Form

4 TAVISTOCK PLACE, LONDON, WC1

STRUCTURAL ENGINEER'S CONSTRUCTION METHOD STATEMENT

Job No: 142264

Date: 6th February 2015

Prepared by Chartered Engineer: Andy Ilsley C.Eng. M.I.Struct.E

Revision: P1

Residential

Commercial

Conservation

Retail

Education

Art

Hotels

Period

FORM Structural Design

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Preamble

This report has been prepared by Form Structural Design Ltd on the instructions of the project architects, Marek Wojciechowski Architects, acting on behalf of the client GFZ Investments and is for the sole use and benefit of the client. It has been prepared as a supporting document to the planning application for the redevelopment of the property at 4 Tavistock Place. The proposals involve extending the existing lower ground floor level back in to the rear garden area which will be lowered throughout to provide level access to the external area. This report presents an outline structural scheme for the construction of the new subterranean structure.

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ABOUT FORM SD

Form has undertaken over 300 projects involving subterranean development, both new build and retrospective, using numerous techniques and sequences of construction. This extensive design, site and local geology/hydrology experience has positioned the practice as one of London's leading subterranean engineering design consultants.

Many of our subterranean projects are in the London Boroughs of Camden, Westminster, and RBKC, making us familiar with the most recent requirements of subterranean development.

Form has designed multi-level basements using techniques including open dig, underpinning (mass and 'L' shaped R.C. special foundations), temporary and permanent steel sheet piling, temporary and permanent concrete piled retaining walls, top down construction and tunnelling.

TERMS OF REFERENCE

We were appointed by the client GFZ Investments to prepare a supporting Structural Design Statement in support of a Planning Submission for new development at 4 Tavistock Place, London, WC1H 9RA.

Site Information

Site Location, History, and the Existing Building

The site is located just off the south east corner of Tavistock Square and it is within the Bloomsbury Conservation Area. The property has a split level arrangement with 6 floors at the front of the property at levels set to align with original façade. At the rear of the property there is an additional level between lower ground floor and third floor which both align.

A desktop study has confirmed that there are no tube tunnels within the vicinity of the site and therefore it not be necessary to advise London Underground asset protection department to check alignments as agreed works will not affect any existing tunnels or access shafts.

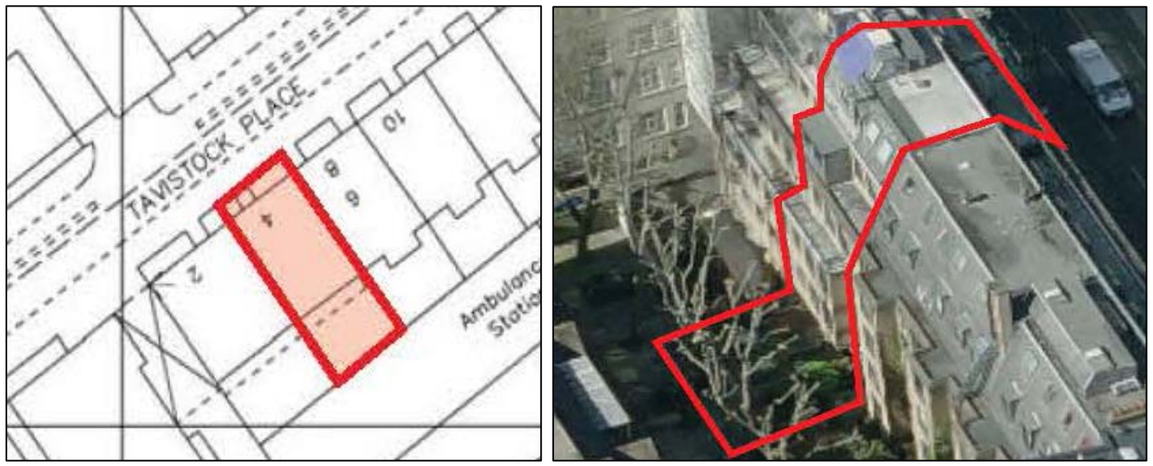

Figure 1: Site Location Plan and Aerial View

The original terrace was demolished in the 1970's. It is not clear why it was demolished but a historic image confirms that at the time the terrace was used a single hotel. It is likely that the building fell in to a state of disrepair that there was no merit in retaining the existing fabric.

The existing terrace that extends from 2 – 14 Tavistock Place was rebuilt in its entirety in 1975 with a facsimile façade. It was Grade II listed the following year although nothing beyond the façade has any historical merit whatsoever. Figure 3 below illustrates some of archive drawings associated with the reconstruction.

- During our visual inspection it was observed that the existing structure is constructed as a reinforced concrete frame.
- The party walls are solid RC walls.
- Internally the lift shaft walls are also a structural RC element.
- The RC floor slabs span from side to side and take support from the lift shaft walls.
- The central spine wall is also a load-bearing RC element which supports the floor slabs and allows for the level changes between the front and the back of the building on all the lower levels.

