efficiently and accurately and hence significantly reduce the risk of any failures.

The Client themselves will need to be aware of all these processes going on as part of their project delivery. In addition to this, they will also share the responsibility with the Principal Contractor for all the welfare facilities and accommodation required for the site personnel.

This will be particularly tricky in relation to the significant site constraints with regards to space. However, this is something that can be resolved within the pre-start planning phase and as part of any tender appraisal process.

Above ground level, the project is straightforward and nothing in the preliminary proposals would suggest that the usual construction methodologies for a structure of this size, type and framing are out of the ordinary. Therefore, they should be well within the capabilities of a competent contractor.

There will be the usual requirements for a Pre-Construction Information File to be prepared by the Principal Designer in conjunction with the Client. This will need to include a significant amount of documentation regarding the adjoining buildings, site geology, services, and any other unusual hazards.

Following this and prior to works commencing on site, the Principal Contractor will need to prepare his Construction Phase Plan which should be sufficiently developed to allow works commence on site. Within this document there will be procedures outlined for the works themselves along with the temporary works management processes.

During the construction phase and following the completion of the building the contents and documentation associated with the Health & Safety File will need to be prepared. This is usually carried out by the Principal Designer in conjunction with the Principal Contractor. The file itself will then be presented to the Client shortly after completion of the building. It is normally then made readily available for any users of the building with regards to maintenance and, operations and any alterations / extensions in the future. Ideally a copy should be placed with the Deeds for future buyers and users of the property.

7.0 Conclusions

7.1 Evaluation of Project

Using current good practice in executing the works, it is considered that the proposed development at 34 Belgrave Mews South can be realised whilst maintaining adequate temporary vertical and horizontal support to the ground and to all the surrounding masonry structures.

The final form of the basement construction will minimise any potential ground movements and will newly create a load path for vertical and horizontal loads that does not overload the surface geology.

Detailed site investigation, design calculations, drawings and method statements will be produced prior to commencement onsite for issue to the contractor, building control and party wall surveyors. Any hazards remaining after design statement will be developed as the design progresses to highlight residual design risks outside those expected in standard construction.

9.0 Certification

Signed:	Title: Designer
Name: Tom Garrod B.Eng. (Hons)	Date: November 2023

Signed: 	Title: Checker
Name: David Smith	Date: November 2023

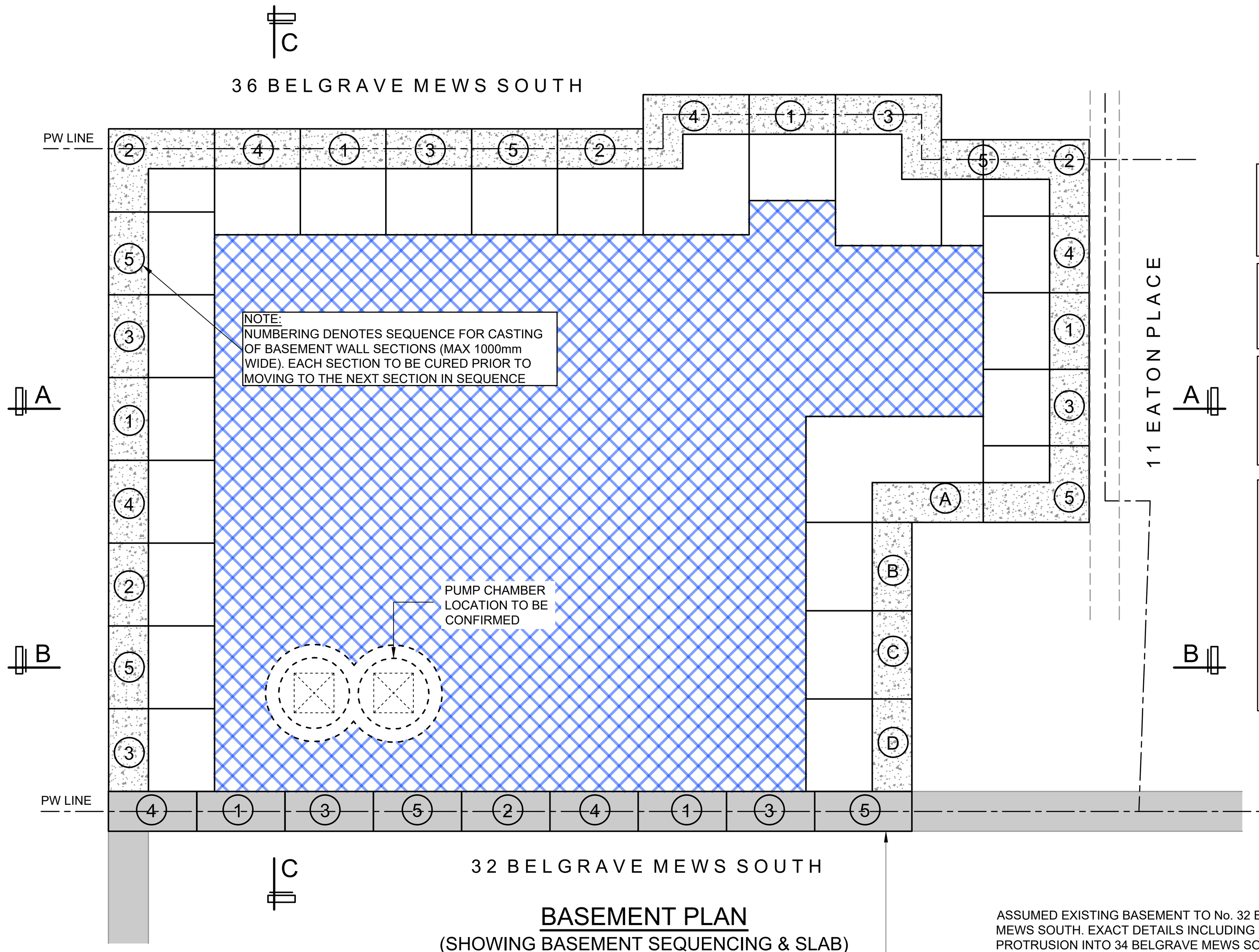
I certify that the staff who have prepared the above Design and Check are competent to carry out their duties and that they have used reasonable professional skill and care.

Eur Ing **David Smith** BSc (Hons), CEng, MICE, MIStructE, CMaPS, MFPWS, FCABE, ACIArb

APPENDIX A

DRAWINGS

ALL DIMENSIONS TO BE CONFIRMED ON SITE PRIOR TO ORDERING / FABRICATION OF MATERIALS AND COMMENCEMENT OF WORKS



BASEMENT PLAN
(SHOWING BASEMENT SEQUENCING & SLAB)
1:50

ASSUMED EXISTING BASEMENT TO No. 32 BELGRAVE MEWS SOUTH. EXACT DETAILS INCLUDING DEPTH AND PROTRUSION INTO 34 BELGRAVE MEWS SOUTH TBC ON SITE. - ALLOW FOR UNDERPINNING TO MEET FORMATION LEVEL (DETAILS TBC)

NOTE:
NO GROUND WATER IS EXPECTED FOLLOWING RESULTS OF BOREHOLE INEVSTIGATION HOWEVER, IF GROUND WATER IS BREACHED, WORKS ON SITE TO STOP. DSA TO BE INFORMED AND PROVIDE PROPOSALS

NOTE:
ALL EXISTING PARTY WALL THICKNESSES ARE ASSUMED TO BE 330mm THK. TO BE CONFIRMED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORKS.

NOTE:
ALLOW FOR LOCALLY FORMING POCKETS TO TOP OF WALLS IN AREAS TO SEAT LOWER GROUND FLOOR SUPPORT BEAMS WHERE REQUIRED (TBC FOLLOWING TRIAL HOLE). REFER TO DSA DRAWING No. 23_54121_11 FOR SUPERSTRUCTURE LAYOUT

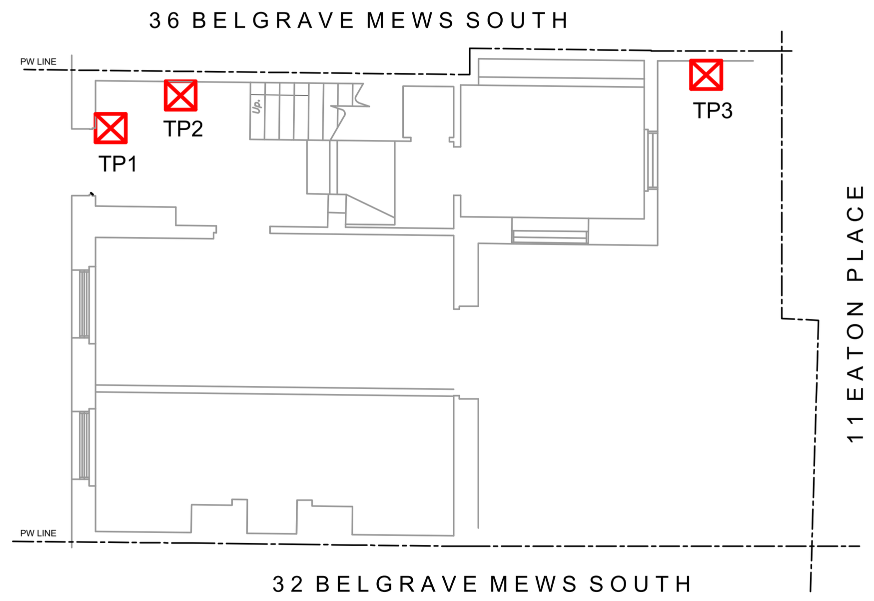
SLAB LEGEND

450mm THICK CONCRETE SLAB WITH 4No. LAYERS B1131 MESH (2No. TOP, 2No. BTM) WITH 40mm COVER (50MM CONCRETE BLINDING

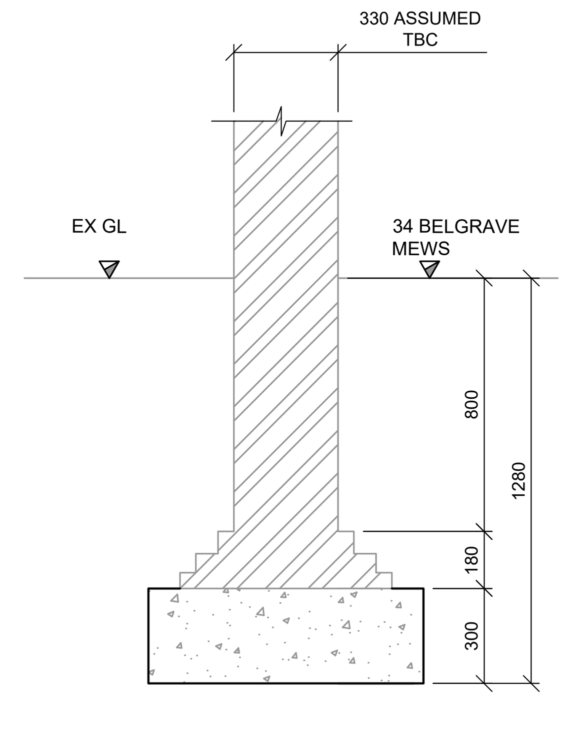
NOTE, FINISHES TO BE CONFIRMED BY ARCHITECT / POOL SPECIALIST

NOTE, B1131 MESH ALTERNATE LAYERS OF DOUBLE MESH REVERSED AND ROTATED AND LAYERS PLACED TOGETHER

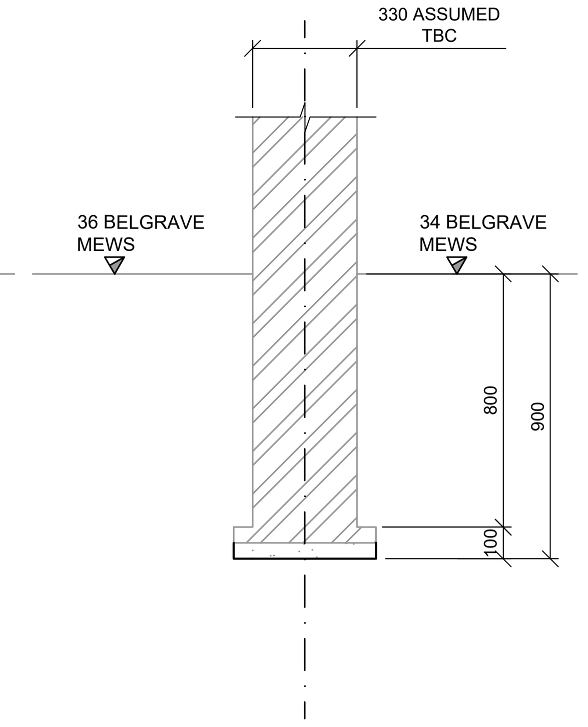
NOTE - NEW CONCRETE WALL PLACED UNDERNEATH EXISTING PARTY WALLS. LAYOUT TO BE SET OUT FROM THIS. ON ALL PARTY WALLS NEW 450mm THICK R.C WALL TO NOT EXCEED PARTY WALL CORBEL LINE - SEE SECTIONS.



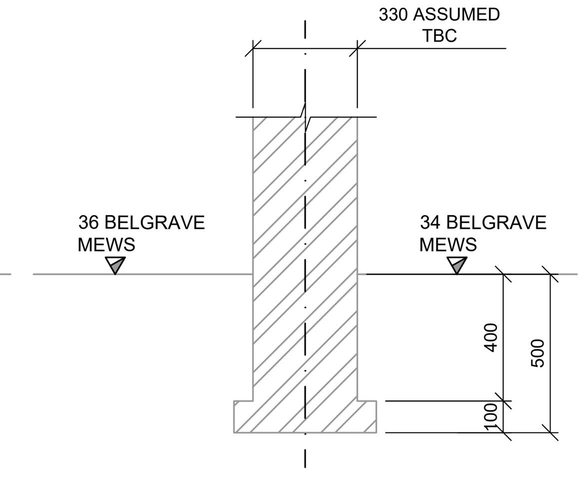
TRIAL PIT LOCATION PLAN
1:100



TP1
1:20



TP2
1:20



TP3
1:20

CDM 2015 DESIGNER NOTES

IN ADDITION TO THE HAZARDS, AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RISKS AND INFORMATION.

CONSTRUCTION:

1. N/A

FOR INFORMATION RELATING TO END USE, MAINTENANCE, DEMOLITION, SEE THE HEALTH AND SAFETY FILE.

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

Notes

1. IF IN DOUBT - ASK !!! DO NOT SCALE
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ARCHITECTS AND ENGINEERS DRAWINGS.
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6. ALL DIMENSIONS FOR CONSTRUCTION ARE TO BE OBTAINED FROM SITE MEASUREMENTS OR ARCHITECTS SETTING OUT DRAWINGS PRIOR TO MANUFACTURE/BUILDING.

CONCRETE MIX SPECIFICATIONS

7. SPECIAL FOUNDATION PANELS
CONCRETE MIX TO BE RC50 (C40/50 STRENGTH CLASS) WITH A MINIMUM CEMENT CONTENT OF 340kg/m3 AND A MAXIMUM WATER/CEMENT RATIO OF 0.45.
MAXIMUM AGGREGATE SIZE TO BE 20mm.
8. BASEMENT SLAB
CONCRETE MIX TO BE RC35 (C28/35 STRENGTH CLASS) WITH A MINIMUM CEMENT CONTENT OF 280kg/m3 AND A MAXIMUM WATER/CEMENT RATIO OF 0.60.
MAXIMUM AGGREGATE SIZE TO BE 20mm.
9. CONCRETE TO BE WELL VIBRATED TO ENSURE A SOLID MASS FREE FROM VOIDS
10. ALL WATERPROOFING TO CONTRACTORS DETAILS AND SPECIFICATION.
11. 50mm CONCRETE BLINDING TO BE INCORPORATED BELOW SPECIAL FOUNDATION WALL PANEL BASE AND BASEMENT FLOOR SLAB.

ISSUE	REVISION	BY	DATE
C2	MINOR AMENDMENT TO RET WALL	JM	05.12.23
C1	FIRST ISSUE	JM	01.12.23

ISSUE
CONSTRUCTION

CLIENT
LECONFIELD PROPERTY GROUP

CONTRACT
34 BELGRAVE MEWS SOUTH
LONDON

TITLE
PROPOSED BASEMENT LAYOUT

ARCHITECT
LEWIS STROUD ARCHITECTS

DRAWN	CHECKED	DATE	SCALE
JM	TG	NOV' 23	1:50 @A1

David Smith Associates
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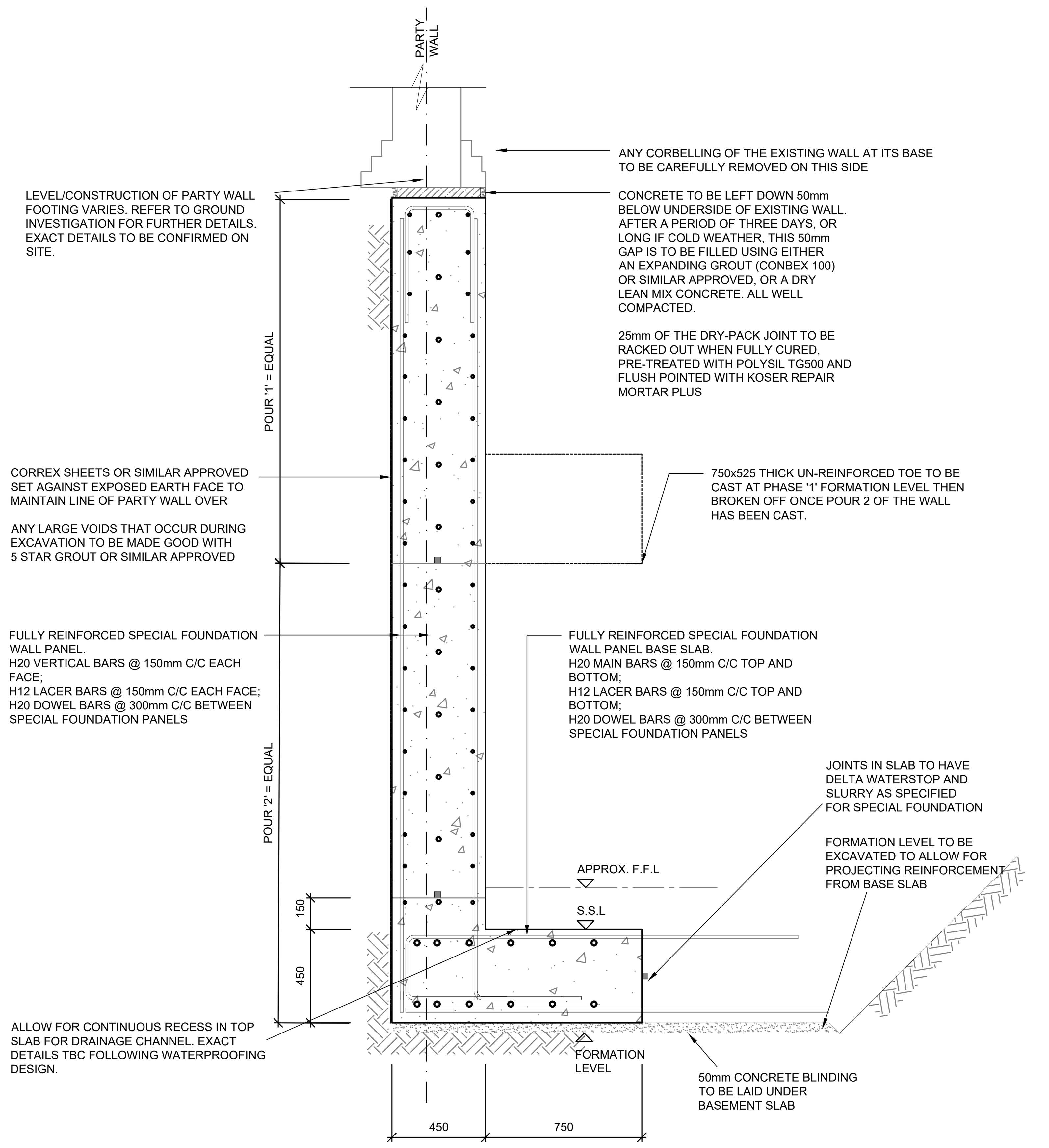
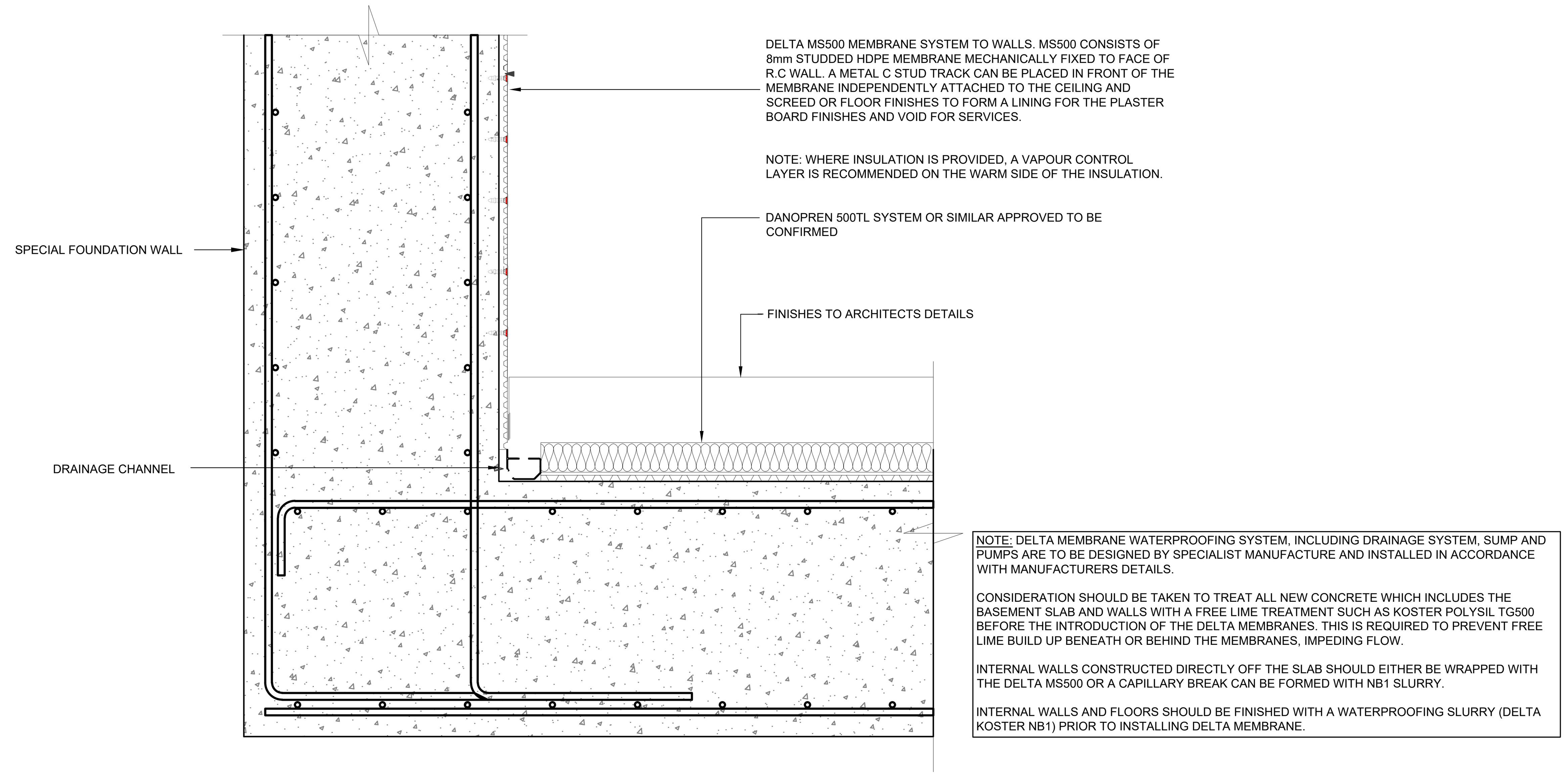
DRAWING NUMBER			REVISION
	23	54121/01	C2

ALL DIMENSIONS TO BE CONFIRMED ON SITE PRIOR TO ORDERING / FABRICATION OF MATERIALS AND COMMENCEMENT OF WORKS



TYPICAL SPECIAL FOUNDATION WALL PANEL

1:20



TYPICAL DELTA MEMBRANE SYSTEM DETAILS

TO BE DESIGNED BY SPECIALIST

1:10

CDM 2015 DESIGNER NOTES

IN ADDITION TO THE HAZARDS, AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RISKS AND INFORMATION.

CONSTRUCTION:

1. N/A

FOR INFORMATION RELATING TO END USE, MAINTENANCE, DEMOLITION, SEE THE HEALTH AND SAFETY FILE.

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

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ISSUE	REVISION	BY	DATE
C1	FIRST ISSUE	JM	01.12.23

ISSUE
CONSTRUCTION

CLIENT
LECONFIELD PROPERTY GROUP

CONTRACT
34 BELGRAVE MEWS SOUTH
LONDON

TITLE
SPECIAL FOUNDATION DETAILS

ARCHITECT
LEWIS STROUD ARCHITECTS

DRAWN	CHECKED	DATE	SCALE
JM	TG	NOV' 23	1:50 @A1

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DRAWING NUMBER			REVISION
	23	54121/02	C1

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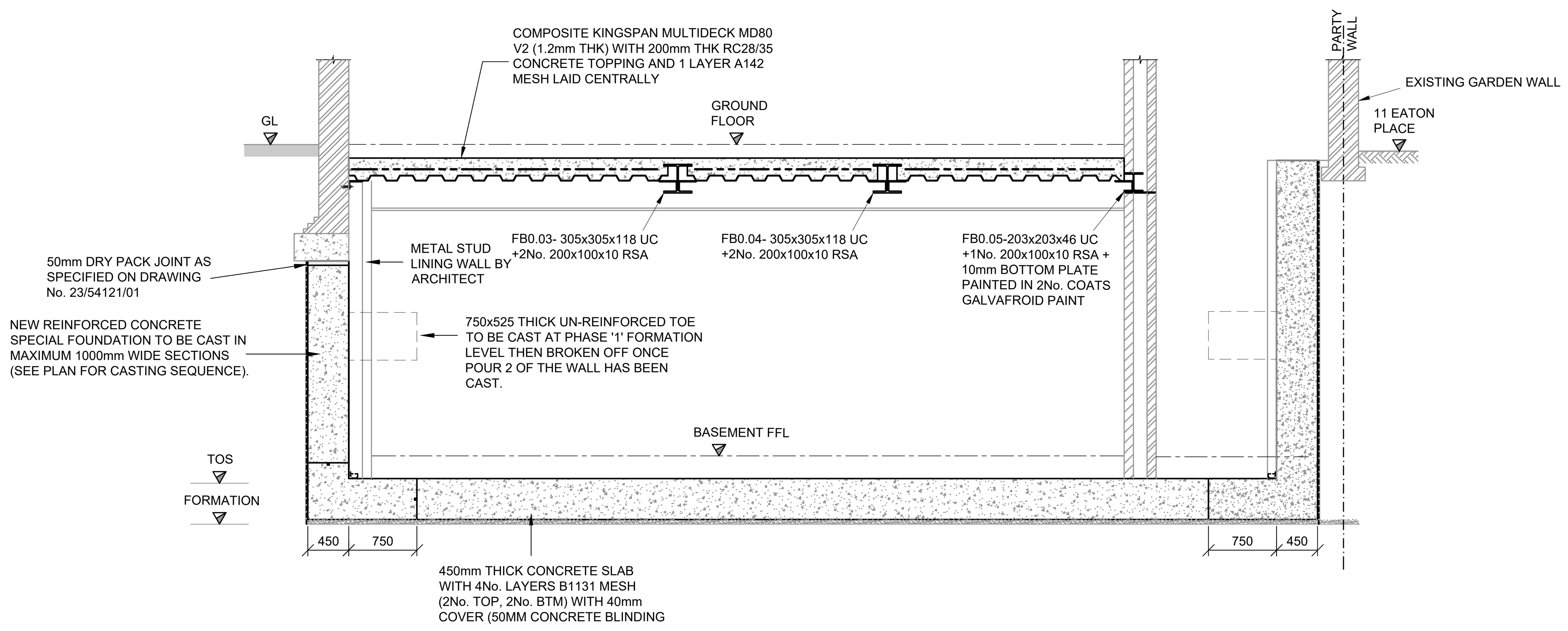
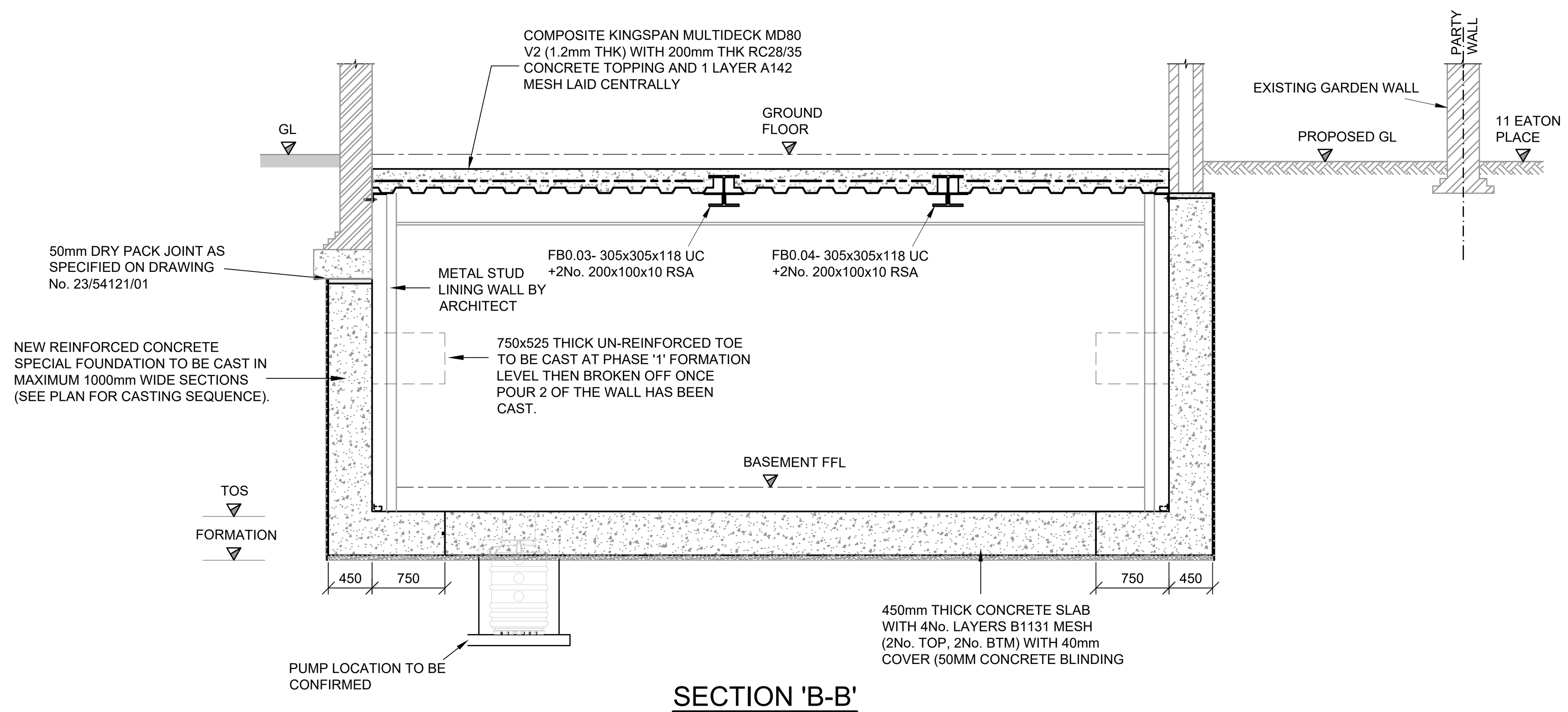
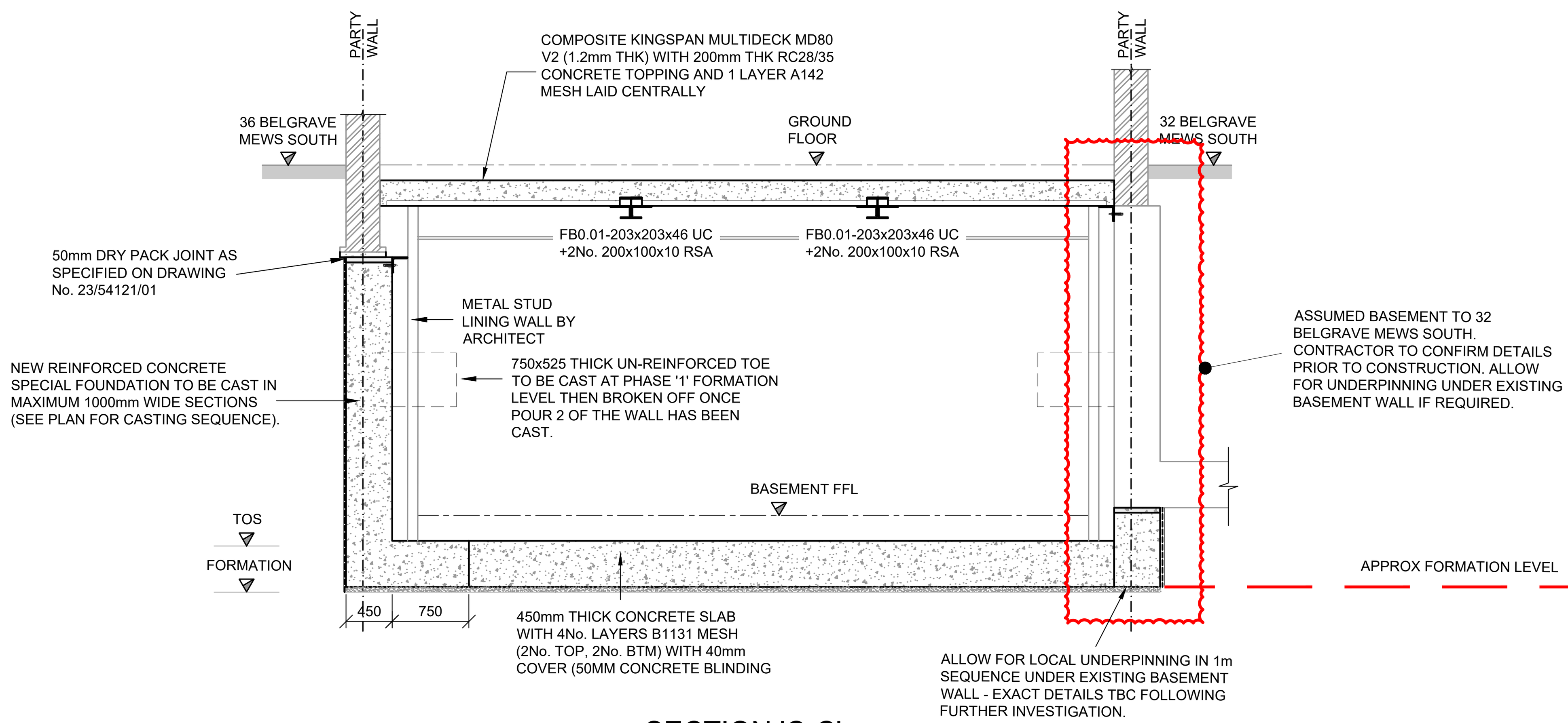


SECTION 'A-A'
1:50



SECTION 'B-B'
1:50



SECTION 'C-C'
1:50

Percussion Drilling Log

Project Name: 34 Belgrave Mews South, London SW1X 8BT	Client: Leconfield Property Group	Date: 08/11/2023
Location: 34 Belgrave Mews South, London SW1X 8BT	Contractor:	
Project No.: GWPR5680	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS01	BH		AS	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.30			MADE GROUND. Pale grey very gravelly fine to coarse SAND. Gravel is fine to coarse angular to sub-rounded flint (70%), concrete (20%) and brick (10%).
					0.70			MADE GROUND. Dark brown gravelly very sandy CLAY. Gravel is fine to coarse sub-angular to sub-rounded. Sand is fine to coarse flint (60%), brick (30%) and calcareous material (10%).
		1.20	SPT	N=20 (2,3/3,5,6,6)	1.30			Dark orangish brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse sub-angular to sub-rounded of flint. (KEMPTON PARK GRAVEL MEMBER)
		2.00	SPT	N=50 (6,10/10,16,18,6)				Dark orangish brown very gravelly fine to coarse SAND. Gravel is fine to coarse sub-angular to sub-rounded of flint. (KEMPTON PARK GRAVEL MEMBER)
		3.00	SPT	N=50 (8,12/50 for 225mm)				
		4.00	SPT	N=30 (12,12/13,7,6,4)	4.10			Dark greyish brown silty CLAY. (LONDON CLAY FORMATION)
		5.00	SPT	N=16 (3,3/3,4,4,5)	5.45			End of Borehole at 5.450m

Depth scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Hole Diameter: Depth Base	Diameter	Casing Diameter: Depth Base	Diameter	Chiselling: Depth Top	Depth Base	Duration	Tool	Inclination and Orientation: Depth Top	Depth Base	Inclination	Orientation

Remarks
Fresh roots were noted to 0.80m bgl. No groundwater strikes were observed..

AGS

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CDM 2015 DESIGNER NOTES

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CONSTRUCTION:

1. N/A

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C2	MINOR AMENDMENT TO RET WALL	JM	05.12.23
C1	FIRST ISSUE	JM	01.12.23

ISSUE
CONSTRUCTION

CLIENT
LECONFIELD PROPERTY GROUP

CONTRACT
34 BELGRAVE MEWS SOUTH
LONDON

TITLE
BASEMENT SECTIONS

ARCHITECT
LEWIS STROUD ARCHITECTS

DRAWN	CHECKED	DATE	SCALE
JM	TG	NOV' 23	1:50 @A1

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DRAWING NUMBER			REVISION
	23	54121/03	C2

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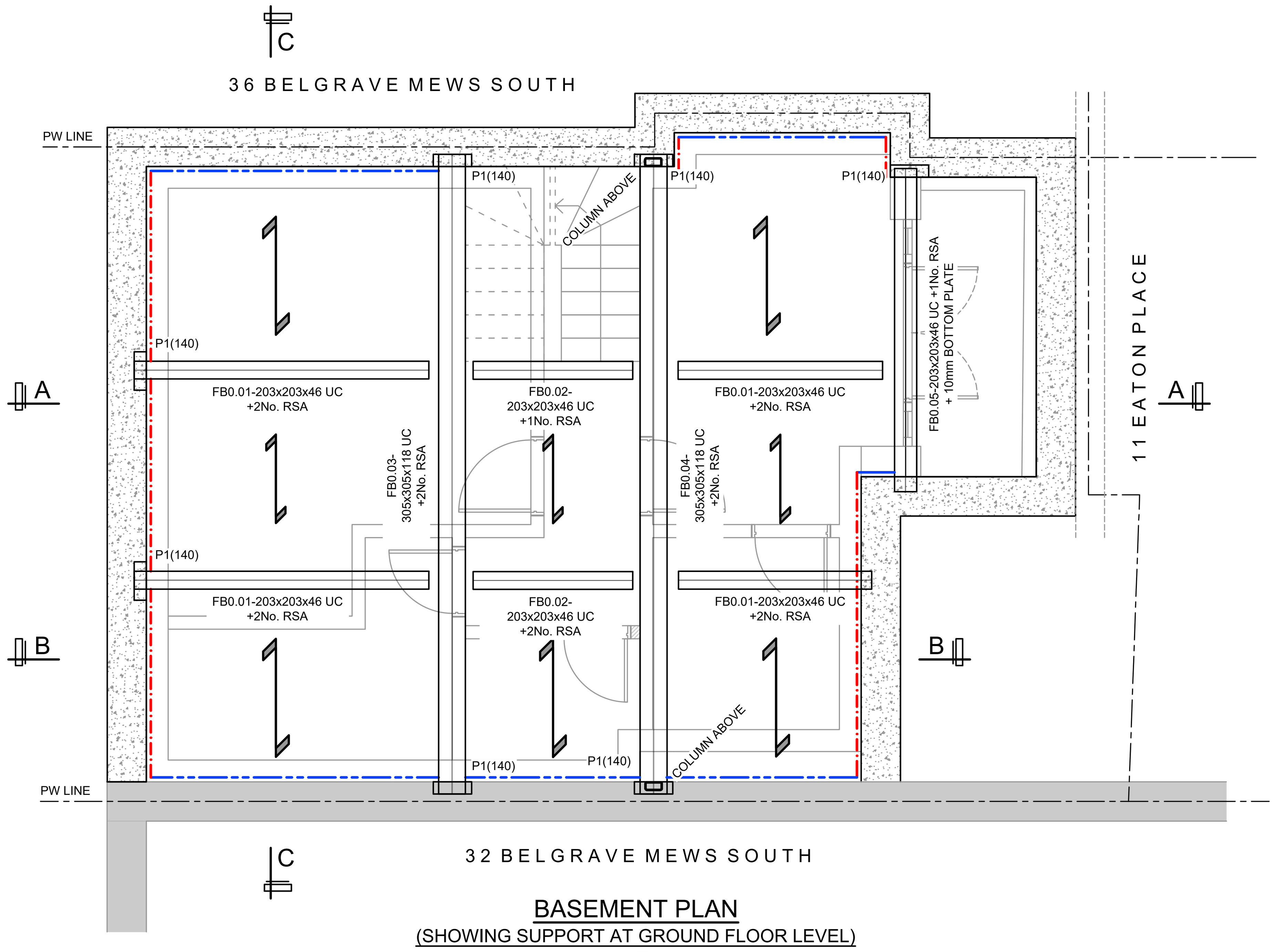


BASEMENT PLAN

(SHOWING SUPPORT AT GROUND FLOOR LEVEL)

1:50

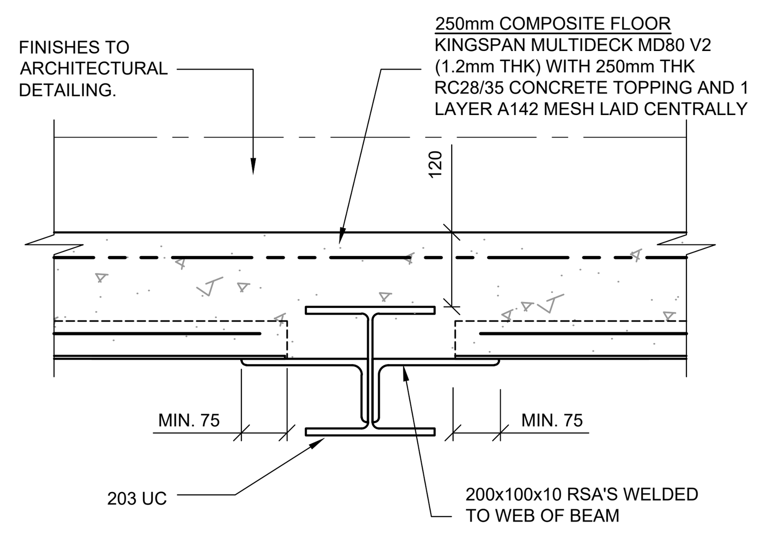
KEY

KINGSPAN MULTIDECK MD80 V2 (1.2mm THK) WITH 200mm THK RC28/35 CONCRETE TOPPING AND 1 LAYER A142 MESH LAID CENTRALLY

150x150x10 RSA ANGLE FIXED TO WALL WITH M12 RESIN ANCHORS @ 300mm C/C (110mm EMBEDMENT)

150x90x10 RSA FLOOR EDGE SUPPORT RESIN FIXED TO WALL USING M10 RESIN ANCHORS @ 300mm C/C (80mm EMBEDMENT)

PS01 = 440x140x'DEPTH TO RET WALL' C30 CONCRETE PADSTONE. FLOOR BEAM SUPPORT 1 (TBC ON SITE)



TYPICAL FLOOR BEAM DETAIL FOR KINGSPAN MULTI DECK SLAB BEARING ONTO 203 UC

1:10

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ALL WELDS TO COMPLY WITH BS EN 1090-1:2009 +A1:2011 EXECUTION CLASS EXC2

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7. STEELWORK NOTES
   ALL STEELWORK TO BE GRADE S355 TO B.S.5950-2. ALL MATERIALS TO COMPLY WITH B.S. 5950:2000 AND TO B.S.C.A.1/89 - NATIONAL STRUCTURAL STEELWORK SPECIFICATION
8. ALL STEELWORK TO BE SHOT BLASTED TO SA 2.5 OR MECHANICALLY WIRE BRUSHED TO REMOVE ALL SURFACE CONTAMINATION, RUST OR MILLSCALE AND HAVE 2 COATS OF ZINC PHOSPHATE PRIMER APPLIED TO ACHIEVE A MINIMUM DRY FILM THICKNESS OF 75 MICRONS PER COAT, PRIOR TO SITE DELIVERY. AFTER ERECTION OF STEELWORK IS COMPLETE ANY DAMAGED SURFACES TO BE MADE GOOD WITH 2 COATS OF ZINC PHOSPHATE PRIMER TO ACHIEVE A MINIMUM DRY FILM THICKNESS OF 75 MICRONS PER COAT.
9. GRADE 4.6 BOLTS TO B.S.4190 AND GRADE 8.8 BOLTS TO B.S.3692. ALL BOLTS AND NUTS TO BE HOT DIP SPUN GALVANISED TO B.S. 729. A ROUND WASHER, TO B.S. 4320 AND HOT SPUN GALVANISED TO B.S. 729, TO BE PROVIDED UNDER EVERY NUT TO MINIMISE DAMAGE TO COATING. ALL NUTS TO BE CORRECTLY TIGHTENED AND HAVE AT LEAST 2 THREADS PROJECTING BEYOND THE NUT. ALL BOLTS TO HAVE STRUCTURAL THREAD AND ROUND SHANK.
10. FIRE SURROUND TO ALL STEELWORK AS PER ARCHITECTS REQUIREMENTS

ISSUE	REVISION	BY	DATE
C2	MINOR AMENDMENT TO RET WALL	JM	05.12.23
C1	FIRST ISSUE	JM	01.12.23

ISSUE
CONSTRUCTION

CLIENT
LECONFIELD PROPERTY GROUP

CONTRACT
34 BELGRAVE MEWS SOUTH
LONDON

TITLE
PROPOSED BASEMENT LAYOUT

ARCHITECT
LEWIS STROUD ARCHITECTS

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JM	TG	NOV' 23	1:50 @A1

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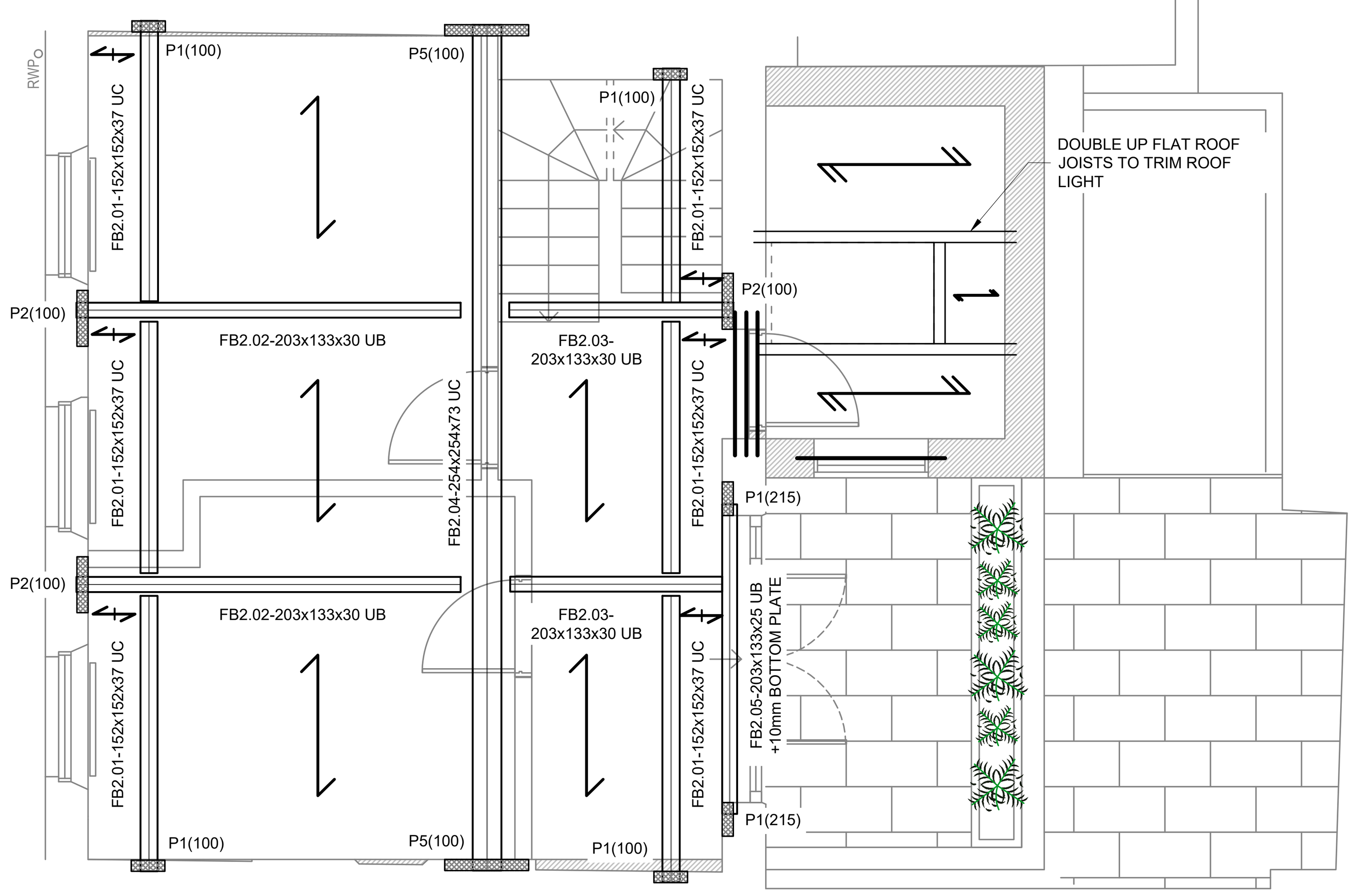
DRAWING NUMBER			REVISION
	23	54121/11	C2

ALL DIMENSIONS TO BE CONFIRMED ON SITE PRIOR TO ORDERING / FABRICATION OF MATERIALS AND COMMENCEMENT OF WORKS

FIRST FLOOR LEGEND

- 200x75 C24 TIMBER FLOOR JOISTS AT 400mm CENTRES
- 200x47 C24 TIMBER MANSARD ROOF JOISTS AT 400mm CENTRES
- 200x47 C24 TIMBER FLAT ROOF JOISTS AT 400mm CENTRES

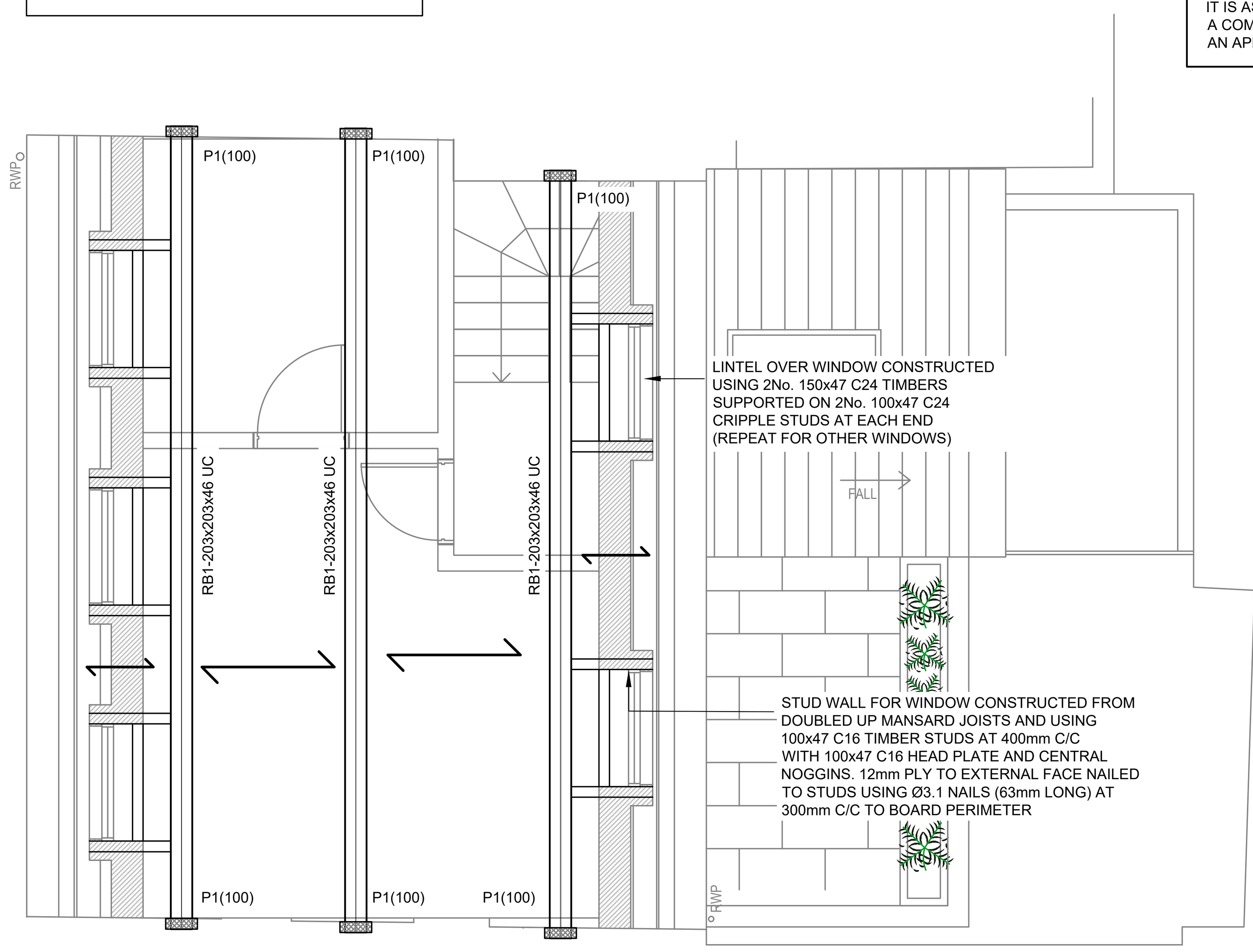


FIRST FLOOR PLAN
(SHOWING SUPPORT AT SECOND FLOOR LEVEL)

1:50

SECOND FLOOR LEGEND

- 200x47 C24 TIMBER MANSARD ROOF JOISTS AT 400mm CENTRES



SECOND FLOOR PLAN
(SHOWING SUPPORT AT SECOND FLOOR LEVEL)

1:50

CDM 2015 DESIGNER NOTES

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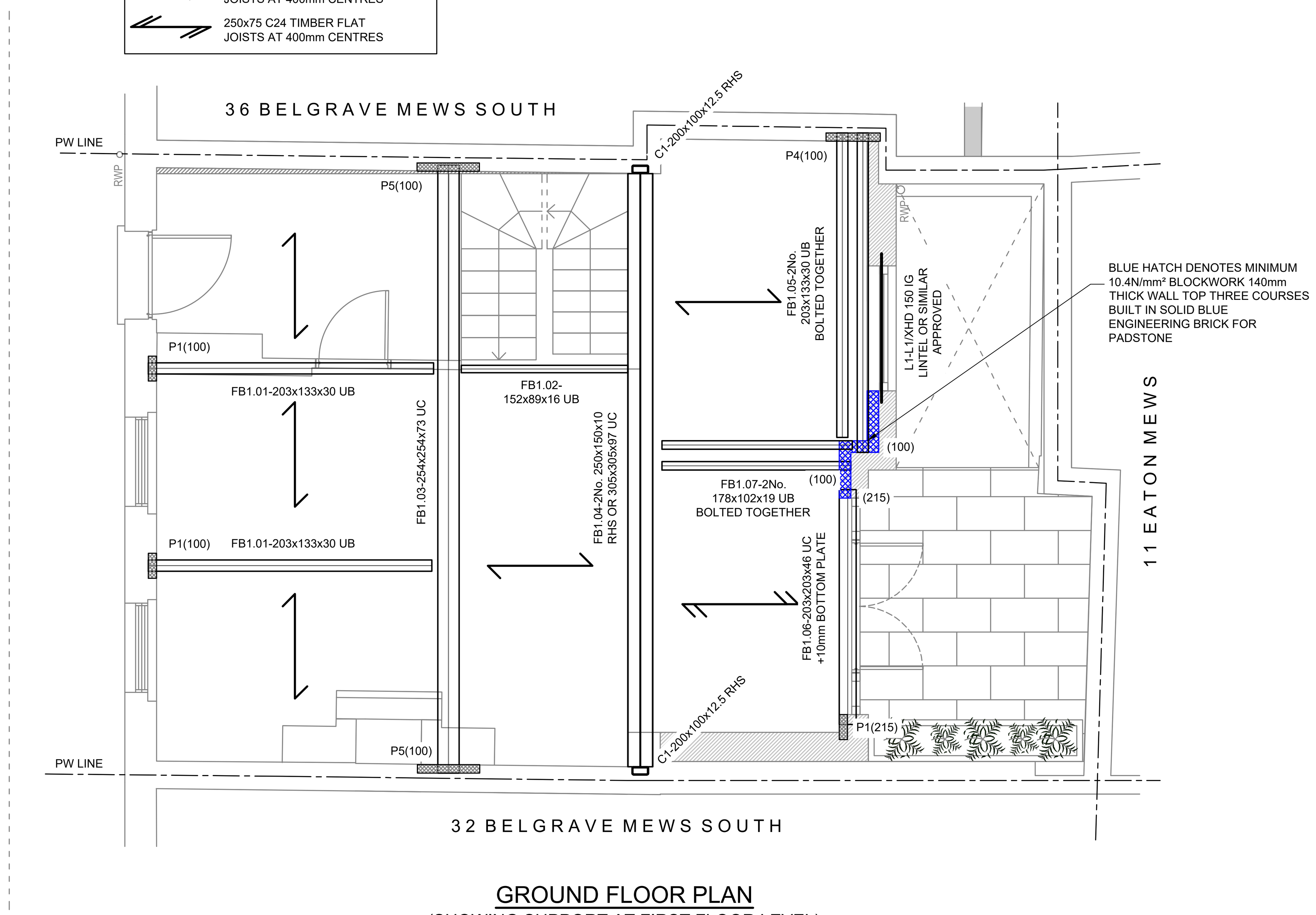
TIMBER NOTES

7. PROVIDE DOUBLED UP FLOOR JOISTS UNDER NEW PARTITIONS PARALLEL TO SPAN, BOLTED TOGETHER WITH M12 GRADE 8.8 BOLTS AT 450mm c/c. PROVIDE FULL DEPTH NOGGINS UNDER NEW PARTITIONS PERPENDICULAR TO JOIST DIRECTION
8. TIMBER TO BE STRESS GRADED TO BS 4978. TIMBER TO COMPLY WITH BS 5268 : PARTS 2 & 3. WBP PLYWOOD TO COMPLY WITH BS 6566 : PART 8.
9. CROSS SECTION DIMENSIONS OF TIMBER SHOWN ON DRAWINGS ARE BASIC SIZES UNLESS STATED OTHERWISE. MAXIMUM PERMITTED VARIATIONS FROM BASIC SIZES TO BE AS STATED IN BS 4471 FOR SOFTWOODS AND BS 5450 FOR HARDWOODS.
10. ALL HANGERS, CONNECTORS & COACHBOLTS/RAGBOLTS/ RAWL BOLTS TO BE FIXED IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS.
11. ALL TIMBER SUPPORTS CONSISTING OF 2 OR MORE PIECES TO BE BOLTED TOGETHER WITH M12 GRADE 8.8 BOLTS AT MAX 450mm c/c.
12. NEW TIMBER IN THE WORKS IS TO BE VACUUM IMPREGNATED WITH PRESERVATIVE TO BS 5268: PART 5 AND THE MANUFACTURER'S RECOMMENDATIONS. CUT ENDS ARE TO BE THOROUGHLY TREATED WITH BRUSH APPLIED COATS OF APPROPRIATE PRESERVATIVE BEFORE FIXING. ALL PRESERVATIVES ARE TO BE TO THE ARCHITECT'S APPROVAL. TIMBER FOR STRUCTURAL USE MUST BE STORED IN A DRY, SHELTERED LOCATION ON SITE. TIMBER WITH A MOISTURE CONTENT GREATER THAN 20% MUST NOT BE USED
13. ALL TIMBER WALL PLATES TO BE STRAPPED AND PLUGGED AND SCREWED TO WALL WITH 30x5 M/S GALVANISED STRAPS AT MAX 1200mm c/c.
14. ALL GABLE ENDS TO BE STRAPPED AND FIXED TO RAFTERS/TRUSSES USING 30x5 M.S.GALV. HOLDING DOWN STRAPS @ 1200 c/c PLUGGED AND SCREWED TO WALL
15. WHERE WALL PLATES ARE SUPPORTED BY STEELWORK 14mmØ HOLES ARE TO BE PRE-DRILLED AT 600mm STAGGERED c/c INTO TOP FLANGE OF BEAM TO ALLOW FOR FIXING OF WALL PLATE WITH M12 GRADE 8.8 BOLTS
16. HERRING BONE STRUTTING TO BE INSTALLED INTO THE TIMBER JOISTS IF THE SPAN IS GREATER THAN 2500mm. JOIST SPAN BETWEEN 2500 TO 4500mm ADD 1 ROW OF STRUTTING (AT CENTRE OF SPAN). JOIST SPAN OVER 4500mm ADD 2 ROWS OF STRUTTING (AT EQUAL SPACING).
17. REFER TO NHBC CHAPTER 6.4-S9 FOR RESTRICTIONS ON SIZE AND POSITIONS FOR NOTCHES AND SERVICE HOLES
18. WHERE APPLICABLE RAFTERS TO BE BIRDSMOUTHED OVER WALL PLATES AT EAVES, PURLIN AND RIDGE LEVELS
19. REFER TO STEELWORK NOTES ON DSA DRG No. 11

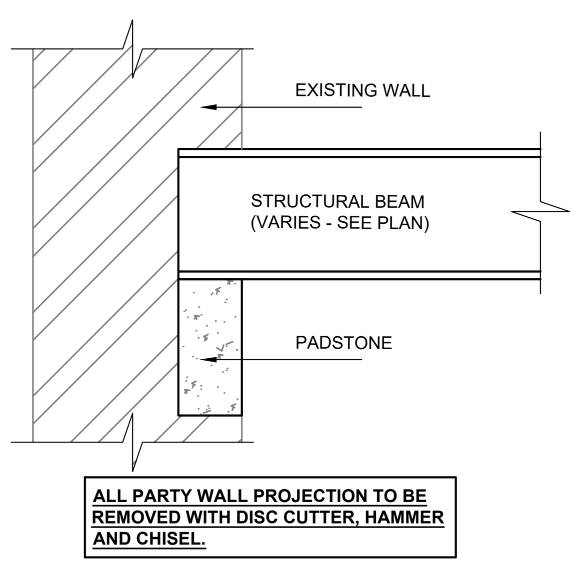
GROUND FLOOR LEGEND

- 200x75 C24 TIMBER FLOOR JOISTS AT 400mm CENTRES
- 250x75 C24 TIMBER FLAT JOISTS AT 400mm CENTRES



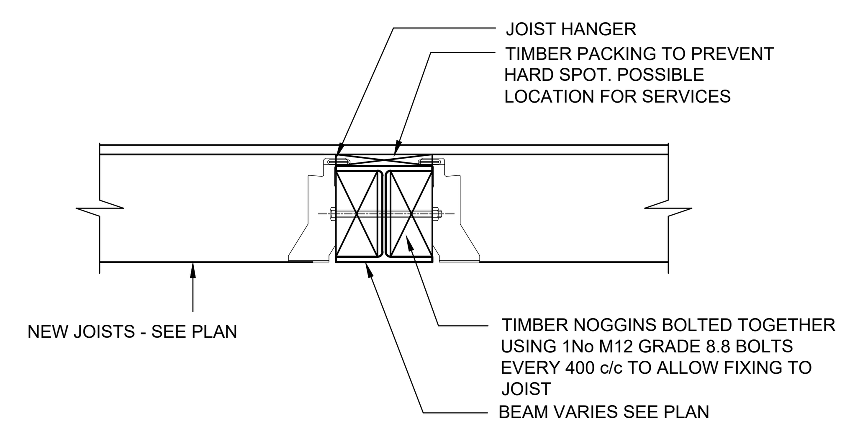
GROUND FLOOR PLAN
(SHOWING SUPPORT AT FIRST FLOOR LEVEL)

1:50



TYPICAL PADSTONE DETAIL

1:10



TYPICAL FLOOR JOIST TO BEAM DETAIL

1:10

ALL WELDS TO COMPLY WITH BS EN 1090-1:2009 +A1:2011 EXECUTION CLASS EXC2

PADSTONES SIZES	
REF	SIZE
P1	330x100x215mm DP C30 CONCRETE PADSTONE
P2	500x100x215mm DP C30 CONCRETE PADSTONE
P3	600x100x215mm DP C30 CONCRETE PADSTONE
P4	750x100x215mm DP C30 CONCRETE PADSTONE
NOTE:- BEAM BEARING LENGTH SHOWN IN BRACKETS	

ISSUE	REVISION	BY	DATE
C1	FIRST ISSUE	JM	01.12.23

ISSUE
CONSTRUCTION

CLIENT
LECONFIELD PROPERTY GROUP

CONTRACT
34 BELGRAVE MEWS SOUTH
LONDON

TITLE
GROUND, FIRST AND SECOND FLOOR PLANS SUPERSTRUCTURE

ARCHITECT
LEWIS STROUD ARCHITECTS

DRAWN	CHECKED	DATE	SCALE
JM	TG	NOV' 23	1:50 @A1

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DRAWING NUMBER 23 54121/12 REVISION C1

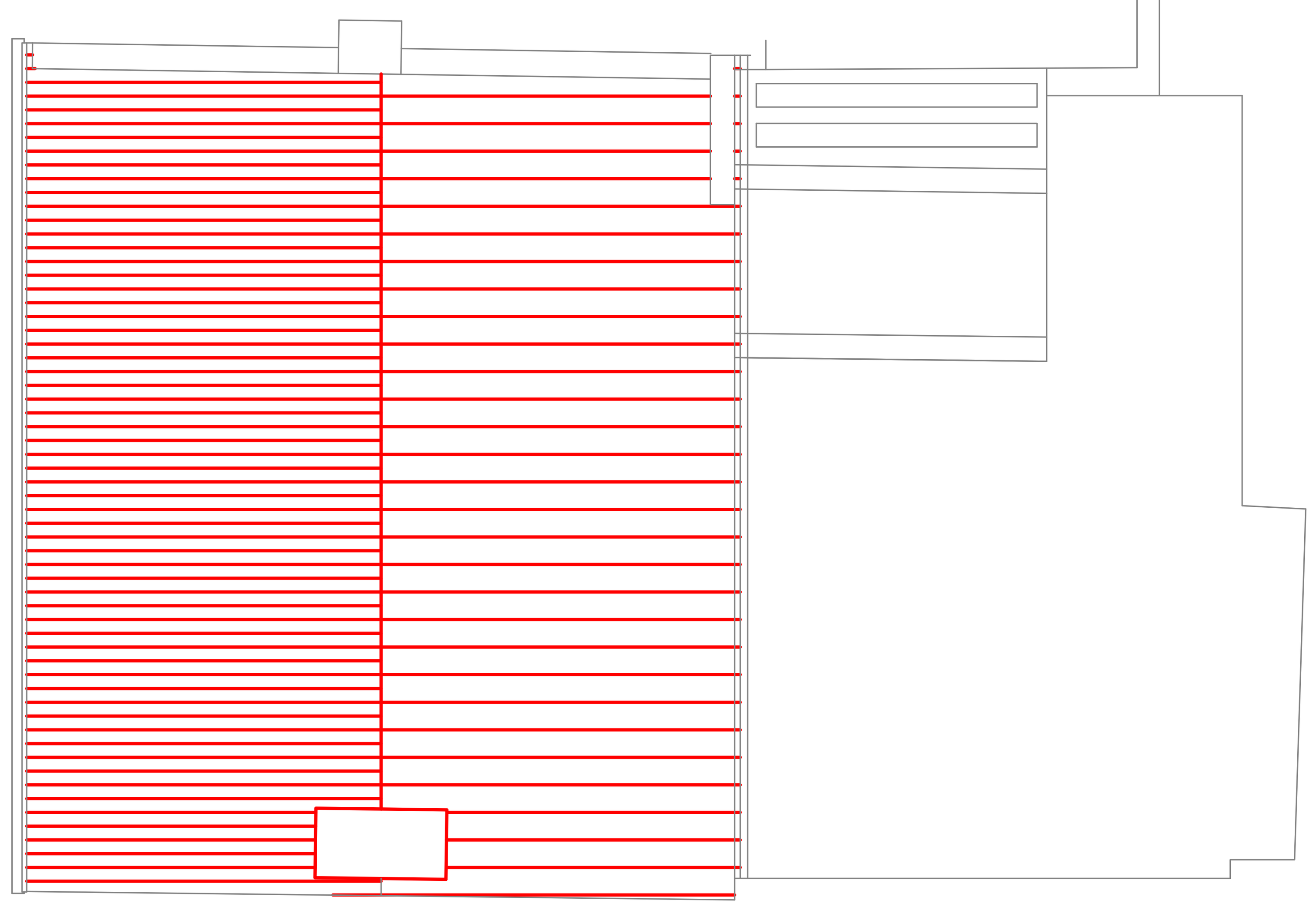
ALL DIMENSIONS TO BE CONFIRMED ON SITE PRIOR TO ORDERING / FABRICATION OF MATERIALS AND COMMENCEMENT OF WORKS

SEQUENCE OF CONSTRUCTION (PHASE 1, STAGES 1-3)

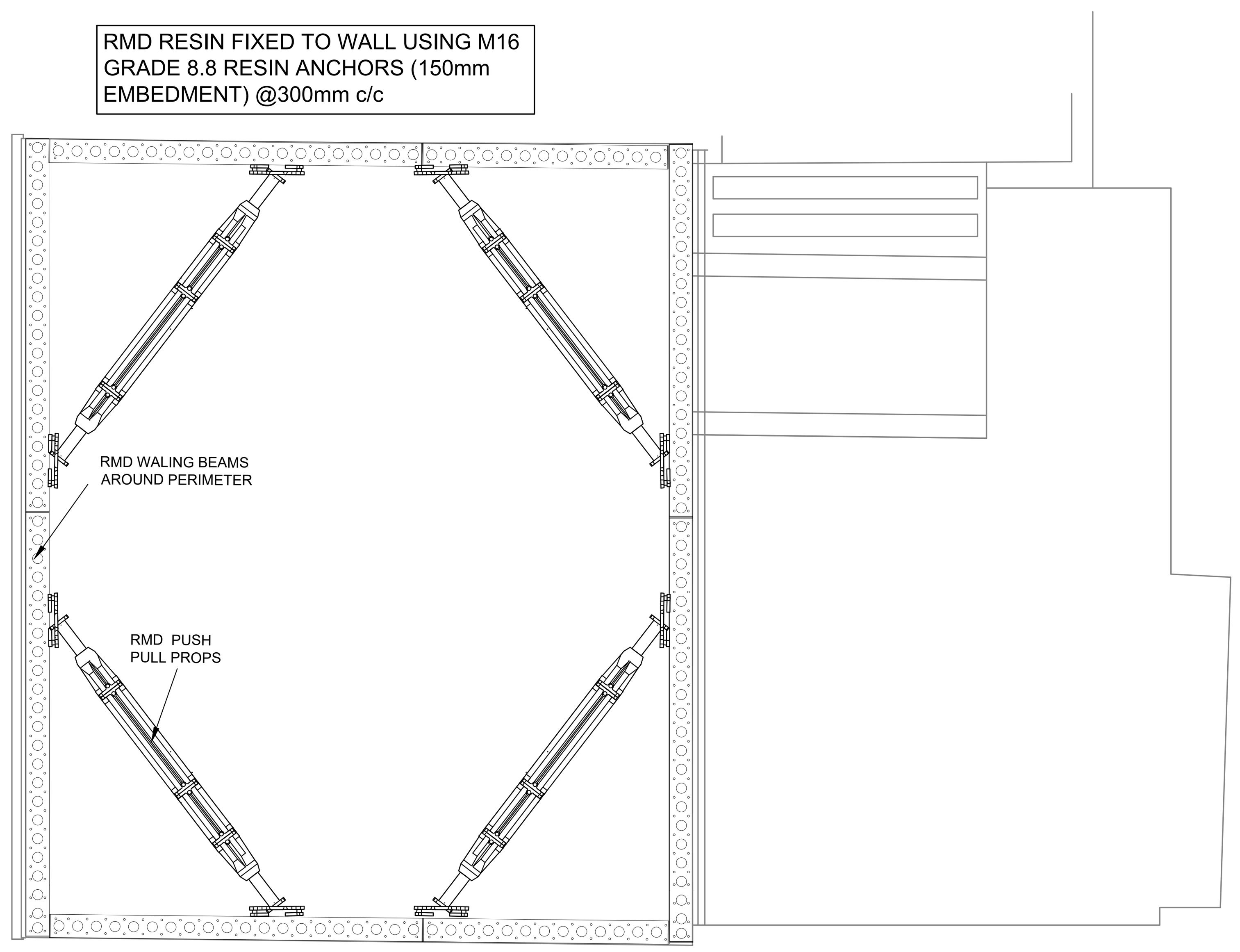
PRELIMINARIES: STRIP AND REMOVE NON-LOAD BEARING ELEMENTS, CEILINGS ETC AND ISOLATE EXISTING SERVICES

STAGES

1. REMOVE EXISTING ROOF STRUCTURE AND CHIMNEY
2. INSTALL WAILING AND HORIZONTAL PROPS AS SHOWN ON PLAN 300mm BELOW EAVES LEVEL
3. STAGE 3 CAN BE DONE AT A LATER DATE TO SUIT CONTRACTOR PROGRAMME - INSTALL SECOND FLOOR / MANSARD STRUCTURE IN ACCORDANCE WITH DSA DRAWING 12



ROOF PLAN SHOWING DEMOLITION
(PHASE 1, STAGE 1)
1:50



ROOF PLAN BRACING AT EAVES LEVEL
(PHASE 1, STAGE 2
1:50

CDM 2015 DESIGNER NOTES

IN ADDITION TO THE HAZARDS, AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RISKS AND INFORMATION.

CONSTRUCTION:

1. N/A

FOR INFORMATION RELATING TO END USE, MAINTENANCE, DEMOLITION, SEE THE HEALTH AND SAFETY FILE.

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

Notes

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3. ALL WORK TO BE CARRIED OUT IN ACCORDANCE WITH THE RELEVANT BRITISH STANDARDS, CODES OF PRACTICE AND BUILDING PRACTICE.
4. ALL DIMENSIONS TO BE CHECKED PRIOR TO STARTING THE WORKS ON SITE. ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER IMMEDIATELY.
5. CONTRACTOR TO ASCERTAIN THE LOCATION OF SERVICES ON SITE PRIOR TO STARTING THE WORK.
6. ALL DIMENSIONS FOR CONSTRUCTION ARE TO BE OBTAINED FROM SITE MEASUREMENTS OR ARCHITECTS SETTING OUT DRAWINGS PRIOR TO MANUFACTURE/BUILDING.
7. REFER TO STEELWORK NOTES ON DSA DRG No. 11 AND TIMBER NOTES ON DRG 12
8. ALL TEMPORARY WORKS HAVE BEEN DESIGNED IN ACCORDANCE WITH BS 5975:2008
9. ALL SCAFFOLDING TO BE DESIGNED IN ACCORDANCE WITH WITH NASC TG20:13
10. PRINCIPAL CONTRACTOR TO APPOINT TEMPORARY WORKS COORDINATOR (TWC) TO OVERSEE ALL AREAS OF TEMPORARY WORK UNTIL COMPLETION OF ASSOCAITED WORKS.
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14. CONTRACTOR TO CONFIRM ANY BUILDING MATERIAL WEIGHTS TO BE STORED IN THE AREA OF TEMPORARY SUPPORT PRIOR TO THE COMMENCEMENT OF WORKS.

SEQUENCE OF CONSTRUCTION (PHASE 1, STAGES 4-6)

PRELIMINARIES: STRIP AND REMOVE NON-LOAD BEARING ELEMENTS, CEILINGS ETC AND ISOLATE EXISTING SERVICES

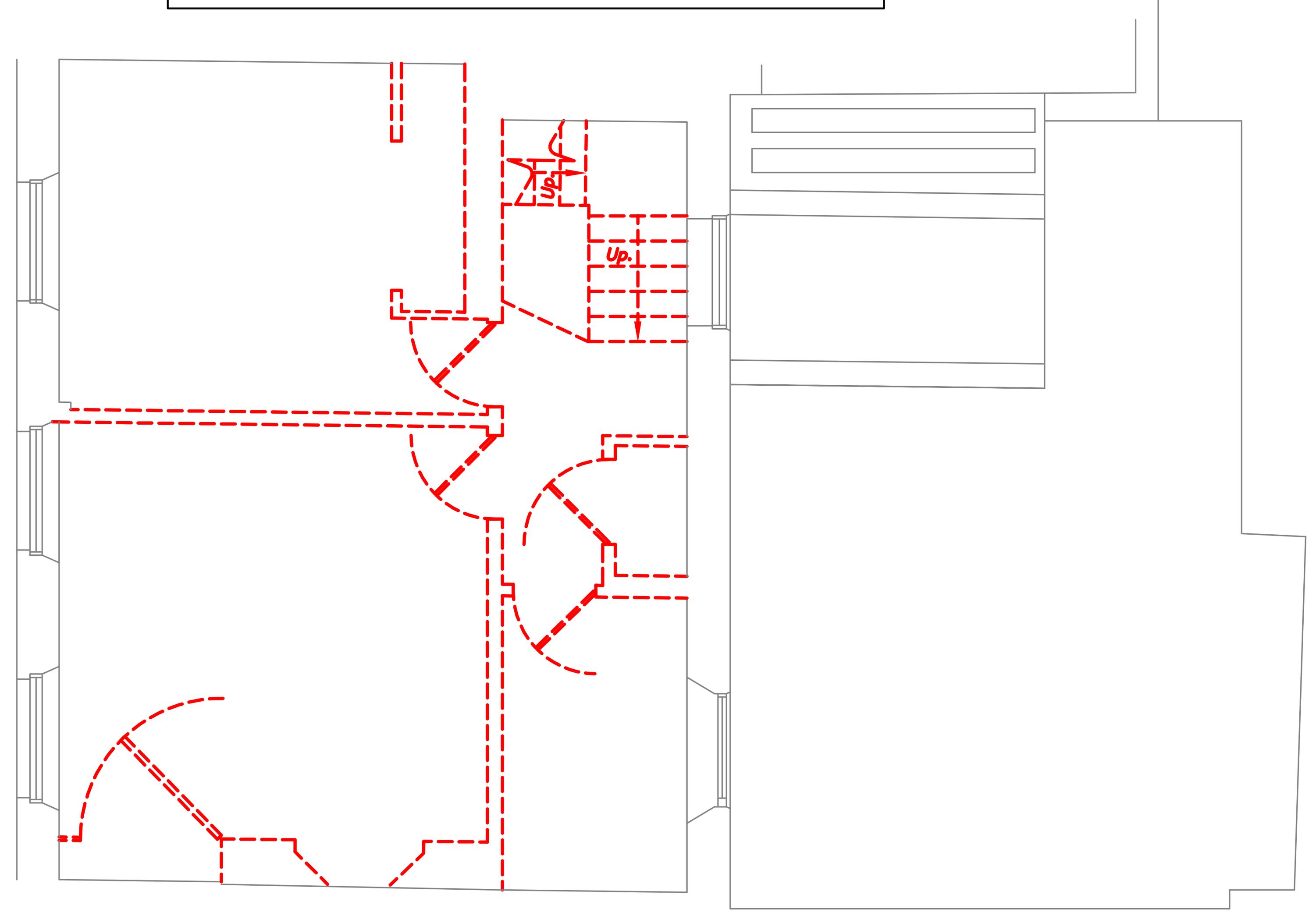
STAGES

4. DEMOLISH ALL INTERNAL WALLS DOWN TO FLOOR JOIST LEVEL

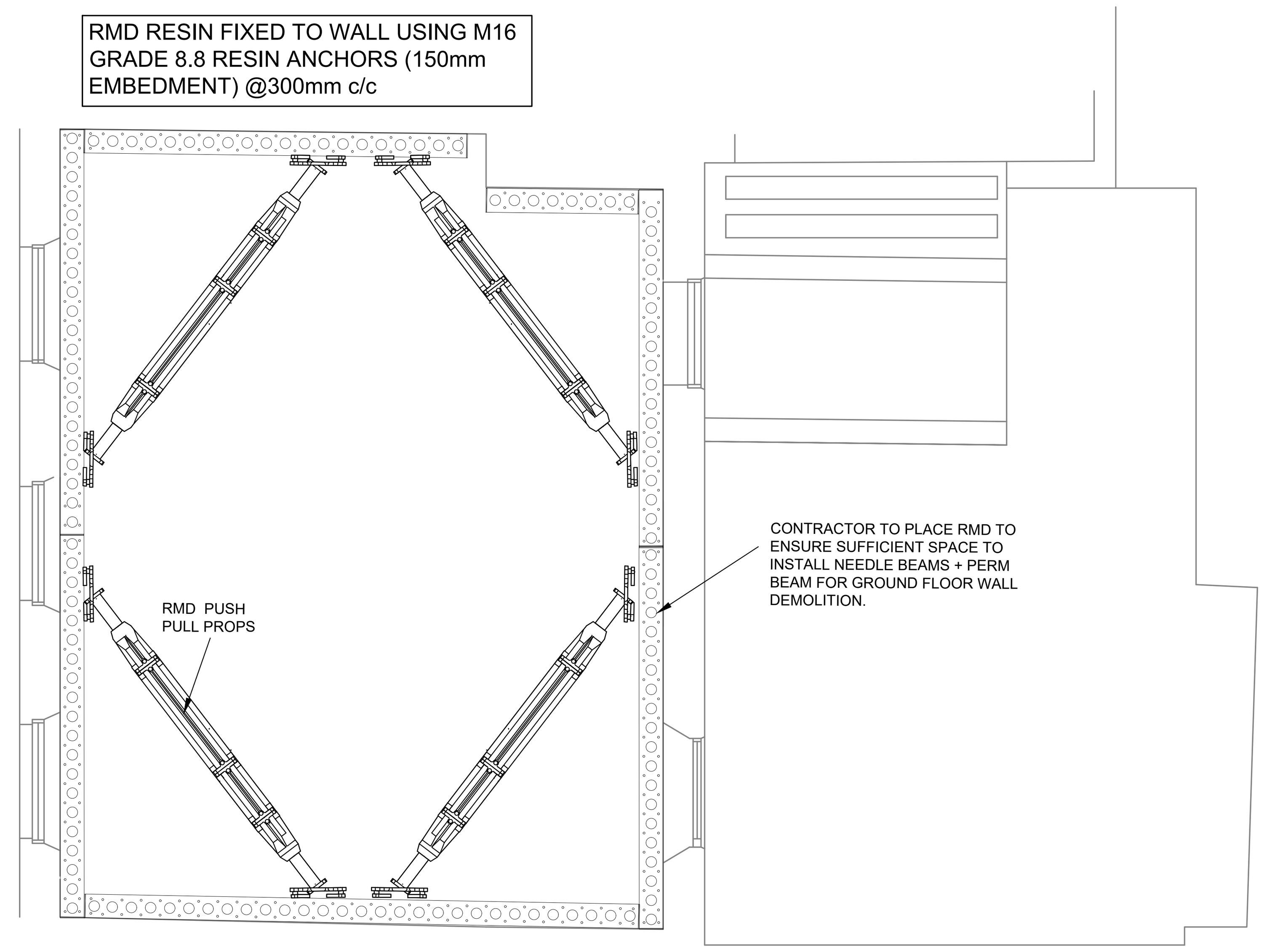
5. INSTALL WAILING AND HORIZONTAL PROPS AS SHOWN ON PLAN 500mm ABOVE EXISTING FLOOR JOISTS - ALLOW SUFFICIENT SPACE FOR NEEDLE BEAMS (STAGE9)

6. REMOVE EXISTING FLOOR STRUCTURE

7. STAGE 7 CAN BE UNDERTAKEN AT A LATER DATE TO SUIT CONTRACTORS PROGRAMME- INSTALL NEW FIRST FLOOR STRUCTURE IN ACCORDANCE WITH DSA DRAWING No. 12. ONLY REMOVE RMD BRACING ONCE FLOOR HAS BEEN REINSTATED



FIRST FLOOR PLAN SHOWING DEMOLITION
(PHASE 1, STAGE 4)
1:50



FIRST FLOOR PLAN SHOWING BRACING
(PHASE 1, STAGE 5)
1:50

ISSUE	REVISION	BY	DATE
C1	FIRST ISSUE	JM	01.12.23

ISSUE: CONSTRUCTION

CLIENT: LECONFIELD PROPERTY GROUP

CONTRACT: 34 BELGRAVE MEWS SOUTH LONDON

TITLE: ENABLING WORKS PHASE 1 SHEET 1 OF 2

ARCHITECT: LEWIS STROUD ARCHITECTS

DRAWN	CHECKED	DATE	SCALE
JM	TG	NOV' 23	1:50 @A1

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Northampton NN3 6WL

DRAWING NUMBER			REVISION
	23	54121/21	C1

ALL DIMENSIONS TO BE CONFIRMED ON SITE PRIOR TO ORDERING / FABRICATION OF MATERIALS AND COMMENCEMENT OF WORKS

SEQUENCE OF CONSTRUCTION (PHASE 1, STAGES 8-11)

PRELIMINARIES: STRIP AND REMOVE NON-LOAD BEARING ELEMENTS, CEILINGS ETC AND ISOLATE EXISTING SERVICES

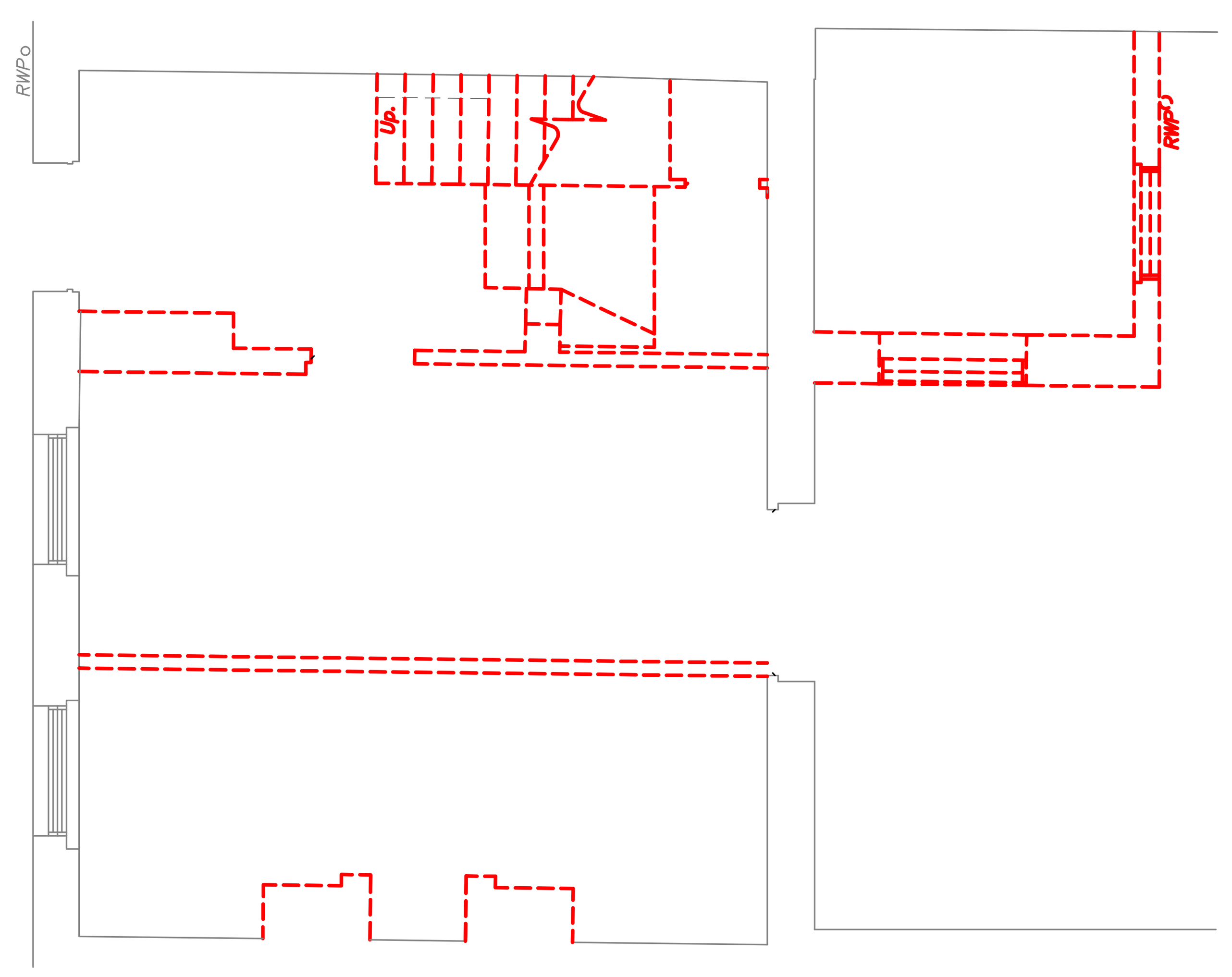
STAGES

8. DEMOLISH ALL INTERNAL WALLS DOWN TO SLAB LEVEL

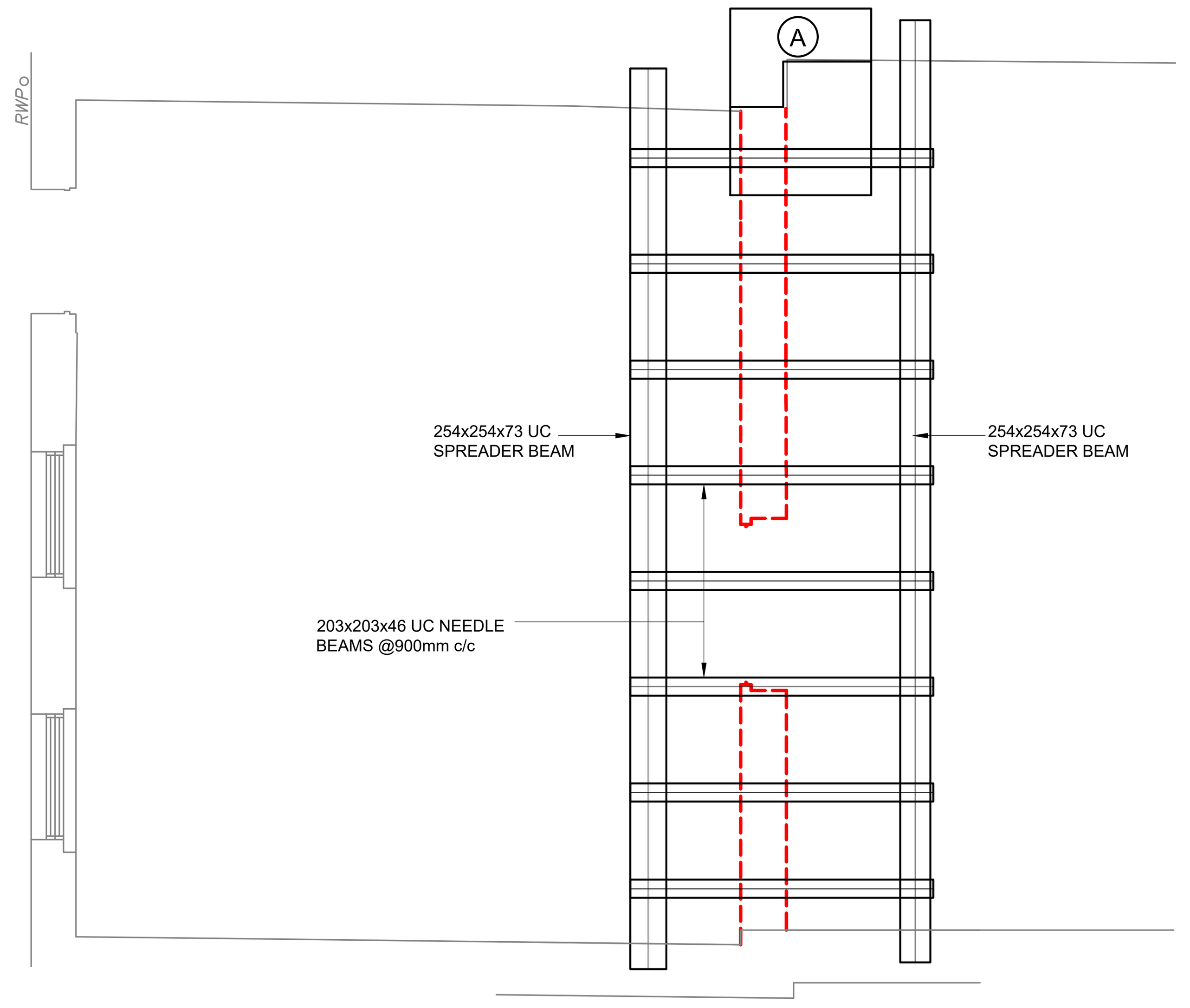
9. INSTALL TEMPORARY STEELWORK AND NEEDLE BEAMS TO ALLOW REMOVAL OF REAR WALL

10. INSTALL PINS TO ALLOW INSTALLATION OF REAR WALL SUPPORT BEAM COLUMN

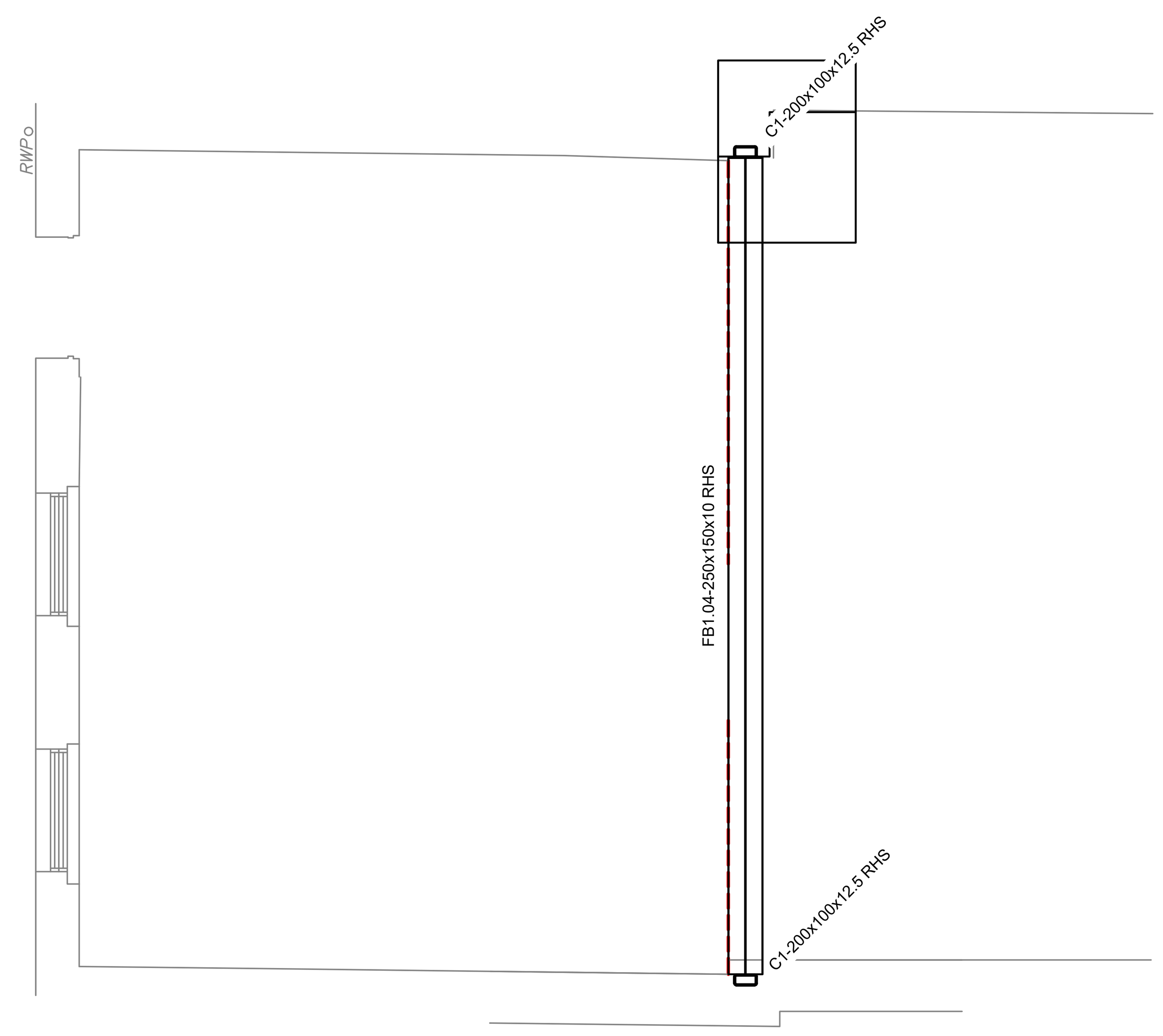
11. INSTALL PERM GOAL POST BEAM AT GROUND FLOOR, FIRST FLOOR + COLUMN TO SUPPORT REAR WALL (SEE DRAWING 12)



GROUND FLOOR PLAN SHOWING DEMOLITION
(PHASE 1, STAGE 8)
1:50



FIRST FLOOR PLAN SHOWING REAR WALL TEMP WORKS
(PHASE 1, STAGE 9 & 10)
1:50



FIRST FLOOR PLAN SHOWING REAR WALL SUPPORT
(PHASE 1, STAGE 11)
1:50

CDM 2015 DESIGNER NOTES

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CONSTRUCTION:

1. N/A

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ISSUE	REVISION	BY	DATE
C1	FIRST ISSUE	JM	01.12.23

ISSUE
CONSTRUCTION

CLIENT
LECONFIELD PROPERTY GROUP

CONTRACT
34 BELGRAVE MEWS SOUTH
LONDON

TITLE
ENABLING WORKS
PHASE 1 SHEET 2 OF 2

ARCHITECT
LEWIS STROUD ARCHITECTS

DRAWN	CHECKED	DATE	SCALE
JM	TG	NOV' 23	1:50 @A1

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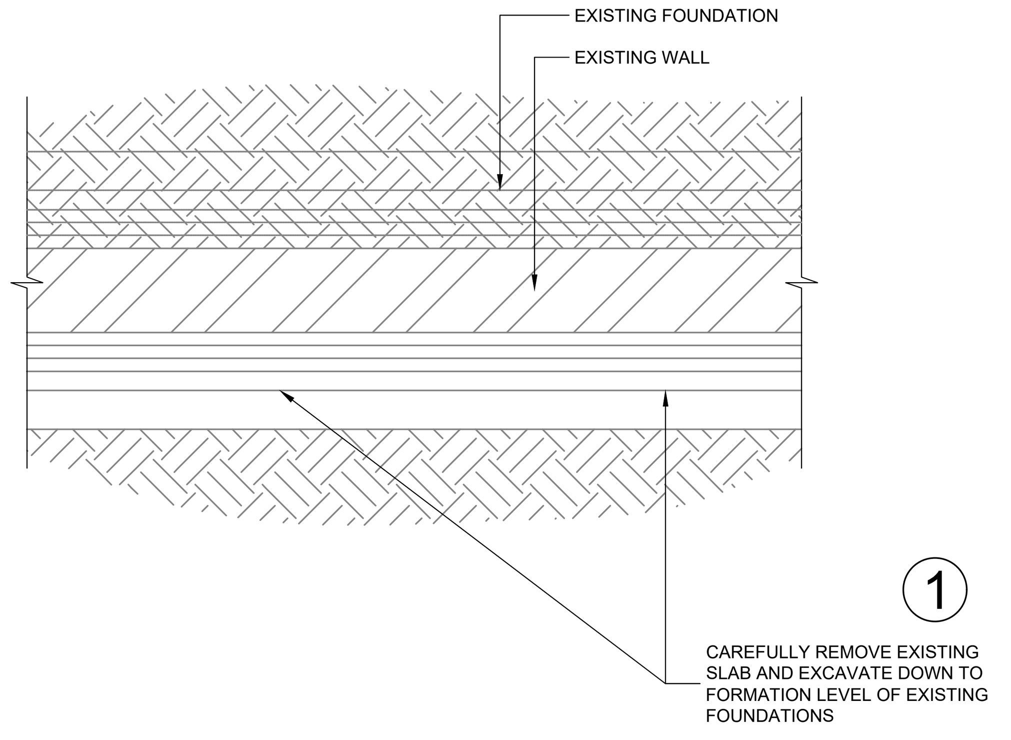
DRAWING NUMBER			REVISION
	23	54121/22	C1

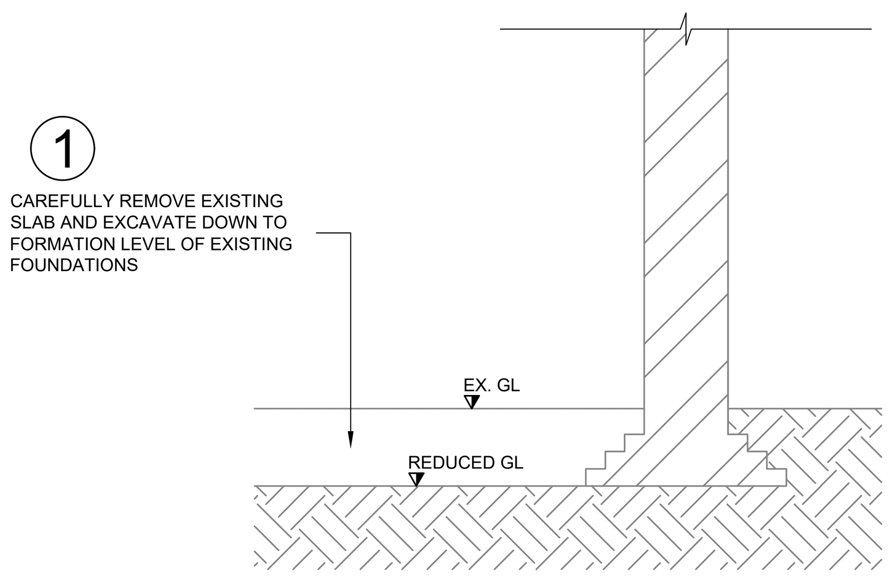
ALL DIMENSIONS TO BE CONFIRMED ON SITE PRIOR TO ORDERING / FABRICATION OF MATERIALS AND COMMENCEMENT OF WORKS

PHASE 1

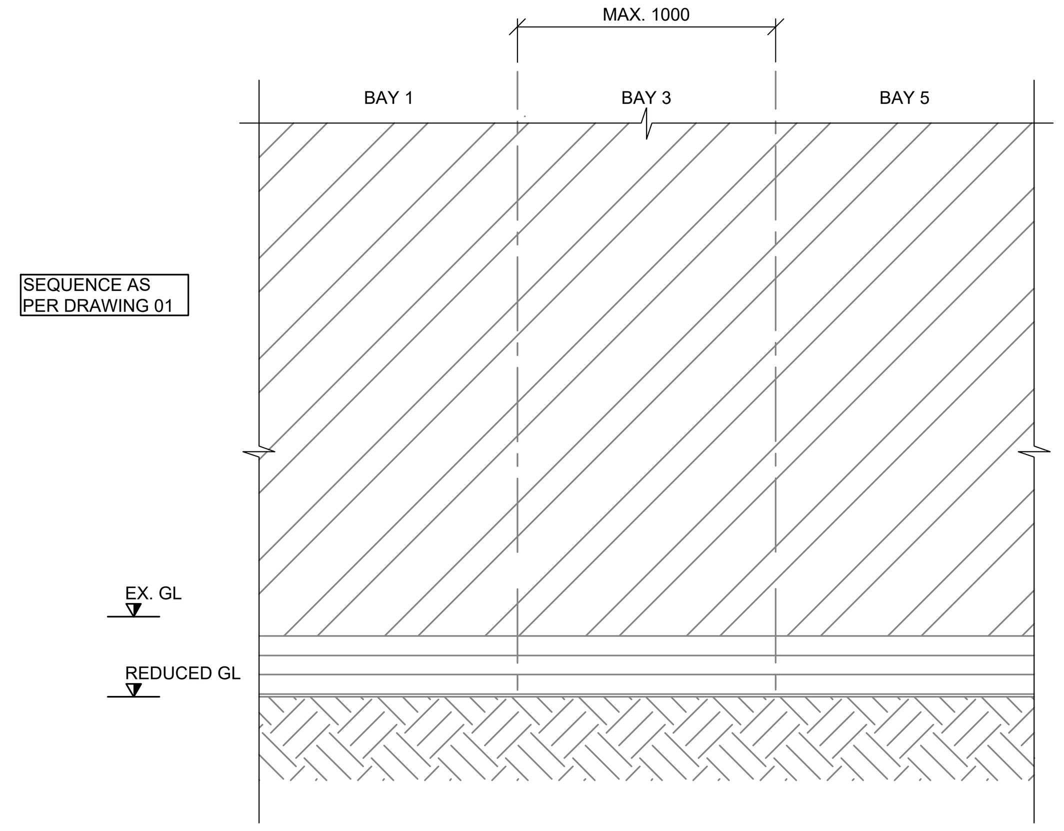
1. THE EXISTING SLAB HAS BEEN REMOVED AND EXCAVATED DOWN TO TOP OF THE FORMATION LEVEL OF THE EXISTING FOUNDATIONS.
2. THE SPECIAL FOUNDATION IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE SEQUENCE HIGHLIGHTED ON PLAN. THE LOCATIONS OF ALL PROPOSED BAYS ARE TO BE MARKED ON THE EXISTING WALLS PRIOR TO COMMENCING WORKS.
3. ALL DRAWINGS, SPECIFICATION AND CONSTRUCTION METHODOLOGY SHOULD BE REFERRED TO PRIOR TO COMMENCING WORKS.
4. A SAFE MEANS OF ACCESS/EGRESS IS TO BE PROVIDED AT ALL TIMES DURING THE CONSTRUCTION WORKS.



PLAN
1:25



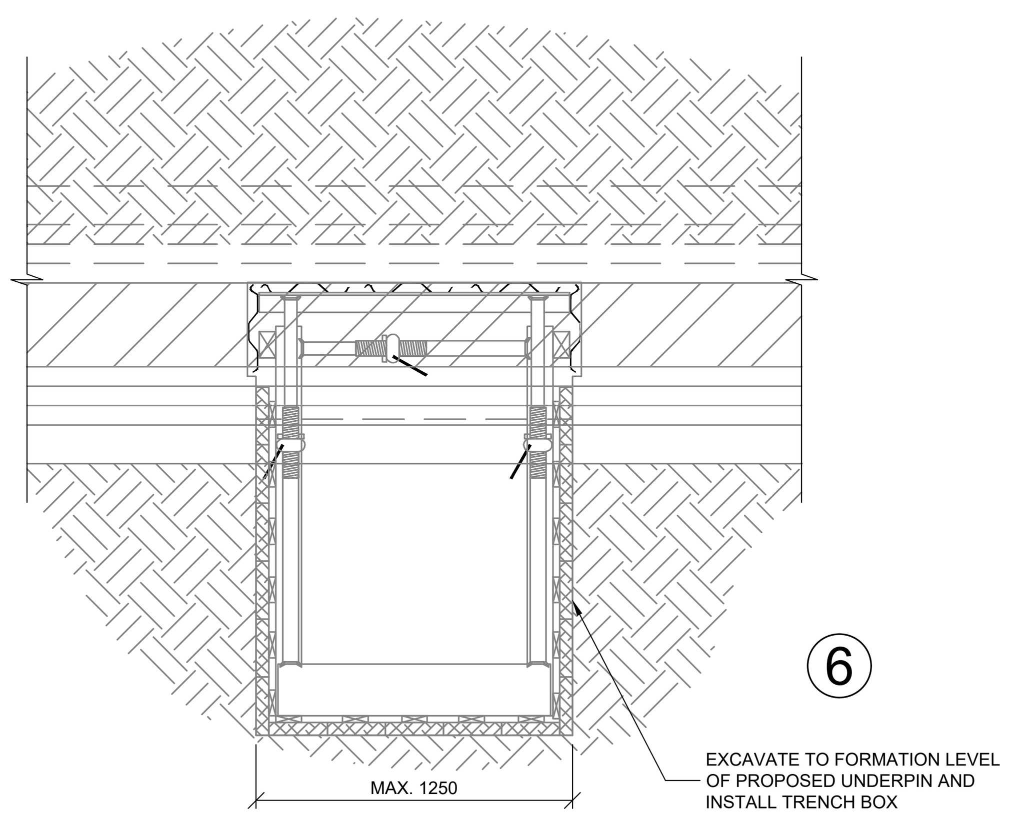
SECTION
1:25



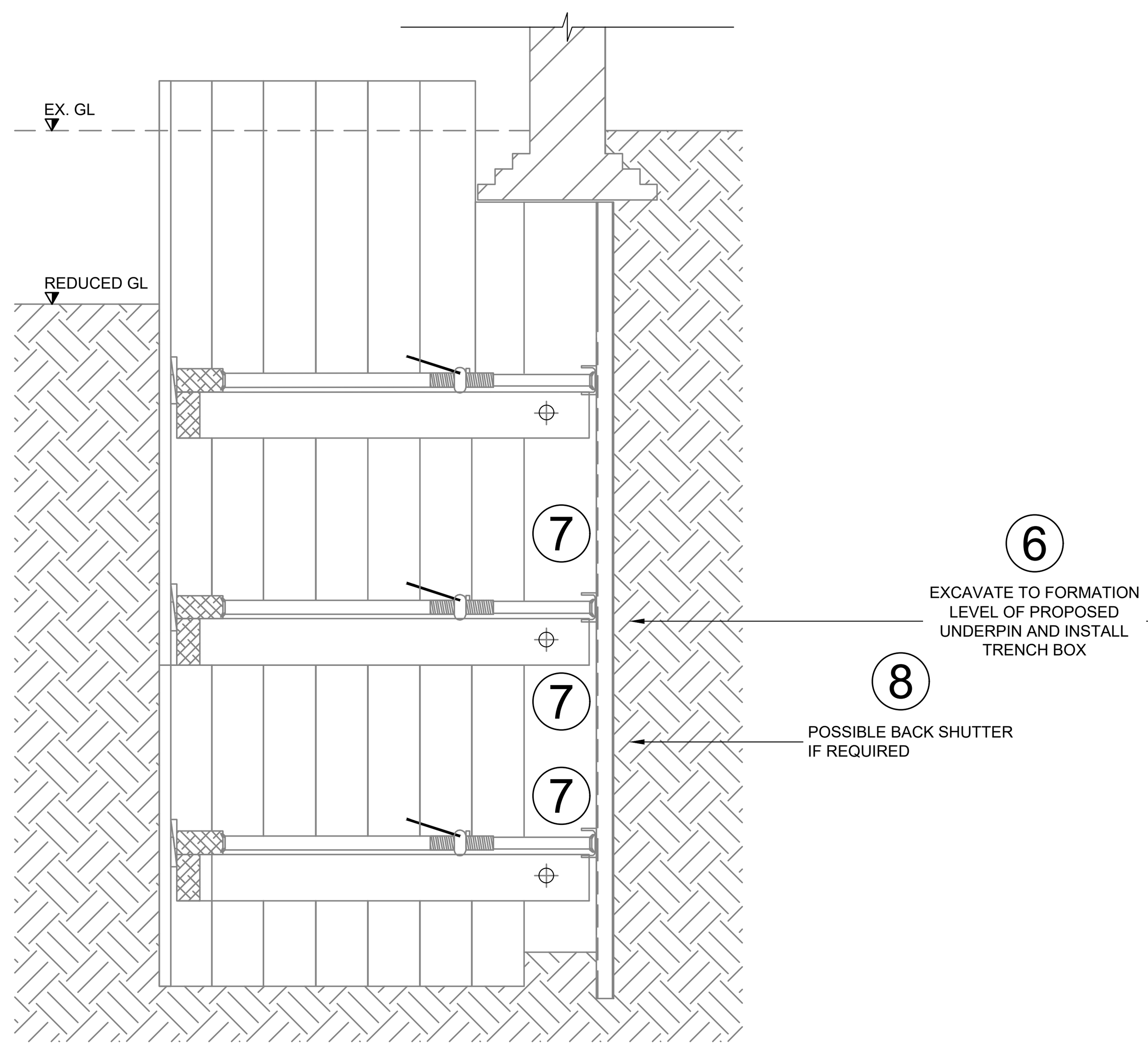
ELEVATION
1:25

PHASE 2

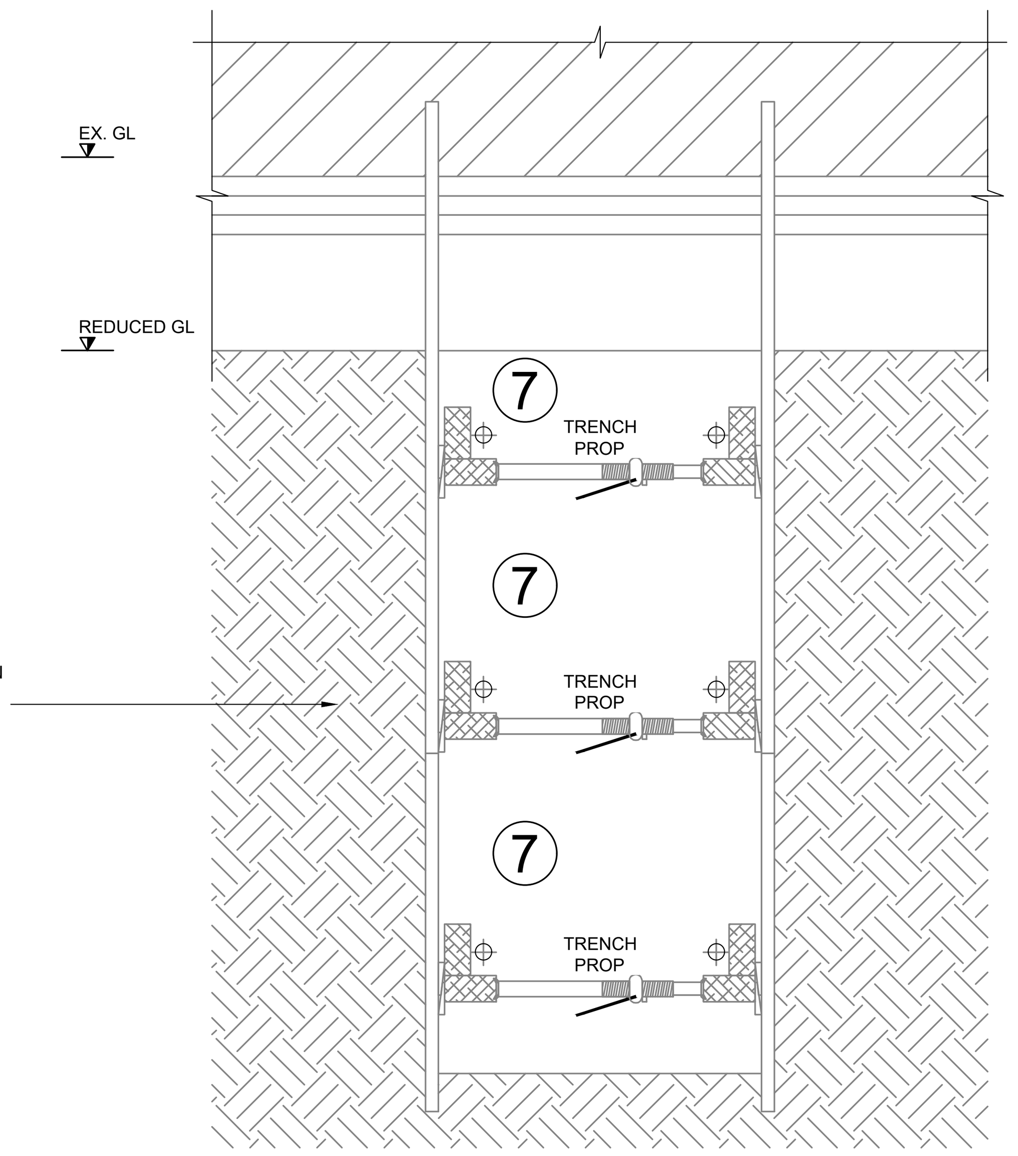
5. EXCAVATE THE PROPOSED SPECIAL FOUNDATION BAYS AT MAXIMUM 1m WIDE STRIPS.
6. PROCEED WITH EXCAVATION TO THE PROPOSED FORMATION LEVEL INDICATED ON PLAN.
7. INSTALL THE TRENCH SUPPORTS AS INDICATED AROUND THE EXCAVATION AS THE EXCAVATION EXTENDS DOWN ENSURING THE SIDES OF THE EXCAVATION ARE SUPPORTED AT ALL TIMES.
8. DEPENDING ON GROUND CONDITIONS ENCOUNTERED AND SOIL PARAMETERS, IT MAY BE A REQUIREMENT TO SUPPORT THE BACK FACE OF THE EXCAVATION. THIS SHALL BE SUPPORTED USING TIMBER BOARDS/TRENCH SHEETS AND BRACED BACK TO THE EXCAVATION FACE IN ORDER TO RESTRAIN THE REAR WALL FACE OF THE EXCAVATION.
9. ONCE IT HAS BEEN EXCAVATED, THE UNDERSIDE OF THE EXISTING FOOTING SHALL BE CLEANED OF ANY LOOSE CRUMPLED MATERIAL TO PROVIDE A SOUND SURFACE TO THE WALL TO BE SUPPORTED.



PLAN
1:25



SECTION
1:25



ELEVATION
1:25

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ISSUE	REVISION	BY	DATE
C1	FIRST ISSUE	JM	01.12.23

ISSUE
CONSTRUCTION

CLIENT
LECONFIELD PROPERTY GROUP

CONTRACT
34 BELGRAVE MEWS SOUTH
LONDON

TITLE
SPECIAL FOUNDATION SEQUENCING - SHT 1 OF 2

ARCHITECT
LEWIS STROUD ARCHITECTS

DRAWN	CHECKED	DATE	SCALE
JM	TG	NOV' 23	1:25 @A1

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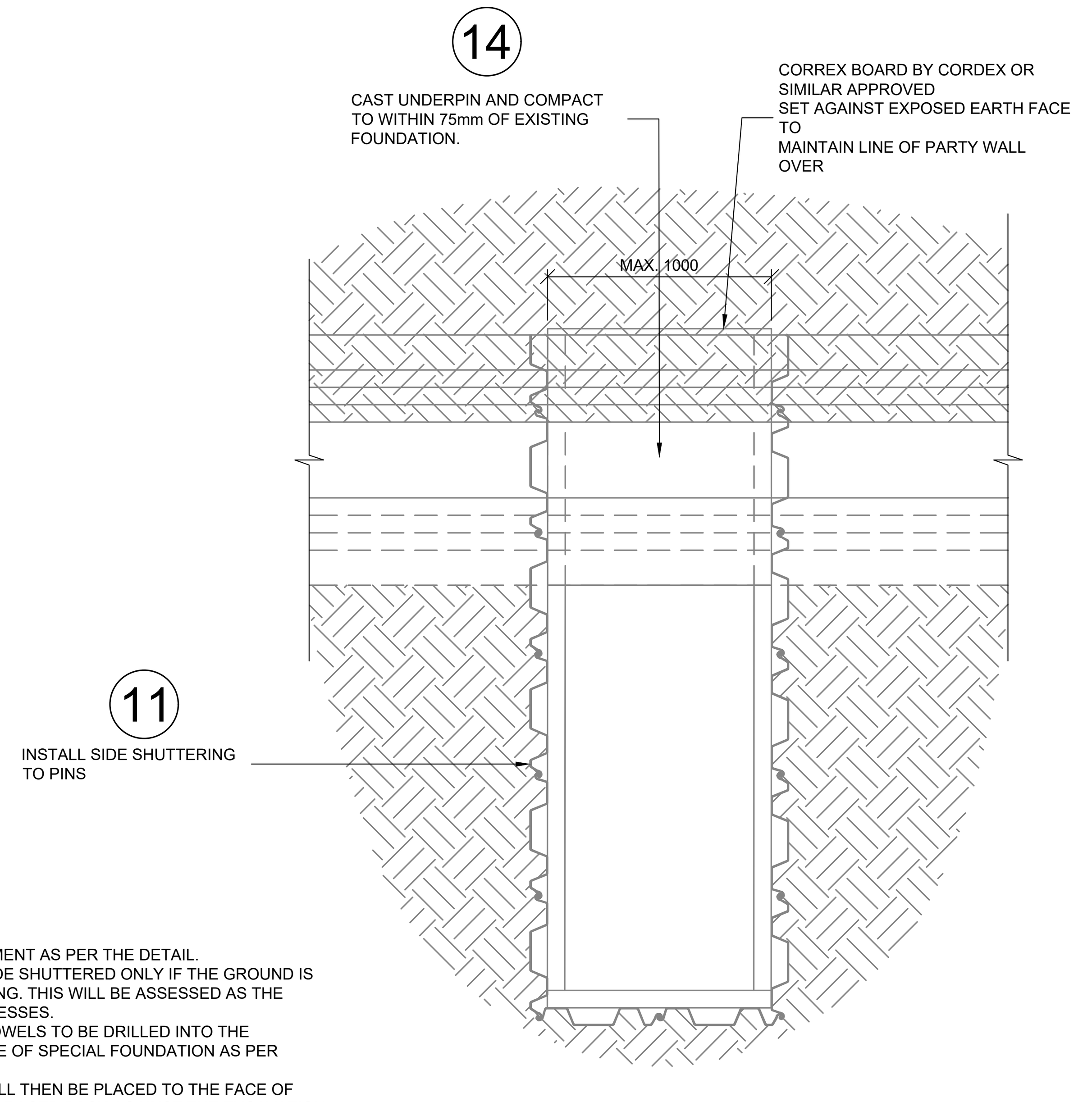
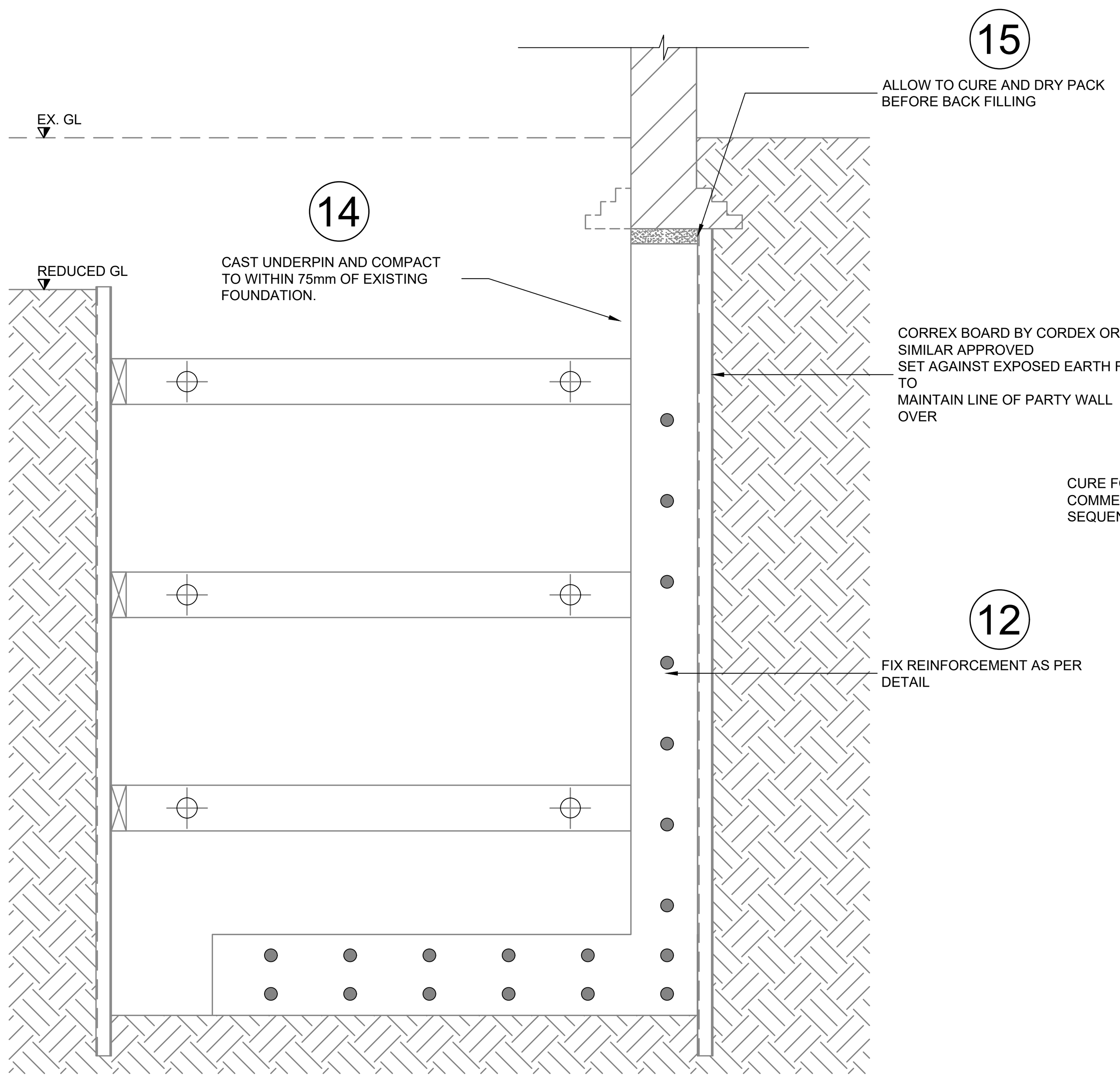
Northampton NN3 6WL

DRAWING NUMBER			REVISION
	23	54121/23	C1

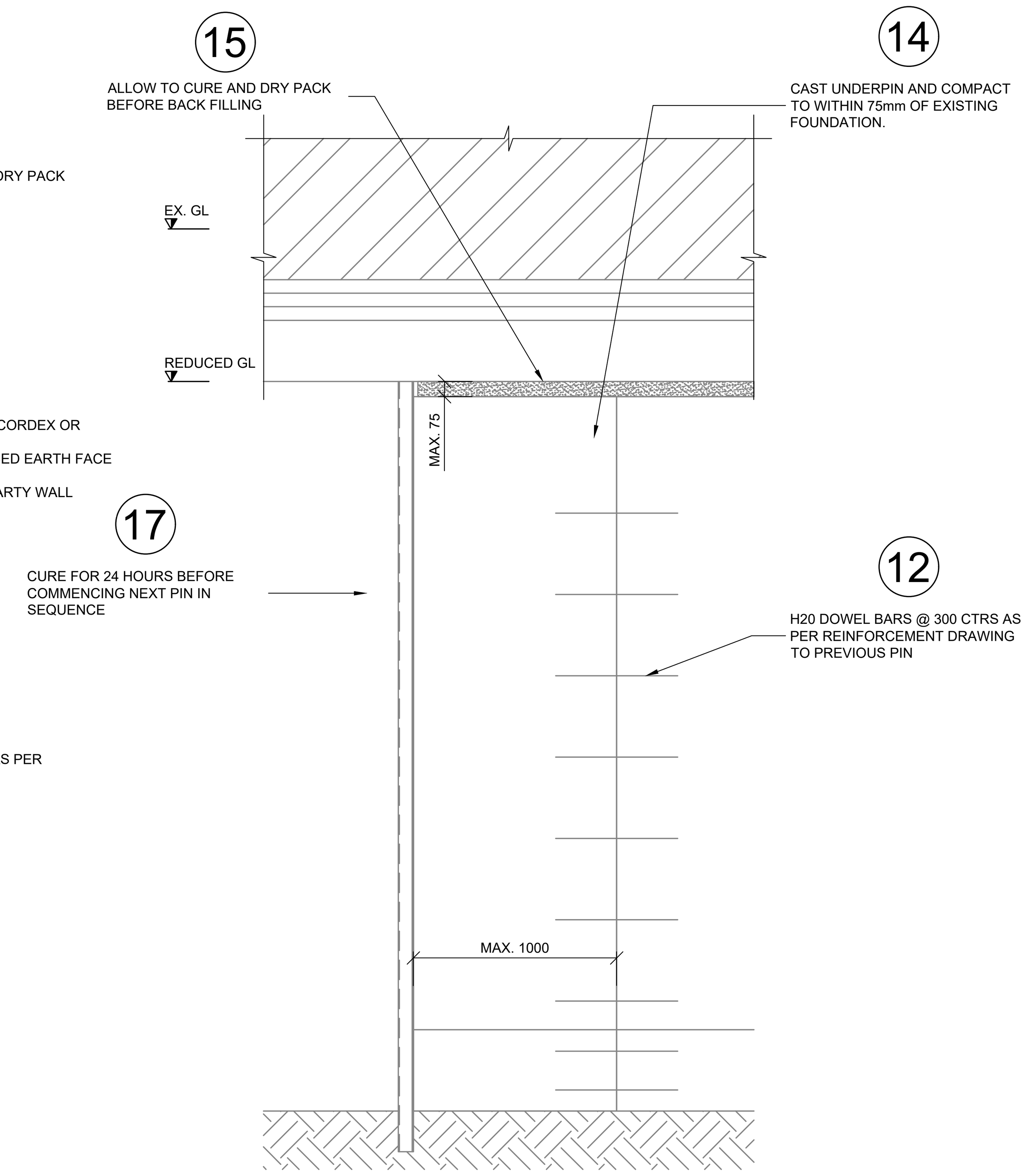
ALL DIMENSIONS TO BE CONFIRMED ON SITE PRIOR TO ORDERING / FABRICATION OF MATERIALS AND COMMENCEMENT OF WORKS



PLAN
1:25



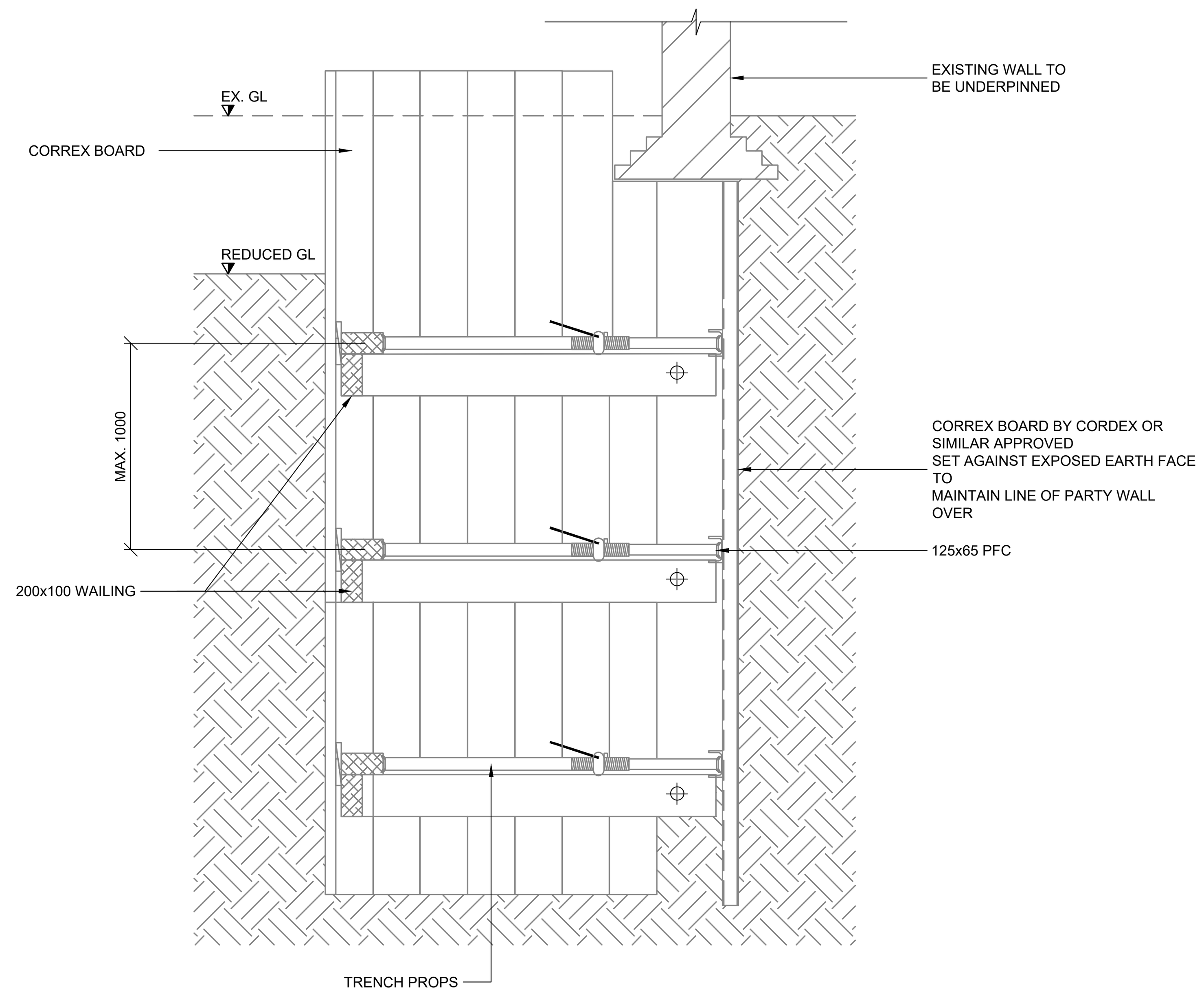
SECTION
1:25



ELEVATION
1:25

PHASE 3

10. FIX THE REINFORCEMENT AS PER THE DETAIL.
11. THE PINS WILL BE SIDE SHUTTERED ONLY IF THE GROUND IS NOT SELF SUPPORTING. THIS WILL BE ASSESSED AS THE EXCAVATION PROGRESSES.
12. INSTALL DOWELS. DOWELS TO BE DRILLED INTO THE PREVIOUS SEQUENCE OF SPECIAL FOUNDATION AS PER DRAWING.
13. CORREX BOARD SHALL THEN BE PLACED TO THE FACE OF THE UNDERPIN AND BRACED BACK AGAINST THE EXCAVATION FACE.
14. THE CONCRETE SHALL THEN BE DISCHARGED INTO THE SHUTTERED UNDERPIN AND WILL BE COMPACTED USING 110v CONCRETE POKER TO WITHIN 75mm OF THE UNDERSIDE OF THE EXISTING FOUNDATION.
15. ALLOW TO CURE FOR 24 HOURS BEFORE DRY PACKING. THE EXCAVATION IS THEN TO BE BACKFILLED AND COMPACTED IN LAYERS NOT EXCEEDING 600mm THICK.
16. DRY PACK MORTAR TO BE RAMMED INTO THE VOID USING HEAVY STEEL RAMMING BAR.
17. ALLOWING THE DRY PACKING TO CURE FOR 24 HOURS PRIOR TO COMMENCING THE EXCAVATION OF THE NEXT PIN IN SEQUENCE.
18. THIS PROCESS SHALL BE REPEATED FOR EACH PIN.



TYPICAL UNDERPINNING TRENCH DETAIL
1:25

Notes

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CDM 2015 DESIGNER NOTES

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ISSUE
CONSTRUCTION

CLIENT
LECONFIELD PROPERTY GROUP

CONTRACT
34 BELGRAVE MEWS SOUTH
LONDON

TITLE
SPECIAL FOUNDATION SEQUENCING - SHT 2 OF 2

ARCHITECT
LEWIS STROUD ARCHITECTS

DRAWN	CHECKED	DATE	SCALE
JM	TG	NOV' 23	1:25 @A1

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DRAWING NUMBER			REVISION
	23	54121/24	C1

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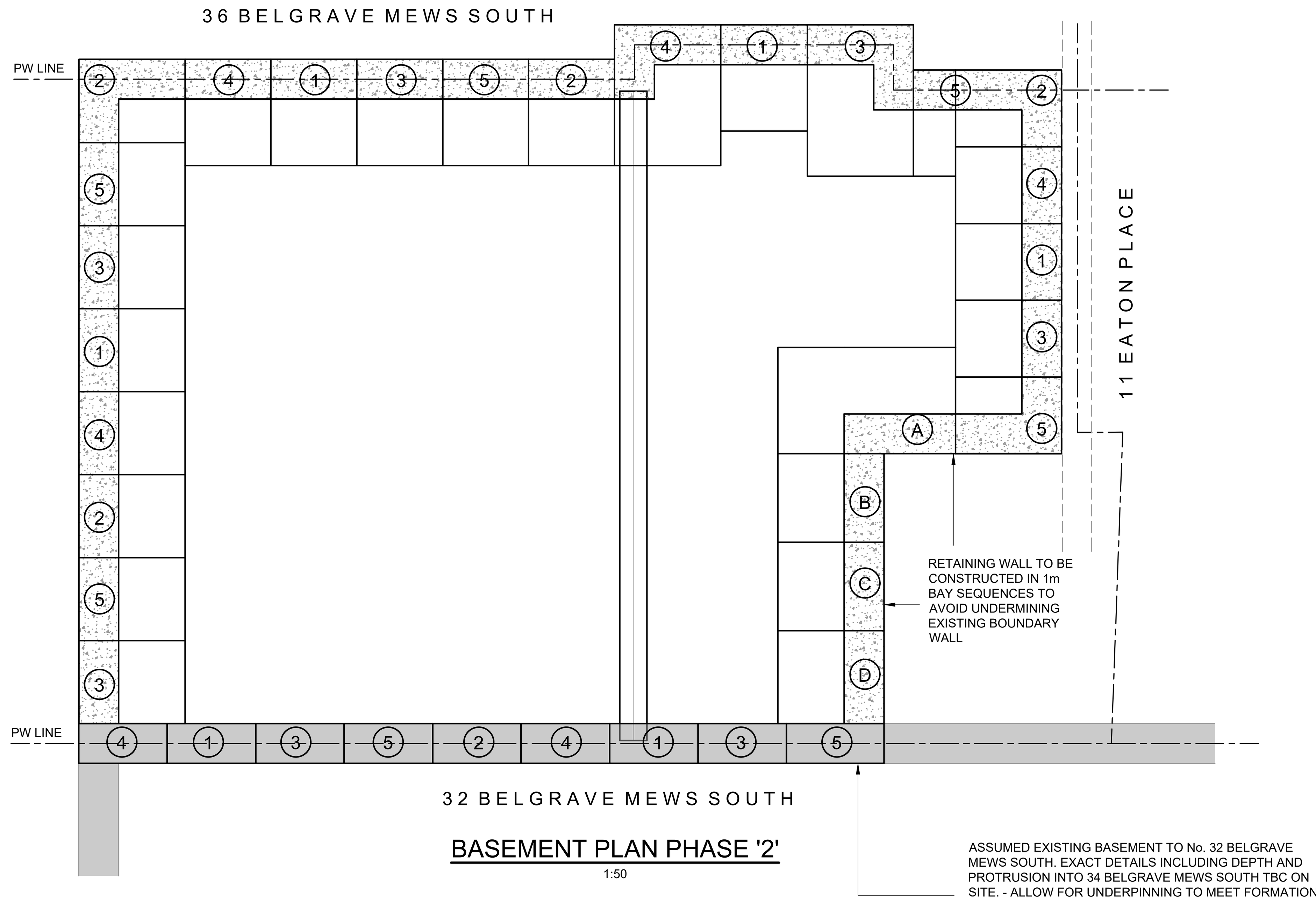


BASEMENT PLAN PHASE '2'
1:50

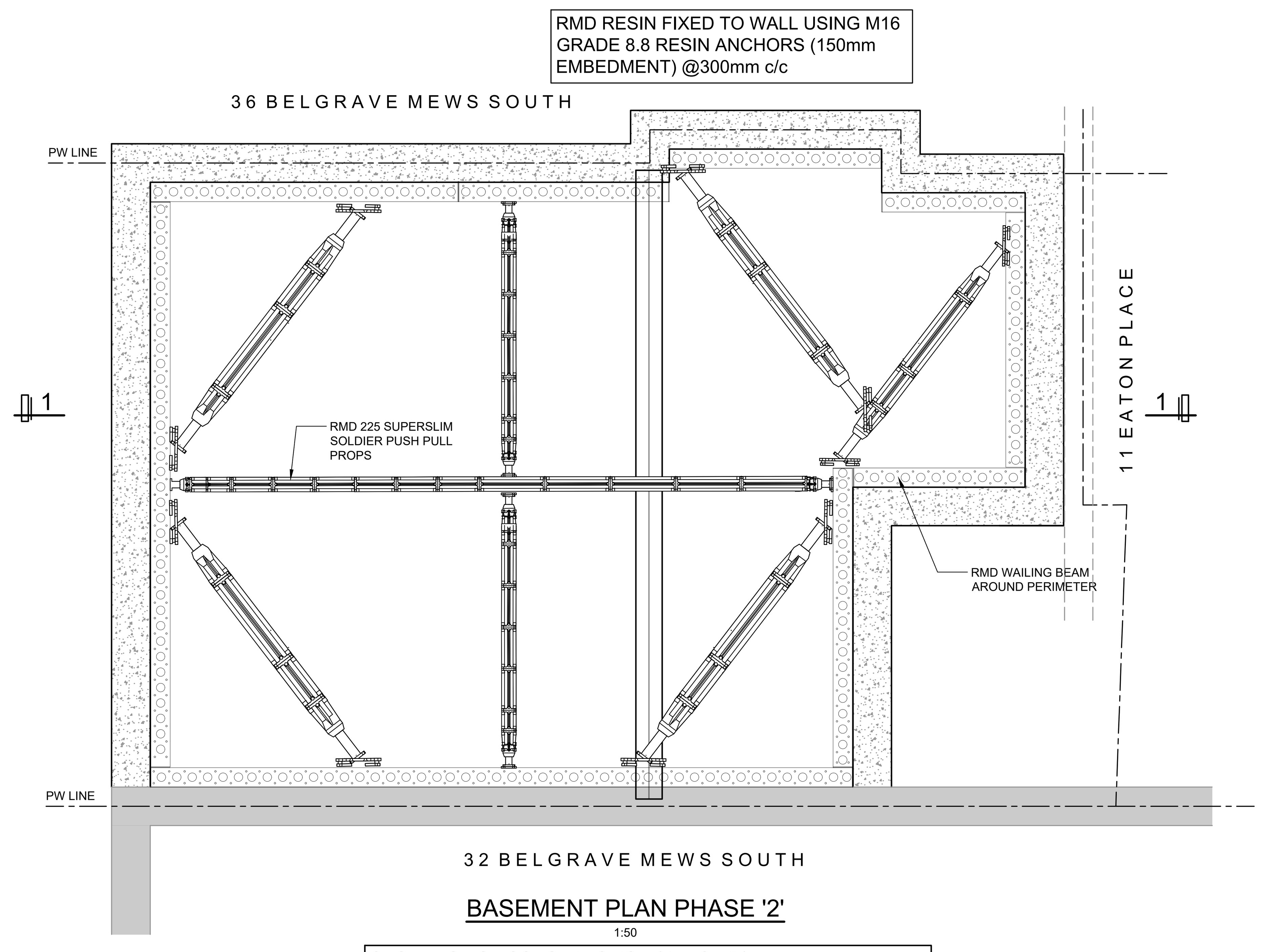
ASSUMED EXISTING BASEMENT TO No. 32 BELGRAVE MEWS SOUTH. EXACT DETAILS INCLUDING DEPTH AND PROTRUSION INTO 34 BELGRAVE MEWS SOUTH TBC ON SITE. - ALLOW FOR UNDERPINNING TO MEET FORMATION LEVEL (DETAILS TBC)

SEQUENCE OF CONSTRUCTION (PHASE 2)

PRELIMINARIES: STRIP AND REMOVE NON-LOAD BEARING ELEMENTS, CEILINGS ETC AND ISOLATE EXISTING SERVICES

STAGES

1 - INSTALL SPECIAL FOUNDATION AND RETAINING WALLS IN ACCORDANCE TO DSA DRAWING No. 01 AND SPECIAL FOUNDATION SEQUENCE DRAWINGS, TO EXTENT SHOWN.



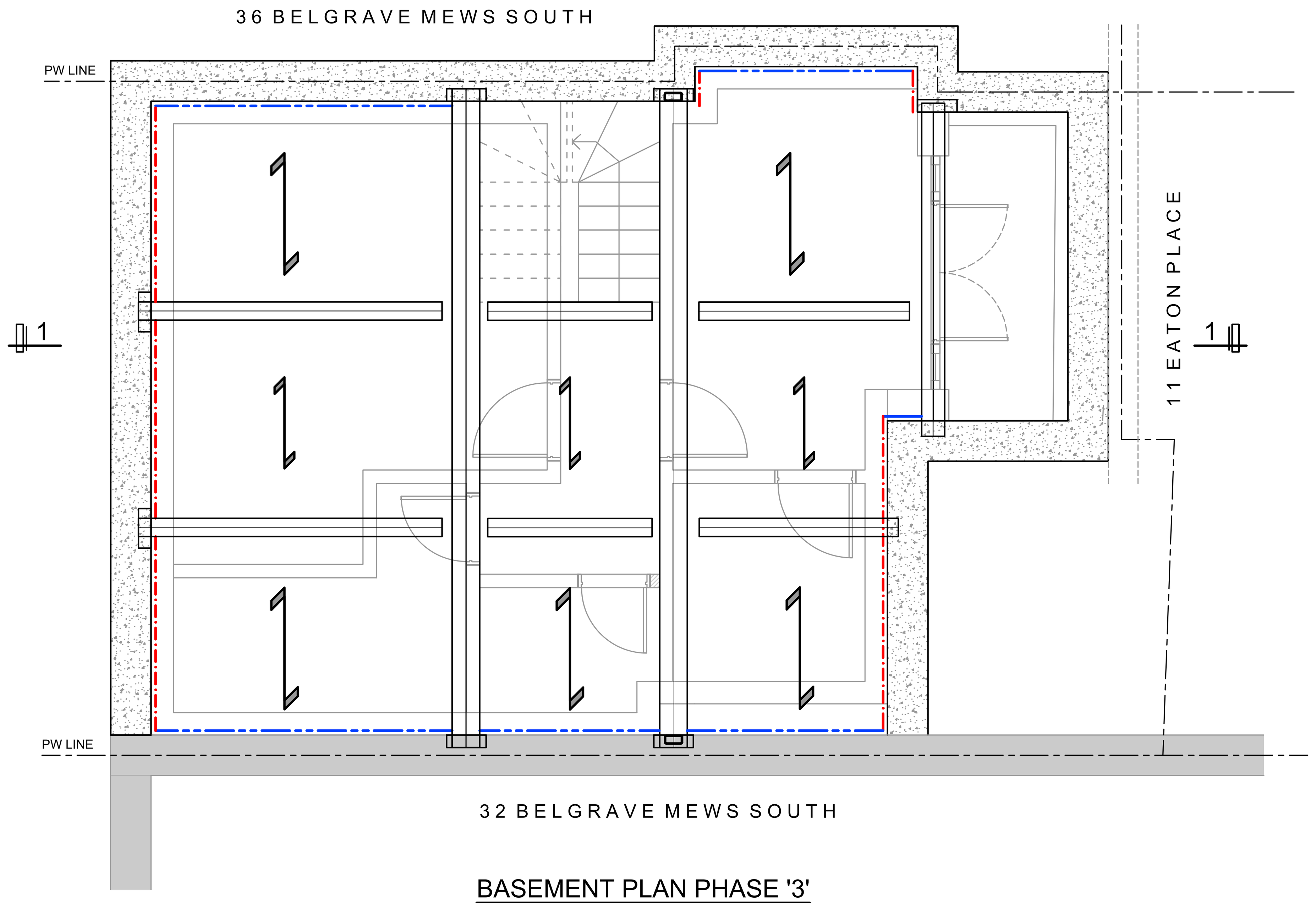
BASEMENT PLAN PHASE '2'
1:50

SEQUENCE OF CONSTRUCTION (PHASE 2)

PRELIMINARIES: STRIP AND REMOVE NON-LOAD BEARING ELEMENTS, CEILINGS ETC AND ISOLATE EXISTING SERVICES

STAGES

1. INSTALL TOP PROPPING RMD TO LAYOUT ABOVE. PROPPING 300mm ABOVE PROPOSED FFL LEVEL
2. REDUCE GROUND LEVEL TO APPROX. 300mm ABOVE SECOND STAGE PIN AND INSTALL LOWER PROPPING TO LAYOUT SHOWN
3. INSTALL SECOND STAGE RETAINING WALLS AND UNDERPIN TO EX BASEMENT WALL (TBC)
4. REDUCE GROUND LEVEL TO FORMATION LEVEL
5. INSTALL DRAINAGE PUMP CHAMBERS
6. FIX REINFORCEMENT AND CAST CONCRETE BASEMENT SLAB
7. (REFER TO SEQUENCING DRAWING FOR DETAILS STAGES FOR PHASES 2-4)



BASEMENT PLAN PHASE '3'
1:50

SEQUENCE OF CONSTRUCTION (PHASE 3)

PRELIMINARIES: STRIP AND REMOVE NON-LOAD BEARING ELEMENTS, CEILINGS ETC AND ISOLATE EXISTING SERVICES

STAGES

1. INSTALL REMAINING PADSTONES, GROUND FLOOR SUPPORT BEAMS AND FLOOR ANGLES.
2. INSTALL KINGSPAN METAL DECK FLOORING AND CAST CONCRETE FLOOR
3. REMOVE HORIZONTAL PROPS ONCE STRUCTURE IS INSTALLED IN ACCORDANCE TO DSA DRAWING No. 11

Notes

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5. CONTRACTOR TO ASCERTAIN THE LOCATION OF SERVICES ON SITE PRIOR TO STARTING THE WORK.
6. ALL DIMENSIONS FOR CONSTRUCTION ARE TO BE OBTAINED FROM SITE MEASUREMENTS OR ARCHITECTS SETTING OUT DRAWINGS PRIOR TO MANUFACTURE/BUILDING.
7. REFER TO STEELWORK NOTES ON DSA DRG No. 11 AND TIMBER NOTES ON DRG 12
8. ALL TEMPORARY WORKS HAVE BEEN DESIGNED IN ACCORDANCE WITH BS 5975:2008
9. ALL SCAFFOLDING TO BE DESIGNED IN ACCORDANCE WITH WITH NASC TG20:13
10. PRINCIPAL CONTRACTOR TO APPOINT TEMPORARY WORKS COORDINATOR (TWC) TO OVERSEE ALL AREAS OF TEMPORARY WORK UNTIL COMPLETION OF ASSOCAITED WORKS.
11. TWC TO INFORM TEMPORARY WORKS DESIGNER (TWD) OF ANY CHANGES MADE TO TEMPORARY WORKS ON SITE AND GAIN FORMAL SIGN OFF PRIOR TO INSTALLATION.
12. CONTRACTOR/CLIENT TO ENSURE ALL TEMPORARY WORKS DESIGNS HAVE BEEN CHECKED TO THE RELEVANT CATEGORY OF DESIGN CHECK AS DETAILED WITHIN TABLE 1 IN BS 5975:2008
13. CONTRACTOR TO SUBMIT DETAILED METHOD STATEMENT AND SEQUENCE OF WORKS TO THE TWD AND TWC FOR CHECKING PRIOR TO COMMENCEMENT OF WORKS ON SITE.
14. CONTRACTOR TO CONFIRM ANY BUILDING MATERIAL WEIGHTS TO BE STORED IN THE AREA OF TEMPORARY SUPPORT PRIOR TO THE COMMENCEMENT OF WORKS.

CDM 2015 DESIGNER NOTES

IN ADDITION TO THE HAZARDS, AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RISKS AND INFORMATION.

CONSTRUCTION:

1. N/A

FOR INFORMATION RELATING TO END USE, MAINTENANCE, DEMOLITION, SEE THE HEALTH AND SAFETY FILE.

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

ISSUE	REVISION	BY	DATE
C2	MINOR AMENDMENT TO RET WALL	JM	05.12.23
C1	FIRST ISSUE	JM	01.12.23

ISSUE
CONSTRUCTION

CLIENT
LECONFIELD PROPERTY GROUP

CONTRACT
34 BELGRAVE MEWS SOUTH
LONDON

TITLE
ENABLING WORKS
PHASES 2-3

ARCHITECT
LEWIS STROUD ARCHITECTS

DRAWN	CHECKED	DATE	SCALE
JM	TG	NOV' 23	1:50 @A1

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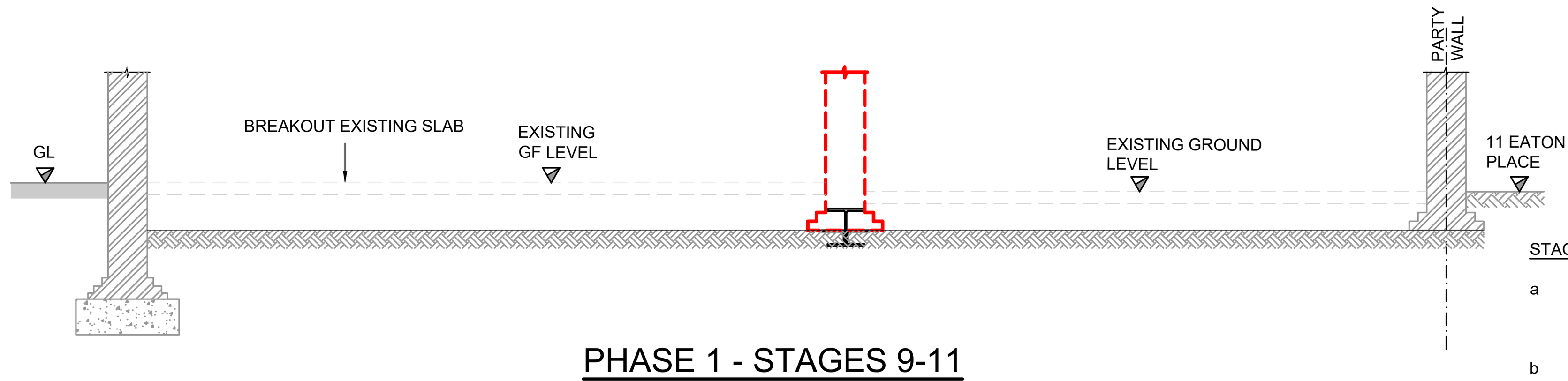
DRAWING NUMBER			REVISION
	23	54121/25	C2

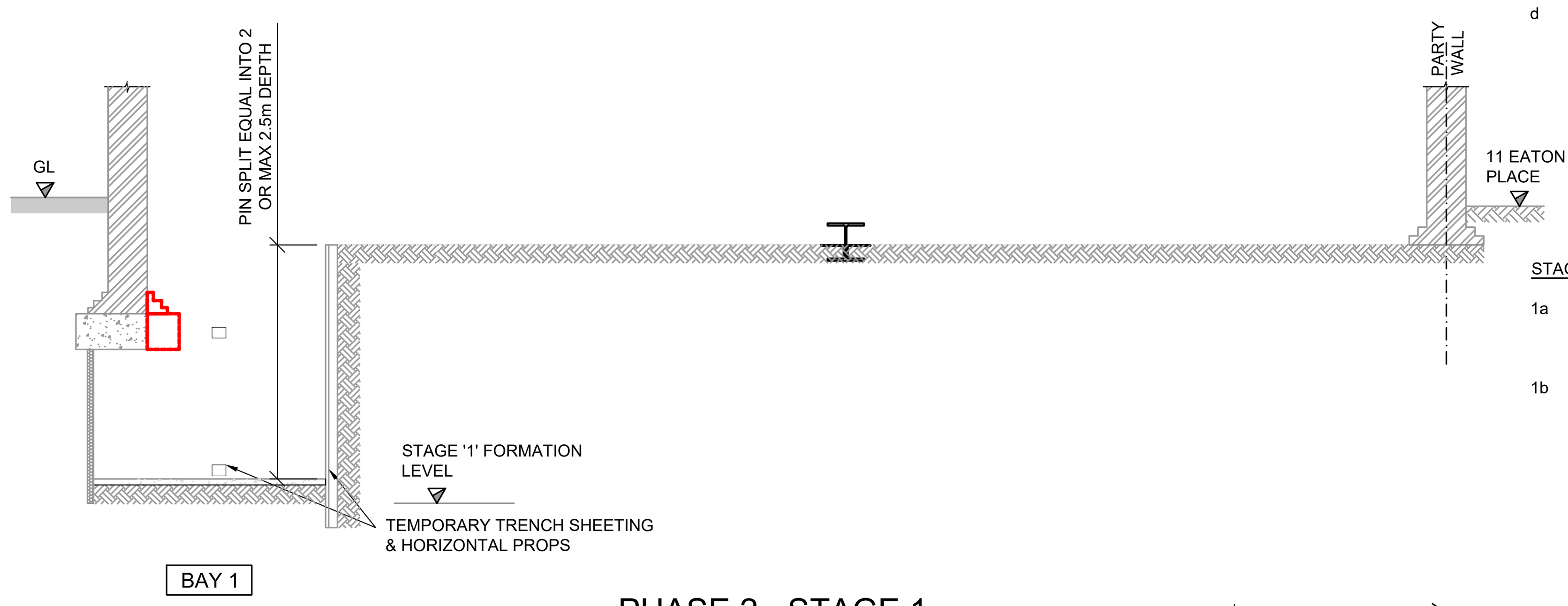
ALL DIMENSIONS TO BE CONFIRMED ON SITE PRIOR TO ORDERING / FABRICATION OF MATERIALS AND COMMENCEMENT OF WORKS



PHASE 1 - STAGES 9-11
(SECTION '1-1')

STAGES

- a LOCALLY INSTALL FIRST PIN + TEMPORARY WORKS AS SHOWN ON DRAWING 22 TO REMOVE EXISTING REAR WALL AS PHASE '1' WORKS
- b INSTALL GOAL POST TO SUPPORT REAR WALL
- c BREAK OUT REMAINING EXISTING SLAB
- d REDUCE GROUND LEVEL TO U/S EXISTING FOUNDATIONS

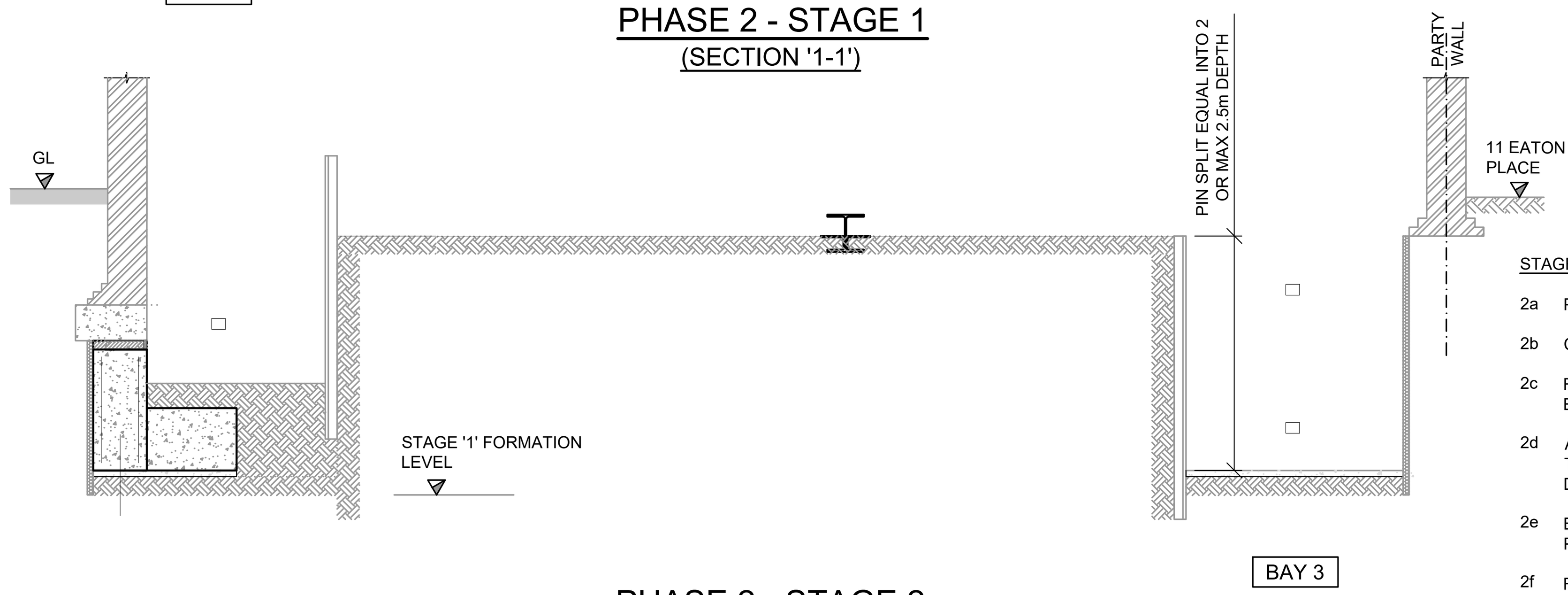


STAGE '2' FORMATION LEVEL

STAGE 1

- 1a EXCAVATE BAY 1 TO FORMATION LEVEL AND INSTALL VERTICAL TRENCH SHEETING AND HORIZONTAL PROPS TO POUR '1' DEPTH
- 1b LOCALLY BREAK OUT CORBEL

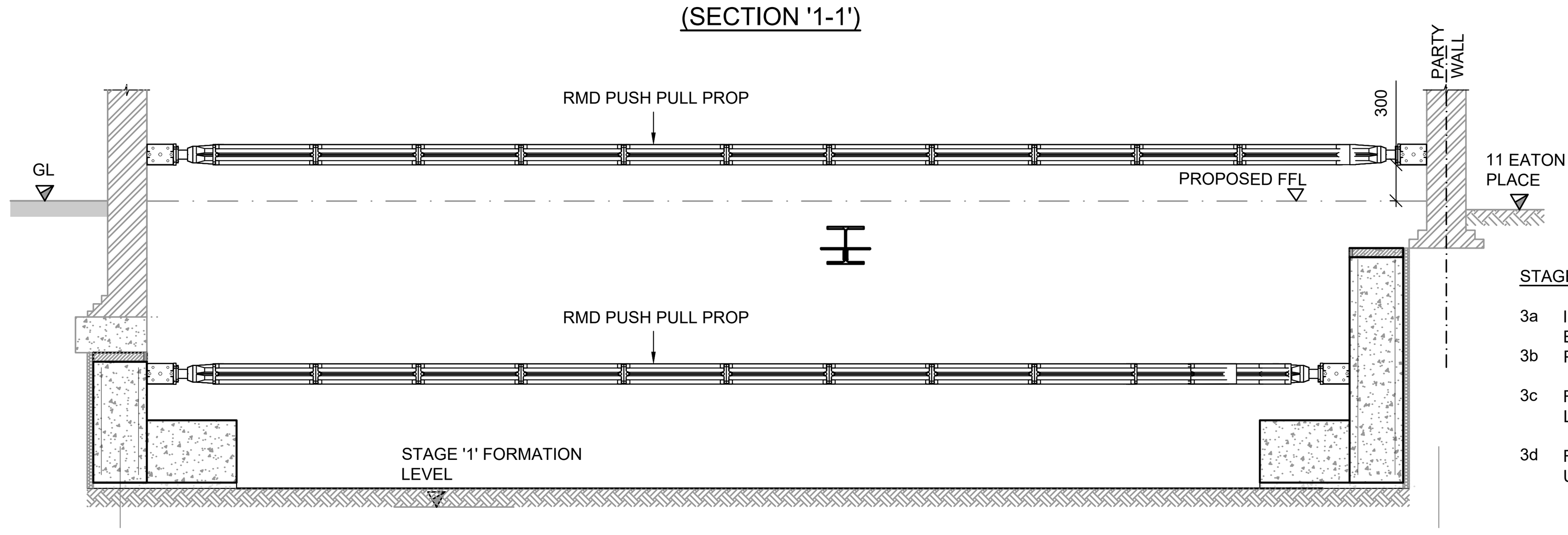
PHASE 2 - STAGE 1
(SECTION '1-1')



STAGE 2

- 2a PREPARE FORMATION LEVEL AND LAY REINFORCEMENT
- 2b CAST WALL AND TOE TO RETAINING WALL
- 2c REFER TO PERMANENT WORKS FOR WATERPROOFING ETC
- 2d AFTER A PERIOD OF 48 HOURS, THE 75mm GAP LEFT TO THE UNDERSIDE OF THE EXISTING FOOTING SHOULD BE DRY PACKED
- 2e BACK FILL BAY 1, REMOVING TRENCH SHEETING AND PROPS AS THE BAY IS BACKFILLED.
- 2f REPEAT STAGES 2-4, IN NUMERICAL ORDER AS INDICATED ON PLAN FOR 'PHASE 1 FIRST STAGE' POUR

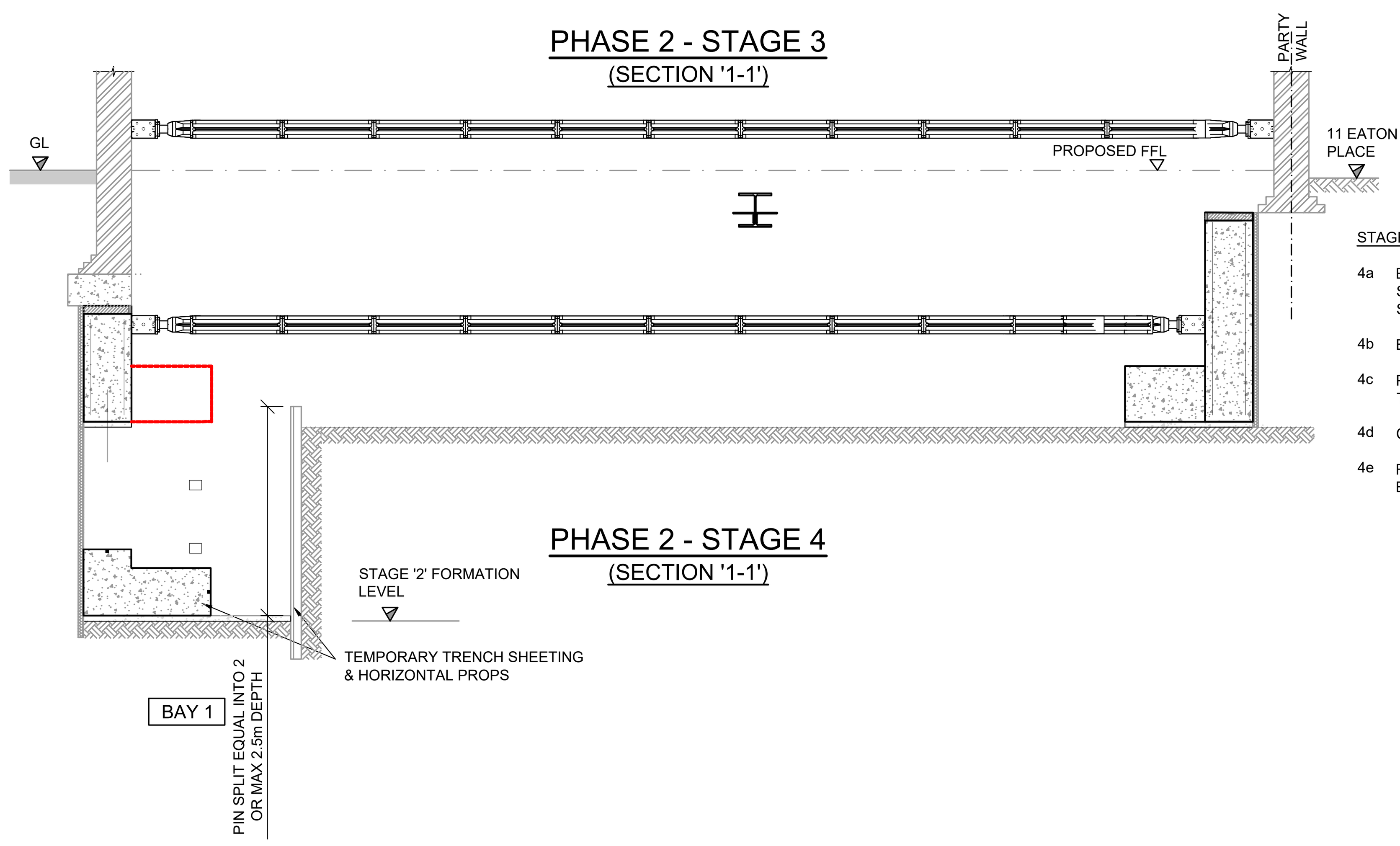
PHASE 2 - STAGE 2
(SECTION '1-1')



STAGE 3

- 3a INSTALL WAILING BEAMS AND RMD PUSH-PULL PROPS AT EXISTING GF LEVEL, APPROXIMATELY 300mm ABOVE THE
- 3b PROPOSED FFL
- 3c REDUCE GROUND TO 100mm ABOVE FIRST STAGE TOF LEVEL AND INSTALL RMD PUSH-PULL PROPS
- 3d REDUCE GROUND LEVEL TO UNDERSIDE OF FIRST STAGE UNDERPINS

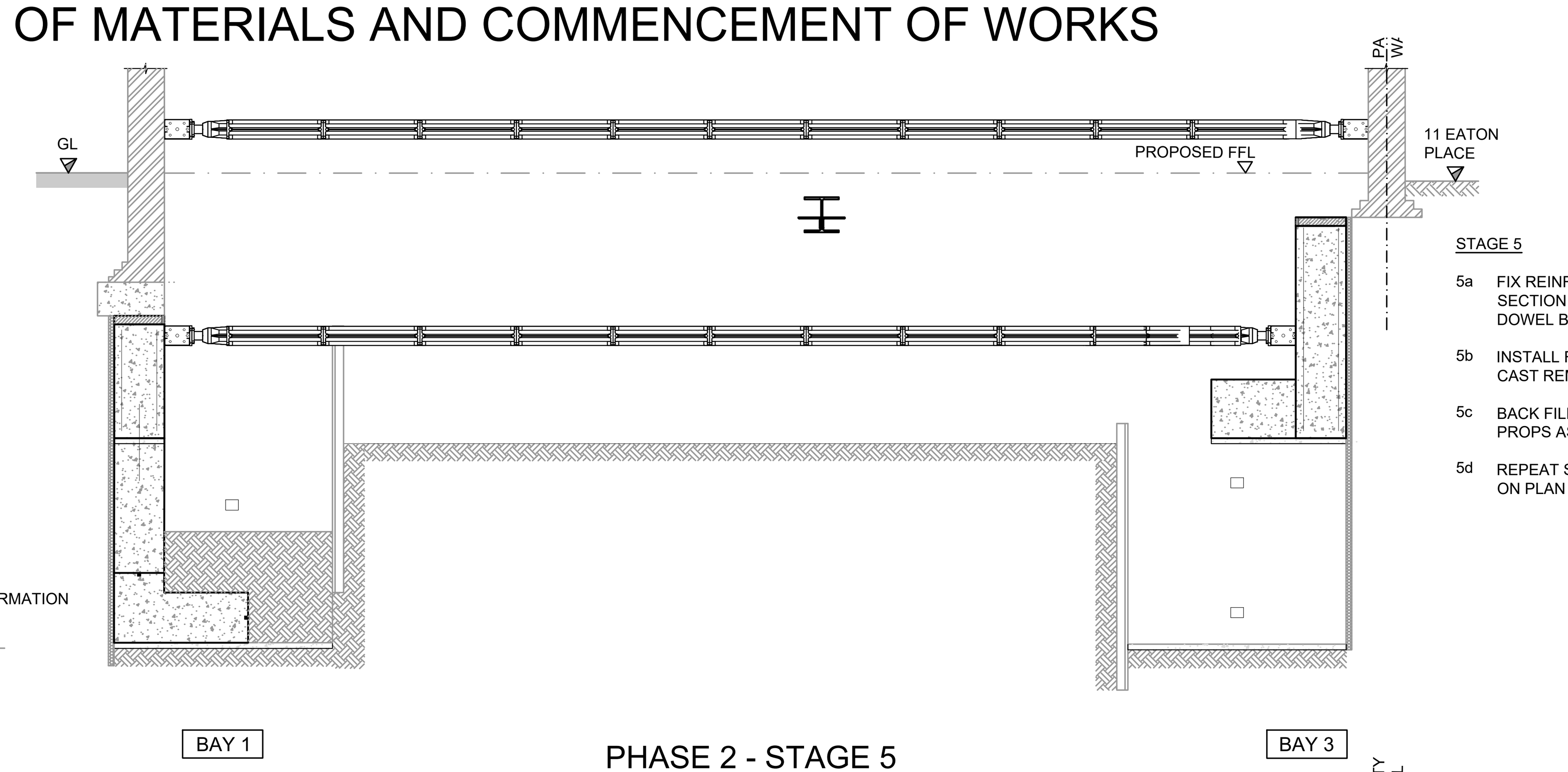
PHASE 2 - STAGE 3
(SECTION '1-1')



STAGE 4

- 4a EXCAVATE BAY 1 TO FORMATION LEVEL OF SECOND STAGE UNDERPIN AND INSTALL VERTICAL TRENCH SHEETING AND HORIZONTAL PROPS
- 4b BREAK OUT TOE
- 4c PREPARE FORMATION LEVEL AND LAY REINFORCEMENT TO BASE SLAB
- 4d CAST BASE SLAB AND KICKER
- 4e REFER TO PERMANENT WORKS FOR WATERPROOFING ETC

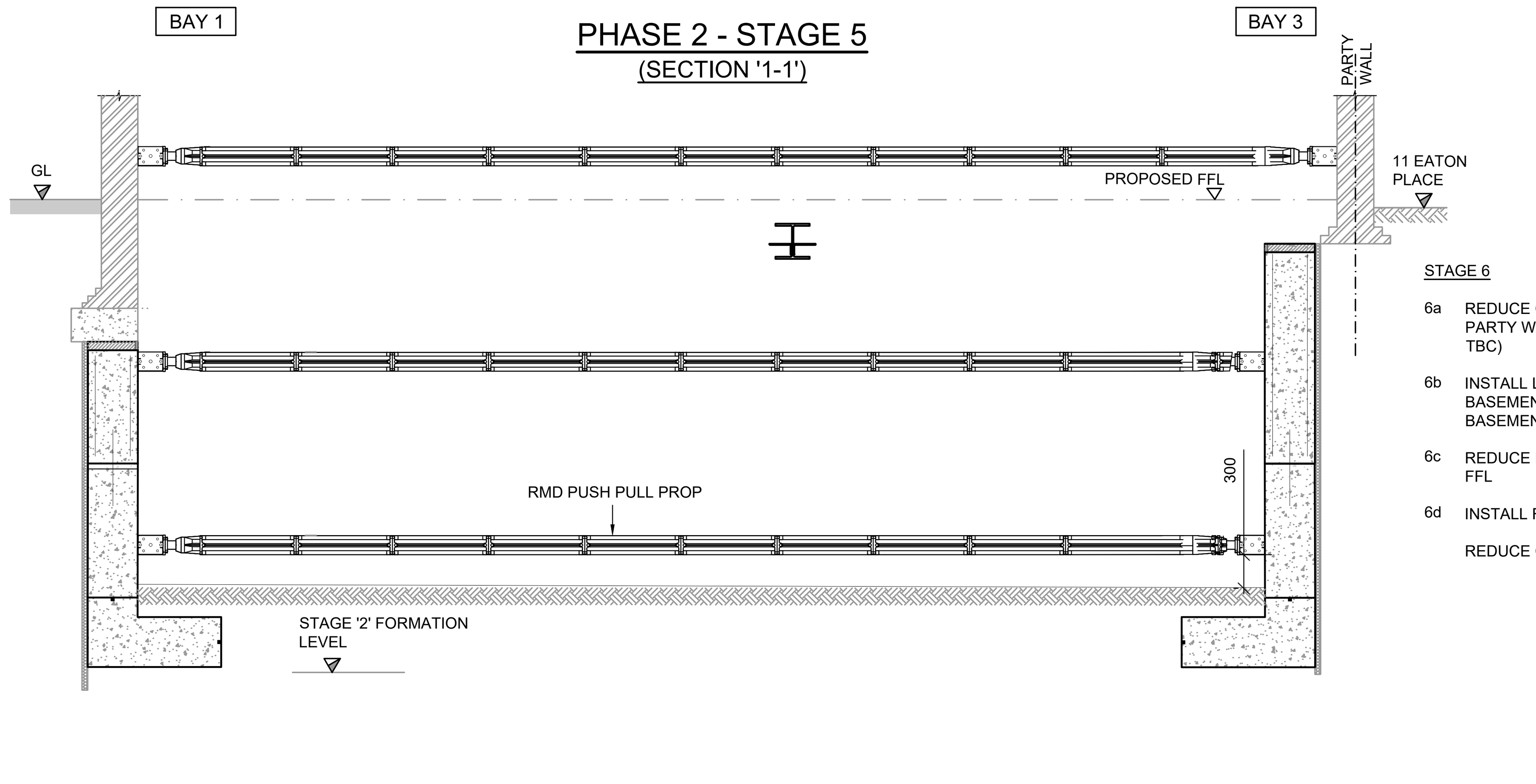
PHASE 2 - STAGE 4
(SECTION '1-1')



STAGE 5

- 5a FIX REINFORCEMENT FOR RETAINING WALL FOUNDATION SECTION AND PROVIDE WATER BAR TO KICKER. INSTALL DOWEL BARS IN SOIL TO ADJOINING BAYS
- 5b INSTALL FORMWORK TO RETAINING WALL SECTION AND CAST REMAINING WALL
- 5c BACK FILL BAY 1, REMOVING TRENCH SHEETING AND PROPS AS THE BAY IS BACKFILLED.
- 5d REPEAT STAGES 5-7, IN NUMERICAL ORDER AS INDICATED ON PLAN

PHASE 2 - STAGE 5
(SECTION '1-1')

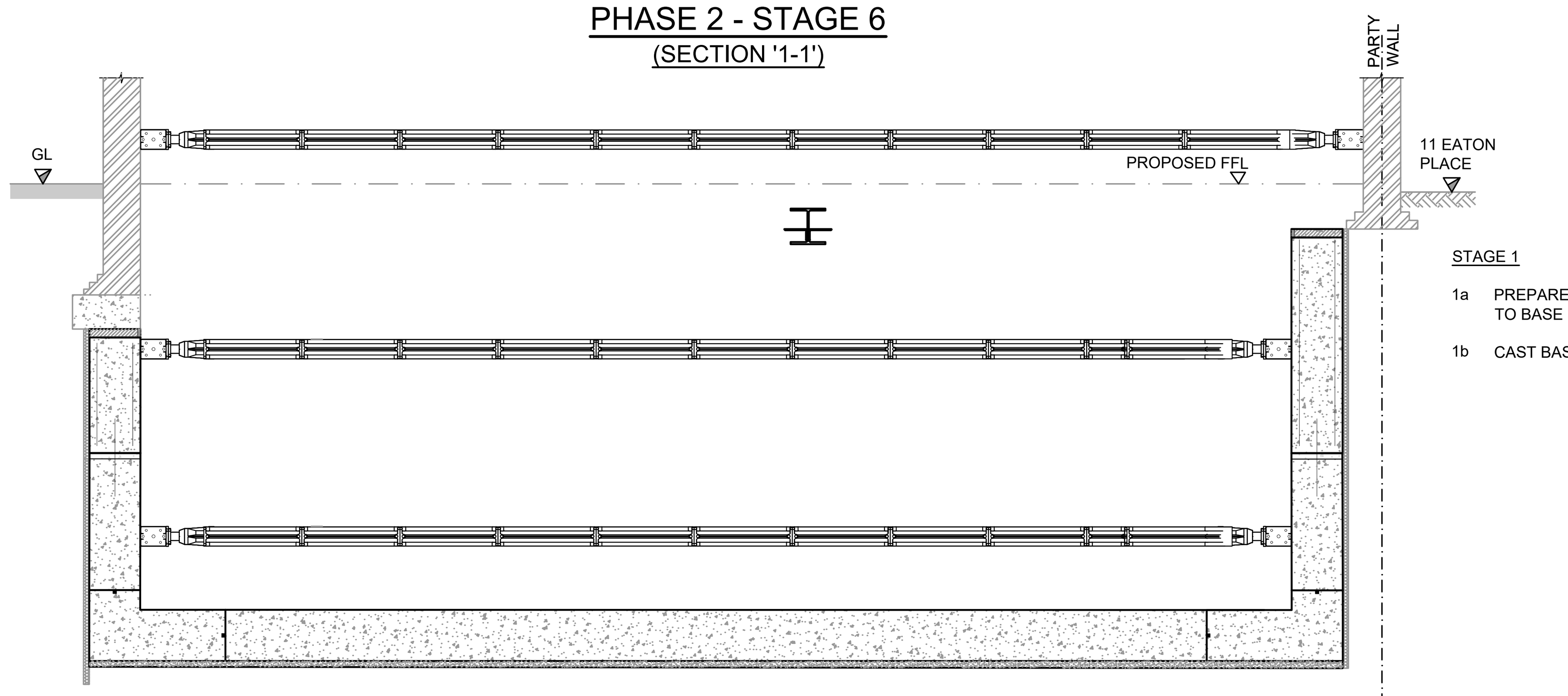


STAGE 6

- 6a REDUCE GROUND LEVEL TO UNDERSIDE OF EXISTING PARTY WALL BASEMENT FOUNDATION (EXACT DETAILS TBC)
- 6b INSTALL LOCAL UNDERPINS / TRENCH TO EXISTING BASEMENT TO ACHIEVE FORMATION LEVEL OF PROPOSED BASEMENT
- 6c REDUCE FORMATION LEVEL TO 300mm ABOVE PROPOSED FFL
- 6d INSTALL RMD 300mm ABOVE PROPOSED FFL

REDUCE GROUND TO FORMATION LEVEL

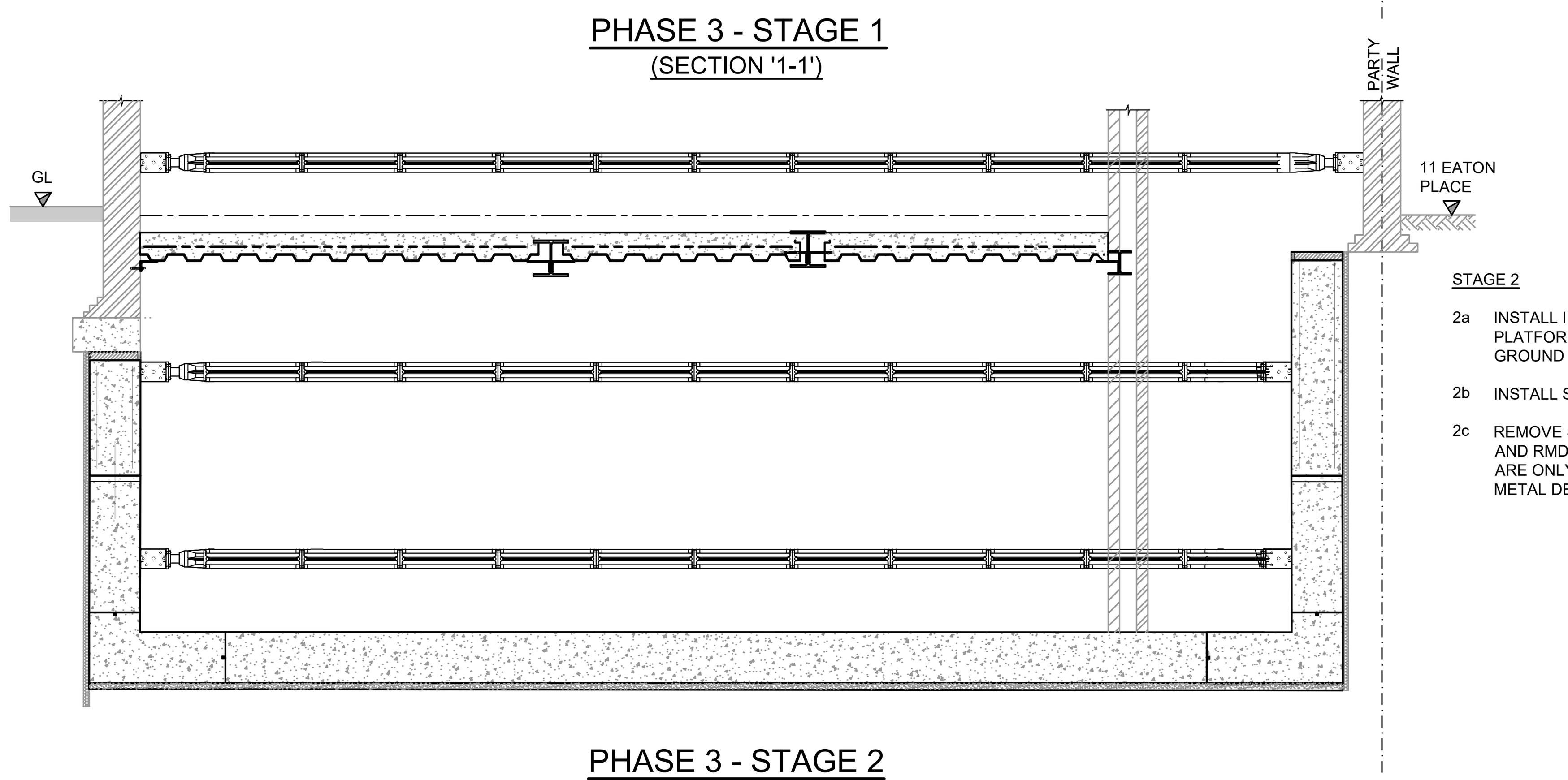
PHASE 2 - STAGE 6
(SECTION '1-1')



STAGE 1

- 1a PREPARE FORMATION LEVEL AND LAY REINFORCEMENT TO BASE SLAB
- 1b CAST BASE SLAB AND PUMPS ETC - SEE PERM WORKS

PHASE 3 - STAGE 1
(SECTION '1-1')



STAGE 2

- 2a INSTALL INTERNAL SCAFFOLD FRAME AND WORKING PLATFORM, TO ALLOW INSTALLATION OF PROPOSED GROUND FLOOR STRUCTURE
- 2b INSTALL STEELWORK AND GROUND FLOOR STRUCTURE
- 2c REMOVE SCAFFOLD FRAME, INCLUDING WAILING BEAMS AND RMD PROPS. NOTE, WAILING BEAMS AND RMD PROPS ARE ONLY TO BE REMOVED WHEN THE CONCRETE TO THE METAL DECK HAS ACHIEVED ITS FULL STRENGTH

PHASE 3 - STAGE 2
(SECTION '1-1')

Notes

1. IF IN DOUBT - ASK !!! DO NOT SCALE
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ARCHITECTS AND ENGINEERS DRAWINGS.
3. ALL WORK TO BE CARRIED OUT IN ACCORDANCE WITH THE RELEVANT BRITISH STANDARDS, CODES OF PRACTICE AND BUILDING PRACTICE.
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C2	MINOR AMENDMENT TO RET WALL	JM	05.12.23
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ISSUE
CONSTRUCTION

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LECONFIELD PROPERTY GROUP

CONTRACT
34 BELGRAVE MEWS SOUTH
LONDON

TITLE
SEQUENCE OF CONSTRUCTION
SECTION '1-1'

ARCHITECT
LEWIS STROUD ARCHITECTS

DRAWN	CHECKED	DATE	SCALE
JM	TG	NOV' 23	1:50 @A1

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	23	54121/26	C2

APPENDIX B

CALCULATIONS

◆ DAVID SMITH ASSOCIATES ◆ Consulting Structural & Civil Engineers ◆
◆ London ◆ Northampton ◆ Cheltenham ◆ Birmingham ◆
www.dsagroup.co.uk

Design Notes | **Job Ref: 23/54121**

RE: 34 BELGRAVE MEWS SOUTH

The following calculations are in respect of our clients brief relating to **specific structural elements listed on the following page(s).** No responsibility is accepted in respect of other elements of the building. Any assumed bearing stresses must be confirmed on site to the satisfaction of the Building Control Officer.

Dimensions have been obtained from information provided and where no figured dimensions have been provided, scaling has been used. **Dimensions indicated on the following calculations are for design purposes only and must not be used for constructional purposes. All dimensions for construction are to be obtained by site measurements prior to manufacture / building**.

Appended sketches are to demonstrate certain features of the design and are not intended as working drawings. Where shown, details are intended to identify the main structural features. It is assumed that the work will be carried out by experienced and competent personnel, therefore exhaustive detailing is not required.

Where constructional connection details are indicated on these calculations, these shall not be varied. Any proposed changes should be substantiated by calculation, submitted and approved in writing by the Engineer before fabrication is commenced.

Where Building Control approval is required it is essential that this be obtained before the works proceed or materials are ordered. The contractor must ensure the stability of each element, and overall stability of the construction is maintained until all the works are completed.

These calculations and designs are copyright and must not be reproduced, defaced or passed to any other person or persons for any purpose other than as originally intended

VAT Registration No.: 670 8636 12

Eur Ing **David Smith** BSc(Hons), C.Eng, MICE, FIStructE, CMaPS, MFPWS, FCABE, ACIArb,
Hitesh Jethwa BSc Eng (Hons), I.Eng, AMIStructE **Steven Ainge** B.Eng (Hons), I.Eng, AMIStructE
Thomas Garrod B.Eng (Hons),**Ben Mason** BSc (Hons), IEng, MICE

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Our Privacy Notice can be viewed by visiting www.dsagroup.co.uk/privacy-policy

REFERENCES

British Standards and Codes of Practice indicated below have been used in the preparation of these calculations - all constructional details must be in accordance with all relevant clauses contained in these same standards, associated standards or manufacturer's recommendations and details and normal good practice.

Loadings	[BS 6399 - Part 1:1996, Part 2:1997, Part 3:1988] [BS 648:1964]
Concrete	[BS 8110 - Part 1:1997, Part 3:1985] [BS 8007 : 1987]
Foundations	[BS 8004:1986] [BS 8002 : 1994]
Timber	[BS 5268 - Part 2:2002]
Masonry	[BS 5628 - Part 1:2005, Part 2:2005, Part 3:2005]
Industrial Floor Slabs	[Concrete Society Technical Report 34 (2nd Edition)] [C & CA Technical Report 550] [BCA Tech Note 11]
Steelwork	[BS 5950 - Part 1:2000, Part 3:1990, Part 5:1987, Part 8:1990] [BS 2853:1957]

ISSUE RECORD

Prep. by	Chkd by	Documents / Sheets / Drawings Issued	Description of Relating Structural Elements	Issue Date
OAM		Structural calculations Pages 1-8 PROPPING SCHEME Pages-11-75 STEEL DESIGN	STEEL BEAMS / STEEL COLUMNS / FOUNDATION.	

HEALTH & SAFETY

Where appropriate, the Client will be the/or appoint a, Principal Designer to act on his behalf who will ensure that where applicable the "Construction (Design and Management) Regulations 2015" are adhered to.

The Principal Contractor must at all times ensure safe working practices, maintain the integrity of the existing structures and conform to all the appropriate requirements of the Health and Safety Executive including the "Construction (Design and Management) Regulations 2015".

The working methods of any hazardous operations must first be discussed with the Principal Designer and the designer prior to commencement.

Below are identified hazards that are either impractical or uneconomic to eliminate at the design stage. The list is not exhaustive and must be read in conjunction with the main contractors own Health & Safety policy.

Hazard	Solution/Precaution/Sequence
Demolition and creation of new openings	To be carried out in accordance with prepared demolition statement ensuring structural integrity of existing building at all times. Openings should follow published procedure in Building Research Establishment publication GBG20 "Removing internal loadbearing walls in older dwellings".
Scaffolds	Scaffolds erected and used in accordance with BS5973. Scaffolds and propping must be inspected by a qualified person before use and at least once per week to ensure they are fit for use.
Personnel working at height	Works to be properly supervised with personnel provided with safe working platforms.
Lifting	Adequate means for moving and positioning elements to be available. Handling and construction to be carried out in accordance with relevant HSE 7 BS guidelines. Individuals are not to manually lift more than 25kg.
Deep excavation	No one shall enter an excavation deeper than 1.2m without adequately designed temporary shoring being in place. Where foundations are deeper than 2.5m they should be constructed in two pours.
Open trenched footings	Access to unattended trenches to be protected.

Job Ref: 23/54121

RE: 34 BELGRAVE MEWS SOUTH

Dimensions

1. **All dimensions for construction to be obtained by site measurements prior to manufacture / building**

Steelwork Specifications

1. Unless noted otherwise, all steelwork to be Grade S275 to BS 5950-2. All materials to comply with BS 5950:2000 and to B.S.C.A. 1/89 - National Structural Steelwork Specification.

2. Unless noted otherwise, all steelwork to be shot blasted to SA 2.5 or mechanically wire brushed to remove all surface contamination, rust or millscale and have 2 coats of zinc phosphate primer applied to achieve a minimum dry film thickness of 75 microns per coat, prior to site delivery.

3. Grade 4.6 bolts to BS4190 and Grade 8.8 bolts to BS3692.

4. Unless stated otherwise, all structural connections to have minimum of 2 bolts. Minimum bolt size for any connection to be M16 Grade 8.8 bolts.

5. Fire surround to all steelwork as per Architects/Local Authority requirements but generally cased in a layer of 12.5mm thick plasterboard and skim.

6. For steel within an external wall cavity (this includes shelf angles and plates supporting external skins that are welded to the bottom flange of beams) the steel should be shot blasted to SA2½ and use 450µm coat of solvent free epoxy applied. Alternatively, the steel may be galvanized to a thickness of 85µm and 200µm of heavy duty bitumen applied in two coats.

General Notes

Works to be carried out regarding installation of new beams/lintels

All works should be carried out by a competent contractor/builder familiar and experienced with the procedures.

1. All works to comply with current British EN Standards and Building Regulations and to be to good building practice.

2. All new steelwork to be to BS EN 10025 1993: Minimum Grade S275 unless noted otherwise.

3. Any bolts to be Grade 8.8 and zinc plated with washers and nuts.

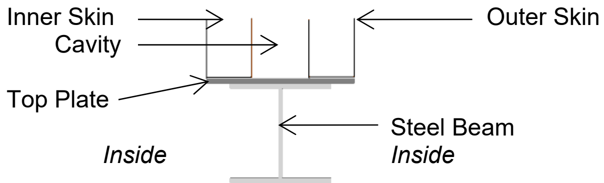
4. All mortar to be 1: 1: 6 (cement: lime: sand) unless noted otherwise.

5. Where new steelwork or other fabricated components are specified, site dimensions must be undertaken by the builder/fabricator to ensure an accurate fit and adequate clearance, etc.

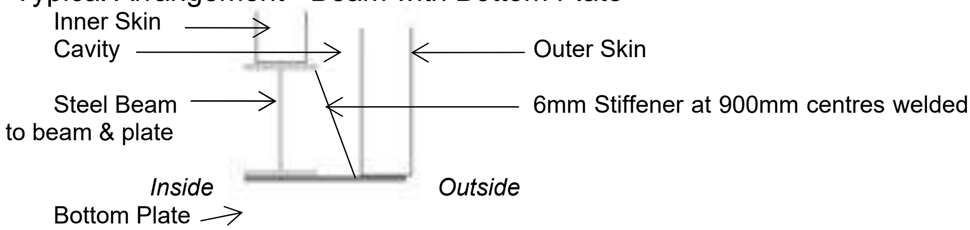
6. Unless noted otherwise, generally steel beam is to be installed so that its centerline coincides with centerline of the wall it is supporting. In case of cavity walls, this will generally be centerline of the overall thickness of the wall including the thickness of the inner skin, cavity and outer-skin (See also Note 8 for variations).

7. Where multiple beams/lintels are indicated to support existing walls, the exact number of beams/lintel is to be determined by the builder on site to suit thickness of wall(s) prior to commencing works in that area and ordering/fabrication of materials. Report immediately to DSA for further advice if site conditions differ to that indicated on the drawings/details.

8. Scenarios for supporting external walls on single beam:
   (a) Typical Arrangement - Beam with Top Plate



(b) Typical Arrangement - Beam with Bottom Plate



9. Where steel beams bear into walls at right angles, fully surround the beam with brickwork to prevent any rotation of the beam.

10. Where steel beams/lintels are required to be concealed within floor/ceiling void, the contractor must take measurements of floor/ceiling void and review the size of beam/lintel specified on the drawings prior to ordering/fabrication of material. Report to DSA for further advice if the specified beam/lintel size cannot be concealed within the floor/ceiling zone due to existing site details.

11. Where walls are to be removed:

    a) Fully support wall over the new beams by needling through the wall and supporting needles on Acrow props. Number of needles and props required will depend on the existing structural format, loading and site conditions. Contractor/Builder to be responsible for the necessary temporary works.
    b) When wall is supported cut out openings and prepare piers and padstones. Ensure padstone size and full bearing lengths as specified are achieved.
    c) Install steel beams and shim / dry pack beams as necessary onto padstones to ensure full load transfer.
    d) To minimize cracking of the walls above, preload the new beams by using machined steel folding wedges rammed home.
    If the beam is not preloaded there is a risk of initial cracking to the walls above as the load is transferred but this will not be progressive.
    e) After preloading the beams dry pack the gap between existing wall and the beam using a minimum thickness of 30mm of sand and cement 3:1 mixed to just bind and then rammed home to ensure a fully packed joint for the full width of the beam/wall.
    f) Leave props in place for at least 7 days until the packing is cured.

<u>Exact arrangement of works to suit site specific conditions; if in doubt, Contractor/Builder to contact DSA for further advice prior to commencing of works and ordering/fabrication of materials.</u>

D S A

◆**DAVID SMITH ASSOCIATES**◆Consulting Structural & Civil Engineers◆

Job Title	Job No.
34 BELGRAVE MEWS SOUTH	23/54121

Compliance with BS EN 1090-1:2009 +A1:2011
Execution of steel structures and aluminium structures.
Requirements for conformity assessment of structural components
CE Marking of Fabricated Structural Steelwork

DERIVATION OF EXECUTION CLASS

Table A.1 - Categorisation of Consequence Classes

Example of categorisation of building type and occupancy	Consequence Class
Single occupancy house not exceeding 4 storeys.	**1**

Table A.1 - Definition of Consequence Classes

Description	Consequence Class
Medium consequence for loss of human life; economic, social or environmental consequences considerable Example Residential and office buildings, public buildings where consequences of failure are medium (e.g. an office building)	**CC2**

Table B.1 - Suggested Criteria for Service Categories

Criteria	Categories
Buildings and components designed for quasi static actions only (Example: Buildings)	**SC1**

Table B.2 - Suggested Criteria for Production Categories

Criteria	Categories
Welded components manufactured from steel grade products below S355	**PC1**

Table B.3 - Recommended Matrix for Determination of Execution Classes

Consequence classes	**CC2**
Service categories	**SC1**
Production categories	**PC1**
Execution Class	**EXC2**

a EXC4 should be applied to special structures or structures with extreme consequences of a structural failure as required by national provisions

Execution Class	**EXC2**

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Project No:	23/54121	Sheet No:	1
Made By:	OAM	Revision:	
Date:	Nov-23	Checked By:	TG

Project: 34 BELGRAVE MEWS SOUTH

LOADING

PITCHED ROOF				SLS				ULS	
Roof angle =	35	deg							
Roof tiles	0.560 /cos	35	=	0.68	KN/m2	x	1.4=	0.96	KN/m2
battens & felt	0.050 /cos	35	=	0.06	KN/m2	x	1.4=	0.09	KN/m2
rafters	0.120 /cos	35	=	0.15	KN/m2	x	1.4=	0.21	KN/m2
insul.	0.050 /cos	35	=	0.06	KN/m2	x	1.4=	0.09	KN/m2
Roof Dead load			=	0.95	KN/m2	x	1.4=	1.33	KN/m2
ceiling dead load	0.180 /cos	35	=	0.22	KN/m2	x	1.4=	0.31	KN/m2
				1.17	KN/m2			**1.64**	KN/m2
Roof imposed load	0.75(60-	35)/30	=	0.63					
			=	**0.75**	KN/m2	x	1.6=	**1.20**	KN/m2
Ceiling imposed load			=	**0.25**	KN/m2	x	1.6=	**0.40**	KN/m2
Imposed load				**1.00**	KN/m2			**1.60**	KN/m2
		TOTAL	=	**2.17**	KN/m2			**3.24**	KN/m2
		DESIGN FOR UDL =		**2.17**	KN/m2		1.49	**3.24**	KN/m2

TIMBER FLOOR							
Boarding	=	0.20	KN/m2	x	1.4=	0.28	KN/m2
Joist	=	0.15	KN/m2	x	1.4=	0.21	KN/m2
Plasterboard/ INS.	=	0.25	KN/m2	x	1.4=	0.35	KN/m2
		0.60	KN/m2			0.84	KN/m2
Imposed	=	1.50	KN/m2	x	1.6=	2.40	KN/m2
TOTAL	=	**2.10**	KN/m2			**3.24**	KN/m2
DESIGN FOR UDL =		**2.10**	KN/m2		1.54	**3.24**	KN/m2

EXTERNAL CAVITY WALL								
Bricks		=	2.20	KN/m2	x	1.4=	3.08	KN/m2
Blocks	100)	=	1.40	KN/m2	x	1.4=	1.96	KN/m2
Plaster/RENDER		=	0.25	KN/m2	x	1.4=	0.35	KN/m2
	TOTAL	=	**3.85**	KN/m2			**5.39**	KN/m2
	DESIGN FOR UDL =		**3.85**	KN/m2		1.40	**5.39**	KN/m2

STONE/ BRICK WORK WALLS

102	mm thick	=	**2.35**	KN/m2	x	1.4=	**3.2844**	KN/m2
215	mm thick	=	**4.95**	KN/m2	x	1.4=	**6.923**	KN/m2
330	mm thick	=	**7.59**	KN/m2	x	1.4=	**10.626**	KN/m2

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Project No:	23/54121	Sheet No:	2
Made By:	OAM	Revision:	
Date:	Nov-23	Checked By:	TG

Project: **34 BELGRAVE MEWS SOUTH**

LOADING			**SLS**				**ULS**
FLAT ROOF							
FELT and CHIPPINGS		=	0.30	KN/m2	x	1.4=	0.42 KN/m2
TIMBER DECK and FIRRINGS		=	0.20	KN/m2	x	1.4=	0.28 KN/m2
JOISTS and INSULATION		=	0.15	KN/m2	x	1.4=	0.21 KN/m2
PLASTERBOARD		=	0.13	KN/m2	x	1.4=	0.18 KN/m2
Dead load		=	0.78	KN/m2			1.09 KN/m2
Roof imposed load		=	0.75 KN/m2		x	1.6=	1.20 KN/m2
Ceiling imposed load		=	**0.00**	KN/m2	x	1.6=	0.00 KN/m2
			0.75	KN/m2			**1.20** KN/m2
	TOTAL	=	1.53 KN/m2				2.29 KN/m2
TERRACE							
Dead load		=	1.50	KN/m2			3.49 KN/m2
Imposed		=	**2.50**	KN/m2	x	1.6=	**4.00** KN/m2

GROUND FLOOR				**SLS**				**ULS**
Screed	75 mm		=	1.80	KN/m2	x	1.4=	2.520 KN/m2
METAL /CONC			=	3.000	KN/m2	x	1.4=	4.200 KN/m2
services			=	0.250	KN/m2	x	1.4=	0.350 KN/m2
RAISED FLOOR			=	0.000	KN/m2	x	1.4=	0.000 KN/m2
	dead load =			**5.05**	KN/m2			**7.07** KN/m2
	Imposed	1.5+1	=	**2.50**	KN/m2	x	1.6=	**4.00** KN/m2
GYM	**Imposed**		=	**5.00** KN/m2				

INTERNAL WALL							
Blocks(	**140**)	=	2.00	KN/m2	x	1.4=	2.80 KN/m2
Plaster		=	0.25	KN/m2	x	1.4=	0.35 KN/m2
	TOTAL	=	**2.25**	KN/m2			**3.15** KN/m2

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	Made By:	*OAM*	Revision:	
	Date:	Nov-23	Checked By:	TG

Project: 34 BELGRAVE MEWS SOUTH

DIMENSIONS IN THESE CALCULATIONS ARE ONLY APPROXIMATE AND THE CONTRACTOR MUST CHECK THE LATEST ARCHITECTURAL DRAWINGS AND MEASURE UP ON SITE BEFORE ORDERING ANY MATERIALS.

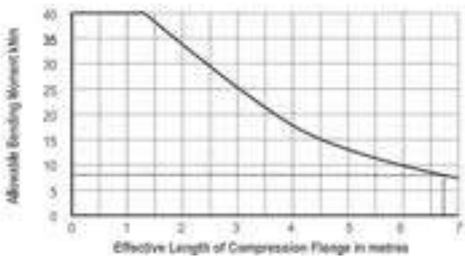
PROPOSE HORZINTAL BRACING

ABOVE FIRST FLOOR LEVEL — CEILING LEVEL

ABOVE EXISTING FLOOR JOITS — **BELOW XISTING CEILING**

wind load say 0.75 KN/m2

h= 2.4 m



FLOOR I floor 0.75* 2.4= 1.80 KN/m

PROPOSED WALER BEAMS TO RESTRAIN THEWALL

MAX SPAN= 2.8 m

bending moment= 0.90* 2.8* 2.8/8= 0.88 KNm

USE RMD 225 SUPER SLIM SOLDIER PROPS

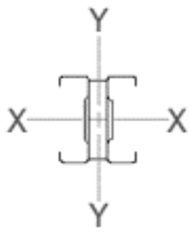
PROP DESIGN length= 5.60 m MAX

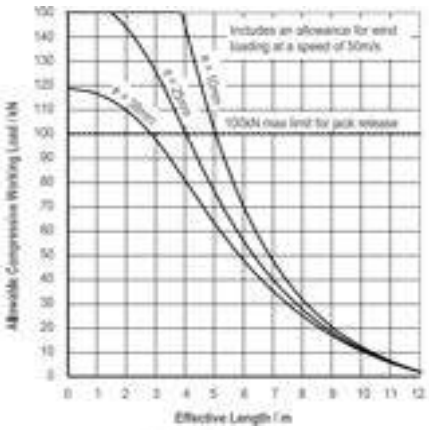
total load= 2.8*0.90= **2.52** KN

PROPS DESIGN

MAX REACTION= 2.52 KN

MAX EFFECTIVE LENGTH 3 m





FOR 3 m LE, CAPACITY= 100 KN

m= 2.52*1/4= 0.63 KNm

USE RMD 225 SUPER SLIM SOLDIER PROPS

FINXING TO BRICK WALL

MAX SHEAR FORCE= 5.04 KN

CAPACITY OF 15 MM TIE BAR= 10.00 KN

REQUIRED PER LEG= 2.52/10.00= **0.25** BAR

MINIMUM LEG LENGTH= 1000 mm

MINIMUM SPACES OF BARS= 1000/0.25= **3968.3** mm

USE M16 FIS V PLUS BOLTS AT 300 C/C

150 mm EMBEDMENT

All design calculations have been author reviewed and subject to additional review by the project team, as required by David Smith Associates Quality Assurance procedures.

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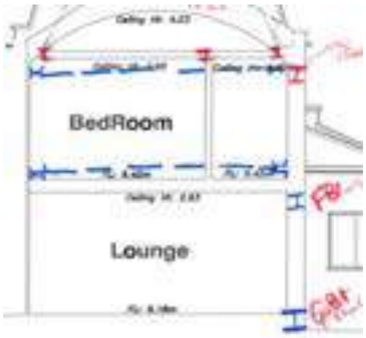
Project No:	23/54121	Sheet No:	4
Made By:	OAM	Revision:	
Date:	Nov-23	Checked By:	TG

Project: **34 BELGRAVE MEWS SOUTH**

DIMENSIONS IN THESE CALCULATIONS ARE ONLY APPROXIMATE AND THE CONTRACTOR MUST CHECK THE LATEST ARCHITECTURAL DRAWINGS AND MEASURE UP ON SITE BEFORE ORDERING ANY MATERIALS.

FIRST FLOOR LEVEL

PROPPING BEAM/ PERMANENT BEAM



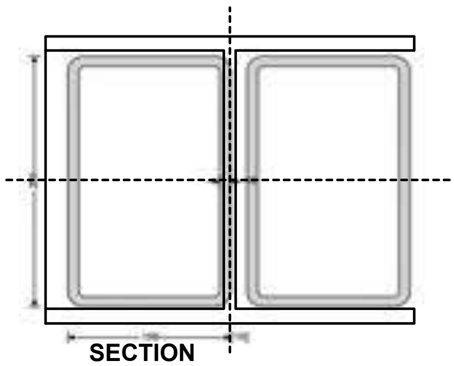
STEEL BEAM **FB1.04**

Max span = 6.7 m

BEAM LOADING		D LOAD	I LOAD	cover y		dead load	live load
		KN/m2	KN/m2	m		KN/m'	KN/m'
ROOF	dead	**1.36**		**3**	=> 3* 1.36=	4.08	
	live		**1.00**	**3**	=> 3*1.00=		3
1ST floor	dead	**0.6**		**3**	=> 3* .6=	1.8	
	live		**1.50**	**3**	=> 3*1.50=		4.5
wall	dead	**7.5**		**3.4**	=> 3.4* 7.5=	25.5	
					UDL	**31.38 KN/m'**	**7.5 KN/m'**

USE 2NO. 250x150x10 RHS **S355** SEE PAGE 5 - 7

PEG SYSTEM



USE 305x305x97 UC **S355** SEE PAGE 8

All design calculations have been author reviewed and subject to additional review by the project team, as required by David Smith Associates Quality Assurance procedures.

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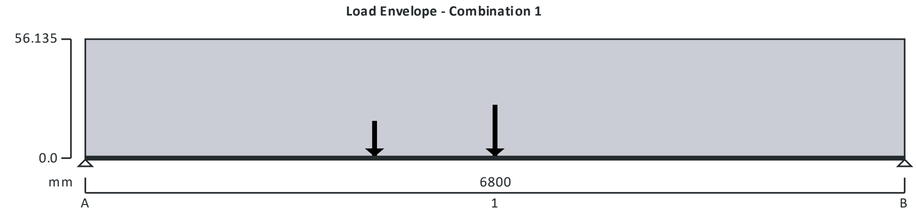
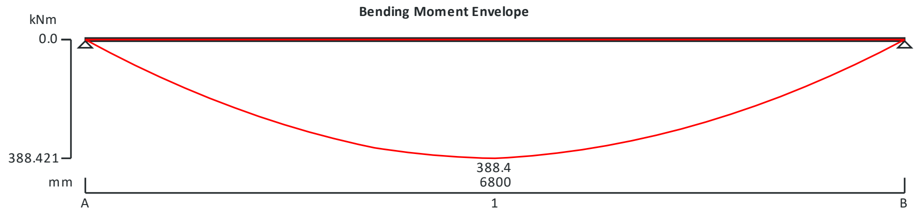
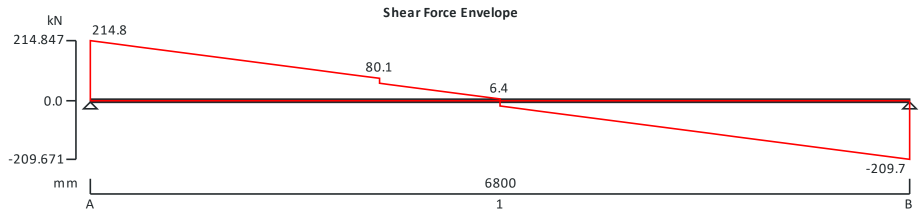
STEEL BEAM ANALYSIS & DESIGN (BS5950)

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

TEDDS calculation version 3.0.07







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 29 kN/m
	Imposed full UDL 8.7 kN/m
	Imposed point load 11 kN at 2400 mm
	Dead point load 18 kN at 3400 mm

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} = **388.4** kNm	M_{min} = **0** kNm
Maximum shear	V_{max} = **214.8** kN	V_{min} = **-209.7** kN
Deflection	δ_{max} = **12.1** mm	δ_{min} = **0** mm
Maximum reaction at support A	R_{A_max} = **214.8** kN	R_{A_min} = **214.8** kN
Unfactored dead load reaction at support A	R_{A_Dead} = **111.5** kN	
Unfactored imposed load reaction at support A	$R_{A\_Imposed}$ = **36.7** kN	
Maximum reaction at support B	R_{B_max} = **209.7** kN	R_{B_min} = **209.7** kN
Unfactored dead load reaction at support B	R_{B_Dead} = **111.5** kN	
Unfactored imposed load reaction at support B	$R_{B\_Imposed}$ = **33.5** kN	

Section details

Section type — **2 x RHS 250x150x10.0 (Tata Steel Celsius (Gr355 Gr420 Gr460))**

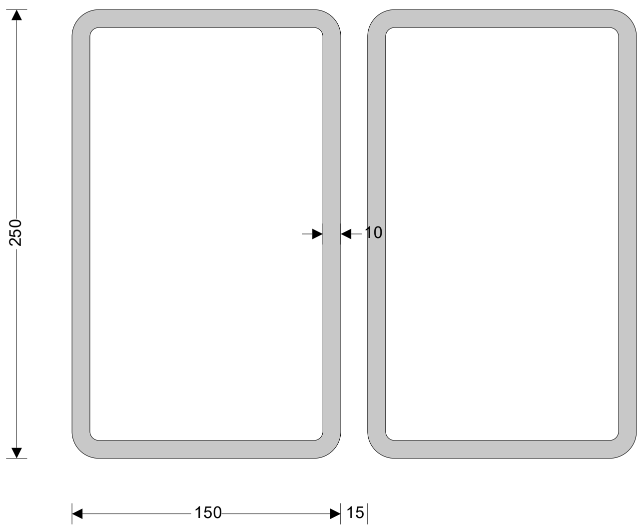
Steel grade — **S355**

From table 9: Design strength p_y

Thickness of element — t = **10.0** mm

Design strength — p_y = **355** N/mm^2

Modulus of elasticity — E = **205000** N/mm^2



Lateral restraint

Span 1 has lateral restraint at supports only

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 — $K_{LT.A}$ = **1.00**

$K_{LT.B}$ = **1.00**

Classification of cross sections - Section 3.5

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

Web - major axis - Table 12

Depth of section — d= D - 3 × t = **220** mm

d / t = 25.0 × ε <= 64 × ε — Class 1 plastic

Flange - major axis - Table 12

Width of section — $b = B - 3 \times t =$ **120** mm

$b / t = 13.6 \times \varepsilon <= \min(28 \times \varepsilon, 80 \times \varepsilon - d / t)$ — Class 1 plastic

Section is class 1 plastic

Shear capacity - Section 4.2.3

Design shear force — $F_v = \max(\text{abs}(V_{max}), \text{abs}(V_{min})) =$ **214.8** kN

$(D - 3 \times t) / t < 70 \times \varepsilon$

Web does not need to be checked for shear buckling

Shear area — $A_v = A \times D / (D + B) =$ **4683** mm^2

Design shear resistance — $P_v = 0.6 \times N \times p_y \times A_v =$ **1994.9** kN

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment — $M = \max(\text{abs}(M_{s1\_max}), \text{abs}(M_{s1\_min})) =$ **388.4** kNm

Moment capacity low shear - cl.4.2.5.2 — $M_c = N \times \min(p_y \times S_{xx}, 1.2 \times p_y \times Z_{xx}) =$ **420.8** kNm

Effective length for lateral-torsional buckling - Section 4.3.5

Effective length for lateral torsional buckling — $L_E = 1.0 \times L_{s1} =$ **6800** mm

Slenderness ratio — $\lambda = L_E / r_{yy} =$ **112.144**

Limiting slenderness ratio - Table 15 — $435 \times (275 \text{ N/mm}^2 / p_y) =$ **336.972**

λ is less than limiting value, no allowance need be made for lateral-torsional buckling

PASS - Moment capacity exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to imposed loads

Limiting deflection — $\delta_{lim} = L_{s1} / 360 =$ **18.889** mm

Maximum deflection span 1 — $\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min})) =$ **12.087** mm

PASS - Maximum deflection does not exceed deflection limit

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Made By:	OAM	Revision:	
Date:	Nov-23	Checked By:	TG

Project: **34 BELGRAVE MEWS SOUTH**

loading

	SLS		ULS
	42.00 KN/m'	1.50	63.00 KN/m'

250x150x10 RHS D= 250 mm tolorance= **1.0** mm

OPENING LENGTH = **300.0** mm

COVER= **0.6** m 25.20 KN/m' per pitch 37.80 KN/m'

lever= 76.95 mm

moment = **1.9** 2.9 KNm

py = **275**

t req. = **14.54** mm

USE

(Ref. No= **89**) **305x305 97 UC**

D= 307.8 mm

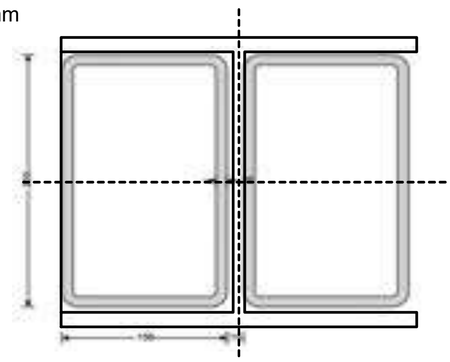
B= 304.8 mm

t= 9.9 mm

T= **15.4** mm **PASS**

T= **15.2** mm

d1= 04.8- 15.4- 15.2- 15.2+1.0= 260.0 mm **PASS**



SECTION

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Project: 34 BELGRAVE MEWS SOUTH

DIMENSIONS IN THESE CALCULATIONS ARE ONLY APPROXIMATE AND THE CONTRACTOR MUST CHECK THE LATEST ARCHITECTURAL DRAWINGS AND MEASURE UP ON SITE BEFORE ORDERING ANY MATERIALS.

ROOF LEVEL

STEEL BEAM RB1

Max span = 7.4 m
Cover= 1.8 m

USE 203x203x46 UC **S355** SEE PAGE 12 - 14

SECOND FLOOR LEVEL

STEEL BEAM FB2.01

Max span = 2.7 m

BEAM LOADING		D LOAD	I LOAD	cover y		dead load	live load
		KN/m2	KN/m2	m		KN/m'	KN/m'
ROOF	dead	1.25		1	=> 1* 1.25=	1.25	
	live		0.75	1	=> 1*0.75=		0.75
1ST floor	dead	0.6		0.6	=> .6* .6=	0.36	
	live		1.50	0.6	=> .6*1.50=		0.9
wall	dead	0.5		2.7	=> 2.7* .5=	1.35	
					UDL	**2.96 KN/m'**	**1.65 KN/m'**

USE 178x102x19 UB **S355** SEE PAGE 15 - 17

STEEL BEAM FB2.02 FB2.03

Max span = 3.6 m
Cover= 2.7 m

USE 203x133x30 UB **S355** SEE PAGE 18 - 20

STEEL BEAM FB2.04

Max span = 7,4 m
Cover= 1.2 m

USE 254x254x73 UC **S355** SEE PAGE 21 - 23

STEEL BEAM FB2.05

Max span = 2.7 m

BEAM LOADING		D LOAD	I LOAD	cover y		dead load	live load
		KN/m2	KN/m2	m		KN/m'	KN/m'
ROOF	dead	1.25		1	=> 1* 1.25=	1.25	
	live		0.75	1	=> 1*0.75=		0.75
1ST floor	dead	0.6		1.2	=> 1.2* .6=	0.72	
	live		1.50	1.2	=> 1.2*1.50=		1.8
wall	dead	7.6		1	=> 1* 7.6=	7.6	
					UDL	**9.57 KN/m'**	**2.55 KN/m'**

USE 203x133x25 UB +PLATE **S355** SEE PAGE 24 - 26

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Project No:	21/44834	Sheet No:	12
Made By:	OAM	Revision:	
Date:	Nov-23	Checked By:	HJ

Project: **34 BELGRAVE MEWS SOUTH**

DESIGN OF STEEL BEAM, SIMPLY SUPPORTED

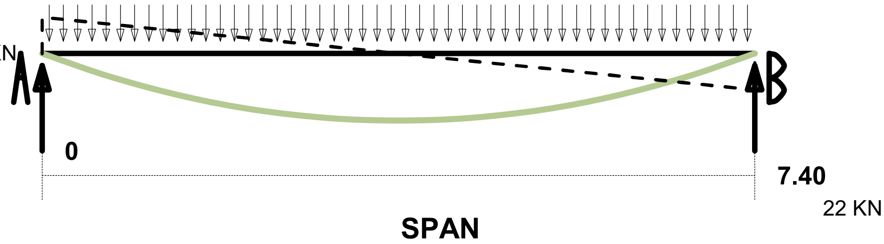
H rolled section **S355**
Calculation in accordance with BS 5950: 1: 2000

LOCATION= **RB1**

Loads are unfactored

Wd= **1.25** KN/m2
Wl= **0.75** KN/m2

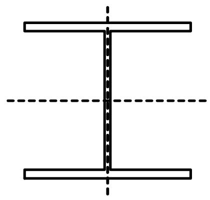
Span= **7.40** m
Cover= **1.80** m



Load on beam	unfactored	factored	
			41 KNm
			Partial safety factor for load
Dead+s/w=	2.71 KN/m'	3.79 KN/m'	dead= 1.4
Live=	1.35 KN/m'	2.16 KN/m'	live= 1.6
	4.06 KN/m'	5.95 KN/m'	

Reaction

RA=	15.0 KN		**22.0** KN
RB=	15.0 KN		**22.0** KN
Shear zero at		X=	3.70 m
Maximum Bending Moment		**Mx =**	**40.8** KNm



					factor
Maximum BM for check	M LT=	37.7 KNm	Local capacity	**PASS**	0.288
Maximum BM about axis Y	MY=	3.77 KNm	Overall buckling 1	**PASS**	0.454
Axial compressive load	Fc=	60.0 KN	Overall buckling 2	**PASS**	0.735
Shear force in x axis	Fv=	22.0 KN	Deflection (dead)=	**PASS**	1/ 654
Beam span	L=	7.40 m	Deflection(live)=	**PASS**	1/ 1313
Effective length about axis X	LX eff=	7.40 m	Deflection (d+l)=	**PASS**	1/ 436
Effective length about axis Y	LYeff=	8.34 m	Fully restraint for Ly& LX <1.		
Limiting span/deflection (live)	=	**360.0** or 14 mm			
	z rep=	115 cm3			

Section properties

Section size (Ref. No= **99**) **203x203 46 kg UC S355**

Depth of steel section	D=	203.2 mm				
Width of section	B=	203.2 mm	Pcy=	368 KN		
Thickness of web	t=	7.3 mm	Mcx=	176.6 KNm		
Thickness of flange	T=	11 mm	Mcy=	81.65 KNm		414.5
Root radius	r=	10.2 mm	Mb L=	74.61 KNm		
Second moment of area x-x	Ix=	4564 cm4	Mlt=	**0.925**	Pcy=	368.35 KN
Second moment of area y-y	Iy=	1539 cm4				
Plastic modulus x-x	Sx=	497.4 cm3	Sx eff=	442.53 cm3		
Plastic modulus y-y	Sy=	230 cm3	Sy eff=	140.06 cm3		
Area of section	Ag=	58.8 cm2	An=	53.45 cm2	ke= 1.1	

DEFLECTION

			unfactored	
Unfactored dead load deflection=	11.31 mm		E UDL=	2.71 KN/m'
Unfactored live load deflection=	5.63 mm		E UDL=	1.35 KN/m'
Unfactored dead+ live load def =	16.94 mm		E UDL=	4.06 KN/m'
Span/def. ratio for dead load=	654			
Span/def. ratio for live load=	**1314**	**>360**		
Span/def. ratio fordead+ live load=	437			

CONTINUE OF RB1

Strength of steel Clause 3.1.1

Design strength	**(Grade**	**S 355**	**)**				
for thickness of	11 mm	**py=**	**355** N/mm2	py=	**355.0**	N/mm2	pyw= py
Young's Modulus		**E=**	205 KN/mm2				

Classification of cross section (clause 3.5.2) TABLE 11 rolled section

Constant (table 11 note b)	ε =	0.880		class 1	class 2	class 3
Outstand of flange	b=	101.6 mm		plastic	compac	semi compact
Ratio	b/T=	9.24	b/Tlim=	7.92	8.80	13.20

The classification is based on the outsatnd element — **The section is class 3 semi compact**

r1 =min(1.0,max(-0.1,Fc/(dxtxpyw)))= 0.14 r2=Fc/(Agxpyw)= 0.029

Depth between fillets	d=	160.8 mm		TABLE 11 rolled section		
ratio	d/t=	22.03		class 1	class 2	class 3
40 ε	=	35.21	d/tlim=	61.55	72.38	99.88

The classification is based on the general web condition — **The section is class1 plastic**

Shear capacity CL 4.2.3

Shear area		Av y=	1483 mm2	(t x D)
Shear capacity	(0.6pyA)	Pvy=	316 KN	
Shear force		Fvy=	22.0 KN	Fvy/Pvy= 0.07 **SHEAR PASS OK**

Moment Capacity

Elastic modulus	Zx=	449.2 cm3	Mcx1=	159.5
Plastic modulus	Sx=	497 cm3	Mcx2=	176.6
Moment capacity for section	Mcx=	**177** KNm		
Elastic modulus	Zy=	151 cm3	Mcy1=	53.61
Plastic modulus	Sy=	230 cm3	mcy2=	81.65
Moment capacity for section	Mcy=	**82** KNm		

Local capacity check Clause 4.8.3.2

$\frac{F}{Ag.\,py} + \frac{Mx}{Mcx} + \frac{My}{Mcy} = \,<=1$

0.029 + 0.213 + 0.046 = **0.288** **LOCAL CAPACITY IS SATISFIED**

restraint/effective length Clause 4.31 to 4.3.5 TABLE 13

Effective length	Le lt1=	7400 mm	normal condition
Effective length	Lelt2=	8343 mm	
	L e lt=	7872 mm	
Radius of gyration y-y	ry=	5.11 cm	
	rx=	8.81 cm	
	Lam'y=	163.3	
	La'mx=	84.0	

CONTINUE OF RB1

Buckling resistance Clause 4.8.3.3.1

Compressive strength:perry strust formula from Appendex C.1

Limiting slenderness	lam 0=	15.10		py=	355 N/mm2
For buckling about y-y				λ L0=	30.20 TABLE 16
Robertson constant for section					
	a=	5.5	for table 23	c	
Perry factor	eta=	0.81			
Euler strength	pe=	76	N/mm2		
Factor	phi=	246	N/mm2		
Compressive strength	pcy=	**62.6**	N/mm2		

	Lam'y=	163.3	La'mx=	84.00	Lamy/x=	9.2244
Slenderness of section	Lamda=	163.3			Lamx/x=	4.7455
Torsional index	x=	17.7				
	N=	0.5				
Slenderness factor	v=	0.66	from Table 19			
	β w =	1.0				
Buckling parameter	u=	0.846				
Equivalent slenderness	lamlt=	91.2				
Buckling strength (Table 16)	pb=	150	N/mm2	for lamlt= 95	py=	355
Buckling resisrance moment	Mb=	75	KNm			
	Mb L=	75	KNm			
	Mry=	82	KNm			
	Pc=	368.4	KN			
	Pcy=	368.4	KN			

$\frac{Fc}{PC} + m\frac{x\,Mx}{Py\,Zx} + m\frac{y\,My}{py\,Zy} = \le 1$ m x= 0.95, m y= 0.95

0.163 + 0.225 + 0.067 = **0.454** **The interaction formula is satisfied**

$\frac{Fc}{Pcy} + m\frac{LT\,M\,lt}{Mb} + m\frac{y\,My}{py\,Zy} = \le 1$

0.163 + 0.505 + 0.067 = **0.735** **The interaction formula is satisfied**

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Project No:	23/54121	Sheet No:	15
Made By:	OAM	Revision:	
Date:	Nov-23	Checked By:	HJ

Project: **34 BELGRAVE MEWS SOUTH**

DESIGN OF STEEL BEAM, SIMPLY SUPPORTED

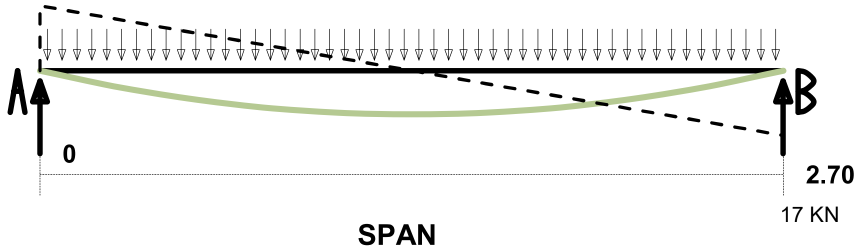
H rolled section S355
Calculation in accordance with BS 5950: 1: 2000

LOCATION= **FB2.01**

Loads are unfactored

Wd= **2.96** KN/m2
Wl= **1.65** KN/m2

Span= **2.70** m
Cover= **1.80** m



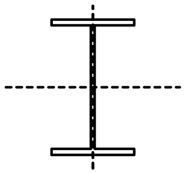
11 KNm

Load on beam	unfactored	factored
Dead+s/w=	5.518 KN/m'	7.73 KN/m'
Live=	2.97 KN/m'	4.75 KN/m'
	8.49 KN/m'	12.48 KN/m'

Partial safety factor for load
dead= 1.4
live= 1.6

Reaction

RA=	11.5 KN		**16.8** KN
RB=	11.5 KN		**16.8** KN
Shear zero at		X=	1.35 m
Maximum Bending Moment		**Mx =**	**11.4** KNm



SECTION

					factor
Maximum BM for check	M LT=	10.5 KNm	Local capacity	PASS	0.314
Maximum BM about axis Y	MY=	1.05 KNm	Overall buckling 1	PASS	0.539
Axial compressive load	Fc=	60.0 KN	Overall buckling 2	PASS	0.765
Shear force in x axis	Fv=	16.8 KN	Deflection (dead)=	PASS	1/ 1971
Beam span	L=	2.70 m	Deflection(live)=	PASS	1/ 3662
Effective length about axis X	LX eff=	2.70 m	Deflection (d+l)=	PASS	1/ 1281
Effective length about axis Y	LYeff=	3.15 m	Fully restraint for Ly& LX <1.		
Limiting span/deflection (live)	=	**360.0** or 14 mm			
	z rep=	32 cm3			

Section properties

Section size (Ref. No= **69**) **178x102 19 kg UB S355**

Depth of steel section	D=	177.8 mm				
Width of section	B=	101.6 mm	Pcy=	238 KN		
Thickness of web	t=	4.7 mm	Mcx=	60.71 KNm		
Thickness of flange	T=	7.9 mm	Mcy=	14.87 KNm		142.5
Root radius	r=	7.6 mm	Mb L=	25.65 KNm		
Second moment of area x-x	Ix=	1360 cm4	Mlt=	**0.925**	Pcy=	238.09 KN
Second moment of area y-y	Iy=	138 cm4				
Plastic modulus x-x	Sx=	171 cm3	Sx eff=	150.15 cm3		
Plastic modulus y-y	Sy=	41.9 cm3	Sy eff=	24.87 cm3		
Area of section	Ag=	24.2 cm2	An=	22.00 cm2	ke= 1.1	

DEFLECTION

			unfactored
Unfactored dead load deflection=	1.37 mm		E UDL= 5.52 KN/m'
Unfactored live load deflection=	0.74 mm		E UDL= 2.97 KN/m'
Unfactored dead+ live load def =	2.11 mm		E UDL= 8.49 KN/m'
Span/def. ratio for dead load=	1971		
Span/def. ratio for live load=	**3663**	**>360**	
Span/def. ratio fordead+ live load=	1282		

CONTINUE OF FB2.01

Strength of steel Clause 3.1.1

Design strength	(Grade	S 355)					
for thickness of	7.9 mm	py=	355 N/mm2	py=	355.0	N/mm2	pyw= py
Young's Modulus		E=	205 KN/mm2				

Classification of cross section (clause 3.5.2)

			TABLE 11 rolled section			
Constant (table 11 note b)	ε =	0.880		class 1	class 2	class 3
Outstand of flange	b=	50.8 mm		plastic	compac	semi compact
Ratio	b/T=	6.43	b/Tlim=	7.92	8.80	13.20
The classification is based on the outsatnd element			The section is class1 plastic			
r1 =min(1.0,max(-0.1,Fc/(dxtxpyw)))=		0.24	r2=Fc/(Agxpyw)=	0.07		
Depth between fillets	d=	146.8 mm	TABLE 11 rolled section			
ratio	d/t=	31.23		class 1	class 2	class 3
40 ε	=	35.21	d/tlim=	56.56	64.36	92.67
The classification is based on the general web condition			The section is class1 plastic			

Shear capacity CL 4.2.3

Shear area		Av y=	835.7 mm2	(t x D)	
Shear capacity	(0.6pyA)	Pvy=	178 KN		
Shear force		Fvy=	16.8 KN	Fvy/Pvy= 0.09	**SHEAR PASS OK**

Moment Capacity

Elastic modulus	Zx=	153 cm3	Mcx1=	54.32
Plastic modulus	Sx=	171 cm3	Mcx2=	60.71
Moment capacity for section	Mcx=	**61** KNm		
Elastic modulus	Zy=	27.2 cm3	Mcy1=	9.656
Plastic modulus	Sy=	42 cm3	mcy2=	14.87
Moment capacity for section	Mcy=	**15** KNm		

Local capacity check Clause 4.8.3.2

$$\frac{F}{Ag.\,py} + \frac{Mx}{Mcx} + \frac{My}{Mcy} <= 1$$

0.070 + 0.173 + 0.071 = **0.314** **LOCAL CAPACITY IS SATISFIED**

restraint/effective length Clause 4.31 to 4.3.5 TABLE 13

Effective length	Le lt1=	2700 mm	normal condition
Effective length	Lelt2=	3148 mm	
	L e lt=	2924 mm	
Radius of gyration y-y	ry=	2.39 cm	
	rx=	7.49 cm	
	Lam'y=	131.7	
	La'mx=	36.0	

CONTINUE OF FB2.01

Buckling resistance Clause 4.8.3.3.1

Compressive strength:perry strust formula from Appendex C.1

Limiting slenderness	lam 0=	15.10		py=	355 N/mm2
For buckling about y-y			λ L0=		30.20 TABLE 16
Robertson constant for section					
	a=	3.5 for table 23	b		
Perry factor	eta=	0.41			
Euler strength	pe=	117 N/mm2			
Factor	phi=	260 N/mm2			
Compressive strength	pcy=	**98.4** N/mm2			

	Lam'y=	131.7	La'mx=	36.05	Lamy/x=	5.8277
Slenderness of section	Lamda=	131.7			Lamx/x=	1.595
Torsional index	x=	22.6				
	N=	0.5				
Slenderness factor	v=	0.78 from Table 19				
	β w =	1.0				
Buckling parameter	u=	0.889				
Equivalent slenderness	lamlt=	91.4				
Buckling strength (Table 16)	pb=	150 N/mm2	for lamlt=	95	py=	355
Buckling resisrance moment	Mb=	26 KNm				
	Mb L=	26 KNm				
	Mry=	15 KNm				
	Pc=	238.1 KN				
	Pcy=	238.1 KN				

Fc / PC + m x Mx / Py Zx + m y My / py Zy = <=1   m x= 0.95, m y= 0.95

0.252 + 0.184 + 0.103 = **0.539**   **The interaction formula is satisfied**

Fc / Pcy + m LT M lt / Mb + m y My / py Zy = <=1

0.252 + 0.410 + 0.103 = **0.765**   **The interaction formula is satisfied**

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Project No:	23/54121	Sheet No:	18
Made By:	OAM	Revision:	
Date:	Nov-23	Checked By:	TG

Project: 34 BELGRAVE MEWS SOUTH

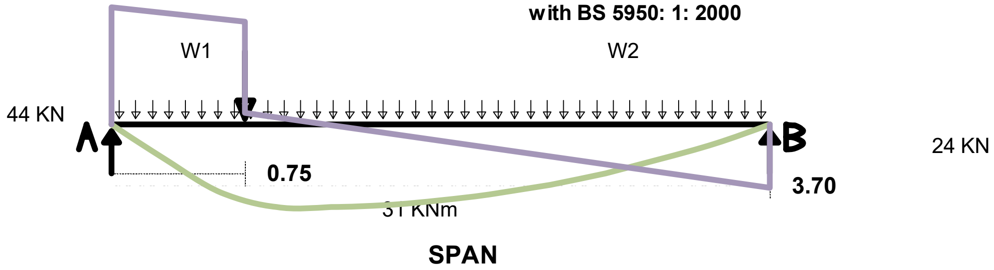
DESIGN OF STEEL BEAM, SIMPLY SUPPORTED

H rolled section S355
Calculation in accordance
with BS 5950: 1: 2000

LOCATION= **FB2.02**

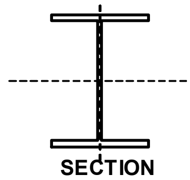
Loads are unfactored

Wd1=	0.60	KN/m2
Wl1=	1.50	KN/m2
Wd2=	0.60	KN/m2
wl2=	1.50	KN/m2
P1=	23.00	KN
a=	0.75	m
Span=	3.70	m
Cover=	2.70	m



Load on beam	unfactored	factored
Point load=	23.00 KN	34.5 KN
AV-Dead+s/w=	1.92 KN/m'	2.688 KN/m'
Live=	4.05 KN/m'	6.48 KN/m'
	5.97 KN/m'	9.168 KN/m'

Partial safety factor for load
dead= 1.4
live= 1.6



Reaction

	unfactored	factored
RA=	29.4 KN	44.5 KN
RB=	15.7 KN	24.0 KN
Shear zero at	X=	1.09 m
Maximum Bending Moment	Mx =	31 KNm

					factor
Maximum BM for check	M LT=	28.0 KNm	Local capacity	PASS	0.252
Maximum BM about axis Y	MY=	0.00 KNm	Overall buckling 1	PASS	0.270
Axial compressive load	Fc=	1.00 KN	Overall buckling 2	PASS	0.472
Shear force in x axis	Fv=	44.5 KN	Deflection (dead)=	PASS	1/ 2576
Beam span	L=	3.70 m	Deflection(live)=	PASS	1/ 1030
Effective length about axis X	LX eff=	3.70 m	Deflection (d+l)=	PASS	1/ 736
Effective length about axis Y	LYeff=	3.45 m	Fully restraint for Ly& LX <1.		
Limiting span/deflection (live)	=	360.0 or 14 mm			
	z rep=	88 cm3			

Section properties

Section size (Ref. No= 66) **203x133 30 kg 30 S355**

Depth of steel section	D=	206.8 mm		
Width of section	B=	133.8 mm		
Thickness of web	t=	6.3 mm	Mcx=	111.22 KNm
Thickness of flange	T=	9.6 mm	Mcy=	31.258 KNm
Root radius	r=	9.6 mm	Mb L=	59.527 KNm
Second moment of area x-x	Ix=	2887 cm4	Mlt=	0.894 TABLE 18
Second moment of area y-y	Iy=	384 cm4		
Plastic modulus x-x	Sx=	313.3 cm3	Sx eff=	273.81 cm3
Plastic modulus y-y	Sy=	88.05 cm3	Sy eff=	52.45 cm3
Area of section	Ag=	38 cm2	An=	34.55 cm2 ke= 1.1

DEFLECTION

			unfactored	
Unfactored dead load deflection=	1.44 mm		E UDL=	3.48 KN/m'
Unfactored live load deflection=	3.59 mm		E UDL=	8.71 KN/m'
Unfactored dead+ live load def =	5.03 mm		E UDL=	12.19 KN/m'
Span/def. ratio for dead load=	2576			
Span/def. ratio for live load=	1030	>360		
Span/def. ratio fordead+ live load=	736			

CONTINUE OF FB2.02

Strength of steel Clause 3.1.1

Design strength **(Grade** **S 355**)

for thickness of 9.6 mm **py=** **355** N/mm2 py= **355.0** N/mm2 pyw= py

Young's Modulus **E=** 205 KN/mm2

Classification of cross section (clause 3.5.2) TABLE 11 rolled section

Constant	ε =	0.880		class 1	class 2	class 3
Outstand of flange	b=	66.9 mm		plastic	compac	semi compact
Ratio	b/T=	6.97	b/Tlim=	7.92	8.80	13.20

The section is class1 plastic

r1 =min(1.0,max(-0.1,Fc/(dxtxpyw)))= 0.26 r2=Fc/(Agxpyw)= 0.0007

Depth between fillets d= 172.3 mm TABLE 11 rolled section

ratio	d/t=	27.35		class 1	class 2	class 3
40 ε	=	35.206	d/tlim=	55.90	63.35	105.46

The classification is based on the general web condition **The section is class1 plastic**

Shear capacity CL 4.2.3

Shear area Av y= 1302.8 mm2 (t x D)

Shear capacity (0.6pyA) Pvy= 278 KN

Shear force Fvy= 44.5 KN Fvy/Pvy= 0.16 **SHEAR PASS OK**

Moment Capacity

Elastic modulus	Zx=	279.3 cm3	Mcx1=	99.152
Plastic modulus	Sx=	313 cm3	Mcx2=	111.22
Moment capacity for section	Mcx=	**111.2** KNm		
Elastic modulus	Zy=	57.4 cm3	Mcy1=	20.377
Plastic modulus	Sy=	88.1 cm3	mcy2=	31.258
Moment capacity for section	Mcy=	**31.3** KNm		

Local capacity check Clause 4.8.3.2

$$\frac{F}{Ag.\,py} + \frac{Mx}{Mcx} + \frac{My}{Mcy} <= 1$$

0.001 + 0.252 + 0.000 = **0.252** **LOCAL CAPACITY IS SATISFIED**

restraint/effective length Clause 4.31 to 4.3.5 TABLE 13

Effective length Le lt1= 3700 mm normal condition

Effective length Lelt2= 3451.8 mm

L e lt= 3575.9 mm

Radius of gyration y-y ry= 3.18 cm

rx= 8.72 cm

Lam'y= 108.5

La'mx= 42.4

CONTINUE OF FB2.02

Buckling resistance Clause 4.8.3.3.1

Compressive strength:perry strust formula from Appendex C.1

Limiting slenderness	lam 0=	15.10	py=	355 N/mm2
For buckling about y-y			λ L0=	30.20 TABLE 16
Robertson constant for H section				
	a=	5.5		
Perry factor	eta=	0.51		
Euler strength	pe=	172 N/mm2		
Factor	phi=	307 N/mm2		
Compressive strength	pcy=	**124.2** N/mm2		

	Lam'y=	108.5	La'mx=	42.43	Lamy/x=	5.04871
Slenderness of section	Lamda=	108.5			Lamx/x=	1.97354
Torsional index	x=	21.5				
	N=	0.5				
Slenderness factor	v=	0.82 from Table 19				
	β w =	1.0				
Buckling parameter	u=	0.882				
Equivalent slenderness	lamlt=	78.5				
Buckling strength (Table 16)	pb=	190 N/mm2	for lamlt=	80	py=	355
Buckling resisrance moment	Mb=	59.5 KNm				
	Mb L=	59.5 KNm				
	Mry=	31.3 KNm				
	Pc=	472.02 KN				
	Pcy=	472.02 KN				

Fc/PC + m x Mx/Py Zx + m y My/py Zy = <=1   m x= 0.95, m y= 1

0.002 + 0.268 + 0.000 = **0.270**   **The interaction formula is satisfied**

Fc/Pcy + m LT M lt/Mb + m y My/py Zy = <=1

0.002 + 0.470 + 0.000 = **0.472**   **The interaction formula is satisfied**

DESIGN OF STEEL BEAM, SIMPLY SUPPORTED S355

LOCATION= **FB2.04** SPAN= **7.40** m

Uniform distributed load COVER= **1.20** m

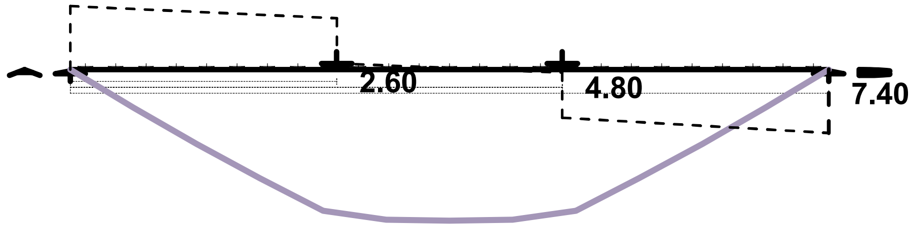
	Unfactored		Factored	
wdl=	**0.60**	KN/m2	(**0.84**)	
wll =	**1.50**	KN/m2	(**2.40**)	
	2.10		**3.24**	KN/m2
		factor=	**1.54**	

H rolled section
Calculation in accordance
with BS 5950: 1: 2000

Point load

P1=	**30.00**	KN	(**45.0**)KN
a1=	**2.60**	m	
P2=	**30.0**	KN	(**45.00**)KN
a2=	**4.80**	m	

Partial safety factor for load
dead= 1.4
live= 1.6



63 KN 63 KN

151 KNm 3.7 m from A

SPAN

	Unfactored		(Factored)	
Wd=	1.45	KN/m'	(2.03)	
Wl =	1.8	kKN/m'	(2.88)	
	3.25	KN/m'	**4.91**	KN/m'

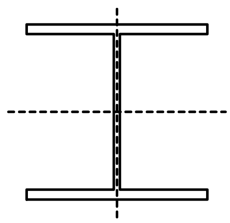
Reactions

RA=	42.025	KN	(**63.2**	KN
RB=	42.025	KN	(**63.2**	KN

Desidn bending moment(factored)=

M@P1 =	**147.6**	KNm
M@P2 =	**147.6**	KNm
X=	**3.70**	m from A
M@ X=	**150.6**	KNm
DBM=	**150.6**	**KNm**

Eq. udl = 22.003 KN/m' (factored)
Eq. ud l= 10.478 lKN/m' (live unfactored)



SECTION

						factor
Maximum BM for check	M LT=	138.0 KNm	Local capacity	PASS		0.454
Maximum BM about axis Y	MY=	6.90 KNm	Overall buckling 1	PASS		0.503
Axial compressive load	Fc=	63.17 KN	Overall buckling 2	PASS		0.600
Shear force in x axis	Fv=	63.2 KN	Deflection (dead)=	PASS		1/ 1154
Beam span	L=	7.40 m	Deflection(live)=	PASS		1/ 570
Effective length about axis X	LX eff=	7.40 m	Deflection (d+l)=	PASS		1/ 381
Effective length about axis Y	LYeff=	2.47 m	Fully restraint for Ly& LX <1.			
Limiting span/deflection (live)	=	**360.0** or 14 mm				
	z rep=	389 cm3				

Section properties

Section size (Ref. No= **94**) **254x254 73 kg 73 S355**

Depth of steel section	D=	254 mm			
Width of section	B=	254 mm			
Thickness of web	t=	8.6 mm	Mcx=	351 KNm	
Thickness of flange	T=	14.2 mm	Mcy=	164.2 KNm	
Root radius	r=	14.2 mm	Mb L=	270.9 KNm	
Second moment of area x-x	Ix=	11360 cm4	mlt=	**0.916** AUTO	
Second moment of area y-y	Iy=	3873 cm4			
Plastic modulus x-x	Sx=	988.6 cm3	Sx eff=	863.13 cm3	
Plastic modulus y-y	Sy=	462.4 cm3	Sy eff=	252.53 cm3	
Area of section	Ag=	92.9 cm2	An=	84.45 cm2	ke= 1.1

CONTINUE OF FB2.04

DEFLECTION (unfactored)

Unfactored dead load deflection=	6.41 mm		E UDL=	4.09	KN/m'
Unfactored live load deflection=	12.97 mm		E UDL=	10.48	KN/m'
Unfactored dead+ live load def =	19.38 mm		E UDL=	14.56	KN/m'
Span/def. ratio for dead load=	1154				
Span/def. ratio for live load=	**571**	**>360**			
Span/def. ratio fordead+ live load=	382				

Strength of steel Clause 3.1.1

Design strength **(Grade S 355)**

for thickness of 14.2 mm **py=** **355** N/mm2 py= **355.0** N/mm2 pyw= py

Young's Modulus **E=** 205 KN/mm2

Classification of cross section (clause 3.5.2) TABLE 11 rolled section

Constant	ε =	0.880		class 1	class 2	class 3
Outstand of flange	b=	108.5 mm		plastic	compac	semi compact
Ratio	b/T=	7.64	b/Tlim=	7.92	8.80	13.20

The section is class1 plastic

r1 =min(1.0,max(-0.1,Fc/(dxtxpyw)))= 1.00 r2=Fc/(Agxpyw)= 0.019

Depth between fillets	d=	200.2 mm		TABLE 11 rolled section		
ratio	d/t=	23.28		class 1	class 2	class 3
40 ε	=	35.206	d/tlim=	35.21	35.21	101.72

The classification is based on the general web condition **The section is class1 plastic**

Shear capacity CL 4.2.3

Shear area	Av y=	2184.4 mm2	(t x D)	
Shear capacity (0.6pyA)	Pvy=	465 KN		
Shear force	Fvy=	63.2 KN	Fvy/Pvy= 0.14	**SHEAR PASS OK**

Moment Capacity

Elastic modulus	Zx=	894.5 cm3	Mcx1=	317.5
Plastic modulus	Sx=	989 cm3	Mcx2=	351
Moment capacity for section	Mcx=	**351.0** KNm		
Elastic modulus	Zy=	305 cm3	Mcy1=	108.3
Plastic modulus	Sy=	462.4 cm3	mcy2=	164.2
Moment capacity for section	Mcy=	**164.2** KNm		

Local capacity check Clause 4.8.3.2

$\frac{F}{Ag.\,py} + \frac{Mx}{Mcx} + \frac{My}{Mcy} = \; <=1$

0.019 + 0.393 + 0.042 = **0.454** **LOCAL CAPACITY IS SATISFIED**

restraint/effective length Clause 4.31 to 4.3.5 TABLE 13

Effective length	Le lt1=	7400 mm	normal condition
Effective length	Lelt2=	2466.7 mm	
	L e lt=	4933.3 mm	
Radius of gyration y-y	ry=	6.46 cm	
	rx=	11.1 cm	
	Lam'y=	38.2	
	La'mx=	66.7	

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Made By:	OAM	Revision:	
Date:	Nov-23	Checked By:	TG

Project: 34 BELGRAVE MEWS SOUTH

CONTINUE OF FB2.04

Buckling resistance Clause 4.8.3.3.1

Compressive strength:perry strust formula from Appendex C.1

Limiting slenderness	lam 0=	15.10		py=	355 N/mm2
For buckling about y-y				λ L0=	30.20 TABLE 16
Robertson constant for H section					
	a=	5.5			
Perry factor	eta=	0.28			
Euler strength	pe=	455	N/mm2		
Factor	phi=	470	N/mm2		
Compressive strength	pcy=	**226.8**	N/mm2		

	Lam'y=	38.2		La'mx=	66.67	Lamy/x=	2.2071
Slenderness of section	Lamda=	66.7				Lamx/x=	3.8536
Torsional index	x=	17.3					
	N=	0.5					
Slenderness factor	v=	0.96	from Table 19				
	β w =	1.0					
Buckling parameter	u=	0.849					
Equivalent slenderness	lamlt=	54.3					
Buckling strength (Table 16)	pb=	274	N/mm2	for lamlt=	55	py=	355
Buckling resisrance moment	Mb=	270.9	KNm				
	Mb L=	270.9	KNm				
	Mry=	164.2	KNm				
	Pc=	2107	KN				
	Pcy=	2107	KN				

$\frac{Fc}{PC} + m \frac{x\,Mx}{Py\,Zx} + m \frac{y\,My}{py\,Zy} = \;<=1$ m x= 0.95, m y= 0.95

0.030 + 0.413 + 0.061 = **0.503** **The interaction formula is satisfied**

$\frac{Fc}{Pcy} + m \frac{LT\,M\,lt}{Mb} + m \frac{y\,My}{py\,Zy} = \;<=1$

0.030 + 0.509 + 0.061 = **0.600** **The interaction formula is satisfied**

DESIGN OF STEEL BEAM, SIMPLY SUPPORTED

H rolled section S355
Calculation in accordance with BS 5950: 1: 2000

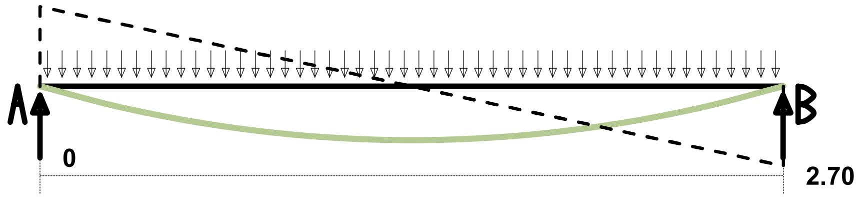
LOCATION= FB2.05

Loads are unfactored

Wd= 9.57 KN/m2
Wl= 2.55 KN/m2

Span= 2.70 m
Cover= 1.00 m

24 KN

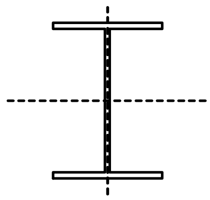


SPAN

Load on beam	unfactored	factored	16 KNm
			Partial safety factor for load
Dead+s/w=	9.82 KN/m'	13.75 KN/m'	dead= 1.4
Live=	2.55 KN/m'	4.08 KN/m'	live= 1.6
	12.37 KN/m'	17.83 KN/m'	

Reaction

	unfactored		factored
RA=	16.7 KN		**24.1** KN
RB=	16.7 KN		**24.1** KN
Shear zero at		X=	1.35 m
Maximum Bending Moment		**Mx =**	**16.2** KNm



SECTION

					factor
Maximum BM for check	M LT=	15.0 KNm	Local capacity	PASS	0.275
Maximum BM about axis Y	MY=	1.50 KNm	Overall buckling 1	PASS	0.384
Axial compressive load	Fc=	60.0 KN	Overall buckling 2	PASS	0.515
Shear force in x axis	Fv=	24.1 KN	Deflection (dead)=	PASS	1/ 1919
Beam span	L=	2.70 m	Deflection(live)=	PASS	1/ 7390
Effective length about axis X	LX eff=	2.70 m	Deflection (d+l)=	PASS	1/ 1523
Effective length about axis Y	LYeff=	3.17 m	Fully restraint for Ly& LX <1.		
Limiting span/deflection (live)	=	**360.0** or 14 mm			
	z rep=	46 cm3			

Section properties

Section size (Ref. No= 67) **203x133 25 kg UB S355**

Depth of steel section	D=	203.2 mm				
Width of section	B=	133.4 mm	Pcy=	483 KN		
Thickness of web	t=	5.8 mm	Mcx=	92.23 KNm		
Thickness of flange	T=	7.8 mm	Mcy=	25.34 KNm		274.23
Root radius	r=	7.6 mm	Mb L=	49.36 KNm		
Second moment of area x-x	Ix=	2356 cm4	Mlt=	**0.925**	Pcy=	482.89 KN
Second moment of area y-y	Iy=	310 cm4				
Plastic modulus x-x	Sx=	259.8 cm3	Sx eff=	227.90 cm3		
Plastic modulus y-y	Sy=	71.39 cm3	Sy eff=	42.82 cm3		
Area of section	Ag=	32.2 cm2	An=	29.27 cm2	ke= 1.1	

DEFLECTION

			unfactored	
Unfactored dead load deflection=	1.41 mm		E UDL=	9.82 KN/m'
Unfactored live load deflection=	0.37 mm		E UDL=	2.55 KN/m'
Unfactored dead+ live load def =	1.77 mm		E UDL=	12.37 KN/m'
Span/def. ratio for dead load=	1919			
Span/def. ratio for live load=	**7390**	**>360**		
Span/def. ratio fordead+ live load=	1523			

CONTINUE OF FB2.05

Strength of steel Clause 3.1.1

Design strength	**(Grade**	**S 355)**						
for thickness of	7.8 mm	**py=**	**355**	N/mm2	py=	**355.0**	N/mm2	pyw= py
Young's Modulus		**E=**	205	KN/mm2				

Classification of cross section (clause 3.5.2) TABLE 11 rolled section

Constant (table 11 note b)	ε =	0.880			class 1	class 2	class 3
Outstand of flange	b=	66.7	mm		plastic	compac	semi compact
Ratio	b/T=	8.55		b/Tlim=	7.92	8.80	13.20

The classification is based on the outsatnd element — **The section is class2 compact**

r1 =min(1.0,max(-0.1,Fc/(dxtxpyw)))= 0.17 — r2=Fc/(Agxpyw)= 0.052

Depth between fillets	d=	172.3	mm		TABLE 11 rolled section		
ratio	d/t=	29.71			class 1	class 2	class 3
40 ε	=	35.21		d/tlim=	60.23	70.20	95.58

The classification is based on the general web condition — **The section is class1 plastic**

Shear capacity CL 4.2.3

Shear area		Av y=	1179 mm2	(t x D)		
Shear capacity	(0.6pyA)	Pvy=	251 KN			
Shear force		Fvy=	24.1 KN	Fvy/Pvy=	0.10	**SHEAR PASS OK**

Moment Capacity

Elastic modulus	Zx=	231.9 cm3	Mcx1=	82.32
Plastic modulus	Sx=	260 cm3	Mcx2=	92.23
Moment capacity for section	Mcx=	**92** KNm		
Elastic modulus	Zy=	46.4 cm3	Mcy1=	16.47
Plastic modulus	Sy=	71 cm3	mcy2=	25.34
Moment capacity for section	Mcy=	**25** KNm		

Local capacity check Clause 4.8.3.2

$$\frac{F}{Ag.\,py} + \frac{Mx}{Mcx} + \frac{My}{Mcy} = \ <=1$$

0.052 + 0.163 + 0.059 = **0.275** **LOCAL CAPACITY IS SATISFIED**

restraint/effective length Clause 4.31 to 4.3.5 TABLE 13

Effective length	Le lt1=	2700 mm	normal condition
Effective length	Lelt2=	3173 mm	
	L e lt=	2937 mm	
Radius of gyration y-y	ry=	3.1 cm	
	rx=	8.54 cm	
	Lam'y=	102.4	
	La'mx=	31.6	

CONTINUE OF FB2.05

Buckling resistance Clause 4.8.3.3.1

Compressive strength:perry strust formula from Appendex C.1

Limiting slenderness	lam 0=	15.10		py=	355	N/mm2
For buckling about y-y			λ L0=		30.20	TABLE 16
Robertson constant for section						
	a=	3.5	for table 23	b		
Perry factor	eta=	0.31				
Euler strength	pe=	193	N/mm2			
Factor	phi=	304	N/mm2			
Compressive strength	pcy=	**150.0**	N/mm2			

	Lam'y=	102.4		La'mx=	31.62	Lamy/x=	4.03
Slenderness of section	Lamda=	102.4				Lamx/x=	1.2447
Torsional index	x=	25.4					
	N=	0.5					
Slenderness factor	v=	0.86	from Table 19				
	β w =	1.0					
Buckling parameter	u=	0.876					
Equivalent slenderness	lamlt=	77.3					
Buckling strength (Table 16)	pb=	190	N/mm2	for lamlt=	80	py=	355
Buckling resisrance moment	Mb=	49	KNm				
	Mb L=	49	KNm				
	Mry=	25	KNm				
	Pc=	482.9	KN				
	Pcy=	482.9	KN				

$$\frac{Fc}{PC} + m\frac{x\,Mx}{Py\,Zx} + m\frac{y\,My}{py\,Zy} = \le 1$$

m x= 0.95

m y= 0.95

0.124 + 0.173 + 0.087 = **0.384** **The interaction formula is satisfied**

$$\frac{Fc}{Pcy} + m\frac{LT\,M\,lt}{Mb} + m\frac{y\,My}{py\,Zy} = \le 1$$

0.124 + 0.304 + 0.087 = **0.515** **The interaction formula is satisfied**

DIMENSIONS IN THESE CALCULATIONS ARE ONLY APPROXIMATE AND THE CONTRACTOR MUST CHECK THE LATEST ARCHITECTURAL DRAWINGS AND MEASURE UP ON SITE BEFORE ORDERING ANY MATERIALS.

FIRST FLOOR LEVEL

STEEL BEAM **FB1.01**

Max span = 3.7 m

Cover= 2.7 m

USE 203x133x30 UB **S355** SEE PAGE 28 - 30

STEEL BEAM **FB1.02**

Max span = 2 m

Cover= 1 m

USE 152x89x16 UB **S355** SEE PAGE 31 - 33

STEEL BEAM **FB1.03**

Max span = 7,4 m

Cover= 1.2 m

USE 254x254x73 UC **S355** SEE PAGE 34 - 36

STEEL BEAM **FB1.07**

Max span = 2.6 m

BEAM LOADING		D LOAD	I LOAD	cover y		dead load	live load
		KN/m2	KN/m2	m		KN/m'	KN/m'
ROOF	dead	**1.25**		**1**	=> 1* 1.25=	1.25	
	live		**0.75**	**1**	=> 1*0.75=		0.75
1ST floor	dead	**0.6**		**0.6**	=> .6* .6=	0.36	
	live		**1.50**	**0.6**	=> .6*1.50=		0.9
wall	dead	**3.85**		**2.7**	=> 2.7* 3.85=	10.395	
					UDL	**12.005 KN/m'**	**1.65 KN/m'**

USE 2NO. 178x102x19 UB BOLTED **S355** SEE PAGE 37 - 39

go to page 40

♦ David Smith Associates ♦ 8 Duncan Close ♦ Moulton Park ♦ Northampton NN3 6WL Tel: (01604) 782620 ♦ Fax: (01604) 782629 E-mail: post@dsagroup.co.uk	Project No:	21/44834	Sheet No:	28
	Made By:	OAM	Revision:	
	Date:	Nov-23	Checked By:	HJ

Project: 34 BELGRAVE MEWS SOUTH

DESIGN OF STEEL BEAM, SIMPLY SUPPORTED

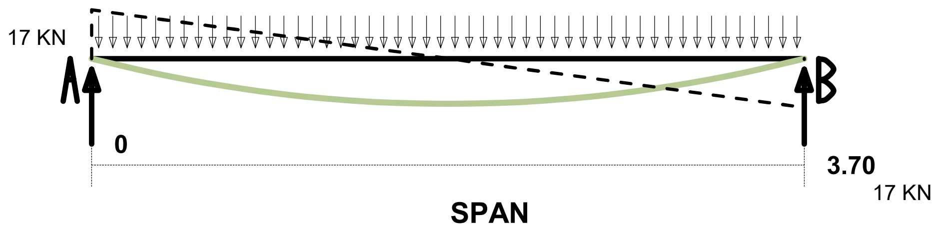
H rolled section S355
Calculation in accordance with BS 5950: 1: 2000

LOCATION= **FB1.01**

Loads are unfactored

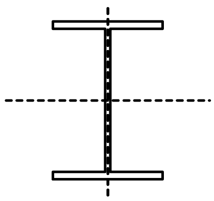
Wd= **0.60** KN/m2
Wl= **1.50** KN/m2

Span= **3.70** m
Cover= **2.70** m



SPAN

Load on beam	unfactored	factored	
			16 KNm
			Partial safety factor for load
Dead+s/w=	1.92 KN/m'	2.69 KN/m'	dead= 1.4
Live=	4.05 KN/m'	6.48 KN/m'	live= 1.6
	5.97 KN/m'	9.17 KN/m'	



SECTION

Reaction

RA=	11.0 KN		**17.0** KN
RB=	11.0 KN		**17.0** KN
Shear zero at		X=	1.85 m
Maximum Bending Moment		**Mx =**	**15.7** KNm

					factor
Maximum BM for check	M LT=	14.5 KNm	Local capacity	PASS	0.221
Maximum BM about axis Y	MY=	1.45 KNm	Overall buckling 1	PASS	0.373
Axial compressive load	Fc=	60.0 KN	Overall buckling 2	PASS	0.543
Shear force in x axis	Fv=	17.0 KN	Deflection (dead)=	PASS	1/ 4673
Beam span	L=	3.70 m	Deflection(live)=	PASS	1/ 2215
Effective length about axis X	LX eff=	3.70 m	Deflection (d+l)=	PASS	1/ 1503
Effective length about axis Y	LYeff=	4.28 m	Fully restraint for Ly& LX <1.		
Limiting span/deflection (live)	=	**360.0** or 14 mm			
	z rep=	44 cm3			

Section properties

Section size (Ref. No= **66**) **203x133 30 kg UB S355**

Depth of steel section	D=	206.8 mm				
Width of section	B=	133.8 mm	Pcy=	360 KN		
Thickness of web	t=	6.3 mm	Mcx=	111.2 KNm		
Thickness of flange	T=	9.6 mm	Mcy=	31.26 KNm		261.08
Root radius	r=	7.6 mm	Mb L=	47 KNm		
Second moment of area x-x	Ix=	2887 cm4	Mlt=	**0.925**	Pcy=	360.33 KN
Second moment of area y-y	Iy=	384 cm4				
Plastic modulus x-x	Sx=	313.3 cm3	Sx eff=	274.52 cm3		
Plastic modulus y-y	Sy=	88.05 cm3	Sy eff=	53.09 cm3		
Area of section	Ag=	38 cm2	An=	34.55 cm2	ke=	1.1

DEFLECTION

			unfactored	
Unfactored dead load deflection=	0.79 mm		E UDL=	1.92 KN/m'
Unfactored live load deflection=	1.67 mm		E UDL=	4.05 KN/m'
Unfactored dead+ live load def =	2.46 mm		E UDL=	5.97 KN/m'
Span/def. ratio for dead load=	4674			
Span/def. ratio for live load=	**2216**	**>360**		
Span/def. ratio fordead+ live load=	1503			

CONTINUE OF FB1.01

Strength of steel Clause 3.1.1

Design strength (**Grade S 355**)
for thickness of 9.6 mm **py=** 355 N/mm2 py= **355.0** N/mm2 pyw= py
Young's Modulus **E=** 205 KN/mm2

Classification of cross section (clause 3.5.2) TABLE 11 rolled section

				class 1	class 2	class 3
Constant (table 11 note b)	ε =	0.880				
Outstand of flange	b=	66.9 mm		plastic	compac	semi compact
Ratio	b/T=	6.97	b/Tlim=	7.92	8.80	13.20

The classification is based on the outsatnd element **The section is class1 plastic**

r1 =min(1.0,max(-0.1,Fc/(dxtxpyw)))= 0.16 r2=Fc/(Agxpyw)= 0.044

Depth between fillets d= 172.3 mm TABLE 11 rolled section

				class 1	class 2	class 3
ratio	d/t=	27.35				
40 ε	=	35.21	d/tlim=	60.93	71.35	96.99

The classification is based on the general web condition **The section is class1 plastic**

Shear capacity CL 4.2.3

Shear area Av y= 1303 mm2 (t x D)
Shear capacity (0.6pyA) Pvy= 278 KN
Shear force Fvy= 17.0 KN Fvy/Pvy= 0.06 **SHEAR PASS OK**

Moment Capacity

Elastic modulus	Zx=	279.3 cm3	Mcx1=	99.15
Plastic modulus	Sx=	313 cm3	Mcx2=	111.2
Moment capacity for section	Mcx=	**111** KNm		
Elastic modulus	Zy=	57.4 cm3	Mcy1=	20.38
Plastic modulus	Sy=	88 cm3	mcy2=	31.26
Moment capacity for section	Mcy=	**31** KNm		

Local capacity check Clause 4.8.3.2

$\frac{F}{Ag.\ py} + \frac{Mx}{Mcx} + \frac{My}{Mcy} = \;<=1$

0.044 + 0.130 + 0.046 = **0.221** **LOCAL CAPACITY IS SATISFIED**

restraint/effective length Clause 4.31 to 4.3.5 TABLE 13

Effective length Le lt1= 3700 mm normal condition
Effective length Lelt2= 4277 mm
L e lt= 3988 mm

Radius of gyration y-y ry= 3.18 cm
rx= 8.72 cm
Lam'y= 134.5
La'mx= 42.4

CONTINUE OF FB1.01

Buckling resistance Clause 4.8.3.3.1

Compressive strength:perry strust formula from Appendex C.1

Limiting slenderness	lam 0=	15.10	py=	355 N/mm2
For buckling about y-y			λ L0=	30.20 TABLE 16
Robertson constant for section				
	a=	3.5 for table 23	b	
Perry factor	eta=	0.42		
Euler strength	pe=	112 N/mm2		
Factor	phi=	257 N/mm2		
Compressive strength	pcy=	**94.8** N/mm2		

	Lam'y=	134.5	La'mx=	42.43	Lamy/x=	6.2554
Slenderness of section	Lamda=	134.5			Lamx/x=	1.9735
Torsional index	x=	21.5				
	N=	0.5				
Slenderness factor	v=	0.76 from Table 19				
	β w =	1.0				
Buckling parameter	u=	0.882				
Equivalent slenderness	lamlt=	90.5				
Buckling strength (Table 16)	pb=	150 N/mm2	for lamlt=	95	py=	355
Buckling resisrance moment	Mb=	47 KNm				
	Mb L=	47 KNm				
	Mry=	31 KNm				
	Pc=	360.3 KN				
	Pcy=	360.3 KN				

$\frac{Fc}{PC} + m\frac{x\,Mx}{Py\,Zx} + m\frac{y\,My}{py\,Zy} = \leq 1$ m x= 0.95, m y= 0.95

0.167 + 0.139 + 0.068 = **0.373**   **The interaction formula is satisfied**

$\frac{Fc}{Pcy} + m\frac{LT\,M\,lt}{Mb} + m\frac{y\,My}{py\,Zy} = \leq 1$

0.167 + 0.309 + 0.068 = **0.543**   **The interaction formula is satisfied**

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Project No:	**21/44834**	**Sheet No:**	**31**
Made By:	***OAM***	**Revision:**	
Date:	**Nov-23**	**Checked By:**	**HJ**

Project: **34 BELGRAVE MEWS SOUTH**

DESIGN OF STEEL BEAM, SIMPLY SUPPORTED

H rolled section S355
Calculation in accordance
with BS 5950: 1: 2000

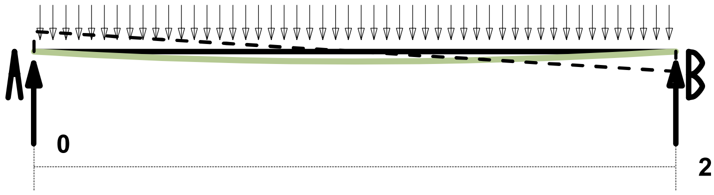
LOCATION= **FB1.02**

Loads are unfactored

Wd= **0.60** KN/m2
Wl= **1.50** KN/m2

Span= **2.00** m
Cover= **1.00** m

3 KN



3 KN

SPAN

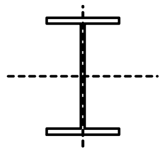
2 KNm

Load on beam	unfactored	**factored**
Dead+s/w=	0.76 KN/m'	1.06 KN/m'
Live=	1.50 KN/m'	2.40 KN/m'
	2.26 KN/m'	3.46 KN/m'

Partial safety factor for load
dead= 1.4
live= 1.6

Reaction

	unfactored	factored
RA=	2.3 KN	**3.5** KN
RB=	2.3 KN	**3.5** KN
Shear zero at X=		1.00 m
Maximum Bending Moment **Mx =**		**1.7** KNm



SECTION

					factor
Maximum BM for check	M LT=	1.6 KNm	Local capacity	**PASS**	0.133
Maximum BM about axis Y	MY=	0.16 KNm	Overall buckling 1	**PASS**	0.286
Axial compressive load	Fc=	60.0 KN	Overall buckling 2	**PASS**	0.315
Shear force in x axis	Fv=	3.5 KN	Deflection (dead)=	**PASS**	1/ 21699
Beam span	L=	2.00 m	Deflection(live)=	**PASS**	1/ 10994
Effective length about axis X	LX eff=	2.00 m	Deflection (d+l)=	**PASS**	1/ 7297
Effective length about axis Y	LYeff=	2.35 m	Fully restraint for Ly& LX <1.		
Limiting span/deflection (live)	=	**360.0** or 14 mm			
	z rep=	5 cm3			

Section properties

Section size (Ref. No= **70**) **152x89 16 kg UB S355**

Depth of steel section	D=	152.4 mm				
Width of section	B=	88.9 mm	Pcy=	266 KN		
Thickness of web	t=	4.6 mm	Mcx=	44.02 KNm		
Thickness of flange	T=	7.7 mm	Mcy=	11.15 KNm		130.89
Root radius	r=	7.6 mm	Mb L=	23.56 KNm		
Second moment of area x-x	Ix=	838 cm4	Mlt=	**0.925**	Pcy=	265.96 KN
Second moment of area y-y	Iy=	90.4 cm4				
Plastic modulus x-x	Sx=	124 cm3	Sx eff=	107.62 cm3		
Plastic modulus y-y	Sy=	31.4 cm3	Sy eff=	18.41 cm3		
Area of section	Ag=	20.5 cm2	An=	18.64 cm2	ke=	1.1

DEFLECTION

			unfactored
Unfactored dead load deflection=	0.09 mm		E UDL= 0.76 KN/m'
Unfactored live load deflection=	0.18 mm		E UDL= 1.50 KN/m'
Unfactored dead+ live load def =	0.27 mm		E UDL= 2.26 KN/m'
Span/def. ratio for dead load=	21700		
Span/def. ratio for live load=	**10995**	**>360**	
Span/def. ratio fordead+ live load=	7297		

CONTINUE OF FB1.02

Strength of steel Clause 3.1.1

Design strength	**(Grade**	**S 355** **)**							
for thickness of	7.7	mm	**py=**	**355**	N/mm2	py=	**355.0**	N/mm2	pyw= py
Young's Modulus			**E=**	205	KN/mm2				

Classification of cross section (clause 3.5.2) TABLE 11 rolled section

Constant (table 11 note b)	ε =	0.880		class 1	class 2	class 3	
Outstand of flange	b=	44.45	mm	plastic	compac	semi compact	
Ratio	b/T=	5.77	b/Tlim=	7.92	8.80	13.20	
The classification is based on the outsatnd element				**The section is class1 plastic**			
r1 =min(1.0,max(-0.1,Fc/(dxtxpyw)))=		0.30	r2=Fc/(Agxpyw)=	0.082			
Depth between fillets	d=	121.8	mm	TABLE 11 rolled section			
ratio	d/t=	26.48		class 1	class 2	class 3	
40 ε	=	35.21	d/tlim=	54.09	60.60	90.67	
The classification is based on the general web condition				**The section is class1 plastic**			

Shear capacity CL 4.2.3

Shear area		Av y=	701 mm2	(t x D)		
Shear capacity	(0.6pyA)	Pvy=	149 KN			
Shear force		Fvy=	3.5 KN	Fvy/Pvy=	0.02	**SHEAR PASS OK**

Moment Capacity

Elastic modulus	Zx=	110 cm3	Mcx1=	39.05
Plastic modulus	Sx=	124 cm3	Mcx2=	44.02
Moment capacity for section	Mcx=	**44** KNm		
Elastic modulus	Zy=	20.3 cm3	Mcy1=	7.207
Plastic modulus	Sy=	31 cm3	mcy2=	11.15
Moment capacity for section	Mcy=	**11** KNm		

Local capacity check Clause 4.8.3.2

$$\frac{F}{Ag.\,py} + \frac{Mx}{Mcx} + \frac{My}{Mcy} = \; <=1$$

0.082 + 0.036 + 0.014 = **0.133** **LOCAL CAPACITY IS SATISFIED**

restraint/effective length Clause 4.31 to 4.3.5 TABLE 13

Effective length	Le lt1=	2000 mm	normal condition
Effective length	Lelt2=	2352 mm	
	L e lt=	2176 mm	
Radius of gyration y-y	ry=	2.1 cm	
	rx=	6.4 cm	
	Lam'y=	112.0	
	La'mx=	31.3	

CONTINUE OF FB1.02

Buckling resistance Clause 4.8.3.3.1

Compressive strength:perry strust formula from Appendex C.1

Limiting slenderness	lam 0=	15.10		py=	355	N/mm2	
For buckling about y-y				λ L0=	30.20	TABLE 16	
Robertson constant for section							
	a=	3.5	for table 23	b			
Perry factor	eta=	0.34					
Euler strength	pe=	161	N/mm2				
Factor	phi=	285	N/mm2				
Compressive strength	pcy=	**129.7**	N/mm2				

	Lam'y=	112.0		La'mx=	31.25	Lamy/x=	5.7446
Slenderness of section	Lamda=	112.0				Lamx/x=	1.6026
Torsional index	x=	19.5					
	N=	0.5					
Slenderness factor	v=	0.78	from Table 19				
	β w =	1.0					
Buckling parameter	u=	0.889					
Equivalent slenderness	lamlt=	78.1					
Buckling strength (Table 16)	pb=	190	N/mm2	for lamlt=	80	py=	355
Buckling resisrance moment	Mb=	24	KNm				
	Mb L=	24	KNm				
	Mry=	11	KNm				
	Pc=	266	KN				
	Pcy=	266	KN				

$\frac{Fc}{PC} + m\frac{x\,Mx}{Py\,Zx} + m\frac{y\,My}{py\,Zy} = \leq 1$ m x= 0.95, m y= 0.95

0.226 + 0.039 + 0.021 = **0.286**   **The interaction formula is satisfied**

$\frac{Fc}{Pcy} + m\frac{LT\,M\,lt}{Mb} + m\frac{y\,My}{py\,Zy} = \leq 1$

0.226 + 0.068 + 0.021 = **0.315**   **The interaction formula is satisfied**

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	Date:	Nov-23	Checked By:	TG

Project: 34 BELGRAVE MEWS SOUTH

DESIGN OF STEEL BEAM, SIMPLY SUPPORTED S355

LOCATION= **FB1.03** SPAN= **7.40** m
Uniform distributed load COVER= **1.20** m

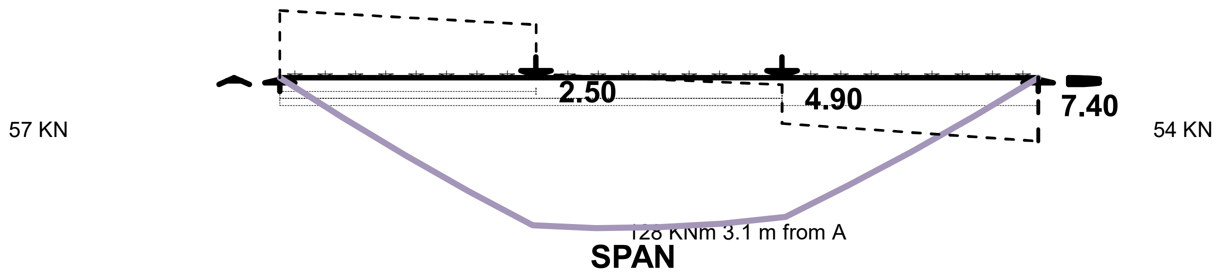
	Unfactored		Factored	
wdl=	**0.60**	KN/m2	(**0.84**)	
wll =	**1.50**	KN/m2	(**2.40**)	
	2.10		**3.24**	KN/m2
		factor=	**1.54**	

H rolled section
Calculation in accordance with BS 5950: 1: 2000

Point load

P1=	**28.00**	KN	(**42.0**)KN	
a1=	**2.50**	m		
P2=	**22.0**	KN	(**33.00**)KN	
a2=	**4.90**	**m**		

Partial safety factor for load
dead= 1.4
live= 1.6



	Unfactored		(Factored)	
Wd=	1.45	KN/m'	(2.03)	
Wl =	1.8	kKN/m'	(2.88)	
	3.25	KN/m'	**4.91**	KN/m'

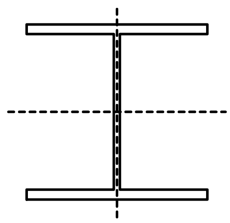
Reactions

RA=	37.998	KN	(**57.1**	KN
RB=	36.052	KN	(**54.2**	KN

Desidn bending moment(factored)=

M@P1 =	**127.5**	KNm
M@P2 =	**120.2**	KNm
X=	**3.08**	m from A
M@ X=	**128.3**	KNm
DBM=	**128.3**	**KNm**

Eq. udl = 18.744 KN/m' (factored)
Eq. ud l= 8.9256 lKN/m' (live unfactored)



SECTION

						factor
Maximum BM for check	M LT=	117.7	KNm	Local capacity	PASS	0.389
Maximum BM about axis Y	MY=	5.89	KNm	Overall buckling 1	PASS	0.431
Axial compressive load	Fc=	57.13	KN	Overall buckling 2	PASS	0.513
Shear force in x axis	Fv=	57.1	KN	Deflection (dead)=	PASS	1/ 1468
Beam span	L=	7.40	m	Deflection(live)=	PASS	1/ 776
Effective length about axis X	LX eff=	7.40	m	Deflection (d+l)=	PASS	1/ 507
Effective length about axis Y	LYeff=	2.47	m	Fully restraint for Ly& LX <1.		
Limiting span/deflection (live)	=	**360.0**	or 14 mm			
	z rep=	332	cm3			

Section properties

Section size (Ref. No= **94**) **254x254 73 kg 73 S355**

Depth of steel section	D=	254	mm				
Width of section	B=	254	mm				
Thickness of web	t=	8.6	mm	Mcx=	351	KNm	
Thickness of flange	T=	14.2	mm	Mcy=	164.2	KNm	
Root radius	r=	14.2	mm	Mb L=	270.9	KNm	
Second moment of area x-x	Ix=	11360	cm4	mlt=	**0.917**	AUTO	
Second moment of area y-y	Iy=	3873	cm4				
Plastic modulus x-x	Sx=	988.6	cm3	Sx eff=	863.13	cm3	
Plastic modulus y-y	Sy=	462.4	cm3	Sy eff=	252.53	cm3	
Area of section	Ag=	92.9	cm2	An=	84.45	cm2	ke= 1.1

CONTINUE OF FB1.03

DEFLECTION — unfactored

Unfactored dead load deflection=	5.04 mm		E UDL=	3.48	KN/m'
Unfactored live load deflection=	9.54 mm		E UDL=	8.93	KN/m'
Unfactored dead+ live load def =	14.57 mm		E UDL=	12.41	KN/m'
Span/def. ratio for dead load=	1469				
Span/def. ratio for live load=	**776**	**>360**			
Span/def. ratio fordead+ live load=	508				

Strength of steel Clause 3.1.1

Design strength **(Grade S 355)**

for thickness of 14.2 mm **py=** **355** N/mm2 py= **355.0** N/mm2 pyw= py

Young's Modulus **E=** 205 KN/mm2

Classification of cross section (clause 3.5.2) TABLE 11 rolled section

Constant	ε =	0.880		class 1	class 2	class 3
Outstand of flange	b=	108.5 mm		plastic	compac	semi compact
Ratio	b/T=	7.64	b/Tlim=	7.92	8.80	13.20

The section is class1 plastic

r1 =min(1.0,max(-0.1,Fc/(dxtxpyw)))= 1.00 r2=Fc/(Agxpyw)= 0.017

Depth between fillets	d=	200.2 mm		TABLE 11 rolled section		
ratio	d/t=	23.28		class 1	class 2	class 3
40 ε	=	35.206	d/tlim=	35.21	35.21	102.08

The classification is based on the general web condition **The section is class1 plastic**

Shear capacity CL 4.2.3

Shear area	Av y=	2184.4 mm2	(t x D)	
Shear capacity (0.6pyA)	Pvy=	465 KN		
Shear force	Fvy=	57.1 KN	Fvy/Pvy= 0.12	**SHEAR PASS OK**

Moment Capacity

Elastic modulus	Zx=	894.5 cm3	Mcx1=	317.5
Plastic modulus	Sx=	989 cm3	Mcx2=	351
Moment capacity for section	Mcx=	**351.0** KNm		
Elastic modulus	Zy=	305 cm3	Mcy1=	108.3
Plastic modulus	Sy=	462.4 cm3	mcy2=	164.2
Moment capacity for section	Mcy=	**164.2** KNm		

Local capacity check Clause 4.8.3.2

$$\frac{F}{Ag.\,py} + \frac{Mx}{Mcx} + \frac{My}{Mcy} = \le 1$$

0.017 + 0.335 + 0.036 = **0.389** **LOCAL CAPACITY IS SATISFIED**

restraint/effective length Clause 4.31 to 4.3.5 TABLE 13

Effective length	Le lt1=	7400 mm	normal condition
Effective length	Lelt2=	2466.7 mm	
	L e lt=	4933.3 mm	
Radius of gyration y-y	ry=	6.46 cm	
	rx=	11.1 cm	
	Lam'y=	38.2	
	La'mx=	66.7	

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Date:	Nov-23	Checked By:	TG

Project: **34 BELGRAVE MEWS SOUTH**

CONTINUE OF FB1.03

Buckling resistance Clause 4.8.3.3.1

Compressive strength:perry strust formula from Appendex C.1

Limiting slenderness	lam 0=	15.10		py=	355	N/mm2
For buckling about y-y				λ L0=	30.20	TABLE 16
Robertson constant for H section						
	a=	5.5				
Perry factor	eta=	0.28				
Euler strength	pe=	455	N/mm2			
Factor	phi=	470	N/mm2			
Compressive strength	pcy=	**226.8**	N/mm2			

	Lam'y=	38.2		La'mx=	66.67	Lamy/x=	2.2071
Slenderness of section	Lamda=	66.7				Lamx/x=	3.8536
Torsional index	x=	17.3					
	N=	0.5					
Slenderness factor	v=	0.96	from Table 19				
	β w =	1.0					
Buckling parameter	u=	0.849					
Equivalent slenderness	lamlt=	54.3					
Buckling strength (Table 16)	pb=	274	N/mm2	for lamlt=	55	py=	355
Buckling resisrance moment	Mb=	270.9	KNm				
	Mb L=	270.9	KNm				
	Mry=	164.2	KNm				
	Pc=	2107	KN				
	Pcy=	2107	KN				

$\frac{Fc}{PC} + m\frac{x\,Mx}{Py\,Zx} + m\frac{y\,My}{py\,Zy} = \; <=1$ m x= 0.95, m y= 0.95

0.027 + 0.352 + 0.052 = **0.431** **The interaction formula is satisfied**

$\frac{Fc}{Pcy} + m\frac{LT\,M\,lt}{Mb} + m\frac{y\,My}{py\,Zy} = \; <=1$

0.027 + 0.435 + 0.052 = **0.513** **The interaction formula is satisfied**

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	Made By:	OAM	Revision:	
	Date:	Nov-23	Checked By:	TG

Project: 34 BELGRAVE MEWS SOUTH

DESIGN OF STEEL BEAM, SIMPLY SUPPORTED

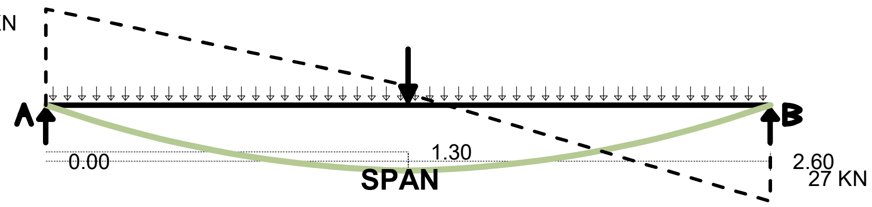
H rolled section **S275**

Calculation in accordance
with BS 5950: 1: 2000

LOCATION= **FB1.07**

Loads are unfactored

Wd1=	**12.01**	KN/m2
Wl1=	**1.65**	KN/m2
Wd2=	**12.01**	KN/m2
wl2=	**1.65**	KN/m2
P1=	**1.50**	KN
a=	**1.30**	m
Span=	**2.60**	m
Cover=	**1.00**	m



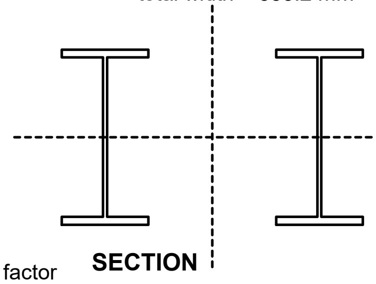
Load on beam	unfactored		factored	
Point load=	**1.50**	KN	**2.25**	KN
Dead+s/w=	12.20	KN/m'	17.07	KN/m'
Live=	1.65	KN/m'	2.64	KN/m'
	13.85	KN/m'	19.71	KN/m'

Partial safety factor for load
dead= 1.4
live= 1.6

gap= 150 mm
total width = 353.2 mm

Reaction

RA=	18.7 KN		**26.8**	KN
RB=	18.7 KN		**26.8**	KN
Shear zero at		X=	1.3	m
Maximum Bending Moment		**Mx =**	**18.1**	KNm



					factor
Maximum BM for check	M LT=	16.8 KNm	Local capacity	**PASS**	0.403
Maximum BM about axis Y	MY=	1.68 KNm	Overall buckling 1	**PASS**	0.404
Axial compressive load	Fc=	1.0 KN	Overall buckling 2	**PASS**	0.555
Shear force in x axis	Fv=	26.8 KN	Deflection (dead)=	**PASS**	1/ 1938
Beam span	L=	2.60 m	Deflection(live)=	**PASS**	1/ 14104
Effective length about axis X	LX eff=	2.60 m	Deflection (d+l)=	**PASS**	1/ 1704
Effective length about axis Y	LYeff=	3.04 m	Fully restraint for Ly& LX <1.		
Limiting span/deflection (live)	=	**360.0** or 14 mm			
	z rep=	66 cm3			

Section properties

Section size (Ref. No= **69**) **2NO** **178x102 19 kg UB S275**

Depth of steel section	D=	177.8 mm			
Width of section	B=	101.6 mm			
Thickness of web	t=	4.7 mm	Mcx=	94.05 KNm	
Thickness of flange	T=	7.9 mm	Mcy=	7.48 KNm	
Root radius	r=	7.9 mm	Mb L=	49.25 KNm	
Second moment of area x-x	TOTAL I x=	2720 cm4	Mlt=	**0.925**	
Second moment of area y-y	TOTAL Iy=	276 cm4			Iy= 138 cm4
Plastic modulus x-x	TOTAL Sx=	342 cm3	Sx eff=	301.96 cm3	
Plastic modulus y-y	Sy=	23.44 cm3	Sy eff=	27.62 cm3	
Area of section	total A=	48.4 cm2	An=	40.33 cm2	ke= 1.2

DEFLECTION

			unfactored
Unfactored dead load deflection=	1.34 mm		E UDL= 12.57 KN/m'
Unfactored live load deflection=	0.18 mm		E UDL= 1.73 KN/m'
Unfactored dead+ live load def =	1.53 mm		E UDL= 14.30 KN/m'
Span/def. ratio for dead load=	1939		
Span/def. ratio for live load=	**14105**	**>360**	
Span/def. ratio fordead+ live load=	1704		

CONTINUE OF FB1.07

Strength of steel Clause 3.1.1

Design strength	**(Grade**	**S 275**)						
for thickness of	7.9 mm	**py=**	**275**	N/mm2	py=	**275.0**	N/mm2	pyw= py
Young's Modulus		**E=**	205	KN/mm2				

Classification of cross section (clause 3.5.2)

				TABLE 11 rolled section			
Constant (table 11 note b)	ε =	1.000			class 1	class 2	class 3
Outstand of flange	b=	50.8 mm			plastic	compac	semi compact
Ratio	b/T=	6.43		b/Tlim=	9.00	10.00	15.00
The classification is based on the outsatnd element				**The section is class1 plastic**			
r1 =min(1.0,max(-0.1,Fc/(dxtxpyw)))=		0.01		r2=Fc/(Agxpyw)=	8E-04		
Depth between fillets	d=	146.8 mm		TABLE 11 rolled section			
ratio	d/t=	31.23			class 1	class 2	class 3
40 ε	=	40		d/tlim=	79.58	99.22	119.82
The classification is based on the general web condition				**The section is class1 plastic**			

Shear capacity CL 4.2.3

Shear area		Av y=	835.7 mm2	(t x D)	
Shear capacity	(0.6pyA)	Pvy=	138 KN		
Shear force		Fvy=	26.8 KN	Fvy/Pvy= 0.19	**SHEAR PASS OK**

Moment Capacity

Elastic modulus	Zx=	306 cm3	Mcx1=	84.15
Plastic modulus	TOTAL Sx=	342 cm3	Mcx2=	94.05
Moment capacity for section	Mcx=	**94** KNm		
Elastic modulus	zy=	27 cm2	Mcy1=	7.48
Plastic modulus	Sy=	23 cm3	mcy2=	6.447
Moment capacity for section	Mcy=	**7** KNm		

Local capacity check Clause 4.8.3.2

$\frac{F}{Ag.\ py} + \frac{Mx}{Mcx} + \frac{My}{Mcy} = \ <=1$

0.001 + 0.178 + 0.224 = **0.403** **LOCAL CAPACITY IS SATISFIED**

restraint/effective length Clause 4.31 to 4.3.5 TABLE 13

Effective length	Le lt1=	2600 mm	normal condition
Effective length	Lelt2=	3038 mm	
	L e lt=	2819 mm	
Radius of gyration y-y	ry=	2.39 cm	
	rx=	7.49 cm	
	Lam'y=	127.2	
	La'mx=	34.7	

CONTINUE OF FB1.07

Buckling resistance Clause 4.8.3.3.1

Compressive strength:perry strust formula from Appendex C.1

Limiting slenderness	lam 0=	17.16			py=	275 N/mm2
For buckling about y-y				λ L0=		34.80 TABLE 16
Robertson constant for section						
	a=	3.5	for table 23	b		
Perry factor	eta=	0.39				
Euler strength	pe=	125	N/mm2			
Factor	phi=	224	N/mm2			
Compressive strength	pcy=	**98.3**	N/mm2			

	Lam'y=	127.2		La'mx=	34.71	Lamy/x=	5.6288
Slenderness of section	Lamda=	127.2				Lamx/x=	1.536
Torsional index	x=	22.6					
	N=	0.5					
Slenderness factor	v=	0.79	from Table 19				
	β w =	1.0					
Buckling parameter	u=	0.889					
Equivalent slenderness	lamlt=	89.2					
Buckling strength (Table 16)	pb=	144	N/mm2	for lamlt=	90	py=	275
Buckling resisrance moment	Mb=	49	KNm				
	Mb L=	49	KNm				
	Mry=	7	KNm				
	Pc=	475.5	KN				
	Pcy=	475.5	KN				

Fc / PC + m x Mx / Py Zx + m y My / py Zy = <=1 m x= 0.95 m y= 0.95

0.002 + 0.189 + 0.213 = **0.404** **The interaction formula is satisfied**

Fc / Pcy + m LT M lt / Mb + m y My / py Zy = <=1

0.002 + 0.340 + 0.213 = **0.555** **The interaction formula is satisfied**

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Made By:	OAM	Revision:	
Date:	Nov-23	Checked By:	TG

Project: 34 BELGRAVE MEWS SOUTH

DIMENSIONS IN THESE CALCULATIONS ARE ONLY APPROXIMATE AND THE CONTRACTOR MUST CHECK THE LATEST ARCHITECTURAL DRAWINGS AND MEASURE UP ON SITE BEFORE ORDERING ANY MATERIALS.

FIRST FLOOR LEVEL

STEEL BEAM **FB1.04** CHECK

Max span = 6.8 m

BEAM LOADING		D LOAD	I LOAD	cover y		dead load	live load
		KN/m2	KN/m2	m		KN/m'	KN/m'
ROOF	dead	1.25		1.2	=> 1.2* 1.25=	1.5	
	live		1.00	1.2	=> 1.2*1.00=		1.2
second floor	dead	0.6		2.5	=> 2.5* .6=	1.5	
	live		1.50	2.5	=> 2.5*1.50=		3.75
first floor	dead	0.6		2.5	=> 2.5* .6=	1.5	
	live		1.50	2.5	=> 2.5*1.50=		3.75
wall	dead	7.5		3.2	=> 3.2* 7.5=	24	
					UDL	**28.5 KN/m'**	**8.7 KN/m'**

USE 2NO. 250x150x10 RHS SEE PAGE 41 - 43

STEEL BEAM **FB1.05**

Max span = 3.7 m

BEAM LOADING		D LOAD	I LOAD	cover y		dead load	live load
		KN/m2	KN/m2	m		KN/m'	KN/m'
ROOF	dead	1.36		1.4	=> 1.4* 1.36=	1.904	
	live		1.00	1.4	=> 1.4*1.00=		1.4
1ST floor	dead	0.6		1.4	=> 1.4* .6=	0.84	
	live		1.50	1.4	=> 1.4*1.50=		2.1
wall	dead	3.85		3.4	=> 3.4* 3.85=	13.09	
					UDL	**15.834 KN/m'**	**3.5 KN/m'**

USE 2NO. 203x133x30 UB **BOLTED** SEE PAGE 44 - 46

STEEL BEAM **FB1.06**

Max span = 2.7 m

BEAM LOADING		D LOAD	I LOAD	cover y		dead load	live load
		KN/m2	KN/m2	m		KN/m'	KN/m'
first floor	1 dead	2.5		1.4	=> 1.4* 2.5* 1=	3.5	
	live		2.50	1.4	=> 1.4*2.50* 1=		3.5
wall	dead	3.85		1.2	=> 1.2* 3.85=	4.62	
					UDL	**8.12 KN/m'**	**3.5 KN/m'**

USE 203x203x46 UC **+PLATE** SEE PAGE 47 - 49

STEEL COLUMNS **C1**

Max HIGH = 3 m

flanges to be tied to existing wall using m12 (8.8) resin anchor bolts at 450 vertical staggered centers

USE 200x100x12.5 RHS SEE PAGE 50 - 51

go to page 52

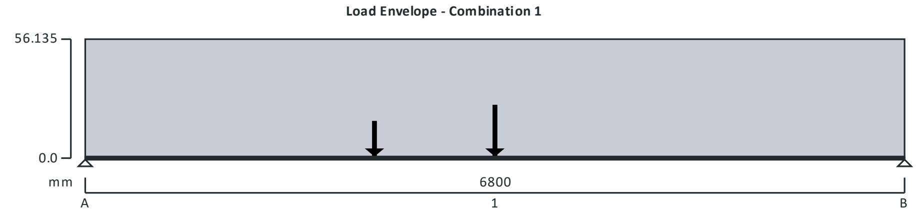
All design calculations have been author reviewed and subject to additional review by the project team, as required by David Smith Associates Quality Assurance procedures.

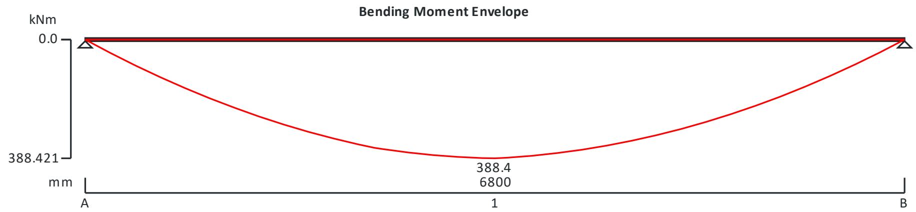
David Smith Associates 8 Duncon Close Moulton Park Northampton NN3 6WL	Project 34 BELGRAVE MEWS SOUTH				Job no. 23/54121	
	Calcs for SUPORT BEAM FB1.04				Start page no./Revision 41	
	Calcs by OAM	Calcs date 17/11/2023	Checked by TG	Checked date	Approved by	Approved date

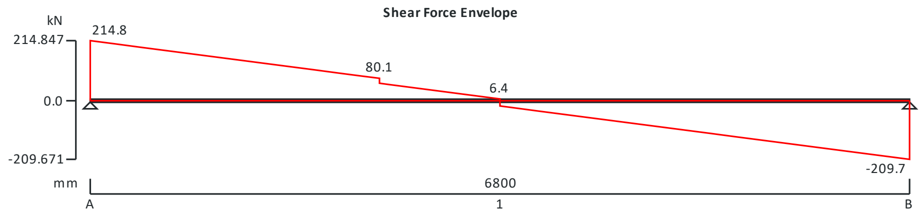
STEEL BEAM ANALYSIS & DESIGN (BS5950)

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

TEDDS calculation version 3.0.07







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 29 kN/m
	Imposed full UDL 8.7 kN/m
	Imposed point load 11 kN at 2400 mm
	Dead point load 18 kN at 3400 mm

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} = **388.4** kNm	M_{min} = **0** kNm
Maximum shear	V_{max} = **214.8** kN	V_{min} = **-209.7** kN
Deflection	δ_{max} = **12.1** mm	δ_{min} = **0** mm
Maximum reaction at support A	R_{A_max} = **214.8** kN	R_{A_min} = **214.8** kN
Unfactored dead load reaction at support A	R_{A_Dead} = **111.5** kN	
Unfactored imposed load reaction at support A	$R_{A\_Imposed}$ = **36.7** kN	
Maximum reaction at support B	R_{B_max} = **209.7** kN	R_{B_min} = **209.7** kN
Unfactored dead load reaction at support B	R_{B_Dead} = **111.5** kN	
Unfactored imposed load reaction at support B	$R_{B\_Imposed}$ = **33.5** kN	

Section details

Section type — **2 x RHS 250x150x10.0 (Tata Steel Celsius (Gr355 Gr420 Gr460))**

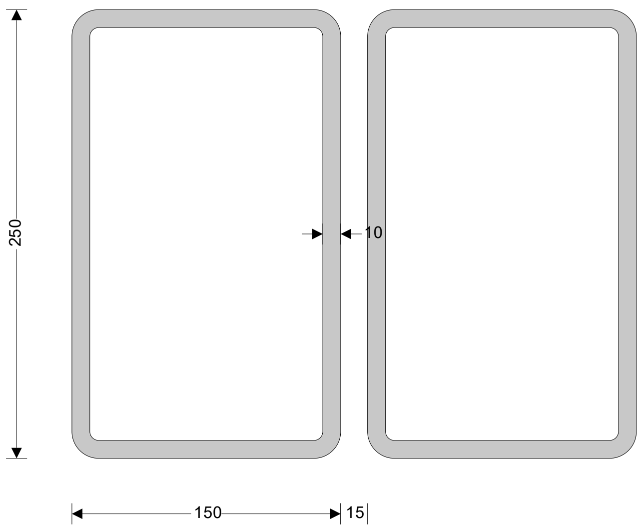
Steel grade — **S355**

From table 9: Design strength p_y

Thickness of element — t = **10.0** mm

Design strength — p_y = **355** N/mm^2

Modulus of elasticity — E = **205000** N/mm^2



Lateral restraint

Span 1 has lateral restraint at supports only

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 — $K_{LT.A}$ = **1.00**

$K_{LT.B}$ = **1.00**

Classification of cross sections - Section 3.5

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

Web - major axis - Table 12

Depth of section — d= D - 3 × t = **220** mm

d / t = 25.0 × ε <= 64 × ε — Class 1 plastic

Flange - major axis - Table 12

Width of section — $b = B - 3 \times t =$ **120** mm

$b / t = 13.6 \times \varepsilon <= \min(28 \times \varepsilon, 80 \times \varepsilon - d / t)$ — Class 1 plastic

Section is class 1 plastic

Shear capacity - Section 4.2.3

Design shear force — $F_v = \max(\text{abs}(V_{max}), \text{abs}(V_{min})) =$ **214.8** kN

$(D - 3 \times t) / t < 70 \times \varepsilon$

Web does not need to be checked for shear buckling

Shear area — $A_v = A \times D / (D + B) =$ **4683** mm^2

Design shear resistance — $P_v = 0.6 \times N \times p_y \times A_v =$ **1994.9** kN

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment — $M = \max(\text{abs}(M_{s1\_max}), \text{abs}(M_{s1\_min})) =$ **388.4** kNm

Moment capacity low shear - cl.4.2.5.2 — $M_c = N \times \min(p_y \times S_{xx}, 1.2 \times p_y \times Z_{xx}) =$ **420.8** kNm

Effective length for lateral-torsional buckling - Section 4.3.5

Effective length for lateral torsional buckling — $L_E = 1.0 \times L_{s1} =$ **6800** mm

Slenderness ratio — $\lambda = L_E / r_{yy} =$ **112.144**

Limiting slenderness ratio - Table 15 — $435 \times (275 \text{ N/mm}^2 / p_y) =$ **336.972**

λ is less than limiting value, no allowance need be made for lateral-torsional buckling

PASS - Moment capacity exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to imposed loads

Limiting deflection — $\delta_{lim} = L_{s1} / 360 =$ **18.889** mm

Maximum deflection span 1 — $\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min})) =$ **12.087** mm

PASS - Maximum deflection does not exceed deflection limit

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Project No:	23/54121	Sheet No:	44
Made By:	OAM	Revision:	
Date:	Nov-23	Checked By:	TG

Project: 34 BELGRAVE MEWS SOUTH

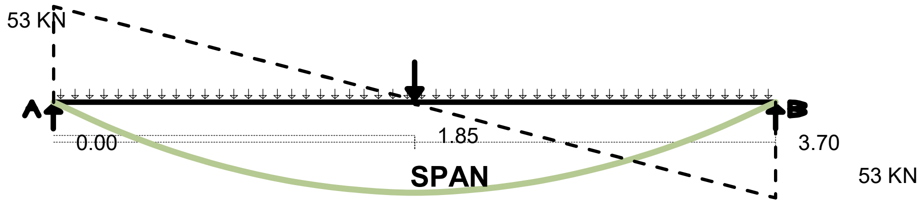
DESIGN OF STEEL BEAM, SIMPLY SUPPORTED

H rolled section S275
Calculation in accordance
with BS 5950: 1: 2000

LOCATION= **FB1.05**

Loads are unfactored

Wd1= **15.83** KN/m2
Wl1= **3.50** KN/m2
Wd2= **15.83** KN/m2
wl2= **3.50** KN/m2
P1= **1.50** KN
a= **1.85** m
Span= **3.70** m
Cover= **1.00** m

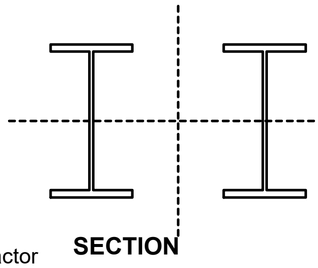


50 KNm

Load on beam	unfactored	factored
Point load=	**1.50** KN	**2.25** KN
Dead+s/w=	16.13 KN/m'	22.59 KN/m'
Live=	3.50 KN/m'	5.60 KN/m'
	19.63 KN/m'	28.19 KN/m'

Partial safety factor for load
dead= 1.4
live= 1.6

gap= 150 mm
total width = 417.6 mm



Reaction

RA=	37.1 KN		**53.3** KN
RB=	37.1 KN		**53.3** KN
Shear zero at		X=	1.9 m
Maximum Bending Moment		**Mx =**	**50.3** KNm

					factor
Maximum BM for check	M LT=	46.5 KNm	Local capacity	PASS	0.565
Maximum BM about axis Y	MY=	4.65 KNm	Overall buckling 1	PASS	0.569
Axial compressive load	Fc=	1.0 KN	Overall buckling 2	PASS	0.836
Shear force in x axis	Fv=	53.3 KN	Deflection (dead)=	PASS	1/ 1117
Beam span	L=	3.70 m	Deflection(live)=	PASS	1/ 5057
Effective length about axis X	LX eff=	3.70 m	Deflection (d+l)=	PASS	1/ 915
Effective length about axis Y	LYeff=	4.28 m	Fully restraint for Ly& LX <1.		
Limiting span/deflection (live)	=	**360.0** or 14 mm			
	z rep=	183 cm3			

Section properties

Section size (Ref. No= **66**) **2NO** **203x133 30 kg UB S275**

Depth of steel section	D=	206.8 mm		
Width of section	B=	133.8 mm		
Thickness of web	t=	6.3 mm	Mcx=	172.3 KNm
Thickness of flange	T=	9.6 mm	Mcy=	15.79 KNm
Root radius	r=	9.6 mm	Mb L=	83.96 KNm
Second moment of area x-x	TOTAL I x=	5774 cm4	Mlt=	**0.925**
Second moment of area y-y	TOTAL Iy=	768 cm4	Iy=	384 cm4
Plastic modulus x-x	TOTAL Sx=	626.6 cm3	Sx eff=	551.00 cm3
Plastic modulus y-y	Sy=	55.17 cm3	Sy eff=	57.65 cm3
Area of section	total A=	76 cm2	An=	63.33 cm2

ke= 1.2

DEFLECTION

				unfactored
Unfactored dead load deflection=	3.31 mm		E UDL=	16.05 KN/m'
Unfactored live load deflection=	0.73 mm		E UDL=	3.55 KN/m'
Unfactored dead+ live load def =	4.04 mm		E UDL=	19.60 KN/m'
Span/def. ratio for dead load=	1118			
Span/def. ratio for live load=	**5057**	**>360**		
Span/def. ratio fordead+ live load=	916			

CONTINUE OF FB1.05

Strength of steel Clause 3.1.1

Design strength	(Grade	S 275	)					
for thickness of	9.6 mm	py=	275	N/mm2	py=	275.0	N/mm2	pyw= py
Young's Modulus		E=	205	KN/mm2				

Classification of cross section (clause 3.5.2)

					TABLE 11 rolled section		
Constant (table 11 note b)	ε =	1.000			class 1	class 2	class 3
Outstand of flange	b=	66.9	mm		plastic	compac	semi compact
Ratio	b/T=	6.97		b/Tlim=	9.00	10.00	15.00
The classification is based on the outsatnd element					The section is class1 plastic		
r1 =min(1.0,max(-0.1,Fc/(dxtxpyw)))=		0.00		r2=Fc/(Agxpyw)=	5E-04		
Depth between fillets	d=	172.3	mm		TABLE 11 rolled section		
ratio	d/t=	27.35			class 1	class 2	class 3
40 ε	=	40		d/tlim=	79.73	99.50	119.89
The classification is based on the general web condition					The section is class1 plastic		

Shear capacity CL 4.2.3

Shear area		Av y=	1303	mm2	(t x D)	
Shear capacity	(0.6pyA)	Pvy=	215	KN		
Shear force		Fvy=	53.3	KN	Fvy/Pvy= 0.25	**SHEAR PASS OK**

Moment Capacity

Elastic modulus	Zx=	558.6	cm3	Mcx1=	153.6
Plastic modulus	TOTAL Sx=	627	cm3	Mcx2=	172.3
Moment capacity for section	Mcx=	**172**	KNm		
Elastic modulus	zy=	57	cm2	Mcy1=	15.79
Plastic modulus	Sy=	55	cm3	mcy2=	15.17
Moment capacity for section	Mcy=	**16**	KNm		

Local capacity check Clause 4.8.3.2

$\frac{F}{Ag.\,py} + \frac{Mx}{Mcx} + \frac{My}{Mcy} = \;<=1$

0.000 + 0.270 + 0.295 = **0.565** **LOCAL CAPACITY IS SATISFIED**

restraint/effective length Clause 4.31 to 4.3.5 TABLE 13

Effective length	Le lt1=	3700	mm	normal condition
Effective length	Lelt2=	4277	mm	
	L e lt=	3988	mm	
Radius of gyration y-y	ry=	3.18	cm	
	rx=	8.72	cm	
	Lam'y=	134.5		
	La'mx=	42.4		

CONTINUE OF FB1.05

Buckling resistance Clause 4.8.3.3.1

Compressive strength:perry strust formula from Appendex C.1

Limiting slenderness	lam 0=	17.16		py=	275 N/mm2
For buckling about y-y				λ L0=	34.80 TABLE 16
Robertson constant for section					
	a=	3.5	for table 23	b	
Perry factor	eta=	0.41			
Euler strength	pe=	112	N/mm2		
Factor	phi=	216	N/mm2		
Compressive strength	pcy=	**89.6**	N/mm2		

	Lam'y=	134.5	La'mx=	42.43	Lamy/x=	6.2576
Slenderness of section	Lamda=	134.5			Lamx/x=	1.9735
Torsional index	x=	21.5				
	N=	0.5				
Slenderness factor	v=	0.76	from Table 19			
	β w =	1.0				
Buckling parameter	u=	0.882				
Equivalent slenderness	lamlt=	90.5				
Buckling strength (Table 16)	pb=	134	N/mm2	for lamlt= 95	py=	275
Buckling resisrance moment	Mb=	84	KNm			
	Mb L=	84	KNm			
	Mry=	16	KNm			
	Pc=	680.9	KN			
	Pcy=	680.9	KN			

Fc/PC + m x Mx/Py Zx + m y My/py Zy = <=1 m x= 0.95, m y= 0.95

0.001 + 0.288 + 0.280 = **0.569** **The interaction formula is satisfied**

Fc/Pcy + m LT M lt/Mb + m y My/py Zy = <=1

0.001 + 0.554 + 0.280 = **0.836** **The interaction formula is satisfied**

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Project No:	21/44834	Sheet No:	47
Made By:	OAM	Revision:	
Date:	Nov-23	Checked By:	HJ

Project: **34 BELGRAVE MEWS SOUTH**

DESIGN OF STEEL BEAM, SIMPLY SUPPORTED

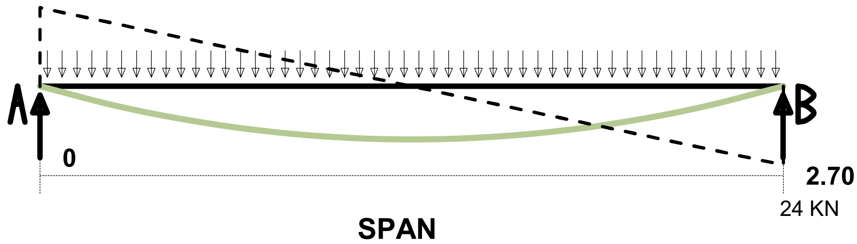
H rolled section S355
Calculation in accordance with BS 5950: 1: 2000

LOCATION= **FB1.06**

Loads are unfactored

Wd= **8.12** KN/m2
Wl= **3.50** KN/m2

Span= **2.70** m
Cover= **1.00** m

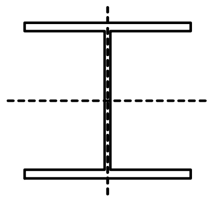


Load on beam	unfactored	factored
Dead+s/w=	8.58 KN/m'	12.01 KN/m'
Live=	3.50 KN/m'	5.60 KN/m'
	12.08 KN/m'	17.61 KN/m'

Partial safety factor for load
dead= 1.4
live= 1.6

Reaction

		unfactored		factored
RA=		16.3 KN		**23.8** KN
RB=		16.3 KN		**23.8** KN
Shear zero at			X=	1.35 m
Maximum Bending Moment			**Mx =**	**16.0** KNm



					factor
Maximum BM for check	M LT=	14.8 KNm	Local capacity	PASS	0.131
Maximum BM about axis Y	MY=	1.48 KNm	Overall buckling 1	PASS	0.157
Axial compressive load	Fc=	60.0 KN	Overall buckling 2	PASS	0.171
Shear force in x axis	Fv=	23.8 KN	Deflection (dead)=	PASS	1/ 4254
Beam span	L=	2.70 m	Deflection(live)=	PASS	1/ 10430
Effective length about axis X	LX eff=	2.70 m	Deflection (d+l)=	PASS	1/ 3022
Effective length about axis Y	LYeff=	3.17 m	Fully restraint for Ly& LX <1.		
Limiting span/deflection (live)	=	**360.0** or 14 mm			
	z rep=	45 cm3			

Section properties

Section size (Ref. No= **99**) **203x203 46 kg UC S355**

Depth of steel section	D=	203.2 mm				
Width of section	B=	203.2 mm	Pcy=	1413 KN		
Thickness of web	t=	7.3 mm	Mcx=	176.6 KNm		
Thickness of flange	T=	11 mm	Mcy=	81.65 KNm		806.89
Root radius	r=	10.2 mm	Mb L=	145.2 KNm		
Second moment of area x-x	Ix=	4564 cm4	Mlt=	**0.925**	Pcy=	1413.3 KN
Second moment of area y-y	Iy=	1539 cm4				
Plastic modulus x-x	Sx=	497.4 cm3	Sx eff=	442.53 cm3		
Plastic modulus y-y	Sy=	230 cm3	Sy eff=	140.06 cm3		
Area of section	Ag=	58.8 cm2	An=	53.45 cm2	ke=	1.1

DEFLECTION

				unfactored
Unfactored dead load deflection=	0.63 mm		E UDL=	8.58 KN/m'
Unfactored live load deflection=	0.26 mm		E UDL=	3.50 KN/m'
Unfactored dead+ live load def =	0.89 mm		E UDL=	12.08 KN/m'
Span/def. ratio for dead load=	4255			
Span/def. ratio for live load=	**10430**	**>360**		
Span/def. ratio fordead+ live load=	3022			

CONTINUE OF FB1.06

Strength of steel Clause 3.1.1

Design strength	(Grade	S 355	)					
for thickness of	11	mm	py=	355	N/mm2	py=	355.0 N/mm2	pyw= py
Young's Modulus			E=	205	KN/mm2			

Classification of cross section (clause 3.5.2) TABLE 11 rolled section

Constant (table 11 note b)	ε =	0.880		class 1	class 2	class 3
Outstand of flange	b=	101.6 mm		plastic	compac	semi compact
Ratio	b/T=	9.24	b/Tlim=	7.92	8.80	13.20

The classification is based on the outsatnd element — **The section is class 3 semi compact**

r1 =min(1.0,max(-0.1,Fc/(dxtxpyw)))= 0.14 r2=Fc/(Agxpyw)= 0.029

Depth between fillets	d=	160.8 mm		TABLE 11 rolled section		
ratio	d/t=	22.03		class 1	class 2	class 3
40 ε	=	35.21	d/tlim=	61.55	72.38	99.88

The classification is based on the general web condition — **The section is class1 plastic**

Shear capacity CL 4.2.3

Shear area		Av y=	1483 mm2	(t x D)
Shear capacity	(0.6pyA)	Pvy=	316 KN	
Shear force		Fvy=	23.8 KN	Fvy/Pvy= 0.08 **SHEAR PASS OK**

Moment Capacity

Elastic modulus	Zx=	449.2 cm3	Mcx1=	159.5
Plastic modulus	Sx=	497 cm3	Mcx2=	176.6
Moment capacity for section	Mcx=	**177** KNm		
Elastic modulus	Zy=	151 cm3	Mcy1=	53.61
Plastic modulus	Sy=	230 cm3	mcy2=	81.65
Moment capacity for section	Mcy=	**82** KNm		

Local capacity check Clause 4.8.3.2

$\frac{F}{Ag.\,py} + \frac{Mx}{Mcx} + \frac{My}{Mcy} = \; <=1$

0.029 + 0.084 + 0.018 = **0.131** **LOCAL CAPACITY IS SATISFIED**

restraint/effective length Clause 4.31 to 4.3.5 TABLE 13

Effective length	Le lt1=	2700 mm	normal condition
Effective length	Lelt2=	3173 mm	
	L e lt=	2937 mm	
Radius of gyration y-y	ry=	5.11 cm	
	rx=	8.81 cm	
	Lam'y=	62.1	
	La'mx=	30.6	

CONTINUE OF FB1.06

Buckling resistance Clause 4.8.3.3.1

Compressive strength:perry strust formula from Appendex C.1

Limiting slenderness	lam 0=	15.10		py=	355	N/mm2
For buckling about y-y				λ L0=	30.20	TABLE 16
Robertson constant for section						
	a=	5.5	for table 23	c		
Perry factor	eta=	0.26				
Euler strength	pe=	525	N/mm2			
Factor	phi=	508	N/mm2			
Compressive strength	pcy=	**240.4**	N/mm2			

	Lam'y=	62.1	La'mx=	30.65	Lamy/x=	3.5084
Slenderness of section	Lamda=	62.1			Lamx/x=	1.7315
Torsional index	x=	17.7				
	N=	0.5				
Slenderness factor	v=	0.89	from Table 19			
	β w =	1.0				
Buckling parameter	u=	0.846				
Equivalent slenderness	lamlt=	46.6				
Buckling strength (Table 16)	pb=	292	N/mm2	for lamlt= 50	py=	355
Buckling resisrance moment	Mb=	145	KNm			
	Mb L=	145	KNm			
	Mry=	82	KNm			
	Pc=	1413	KN			
	Pcy=	1413	KN			

Fc / PC + m x Mx / Py Zx + m y My / py Zy = <=1   m x= 0.95, m y= 0.95

0.042 + 0.088 + 0.026 = **0.157**   **The interaction formula is satisfied**

Fc / Pcy + m LT M lt / Mb + m y My / py Zy = <=1

0.042 + 0.102 + 0.026 = **0.171**   **The interaction formula is satisfied**

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Made By:	OAM	Revision:	
Date:	Nov-23	Checked By:	TG

Project: **34 BELGRAVE MEWS SOUTH**

1.0 DESIGN OF STEEL COLUMN

LOCATION= **C1**

S355

Clause 2.4.2.3
For sway stability a notional horizontal force of 0.5 %
of the dead and imposed vertical loads are considered
in the design of the columns.

H rolled section
Calculation in accordance
with BS 5950: 1: 2000

FACTORED LOAD = **210** KN
notional force = 1.05 KN

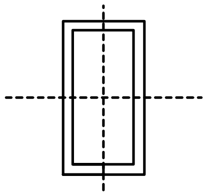
Partial safety factor for load
dead= 1.4
live= 1.6

1.1 All applied loads and moment are factored

Maximum BM about axis X	MX=	25.41	KNm
Maximum BM about axis Y	MY=	3.15	KNm
Axial compressive load	F=	210.0	KN
Shear force in x axis	Fv=	10.00	KN
Length of column	L=	3.00	m
Effective length about axis X	LX=	3.00	m
Effective length about axis Y	LY=	4.50	m

Fully restraint for Ly& LX <1.

		factor
Local capacity	**PASS**	0.308
Overall buckling	**PASS**	0.787



SECTION

1.2 Section properties

Section size (Ref. No= **241** # **200x100 12.5 RHS S355**

Depth of steel section	D=	200	mm
Width of section	B=	100	mm
	T=	12.5	mm
Second moment of area x-x	Ix=	3220	cm4
Second moment of area y-y	Iy=	1020	cm4
Plastic modulus x-x	Sx=	417	cm3
Plastic modulus y-y	Sy=	249	cm3
Area of section	A=	68	cm2

Mcx=	137.2	KNm
Mcy=	88.4	KNm
Mbs=	46	KNm
Pc =	**900**	KN
Mlt=	**0.925**	

1.3 Strength of steel

Clause 3.1.1

Design strength **(Grade S 355**)
for thickness of 12.5 mm **py=** **355** N/mm2
Young's Modulus **E=** 205 KN/mm2

1.4 Classification of cross section

(clause 3.5.2)

Constant (table 11 note b) ε = 0.88
Outstand of flange b= 50 mm
Ratio b/T= 4.000 mm

TABLE 11 rolled section

	class 1	class 2	class 3
	plastic	compac	semi compact
b/Tlim=	7.92	8.80	13.20

The classification is based on the outsatnd element
The section is class1 plastic

r1 =min(1.0,max(-0.1,Fc/(dxtxpyw)))= 0.29
r2=Fc/(Agxpyw)= 0.087
Depth between fillets d= 162.5 mm
ratio d/t= 13.00
40 ε = 35.206

TABLE 11 rolled section

	class 1	class 2	class 3
d/tlim=	54.53	61.26	89.96

The classification is based on the general web condition
The section is class1 plastic

1.5 Shear capacity

CL 4.2.3

Shear area		Av=	5000	mm2
Shear capacity	(0.6pyA)	Pv=	1065.0	KN
Shear force		Fv=	10.00	KN

LOW SHEAR LOAD

CONTINUE OF C1

1.6 Moment Capacity

Elastic modulus	Zx=	322 cm3	Mcx1=	137.2	(1.2 py Zx)
Plastic modulus	Sx=	417 cm3	Mcx2=	148	
Moment capacity for section	Mcx=	**137.2** KNm			
Elastic modulus	Zy=	204 cm3	Mcy1=	108.6	(1.5 py Zy)
Plastic modulus	Sy=	249 cm3	mcy2=	88.4	
Moment capacity for section	Mcy=	**88.40** KNm			

Local capacity check CL 4.8.3.2

$\frac{F}{Ag.\ py} + \frac{Mx}{Mcx} + \frac{My}{Mcy} = \ <=1$

0.087 + 0.185 + 0.036 = **0.308** **LOCAL CAPACITY IS SATISFIED**

1.7 Compressive Resistnace section 4.7

1.7 Slenderness Clause 4.7.3

Effective length x-x	Lex=	3000 mm
Effective length y-y	Ley=	4500 mm
Radius of gyration y-y	ry=	3.88 cm
	rx=	6.88 cm
	Lam'y=	116.0
	La'mx=	43.6

1.8 Compressive strength:perry strust formula from Appendex C.1

Limiting slenderness	lam 0=	15.10	
For buckling about y-y			
Robertson constant for section	a=	2 for table 23	a
Perry factor	eta=	0.20	
Euler strength	pe=	150 N/mm2	
Factor	phi=	268 N/mm2	
Compressive strength	pcy=	**132.4** N/mm2	
	Pc =	900.1 KN	

1.9 Resistance to Lteral-Buckling resistance SECTION 4.3

Limiting slenderness	lam 0=	30.20	Lamy/x=	0.05	
Slenderness of section	Lamda=	116.0	Torsional index x=	2540.00	
Slenderness factor	v=	1 from Table 19	N=	0.5	
Buckling parameter	u=	1	β w =	1.0	0.0
Equivalent slenderness	lamlt=	116.0			1
Perry coefficient	eta lt=	0.6005			
Elastic strength	pe=	150 N/mm2			
Factor	phi lt=	298 N/mm2	Mb L=	45.8 KNm	
Factor	pey=	53400	Mry=	88.4 KNm	
Buckling strength (Table 16)	pb=	109.92 N/mm2	Pc=	900.1 KN	
Buckling resisrance moment	Mb=	**45.8** KNm	Pcy=	900.1 KN	

Overall buckling check

For member with moment about both axes 355

for lateral torsional buckling

$\frac{Fc}{Pcy} + m\frac{LT\ M\ lt}{Mb} + m\frac{y\ My}{py\ Zy}(1+FC/FCY) = \ <=1$ m x= 0.93, m y= 0.93

0.233 + 0.513 + 0.041 = **0.787** **The interaction formula is satisfied**

DIMENSIONS IN THESE CALCULATIONS ARE ONLY APPROXIMATE AND THE CONTRACTOR MUST CHECK THE LATEST ARCHITECTURAL DRAWINGS AND MEASURE UP ON SITE BEFORE ORDERING ANY MATERIALS.

GROUND FLOOR FLOOR

GROUND FLOOR SLAB **S1**

Max span = 2.8 m

150	S50 THICK SLAB		3.6 KN/m2
FILL FLOOR	0.15 m		0.75 KN/m2
			4.35 KN/m2
		IL=	5 KN/m2

KINGSPAN MULTIDECK 80-V2 (1.2mm THK) WITH 150mm THK RC28/35 CONCRETE TOPPING AND 1 LAYER A142 MESH

STEEL BEAM **FB0.01 FB0.02**

Max span = 3.7 m
Cover= 2.7 m

USE **203x203x46 UC** **S355** SEE PAGE 53 - 55

STEEL BEAM **FB0.03**

Max span = 7,4 m
Cover= 1.2 m

USE **305x305x118 UC** **S355** SEE PAGE 56 - 58

STEEL BEAM **FB0.04**

Max span = 6.7 m
Cover= 1 m

USE **305x305x118 UC** **S355** SEE PAGE 59 - 61

STEEL BEAM **FB0.05**

Max span = 2.7 m

BEAM LOADING		D LOAD KN/m2	I LOAD KN/m2	cover y m		dead load KN/m'	live load KN/m'
ROOF	dead	1.25		1.5	=> 1.5* 1.25=	1.875	
	live		0.75	1.5	=> 1.5*0.75=		1.125
1ST floor	dead	0.6		0.6	=> .6* .6=	0.36	
	live		1.50	0.6	=> .6*1.50=		0.9
wall	dead	3.85		2.7	=> 2.7* 3.85=	10.395	
					UDL	**12.63 KN/m'**	**2.025 KN/m'**

USE **203x133x30 UB** +PLATE **S355** SEE PAGE 59 - 61

go to page 62

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Project No:	21/44834	Sheet No:	53
Made By:	OAM	Revision:	
Date:	Nov-23	Checked By:	HJ

Project: **34 BELGRAVE MEWS SOUTH**

DESIGN OF STEEL BEAM, SIMPLY SUPPORTED

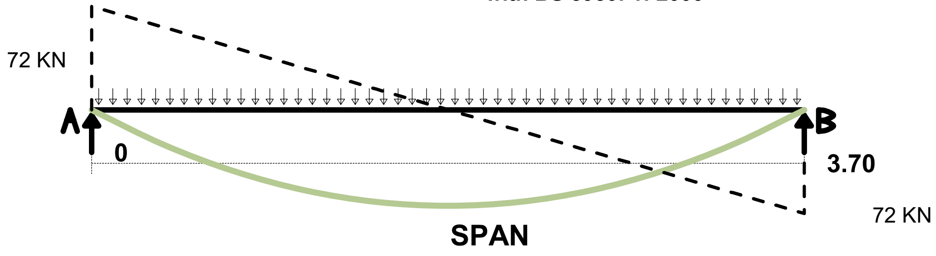
H rolled section **S355**
Calculation in accordance with BS 5950: 1: 2000

LOCATION= **FB0.01**

Loads are unfactored

Wd= **4.40** KN/m2
Wl= **5.00** KN/m2

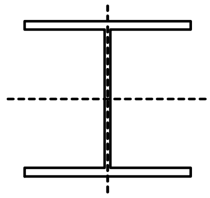
Span= **3.70** m
Cover= **2.70** m



Load on beam	unfactored		**factored**	
Dead+s/w=	12.34	KN/m'	17.28	KN/m'
Live=	13.50	KN/m'	21.60	KN/m'
	25.84	KN/m'	38.88	KN/m'

67 KNm

Partial safety factor for load
dead= 1.4
live= 1.6



SECTION

Reaction

RA=	47.8 KN		**71.9**	KN
RB=	47.8 KN		**71.9**	KN
Shear zero at		X=	1.85	m
Maximum Bending Moment		**Mx =**	**66.5**	KNm

						factor
Maximum BM for check	M LT=	61.5 KNm	Local capacity	**PASS**	0.453	
Maximum BM about axis Y	MY=	6.15 KNm	Overall buckling 1	**PASS**	0.533	
Axial compressive load	Fc=	60.0 KN	Overall buckling 2	**PASS**	0.648	
Shear force in x axis	Fv=	71.9 KN	Deflection (dead)=	**PASS**	1/ 1149	
Beam span	L=	3.70 m	Deflection(live)=	**PASS**	1/ 1050	
Effective length about axis X	LX eff=	3.70 m	Deflection (d+l)=	**PASS**	1/ 548	
Effective length about axis Y	LYeff=	4.27 m	Fully restraint for Ly& LX <1.			
Limiting span/deflection (live)	=	**360.0** or 14 mm				
	z rep=	187 cm3				

Section properties

Section size (Ref. No= **99**) **203x203 46 kg UC S355**

Depth of steel section	D=	203.2 mm			
Width of section	B=	203.2 mm	Pcy=	1051 KN	
Thickness of web	t=	7.3 mm	Mcx=	176.6 KNm	
Thickness of flange	T=	11 mm	Mcy=	81.65 KNm	710.18
Root radius	r=	10.2 mm	Mb L=	127.8 KNm	
Second moment of area x-x	Ix=	4564 cm4	Mlt=	**0.925**	Pcy= 1051 KN
Second moment of area y-y	Iy=	1539 cm4			
Plastic modulus x-x	Sx=	497.4 cm3	Sx eff=	442.53 cm3	
Plastic modulus y-y	Sy=	230 cm3	Sy eff=	140.06 cm3	
Area of section	Ag=	58.8 cm2	An=	53.45 cm2	ke= 1.1

DEFLECTION

			unfactored	
Unfactored dead load deflection=	3.22 mm		E UDL=	12.34 KN/m'
Unfactored live load deflection=	3.52 mm		E UDL=	13.50 KN/m'
Unfactored dead+ live load def =	6.74 mm		E UDL=	25.84 KN/m'
Span/def. ratio for dead load=	1150			
Span/def. ratio for live load=	**1051**	**>360**		
Span/def. ratio fordead+ live load=	549			

CONTINUE OF FB0.01

Strength of steel Clause 3.1.1

Design strength	(Grade	S 355)						
for thickness of	11 mm	py=	355	N/mm2	py=	355.0	N/mm2	pyw= py
Young's Modulus		E=	205	KN/mm2				

Classification of cross section (clause 3.5.2)

				TABLE 11 rolled section			
Constant (table 11 note b)	ε =	0.880		class 1	class 2	class 3	
Outstand of flange	b=	101.6 mm		plastic	compac	semi compact	
Ratio	b/T=	9.24	b/Tlim=	7.92	8.80	13.20	
The classification is based on the outsatnd element				**The section is class 3 semi compact**			
r1 =min(1.0,max(-0.1,Fc/(dxtxpyw)))=		0.14	r2=Fc/(Agxpyw)=	0.029			
Depth between fillets	d=	160.8 mm		TABLE 11 rolled section			
ratio	d/t=	22.03		class 1	class 2	class 3	
40 ε	=	35.21	d/tlim=	61.55	72.38	99.88	
The classification is based on the general web condition				**The section is class1 plastic**			

Shear capacity CL 4.2.3

Shear area		Av y=	1483 mm2	(t x D)		
Shear capacity	(0.6pyA)	Pvy=	316 KN			
Shear force		Fvy=	71.9 KN	Fvy/Pvy=	0.23	**SHEAR PASS OK**

Moment Capacity

Elastic modulus	Zx=	449.2 cm3	Mcx1=	159.5
Plastic modulus	Sx=	497 cm3	Mcx2=	176.6
Moment capacity for section	Mcx=	**177** KNm		
Elastic modulus	Zy=	151 cm3	Mcy1=	53.61
Plastic modulus	Sy=	230 cm3	mcy2=	81.65
Moment capacity for section	Mcy=	**82** KNm		

Local capacity check Clause 4.8.3.2

$$\frac{F}{Ag.\,py} + \frac{Mx}{Mcx} + \frac{My}{Mcy} = \; <=1$$

0.029 + 0.348 + 0.075 = **0.453** **LOCAL CAPACITY IS SATISFIED**

restraint/effective length Clause 4.31 to 4.3.5 TABLE 13

Effective length	Le lt1=	3700 mm	normal condition
Effective length	Lelt2=	4273 mm	
	L e lt=	3987 mm	
Radius of gyration y-y	ry=	5.11 cm	
	rx=	8.81 cm	
	Lam'y=	83.6	
	La'mx=	42.0	

CONTINUE OF FB0.01

Buckling resistance Clause 4.8.3.3.1

Compressive strength:perry strust formula from Appendex C.1

Limiting slenderness	lam 0=	15.10		py=	355 N/mm2
For buckling about y-y				λ L0=	30.20 TABLE 16
Robertson constant for section					
	a=	5.5	for table 23	c	
Perry factor	eta=	0.38			
Euler strength	pe=	289	N/mm2		
Factor	phi=	377	N/mm2		
Compressive strength	pcy=	**178.7**	N/mm2		

	Lam'y=	83.6		La'mx=	42.00	Lamy/x=	4.7245
Slenderness of section	Lamda=	83.6				Lamx/x=	2.3728
Torsional index	x=	17.7					
	N=	0.5					
Slenderness factor	v=	0.83	from Table 19				
	β w =	1.0					
Buckling parameter	u=	0.846					
Equivalent slenderness	lamlt=	58.7					
Buckling strength (Table 16)	pb=	257	N/mm2	for lamlt=	60	py=	355
Buckling resisrance moment	Mb=	128	KNm				
	Mb L=	128	KNm				
	Mry=	82	KNm				
	Pc=	1051	KN				
	Pcy=	1051	KN				

$$\frac{Fc}{PC} + m_x \frac{Mx}{Py\,Zx} + m_y \frac{My}{py\,Zy} = \le 1$$

m x= 0.95

m y= 0.95

0.057 + 0.367 + 0.109 = **0.533** **The interaction formula is satisfied**

$$\frac{Fc}{Pcy} + m_{LT} \frac{M\,lt}{Mb} + m_y \frac{My}{py\,Zy} = \le 1$$

0.057 + 0.481 + 0.109 = **0.648** **The interaction formula is satisfied**

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Project No:	23/54121	Sheet No:	56
Made By:	OAM	Revision:	
Date:	Nov-23	Checked By:	TG

Project: **34 BELGRAVE MEWS SOUTH**

DESIGN OF STEEL BEAM, SIMPLY SUPPORTED S355

LOCATION= **FB0.03** SPAN= **7.40** m
Uniform distributed load COVER= **1.20** m

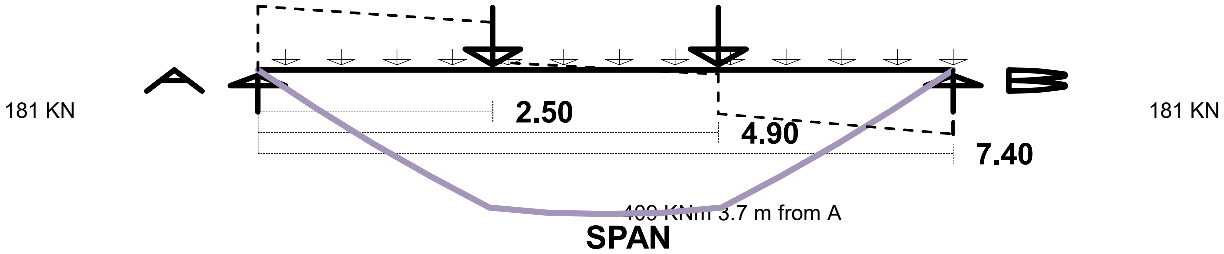
	Unfactored		Factored	
wdl=	**4.40**	KN/m2	(**6.16**)	
wll =	**5.00**	KN/m2	(**8.00**)	
	9.40		**14.16**	KN/m2
	factor=		**1.51**	

H rolled section
Calculation in accordance with BS 5950: 1: 2000

Point load

P1=	**75.00**	KN	(**112.5**)	KN
a1=	**2.50**	m		
P2=	**75.0**	KN	(**112.50**)	KN
a2=	**4.90**	m		

Partial safety factor for load
dead= 1.4
live= 1.6



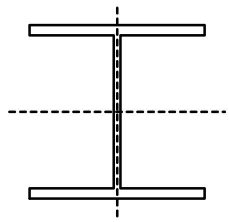
	Unfactored		(Factored)	
Wd=	6.46	KN/m'	(9.04)	
Wl =	6	kKN/m'	(9.60)	
	12.46	KN/m'	**18.64**	KN/m'

Reactions

RA=	121.1	KN	(**181.5**	KN
RB=	121.1	KN	(**181.5**	KN

Desidn bending moment(factored)=

M@P1 =	**395.4**	KNm
M@P2 =	**395.4**	KNm
X=	**3.70**	m from A
M@ X=	**408.9**	KNm
DBM=	**408.9**	**KNm**



SECTION

Eq. udl = 59.732 KN/m' (factored)
Eq. ud l= 21.182 lKN/m' (live unfactored)

						factor
Maximum BM for check	M LT=	377.4 KNm	Local capacity	PASS		0.657
Maximum BM about axis Y	MY=	18.87 KNm	Overall buckling 1	PASS		0.728
Axial compressive load	Fc=	181.48 KN	Overall buckling 2	PASS		0.776
Shear force in x axis	Fv=	181.5 KN	Deflection (dead)=	PASS		1/ 685
Beam span	L=	7.40 m	Deflection(live)=	PASS		1/ 652
Effective length about axis X	LX eff=	7.40 m	Deflection (d+l)=	PASS		1/ 334
Effective length about axis Y	LYeff=	2.47 m	Fully restraint for Ly& LX <1.			
Limiting span/deflection (live)	=	**360.0** or 14 mm				
	z rep=	1094 cm3				

Section properties

Section size (Ref. No= **88**) **305x305 118 kg 118 S355**

Depth of steel section	D=	314.5 mm		
Width of section	B=	306.8 mm		
Thickness of web	t=	11.9 mm	Mcx=	673.8 KNm
Thickness of flange	T=	18.7 mm	Mcy=	307.6 KNm
Root radius	r=	18.7 mm	Mb L=	589.8 KNm
Second moment of area x-x	Ix=	27601 cm4	mlt=	**0.923** AUTO
Second moment of area y-y	Iy=	9006 cm4		
Plastic modulus x-x	Sx=	1953 cm3	Sx eff=	1689.00 cm3
Plastic modulus y-y	Sy=	891.7 cm3	Sy eff=	485.43 cm3
Area of section	Ag=	149.8 cm2	An=	136.18 cm2

ke= 1.1

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Project No:	**23/54121**	**Sheet No:**	**57**
Made By:	**OAM**	**Revision:**	
Date:	**Nov-23**	**Checked By:**	**TG**

Project: **34 BELGRAVE MEWS SOUTH**

CONTINUE OF FB0.03

DEFLECTION unfactored

Unfactored dead load deflection=	10.79 mm		E UDL=	18.74	KN/m'
Unfactored live load deflection=	11.34 mm		E UDL=	21.18	KN/m'
Unfactored dead+ live load def =	22.13 mm		E UDL=	39.92	KN/m'
Span/def. ratio for dead load=	686				
Span/def. ratio for live load=	**653**	**>360**			
Span/def. ratio fordead+ live load=	334				

Strength of steel Clause 3.1.1

Design strength **(Grade S 355)**

for thickness of 18.7 mm **py=** **345** N/mm2 py= **345.0** N/mm2 pyw= py

Young's Modulus **E=** 205 KN/mm2

Classification of cross section (clause 3.5.2) TABLE 11 rolled section

Constant	ε =	0.893		class 1	class 2	class 3
Outstand of flange	b=	128.75 mm		plastic	compac	semi compact
Ratio	b/T=	6.89	b/Tlim=	8.04	8.93	13.39

The section is class1 plastic

r1 =min(1.0,max(-0.1,Fc/(dxtxpyw)))= 1.00 r2=Fc/(Agxpyw)= 0.035

Depth between fillets d= 246.6 mm TABLE 11 rolled section

ratio	d/t=	20.72		class 1	class 2	class 3
40 ε	=	35.712	d/tlim=	35.71	35.71	100.11

The classification is based on the general web condition **The section is class1 plastic**

Shear capacity CL 4.2.3

Shear area		Av y=	3742.6 mm2	(t x D)
Shear capacity	(0.6pyA)	Pvy=	775 KN	
Shear force		Fvy=	181.5 KN	Fvy/Pvy= 0.23 **SHEAR PASS OK**

Moment Capacity

Elastic modulus	Zx=	1755 cm3	Mcx1=	605.5
Plastic modulus	Sx=	1953 cm3	Mcx2=	673.8
Moment capacity for section	Mcx=	**673.8** KNm		
Elastic modulus	Zy=	587 cm3	Mcy1=	202.5
Plastic modulus	Sy=	891.7 cm3	mcy2=	307.6
Moment capacity for section	Mcy=	**307.6** KNm		

Local capacity check Clause 4.8.3.2

$\frac{F}{Ag.\ py} + \frac{Mx}{Mcx} + \frac{My}{Mcy} = \leq 1$

0.035 + 0.560 + 0.061 = **0.657** **LOCAL CAPACITY IS SATISFIED**

restraint/effective length Clause 4.31 to 4.3.5 TABLE 13

Effective length	Le lt1=	7400 mm	normal condition
Effective length	Lelt2=	2466.7 mm	
	L e lt=	4933.3 mm	
Radius of gyration y-y	ry=	7.75 cm	
	rx=	13.6 cm	
	Lam'y=	31.8	
	La'mx=	54.4	

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Project No:	23/54121	Sheet No:	58
Made By:	OAM	Revision:	
Date:	Nov-23	Checked By:	TG

Project: **34 BELGRAVE MEWS SOUTH**

CONTINUE OF FB0.03

Buckling resistance Clause 4.8.3.3.1

Compressive strength:perry strust formula from Appendex C.1

Limiting slenderness	lam 0=	15.32		py=	345 N/mm2
For buckling about y-y				λ L0=	30.60 TABLE 16
Robertson constant for H section					
	a=	5.5			
Perry factor	eta=	0.22			
Euler strength	pe=	683	N/mm2		
Factor	phi=	588	N/mm2		
Compressive strength	pcy=	**256.6**	N/mm2		

	Lam'y=	31.8		La'mx=	54.41	Lamy/x=	1.9647
Slenderness of section	Lamda=	54.4				Lamx/x=	3.3588
Torsional index	x=	16.2					
	N=	0.5					
Slenderness factor	v=	0.96	from Table 19				
	β w =	1.0					
Buckling parameter	u=	0.851					
Equivalent slenderness	lamlt=	44.5					
Buckling strength (Table 16)	pb=	302	N/mm2	for lamlt=	45	py=	345
Buckling resisrance moment	Mb=	589.8	KNm				
	Mb L=	589.8	KNm				
	Mry=	307.6	KNm				
	Pc=	3844.4	KN				
	Pcy=	3844.4	KN				

$\frac{Fc}{PC} + m \frac{x\,Mx}{Py\,Zx} + m \frac{y\,My}{py\,Zy} = \;<=1$ m x= 0.95, m y= 0.95

0.047 + 0.592 + 0.089 = **0.728** **The interaction formula is satisfied**

$\frac{Fc}{Pcy} + m \frac{LT\,M\,lt}{Mb} + m \frac{y\,My}{py\,Zy} = \;<=1$

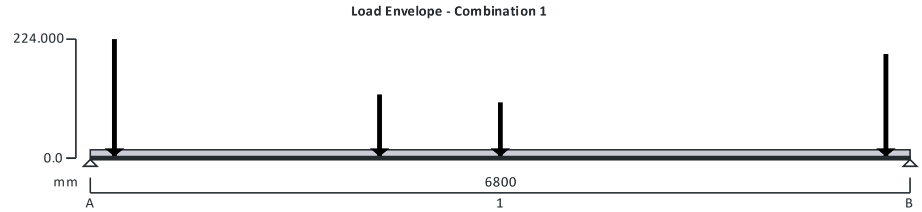
0.047 + 0.640 + 0.089 = **0.776** **The interaction formula is satisfied**

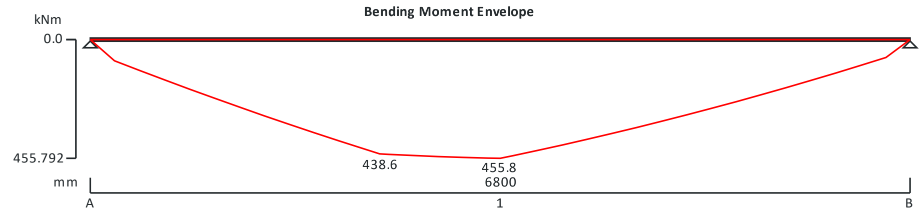
David Smith Associates 8 Duncon Close Moulton Park Northampton NN3 6WL	Project 34 BELGRAVE MEWS SOUTH				Job no. 23/54121	
	Calcs for SUPORT BEAM FB0.04				Start page no./Revision 59	
	Calcs by OAM	Calcs date 17/11/2023	Checked by TG	Checked date	Approved by	Approved date

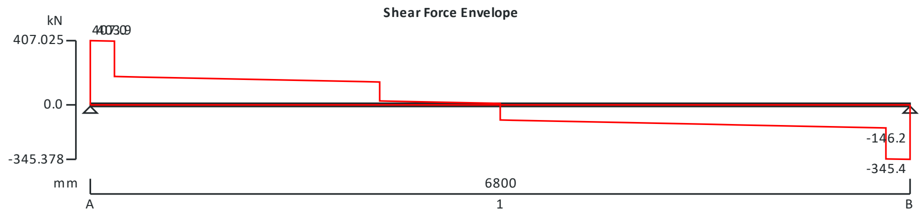
STEEL BEAM ANALYSIS & DESIGN (BS5950)

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

TEDDS calculation version 3.0.07







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 4.4 kN/m
	Imposed full UDL 5 kN/m
	Imposed point load 75 kN at 2400 mm
	Dead point load 75 kN at 3400 mm
	Imposed point load 140 kN at 200 mm
	Dead point load 140 kN at 6600 mm

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} = **455.8** kNm	M_{min} = **0** kNm
Maximum shear	V_{max} = **407** kN	V_{min} = **-345.4** kN
Deflection	δ_{max} = **11.5** mm	δ_{min} = **0** mm
Maximum reaction at support A	R_{A_max} = **407** kN	R_{A_min} = **407** kN
Unfactored dead load reaction at support A	R_{A_Dead} = **60.5** kN	
Unfactored imposed load reaction at support A	$R_{A\_Imposed}$ = **201.4** kN	
Maximum reaction at support B	R_{B_max} = **345.4** kN	R_{B_min} = **345.4** kN
Unfactored dead load reaction at support B	R_{B_Dead} = **192.3** kN	
Unfactored imposed load reaction at support B	$R_{B\_Imposed}$ = **47.6** kN	

Section details

Section type **UC 305x305x118 (British Steel Section Range 2022 (BS4-1))**

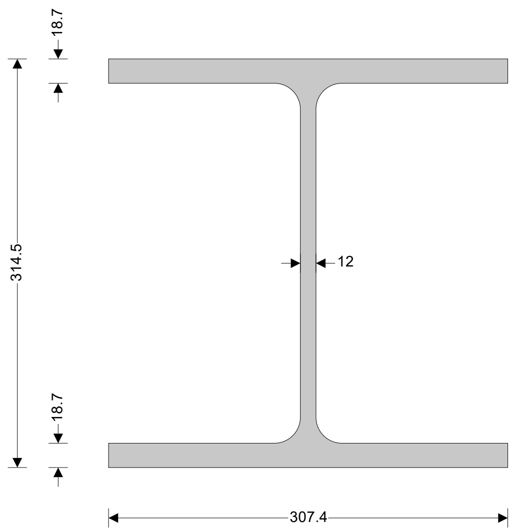
Steel grade **S355**

From table 9: Design strength p_y

Thickness of element max(T, t) = **18.7** mm

Design strength p_y = **345** N/mm^2

Modulus of elasticity E = **205000** N/mm^2



Lateral restraint

Span 1 has lateral restraint at supports only

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 $K_{LT.A}$ = **1.00**

$K_{LT.B}$ = **1.00**

Classification of cross sections - Section 3.5

$\varepsilon = \sqrt{[275 \text{ N/mm}^2 / p_y]}$ = **0.89**

Internal compression parts - Table 11

Depth of section — d = **237.1** mm

$d / t = 22.1 \times \varepsilon <= 80 \times \varepsilon$ — Class 1 plastic

Outstand flanges - Table 11

Width of section — b = B / 2 = **153.7** mm

$b / T = 9.2 \times \varepsilon <= 10 \times \varepsilon$ — Class 2 compact

Section is class 2 compact

Shear capacity - Section 4.2.3

Design shear force — $F_v = \max(\text{abs}(V_{max}), \text{abs}(V_{min}))$ = **407** kN

$d / t < 70 \times \varepsilon$

Web does not need to be checked for shear buckling

Shear area — $A_v = t \times D$ = **3774** mm^2

Design shear resistance — $P_v = 0.6 \times p_y \times A_v$ = **781.2** kN

PASS - Design shear resistance exceeds design shear force

Moment capacity - Section 4.2.5

Design bending moment — $M = \max(\text{abs}(M_{s1\_max}), \text{abs}(M_{s1\_min}))$ = **455.8** kNm

Moment capacity low shear - cl.4.2.5.2 — $M_c = \min(p_y \times S_{xx}, 1.2 \times p_y \times Z_{xx})$ = **682** kNm

Effective length for lateral-torsional buckling - Section 4.3.5

Effective length for lateral torsional buckling — $L_E = 1.0 \times L_{s1}$ = **6800** mm

Slenderness ratio — $\lambda = L_E / r_{yy}$ = **87.970**

Equivalent slenderness - Section 4.3.6.7

Buckling parameter — u = **0.851**

Torsional index — x = **15.781**

Slenderness factor — $v = 1 / [1 + 0.05 \times (\lambda / x)^2]^{0.25}$ = **0.791**

Ratio - cl.4.3.6.9 — β_W = **1.000**

Equivalent slenderness - cl.4.3.6.7 — $\lambda_{LT} = u \times v \times \lambda \times \sqrt{[\beta_W]}$ = **59.227**

Limiting slenderness - Annex B.2.2 — $\lambda_{L0} = 0.4 \times (\pi^2 \times E / p_y)^{0.5}$ = **30.632**

$\lambda_{LT} > \lambda_{L0}$ - Allowance should be made for lateral-torsional buckling

Bending strength - Section 4.3.6.5

Robertson constant — α_{LT} = **7.0**

Perry factor — $\eta_{LT} = \max(\alpha_{LT} \times (\lambda_{LT} - \lambda_{L0}) / 1000, 0)$ = **0.200**

Euler stress — $p_E = \pi^2 \times E / \lambda_{LT}^2$ = **576.8** N/mm^2

$\phi_{LT} = (p_y + (\eta_{LT} + 1) \times p_E) / 2$ = **518.6** N/mm^2

Bending strength - Annex B.2.1 — $p_b = p_E \times p_y / (\phi_{LT} + (\phi_{LT}^2 - p_E \times p_y)^{0.5})$ = **254.1** N/mm^2

Equivalent uniform moment factor - Section 4.3.6.6

Moment at quarter point of segment — M_2 = **333.1** kNm

Moment at centre-line of segment — M_3 = **455.8** kNm

Moment at three quarter point of segment — M_4 = **270.3** kNm

Maximum moment in segment — M_{abs} = **455.8** kNm

Maximum moment governing buckling resistance — $M_{LT} = M_{abs}$ = **455.8** kNm

Equivalent uniform moment factor for lateral-torsional buckling

$m_{LT} = \max(0.2 + (0.15 \times M_2 + 0.5 \times M_3 + 0.15 \times M_4) / M_{abs}, 0.44)$ = **0.899**

Buckling resistance moment - Section 4.3.6.4

Buckling resistance moment — $M_b = p_b \times S_{xx}$ = **502.3** kNm

M_b / m_{LT} = **559** kNm

PASS - Buckling resistance moment exceeds design bending moment

Check vertical deflection - Section 2.5.2

Consider deflection due to imposed loads

Limiting deflection $\delta_{lim} = L_{s1} / 360 =$ **18.889** mm

Maximum deflection span 1 $\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min})) =$ **11.493** mm

PASS - Maximum deflection does not exceed deflection limit

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	Made By:	OAM	Revision:	
	Date:	Nov-23	Checked By:	TG

Project: 34 BELGRAVE MEWS SOUTH

DESIGN OF STEEL BEAM, SIMPLY SUPPORTED

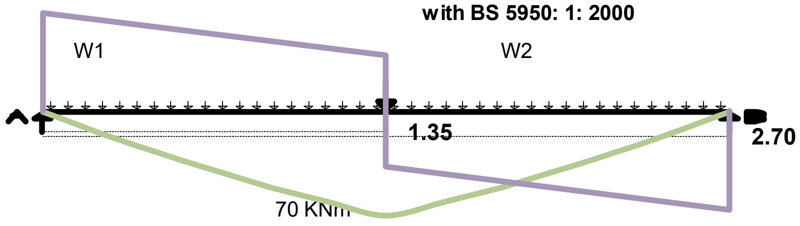
H rolled section **S355**

Calculation in accordance with BS 5950: 1: 2000

LOCATION= **FB0.05**

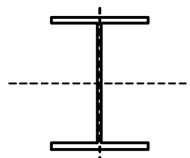
Loads are unfactored

Wd1=	12.63	KN/m2
Wl1=	2.03	KN/m2
Wd2=	12.63	KN/m2
wl2=	2.03	KN/m2
P1=	50.00	KN
a=	1.35	m
Span=	2.70	m
Cover=	1.00	m



Load on beam	unfactored		factored	
Point load=	50.00	KN	75	KN
AV-Dead+s/w=	12.93	KN/m'	18.102	KN/m'
Live=	2.03	KN/m'	3.24	KN/m'
	14.955	KN/m'	21.342	KN/m'

Partial safety factor for load
dead= 1.4
live= 1.6



Reaction

	unfactored		factored	
RA=	45.2	KN	66.3	KN
RB=	45.2	KN	66.3	KN
Shear zero at	X=		1.35	m

Maximum Bending Moment **Mx =** **70** KNm

						factor
Maximum BM for check	M LT=	61.0 KNm	Local capacity	PASS	0.745
Maximum BM about axis Y	MY=	6.10 KNm	Overall buckling 1	PASS	0.885
Axial compressive load	Fc=	1.00 KN	Overall buckling 2	PASS	0.967
Shear force in x axis	Fv=	66.3 KN	Deflection (dead)=	PASS	1/ 522
Beam span	L=	2.70 m	Deflection(live)=	PASS	1/ 3259
Effective length about axis X	LX eff=	2.70 m	Deflection (d+l)=	PASS	1/ 450
Effective length about axis Y	LYeff=	1.69 m	Fully restraint for Ly& LX <1.		
Limiting span/deflection (live)	=	360.0 or 14 mm			
	z rep=	197 cm3			

Section properties

Section size (Ref. No= **66**) **203x133 30 kg 30 S355**

Depth of steel section	D=	206.8 mm		
Width of section	B=	133.8 mm		
Thickness of web	t=	6.3 mm	Mcx=	111.22 KNm
Thickness of flange	T=	9.6 mm	Mcy=	31.258 KNm
Root radius	r=	9.6 mm	Mb L=	91.484 KNm
Second moment of area x-x	Ix=	2887 cm4	Mlt=	0.871 TABLE 18
Second moment of area y-y	Iy=	384 cm4		
Plastic modulus x-x	Sx=	313.3 cm3	Sx eff=	273.81 cm3
Plastic modulus y-y	Sy=	88.05 cm3	Sy eff=	52.45 cm3
Area of section	Ag=	38 cm2	An=	34.55 cm2

ke= 1.1

DEFLECTION

			unfactored
Unfactored dead load deflection=	5.17 mm	E UDL=	44.18 KN/m'
Unfactored live load deflection=	0.83 mm	E UDL=	7.08 KN/m'
Unfactored dead+ live load def =	5.99 mm	E UDL=	51.27 KN/m'
Span/def. ratio for dead load=	523		
Span/def. ratio for live load=	**3260**	**>360**	
Span/def. ratio fordead+ live load=	450		

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Made By:	OAM	Revision:	
Date:	Nov-23	Checked By:	TG

Project: 34 BELGRAVE MEWS SOUTH

CONTINUE OF FB0.05

Strength of steel Clause 3.1.1

Design strength	(Grade	S 355	)			
for thickness of	9.6 mm	py=	355 N/mm2	py=	355.0 N/mm2	pyw= py
Young's Modulus		E=	205 KN/mm2			

Classification of cross section (clause 3.5.2) TABLE 11 rolled section

Constant	ε =	0.880		class 1	class 2	class 3
Outstand of flange	b=	66.9 mm		plastic	compac	semi compact
Ratio	b/T=	6.97	b/Tlim=	7.92	8.80	13.20

The section is class1 plastic

r1 =min(1.0,max(-0.1,Fc/(dxtxpyw)))= 0.26 r2=Fc/(Agxpyw)= 0.0007

Depth between fillets	d=	172.3 mm		TABLE 11 rolled section		
ratio	d/t=	27.35		class 1	class 2	class 3
40 ε	=	35.206	d/tlim=	55.90	63.35	105.46

The classification is based on the general web condition **The section is class1 plastic**

Shear capacity CL 4.2.3

Shear area		Av y=	1302.8 mm2	(t x D)	
Shear capacity	(0.6pyA)	Pvy=	278 KN		
Shear force		Fvy=	66.3 KN	Fvy/Pvy= 0.24	**SHEAR PASS OK**

Moment Capacity

Elastic modulus	Zx=	279.3 cm3	Mcx1=	99.152
Plastic modulus	Sx=	313 cm3	Mcx2=	111.22
Moment capacity for section	Mcx=	**111.2** KNm		
Elastic modulus	Zy=	57.4 cm3	Mcy1=	20.377
Plastic modulus	Sy=	88.1 cm3	mcy2=	31.258
Moment capacity for section	Mcy=	**31.3** KNm		

Local capacity check Clause 4.8.3.2

$$\frac{F}{Ag.\,py} + \frac{Mx}{Mcx} + \frac{My}{Mcy} <= 1$$

0.001 + 0.549 + 0.195 = **0.745** **LOCAL CAPACITY IS SATISFIED**

restraint/effective length Clause 4.31 to 4.3.5 TABLE 13

Effective length	Le lt1=	2700 mm	normal condition
Effective length	Lelt2=	1691.8 mm	
	L e lt=	2195.9 mm	
Radius of gyration y-y	ry=	3.18 cm	
	rx=	8.72 cm	
	Lam'y=	53.2	
	La'mx=	31.0	

CONTINUE OF FB0.05

Buckling resistance Clause 4.8.3.3.1

Compressive strength:perry strust formula from Appendex C.1

Limiting slenderness	lam 0=	15.10	py=	355 N/mm2
For buckling about y-y			λ L0=	30.20 TABLE 16
Robertson constant for H section				
	a=	5.5		
Perry factor	eta=	0.21		
Euler strength	pe=	715 N/mm2		
Factor	phi=	610 N/mm2		
Compressive strength	pcy=	**266.1** N/mm2		

	Lam'y=	53.2	La'mx=	30.96	Lamy/x=	2.47448
Slenderness of section	Lamda=	53.2			Lamx/x=	1.44015
Torsional index	x=	21.5				
	N=	0.5				
Slenderness factor	v=	0.96 from Table 19				
	β w =	1.0				
Buckling parameter	u=	0.882				
Equivalent slenderness	lamlt=	45.0				
Buckling strength (Table 16)	pb=	292 N/mm2	for lamlt=	50	py=	355
Buckling resisrance moment	Mb=	91.5 KNm				
	Mb L=	91.5 KNm				
	Mry=	31.3 KNm				
	Pc=	1011.3 KN				
	Pcy=	1011.3 KN				

$\frac{Fc}{PC} + m\frac{x\,Mx}{Py\,Zx} + m\frac{y\,My}{py\,Zy} = \; <=1$ m x= 0.95, m y= 1

0.001 + 0.585 + 0.299 = **0.885**   **The interaction formula is satisfied**

$\frac{Fc}{Pcy} + m\frac{LT\,M\,lt}{Mb} + m\frac{y\,My}{py\,Zy} = \; <=1$

0.001 + 0.667 + 0.299 = **0.967**   **The interaction formula is satisfied**

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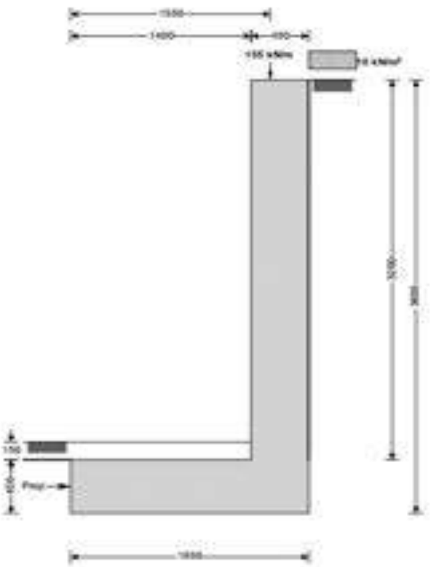
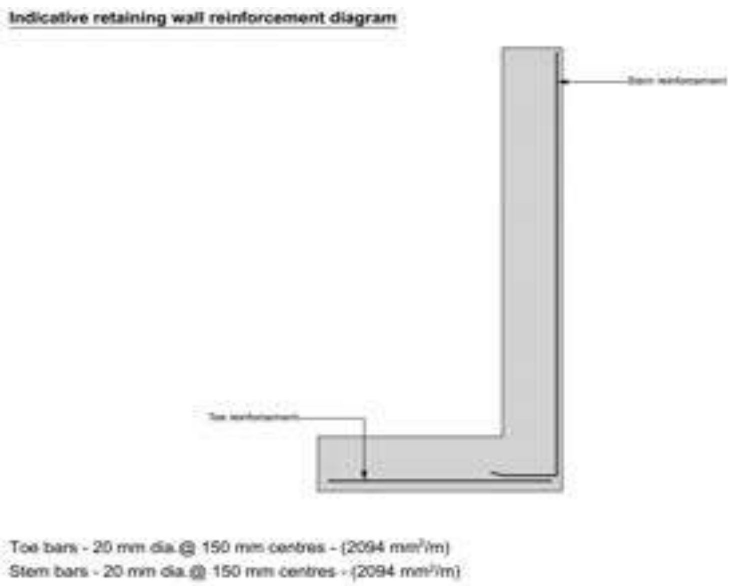
DIMENSIONS IN THESE CALCULATIONS ARE ONLY APPROXIMATE AND THE CONTRACTOR MUST CHECK THE LATEST ARCHITECTURAL DRAWINGS AND MEASURE UP ON SITE BEFORE ORDERING ANY MATERIALS.

RETAINING WALL RW1 RW2

Max high = 2.4 m

BEAM LOADING		D LOAD	I LOAD	cover y		dead load	live load
		KN/m2	KN/m2	m		KN/m'	KN/m'
ROOF	dead	1.25		7	=> 7* 1.25=	8.75	
	live		1.00	7	=> 7*1.00=		7
second floor	dead	0.6		7	=> 7* .6=	4.2	
	live		1.50	7	=> 7*1.50=		10.5
first floor	dead	0.6		7	=> 7* .6=	4.2	
	live		1.50	7	=> 7*1.50=		10.5
GROUND	dead	4.4		7	=> 7* 4.4=	30.8	
	live		2.50	7	=> 7*2.50=		17.5
wall	dead	7.5		8.1	=> 8.1* 7.5=	60.75	
					UDL	108.7 KN/m'	45.5 KN/m'





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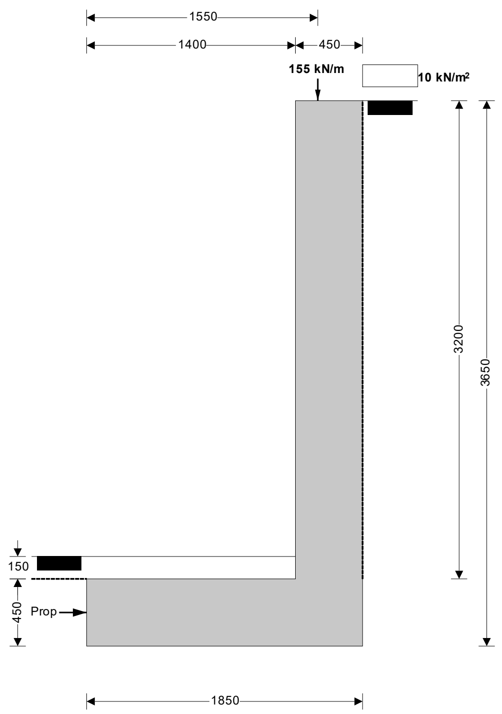
All design calculations have been author reviewed and subject to additional review by the project team, as required by David Smith Associates Quality Assurance procedures.

date printed 21/11/23

RETAINING WALL ANALYSIS (BS 8002:1994)

TEDDS calculation version 1.2.01.08



Wall details

Retaining wall type	**Cantilever propped at base**
Height of retaining wall stem	h_{stem} = **3200** mm
Thickness of wall stem	t_{wall} = **450** mm
Length of toe	l_{toe} = **1400** mm
Length of heel	l_{heel} = **0** mm
Overall length of base	$l_{base} = l_{toe} + l_{heel} + t_{wall}$ = **1850** mm
Thickness of base	t_{base} = **450** mm
Depth of downstand	d_{ds} = **0** mm
Position of downstand	l_{ds} = **1065** mm
Thickness of downstand	t_{ds} = **450** mm
Height of retaining wall	$h_{wall} = h_{stem} + t_{base} + d_{ds}$ = **3650** mm
Depth of cover in front of wall	d_{cover} = **150** mm
Depth of unplanned excavation	d_{exc} = **150** mm
Height of ground water behind wall	h_{water} = **0** mm
Height of saturated fill above base	$h_{sat} = \max(h_{water} - t_{base} - d_{ds}, 0\text{ mm})$ = **0** mm
Density of wall construction	γ_{wall} = **23.6** kN/m^3
Density of base construction	γ_{base} = **23.6** kN/m^3
Angle of rear face of wall	α = **90.0** deg
Angle of soil surface behind wall	β = **0.0** deg
Effective height at virtual back of wall	$h_{eff} = h_{wall} + l_{heel} \times \tan(\beta)$ = **3650** mm

Retained material details

Mobilisation factor	M = **1.5**
Moist density of retained material	γ_m = **18.0** kN/m^3

Saturated density of retained material γ_s = **21.0** kN/m^3

Design shear strength ϕ' = **28.0** deg

Angle of wall friction δ = **0.0** deg

Base material details

Moist density γ_{mb} = **18.0** kN/m^3

Design shear strength ϕ'_b = **28.0** deg

Design base friction δ_b = **18.6** deg

Allowable bearing pressure $P_{bearing}$ = **200** kN/m^2

Using Coulomb theory

Active pressure coefficient for retained material

$$K_a = \sin(\alpha + \phi')^2 / (\sin(\alpha)^2 \times \sin(\alpha - \delta) \times [1 + \sqrt{(\sin(\phi' + \delta) \times \sin(\phi' - \beta) / (\sin(\alpha - \delta) \times \sin(\alpha + \beta)))}]^2) = \mathbf{0.361}$$

Passive pressure coefficient for base material

$$K_p = \sin(90 - \phi'_b)^2 / (\sin(90 - \delta_b) \times [1 - \sqrt{(\sin(\phi'_b + \delta_b) \times \sin(\phi'_b) / (\sin(90 + \delta_b)))}]^2) = \mathbf{5.139}$$

At-rest pressure

At-rest pressure for retained material $K_0 = 1 - \sin(\phi')$ = **0.531**

Loading details

Surcharge load on plan Surcharge = **10.0** kN/m^2

Applied vertical dead load on wall W_{dead} = **105.0** kN/m

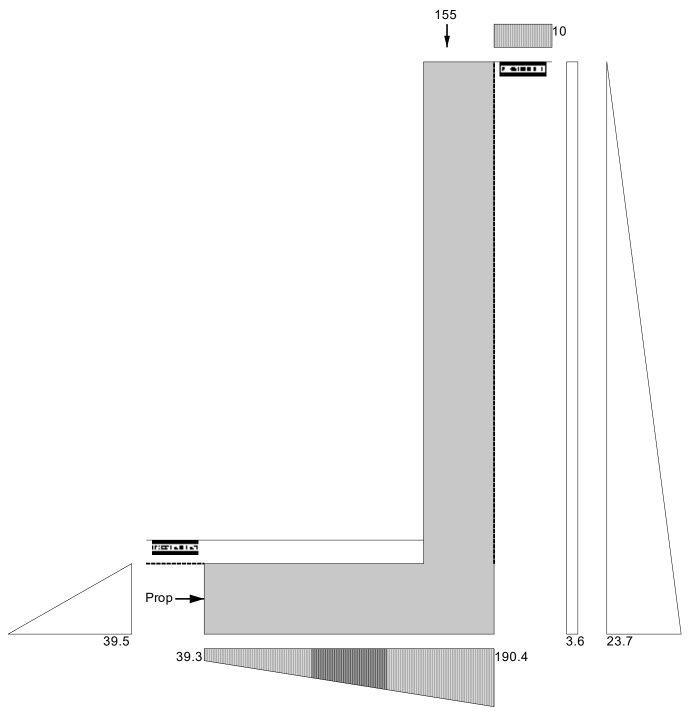
Applied vertical live load on wall W_{live} = **50.0** kN/m

Position of applied vertical load on wall l_{load} = **1550** mm

Applied horizontal dead load on wall F_{dead} = **0.0** kN/m

Applied horizontal live load on wall F_{live} = **0.0** kN/m

Height of applied horizontal load on wall h_{load} = **0** mm



Loads shown in kN/m, pressures shown in kN/m^2

Vertical forces on wall

Wall stem — $w_{wall} = h_{stem} \times t_{wall} \times \gamma_{wall}$ = **34** kN/m

Wall base — $w_{base} = l_{base} \times t_{base} \times \gamma_{base}$ = **19.6** kN/m

Soil in front of wall — $w_p = l_{toe} \times d_{cover} \times \gamma_{mb}$ = **3.8** kN/m

Applied vertical load — $W_v = W_{dead} + W_{live}$ = **155** kN/m

Total vertical load — $W_{total} = w_{wall} + w_{base} + w_p + W_v$ = **212.4** kN/m

Horizontal forces on wall

Surcharge — $F_{sur} = K_a \times \text{Surcharge} \times h_{eff}$ = **13.2** kN/m

Moist backfill above water table — $F_{m\_a} = 0.5 \times K_a \times \gamma_m \times (h_{eff} - h_{water})^2$ = **43.3** kN/m

Total horizontal load — $F_{total} = F_{sur} + F_{m\_a}$ = **56.5** kN/m

Calculate propping force

Passive resistance of soil in front of wall — $F_p = 0.5 \times K_p \times \cos(\delta_b) \times (d_{cover} + t_{base} + d_{ds} - d_{exc})^2 \times \gamma_{mb}$ = **8.9** kN/m

Propping force — $F_{prop} = \max(F_{total} - F_p - (W_{total} - w_p - W_{live}) \times \tan(\delta_b), 0 \text{ kN/m})$

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

Overturning moments

Surcharge — $M_{sur} = F_{sur} \times (h_{eff} - 2 \times d_{ds}) / 2$ = **24** kNm/m

Moist backfill above water table — $M_{m\_a} = F_{m\_a} \times (h_{eff} + 2 \times h_{water} - 3 \times d_{ds}) / 3$ = **52.7** kNm/m

Total overturning moment — $M_{ot} = M_{sur} + M_{m\_a}$ = **76.7** kNm/m

Restoring moments

Wall stem — $M_{wall} = w_{wall} \times (l_{toe} + t_{wall} / 2)$ = **55.2** kNm/m

Wall base — $M_{base} = w_{base} \times l_{base} / 2$ = **18.2** kNm/m

Design vertical dead load — $M_{dead} = W_{dead} \times l_{load}$ = **162.8** kNm/m

Total restoring moment — $M_{rest} = M_{wall} + M_{base} + M_{dead}$ = **236.1** kNm/m

Check bearing pressure

Soil in front of wall — $M_{p\_r} = w_p \times l_{toe} / 2$ = **2.6** kNm/m

Design vertical live load — $M_{live} = W_{live} \times l_{load}$ = **77.5** kNm/m

Total moment for bearing — $M_{total} = M_{rest} - M_{ot} + M_{p\_r} + M_{live}$ = **239.6** kNm/m

Total vertical reaction — $R = W_{total}$ = **212.4** kN/m

Distance to reaction — $x_{bar} = M_{total} / R$ = **1128** mm

Eccentricity of reaction — $e = \text{abs}((l_{base} / 2) - x_{bar})$ = **203** mm

Reaction acts within middle third of base

Bearing pressure at toe — $p_{toe} = (R / l_{base}) - (6 \times R \times e / l_{base}^2)$ = **39.3** kN/m^2

Bearing pressure at heel — $p_{heel} = (R / l_{base}) + (6 \times R \times e / l_{base}^2)$ = **190.4** kN/m^2

PASS - Maximum bearing pressure is less than allowable bearing pressure

RETAINING WALL DESIGN (BS 8002:1994)

TEDDS calculation version 1.2.01.08

Ultimate limit state load factors

Dead load factor γ_{f_d} = **1.4**

Live load factor γ_{f_l} = **1.6**

Earth and water pressure factor γ_{f_e} = **1.4**

Factored vertical forces on wall

Wall stem $w_{wall\_f} = \gamma_{f\_d} \times h_{stem} \times t_{wall} \times \gamma_{wall}$ = **47.6** kN/m

Wall base $w_{base\_f} = \gamma_{f\_d} \times l_{base} \times t_{base} \times \gamma_{base}$ = **27.5** kN/m

Soil in front of wall $w_{p\_f} = \gamma_{f\_d} \times l_{toe} \times d_{cover} \times \gamma_{mb}$ = **5.3** kN/m

Applied vertical load $W_{v\_f} = \gamma_{f\_d} \times W_{dead} + \gamma_{f\_l} \times W_{live}$ = **227** kN/m

Total vertical load $W_{total\_f} = w_{wall\_f} + w_{base\_f} + w_{p\_f} + W_{v\_f}$ = **307.4** kN/m

Factored horizontal at-rest forces on wall

Surcharge $F_{sur\_f} = \gamma_{f\_l} \times K_0 \times Surcharge \times h_{eff}$ = **31** kN/m

Moist backfill above water table $F_{m\_a\_f} = \gamma_{f\_e} \times 0.5 \times K_0 \times \gamma_m \times (h_{eff} - h_{water})^2$ = **89.1** kN/m

Total horizontal load $F_{total\_f} = F_{sur\_f} + F_{m\_a\_f}$ = **120** kN/m

Calculate propping force

Passive resistance of soil in front of wall $F_{p\_f} = \gamma_{f\_e} \times 0.5 \times K_p \times \cos(\delta_b) \times (d_{cover} + t_{base} + d_{ds} - d_{exc})^2 \times \gamma_{mb}$ = **12.4** kN/m

Propping force $F_{prop\_f} = \max(F_{total\_f} - F_{p\_f} - (W_{total\_f} - w_{p\_f} - \gamma_{f\_l} \times W_{live}) \times \tan(\delta_b), 0 \text{ kN/m})$

F_{prop_f} = **32.9** kN/m

Factored overturning moments

Surcharge $M_{sur\_f} = F_{sur\_f} \times (h_{eff} - 2 \times d_{ds}) / 2$ = **56.5** kNm/m

Moist backfill above water table $M_{m\_a\_f} = F_{m\_a\_f} \times (h_{eff} + 2 \times h_{water} - 3 \times d_{ds}) / 3$ = **108.4** kNm/m

Total overturning moment $M_{ot\_f} = M_{sur\_f} + M_{m\_a\_f}$ = **164.9** kNm/m

Restoring moments

Wall stem $M_{wall\_f} = w_{wall\_f} \times (l_{toe} + t_{wall} / 2)$ = **77.3** kNm/m

Wall base $M_{base\_f} = w_{base\_f} \times l_{base} / 2$ = **25.4** kNm/m

Soil in front of wall $M_{p\_r\_f} = w_{p\_f} \times l_{toe} / 2$ = **3.7** kNm/m

Design vertical load $M_{v\_f} = W_{v\_f} \times l_{load}$ = **351.9** kNm/m

Total restoring moment $M_{rest\_f} = M_{wall\_f} + M_{base\_f} + M_{p\_r\_f} + M_{v\_f}$ = **458.3** kNm/m

Factored bearing pressure

Total moment for bearing $M_{total\_f} = M_{rest\_f} - M_{ot\_f}$ = **293.4** kNm/m

Total vertical reaction $R_f = W_{total\_f}$ = **307.4** kN/m

Distance to reaction $x_{bar\_f} = M_{total\_f} / R_f$ = **955** mm

Eccentricity of reaction $e_f = abs((l_{base} / 2) - x_{bar\_f})$ = **30** mm

Reaction acts within middle third of base

Bearing pressure at toe $p_{toe\_f} = (R_f / l_{base}) - (6 \times R_f \times e_f / l_{base}^2)$ = **150.2** kN/m²

Bearing pressure at heel $p_{heel\_f} = (R_f / l_{base}) + (6 \times R_f \times e_f / l_{base}^2)$ = **182.1** kN/m²

Rate of change of base reaction $rate = (p_{toe\_f} - p_{heel\_f}) / l_{base}$ = **-17.23** kN/m²/m

Bearing pressure at stem / toe $p_{stem\_toe\_f} = \max(p_{heel\_f} + (rate \times (l_{heel} + t_{wall})), 0 \text{ kN/m}^2)$ = **174.3** kN/m²

Bearing pressure at mid stem $p_{stem\_mid\_f} = \max(p_{heel\_f} + (rate \times (l_{heel} + t_{wall} / 2)), 0 \text{ kN/m}^2)$ = **178.2** kN/m²

Bearing pressure at stem / heel $p_{stem\_heel\_f} = \max(p_{heel\_f} + (rate \times l_{heel}), 0 \text{ kN/m}^2)$ = **182.1** kN/m²

Design of reinforced concrete retaining wall toe (BS 8002:1994)

Material properties

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

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

Base details

Minimum area of reinforcement k = **0.13** %

Cover to reinforcement in toe c_{toe} = **75** mm

Calculate shear for toe design

Shear from bearing pressure $V_{toe\_bear} = (p_{toe\_f} + p_{stem\_toe\_f}) \times l_{toe} / 2$ = **227.2** kN/m

Shear from weight of base $V_{toe\_wt\_base} = \gamma_{f\_d} \times \gamma_{base} \times l_{toe} \times t_{base}$ = **20.8** kN/m

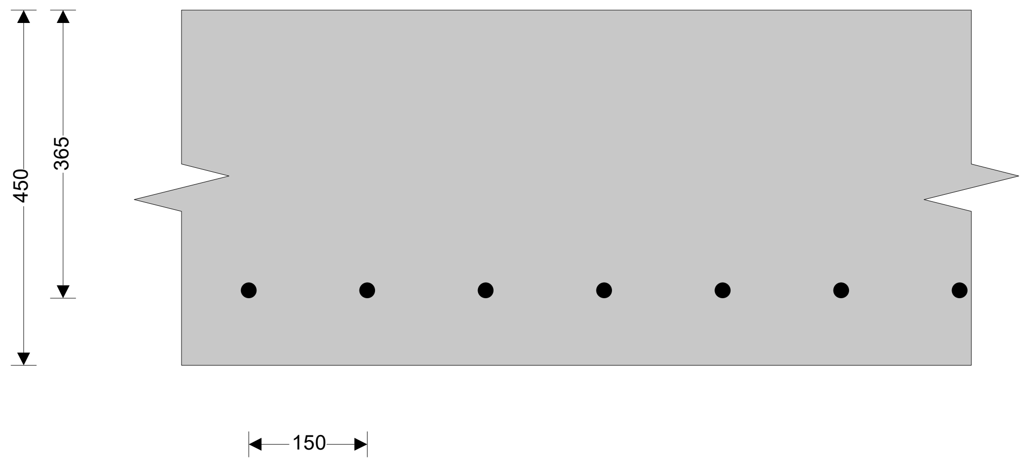
Total shear for toe design $V_{toe} = V_{toe\_bear} - V_{toe\_wt\_base}$ = **206.4** kN/m

Calculate moment for toe design

Moment from bearing pressure $M_{toe\_bear} = (2 \times p_{toe\_f} + p_{stem\_mid\_f}) \times (l_{toe} + t_{wall} / 2)^2 / 6$ = **210.6** kNm/m

Moment from weight of base $M_{toe\_wt\_base} = (\gamma_{f\_d} \times \gamma_{base} \times t_{base} \times (l_{toe} + t_{wall} / 2)^2 / 2)$ = **19.6** kNm/m

Total moment for toe design $M_{toe} = M_{toe\_bear} - M_{toe\_wt\_base}$ = **191** kNm/m



Check toe in bending

Width of toe b = **1000** mm/m

Depth of reinforcement $d_{toe} = t_{base} - c_{toe} - (\phi_{toe} / 2)$ = **365.0** mm

Constant $K_{toe} = M_{toe} / (b \times d_{toe}^2 \times f_{cu})$ = **0.041**

Compression reinforcement is not required

Lever arm $z_{toe} = \min(0.5 + \sqrt{(0.25 - (\min(K_{toe}, 0.225) / 0.9))}, 0.95) \times d_{toe}$

z_{toe} = **347** mm

Area of tension reinforcement required $A_{s\_toe\_des} = M_{toe} / (0.87 \times f_y \times z_{toe})$ = **1266** mm^2/m

Minimum area of tension reinforcement $A_{s\_toe\_min} = k \times b \times t_{base}$ = **585** mm^2/m

Area of tension reinforcement required $A_{s\_toe\_req} = \text{Max}(A_{s\_toe\_des}, A_{s\_toe\_min})$ = **1266** mm^2/m

Reinforcement provided **20 mm dia.bars @ 150 mm centres**

Area of reinforcement provided $A_{s\_toe\_prov}$ = **2094** mm^2/m

PASS - Reinforcement provided at the retaining wall toe is adequate

Check shear resistance at toe

Design shear stress $v_{toe} = V_{toe} / (b \times d_{toe})$ = **0.565** N/mm^2

Allowable shear stress $v_{adm} = \min(0.8 \times \sqrt{(f_{cu} / 1 \text{ N/mm}^2)}, 5) \times 1 \text{ N/mm}^2$ = **4.733** N/mm^2

PASS - Design shear stress is less than maximum shear stress

From BS8110:Part 1:1997 – Table 3.8

Design concrete shear stress v_{c_toe} = **0.601** N/mm^2

$v_{toe} < v_{c\_toe}$ - No shear reinforcement required

Design of reinforced concrete retaining wall stem (BS 8002:1994)

Material properties

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

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

Wall details

Minimum area of reinforcement k = **0.13** %

Cover to reinforcement in stem c_{stem} = **30** mm

Cover to reinforcement in wall c_{wall} = **30** mm

Factored horizontal at-rest forces on stem

Surcharge $F_{s\_sur\_f} = \gamma_{f\_l} \times K_0 \times \text{Surcharge} \times (h_{eff} - t_{base} - d_{ds})$ = **27.2** kN/m

Moist backfill above water table $F_{s\_m\_a\_f} = 0.5 \times \gamma_{f\_e} \times K_0 \times \gamma_m \times (h_{eff} - t_{base} - d_{ds} - h_{sat})^2$ = **68.5** kN/m

Calculate shear for stem design

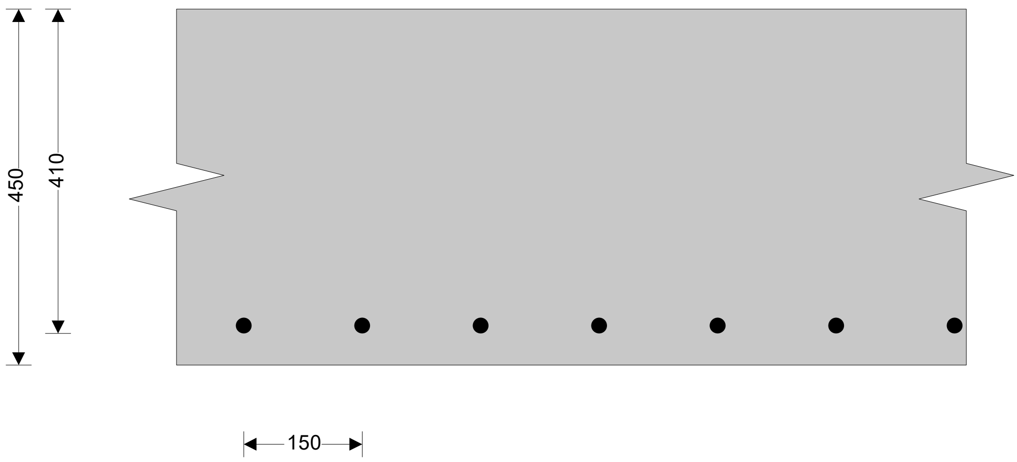
Shear at base of stem $V_{stem} = F_{s\_sur\_f} + F_{s\_m\_a\_f} - F_{prop\_f}$ = **62.7** kN/m

Calculate moment for stem design

Surcharge $M_{s\_sur} = F_{s\_sur\_f} \times (h_{stem} + t_{base}) / 2$ = **49.6** kNm/m

Moist backfill above water table $M_{s\_m\_a} = F_{s\_m\_a\_f} \times (2 \times h_{sat} + h_{eff} - d_{ds} + t_{base} / 2) / 3$ = **88.4** kNm/m

Total moment for stem design $M_{stem} = M_{s\_sur} + M_{s\_m\_a}$ = **138** kNm/m



Check wall stem in bending

Width of wall stem b = **1000** mm/m

Depth of reinforcement $d_{stem} = t_{wall} - c_{stem} - (\phi_{stem} / 2)$ = **410.0** mm

Constant $K_{stem} = M_{stem} / (b \times d_{stem}^2 \times f_{cu})$ = **0.023**

Compression reinforcement is not required

Lever arm $z_{stem} = \min(0.5 + \sqrt{(0.25 - (\min(K_{stem}, 0.225) / 0.9))}, 0.95) \times d_{stem}$

z_{stem} = **390** mm

Area of tension reinforcement required $A_{s\_stem\_des} = M_{stem} / (0.87 \times f_y \times z_{stem})$ = **814** mm^2/m

Minimum area of tension reinforcement $A_{s\_stem\_min} = k \times b \times t_{wall}$ = **585** mm^2/m

Area of tension reinforcement required $A_{s\_stem\_req} = \text{Max}(A_{s\_stem\_des}, A_{s\_stem\_min})$ = **814** mm^2/m

Reinforcement provided **20 mm dia.bars @ 150 mm centres**

Area of reinforcement provided $A_{s\_stem\_prov}$ = **2094** mm^2/m

PASS - Reinforcement provided at the retaining wall stem is adequate

Check shear resistance at wall stem

Design shear stress $v_{stem} = V_{stem} / (b \times d_{stem})$ = **0.153** N/mm^2

Allowable shear stress $v_{adm} = \min(0.8 \times \sqrt{(f_{cu} / 1\ N/mm^2)}, 5) \times 1\ N/mm^2$ = **4.733** N/mm^2

PASS - Design shear stress is less than maximum shear stress

From BS8110:Part 1:1997 – Table 3.8

Design concrete shear stress v_{c_stem} = **0.565** N/mm^2

$v_{stem} < v_{c\_stem}$ - No shear reinforcement required

Check retaining wall deflection

Basic span/effective depth ratio $ratio_{bas}$ = **7**

Design service stress $f_s = 2 \times f_y \times A_{s\_stem\_req} / (3 \times A_{s\_stem\_prov})$ = **129.6** N/mm^2

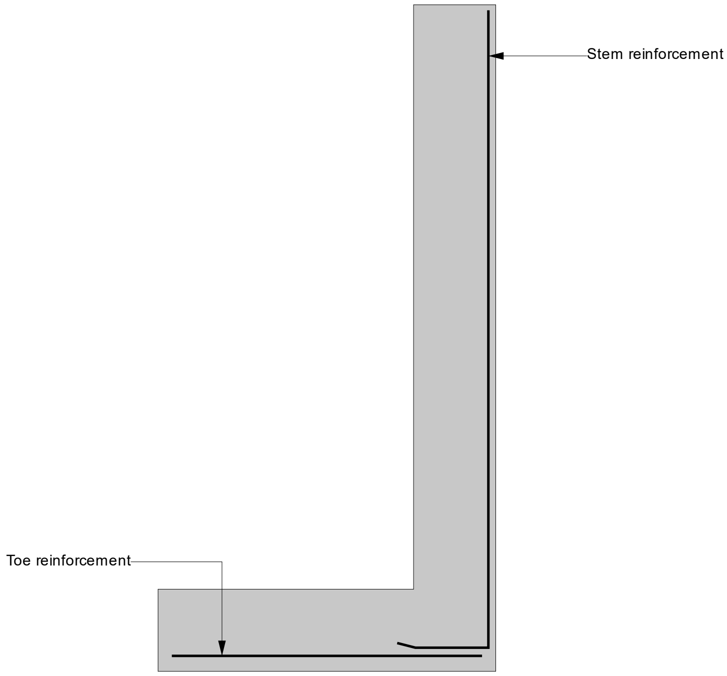
Modification factor $factor_{tens} = \min(0.55 + (477\ N/mm^2 - f_s)/(120 \times (0.9\ N/mm^2 + (M_{stem}/(b \times d_{stem}^2)))),2)$ = **2.00**

Maximum span/effective depth ratio $ratio_{max} = ratio_{bas} \times factor_{tens}$ = **14.00**

Actual span/effective depth ratio $ratio_{act} = h_{stem} / d_{stem}$ = **7.80**

PASS - Span to depth ratio is acceptable

Indicative retaining wall reinforcement diagram



Toe bars - 20 mm dia.@ 150 mm centres - (2094 mm^2/m)
Stem bars - 20 mm dia.@ 150 mm centres - (2094 mm^2/m)

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Project: **34 BELGRAVE MEWS SOUTH**

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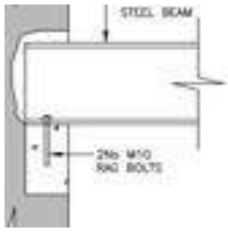
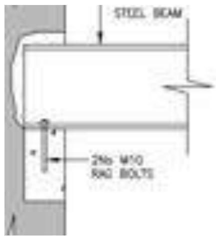
PADSTONE RB1



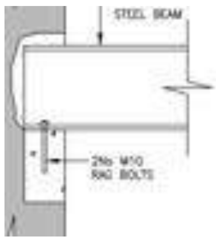
EXISTING MASONRY COMPRESSIVE STRENGTH= **0.42** N/mm2
ENHANCEMENT UNDER BEARING =>0.42*1.5= 0.63 N/mm2 FOR UNFACTORED LOAD
Permitted stress => .63*1.5= **0.945** N/mm2 FOR FACTORED LOAD
203x203x46 UC DESIGN FOR **0.945** N/mm2
REACTION(ULS) = **22** KN
bearing **100** mm beam width = 203.2 mm
stress under beam = **1.08** N/mm2 **OK**
EFFC 100 mm
pad width= **100** mm Pad l= **300** mm
stress under PAD = 22*1000/(100* 300) **0.73** N/mm2 **PASS**
USE 300 X 100 X 215 DP PADSTONE

PADSTONE FB2.01



EXISTING MASONRY COMPRESSIVE STRENGTH= **0.42** N/mm2
ENHANCEMENT UNDER BEARING =>0.42*1.5= 0.63 N/mm2 FOR UNFACTORED LOAD
Permitted stress => .63*1.5= **0.945** N/mm2 FOR FACTORED LOAD
178x102x19 UB DESIGN FOR **0.945** N/mm2
REACTION(ULS) = **17** KN
bearing **100** mm beam width = 101.6 mm
stress under beam = **1.67** N/mm2 **OK**
EFFC 100 mm
pad width= **100** mm Pad l= **215** mm
stress under PAD = 17*1000/(100* 215) **0.79** N/mm2 **PASS**
USE 215 X 100 X 150 DP PADSTONE

PADSTONE FB2.02 FB2.03



EXISTING MASONRY COMPRESSIVE STRENGTH= **0.42** N/mm2
ENHANCEMENT UNDER BEARING =>0.42*1.5= 0.63 N/mm2 FOR UNFACTORED LOAD
Permitted stress => .63*1.5= **0.945** N/mm2 FOR FACTORED LOAD
203x133x30 UB DESIGN FOR **0.945** N/mm2
REACTION(ULS) = **44.5** KN
bearing **100** mm beam width = 133.8 mm
stress under beam = **3.33** N/mm2 **OK**
EFFC 100 mm
pad width= **100** mm Pad l= **500** mm
stress under PAD = 44.5*1000/(100* 500) **0.89** N/mm2 **PASS**
USE 500 X 100 X 215 DP PADSTONE

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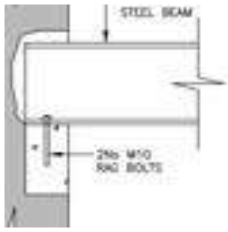
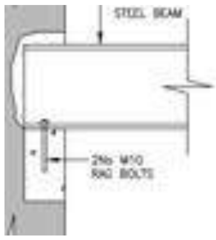
PADSTONE FB2.04



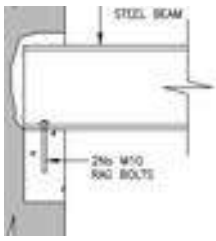
EXISTING MASONRY COMPRESSIVE STRENGTH= **0.42** N/mm2
ENHANCEMENT UNDER BEARING =>0.42*1.5= 0.63 N/mm2 FOR UNFACTORED LOAD
Permitted stress => .63*1.5= **0.945** N/mm2 FOR FACTORED LOAD
254x254x73 UC DESIGN FOR **0.945** N/mm2
REACTION(ULS) = **63** KN
bearing **100** mm beam width = 254 mm
stress under beam = **2.48** N/mm2 **OK**
EFFC 100 mm
pad width= **100** mm Pad l= **750** mm
stress under PAD = 63*1000/(100* 750) **0.84** N/mm2 **PASS**
USE 750 X 100 X 215 DP PADSTONE

PADSTONE FB2.05



EXISTING MASONRY COMPRESSIVE STRENGTH= **0.42** N/mm2
ENHANCEMENT UNDER BEARING =>0.42*1.5= 0.63 N/mm2 FOR UNFACTORED LOAD
Permitted stress => .63*1.5= **0.945** N/mm2 FOR FACTORED LOAD
203x133x25 UB DESIGN FOR **0.945** N/mm2
REACTION(ULS) = **24** KN
bearing **100** mm beam width = 133.4 mm
stress under beam = **1.80** N/mm2 **OK**
EFFC 100 mm
pad width= **100** mm Pad l= **300** mm
stress under PAD = 24*1000/(100* 300) **0.80** N/mm2 **PASS**
USE 300 X 100 X 215 DP PADSTONE

PADSTONE FB1.01



EXISTING MASONRY COMPRESSIVE STRENGTH= **0.42** N/mm2
ENHANCEMENT UNDER BEARING =>0.42*1.5= 0.63 N/mm2 FOR UNFACTORED LOAD
Permitted stress => .63*1.5= **0.945** N/mm2 FOR FACTORED LOAD
203x133x30 UB DESIGN FOR **0.945** N/mm2
REACTION(ULS) = **17** KN
bearing **100** mm beam width = 133.8 mm
stress under beam = **1.27** N/mm2 **OK**
EFFC 100 mm
pad width= **100** mm Pad l= **300** mm
stress under PAD = 17*1000/(100* 300) **0.57** N/mm2 **PASS**
USE 300 X 100 X 215 DP PADSTONE

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Project No:	23/54121	Sheet No:	73
Made By:	*OAM*	Revision:	
Date:	Nov-23	Checked By:	TG

Project: **34 BELGRAVE MEWS SOUTH**

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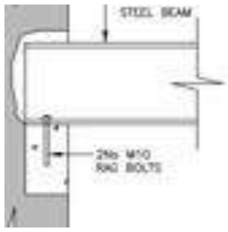
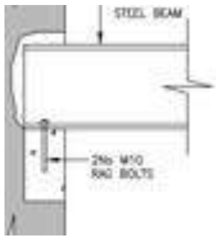
PADSTONE FB1.03



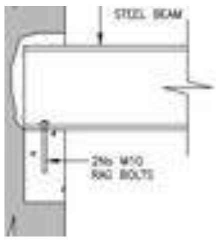
EXISTING MASONRY COMPRESSIVE STRENGTH= **0.42** N/mm2
ENHANCEMENT UNDER BEARING =>0.42*1.5= 0.63 N/mm2 FOR UNFACTORED LOAD
Permitted stress => .63*1.5= **0.945** N/mm2 FOR FACTORED LOAD
254x254x73 UC DESIGN FOR **0.945** N/mm2
REACTION(ULS) = **57** KN
bearing **100** mm beam width = 254 mm
stress under beam = **2.24** N/mm2 **OK**
EFFC 100 mm
pad width= **100** mm Pad l= **700** mm
stress under PAD = 57*1000/(100* 700) **0.81** N/mm2 **PASS**
USE 700 X 100 X 215 DP PADSTONE

PADSTONE FB1.05



EXISTING MASONRY COMPRESSIVE STRENGTH= **0.42** N/mm2
ENHANCEMENT UNDER BEARING =>0.42*1.5= 0.63 N/mm2 FOR UNFACTORED LOAD
Permitted stress => .63*1.5= **0.945** N/mm2 FOR FACTORED LOAD
203x133x30 UB DESIGN FOR **0.945** N/mm2
REACTION(ULS) = **53** KN
bearing **215** mm beam width = 133.8 mm
stress under beam = **1.84** N/mm2 **OK**
EFFC 100 mm
pad width= **100** mm Pad l= **600** mm
stress under PAD = 53*1000/(100* 600) **0.88** N/mm2 **PASS**
USE 600 X 100 X 215 DP PADSTONE

PADSTONE FB1.06



EXISTING MASONRY COMPRESSIVE STRENGTH= **0.42** N/mm2
ENHANCEMENT UNDER BEARING =>0.42*1.5= 0.63 N/mm2 FOR UNFACTORED LOAD
Permitted stress => .63*1.5= **0.945** N/mm2 FOR FACTORED LOAD
203x203x46 UC DESIGN FOR **0.945** N/mm2
REACTION(ULS) = **24** KN
bearing **215** mm beam width = 203.2 mm
stress under beam = **0.55** N/mm2 **OK**
EFFC 100 mm
pad width= **100** mm Pad l= **300** mm
stress under PAD = 24*1000/(100* 300) **0.80** N/mm2 **PASS**
USE 300 X 100 X 215 DP PADSTONE

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♦ **David Smith Associates** ♦ 8 Duncan Close ♦ Moulton Park ♦ Northampton NN3 6WL Tel: (01604) 782620 ♦ Fax: (01604) 782629 E-mail: northampton@dsagroup.co.uk	**Project No:**	23/54121	**Sheet No:**	74
	Made By:	*OAM*	**Revision:**	
	Date:	Nov-23	**Checked By:**	TG

Project: **34 BELGRAVE MEWS SOUTH**

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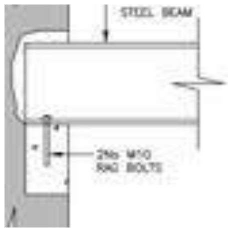
PADSTONE FB1.07 EACH



EXISTING MASONRY COMPRESSIVE STRENGTH= **0.42** N/mm2

ENHANCEMENT UNDER BEARING =>0.42*1.5= 0.63 N/mm2 FOR UNFACTORED LOAD

Permitted stress => .63*1.5= **0.945** N/mm2 FOR FACTORED LOAD

178x102x19 UB DESIGN FOR **0.945** N/mm2

REACTION(ULS) = **27** KN

bearing **215** mm beam width = 101.6 mm

stress under beam = **1.24** N/mm2 **OK**

EFFC 100 mm

pad width= **100** mm Pad l= **330** mm

stress under PAD = 27*1000/(100* 330) **0.82** N/mm2 **PASS**

USE 330 X 100 X 215 DP PADSTONE

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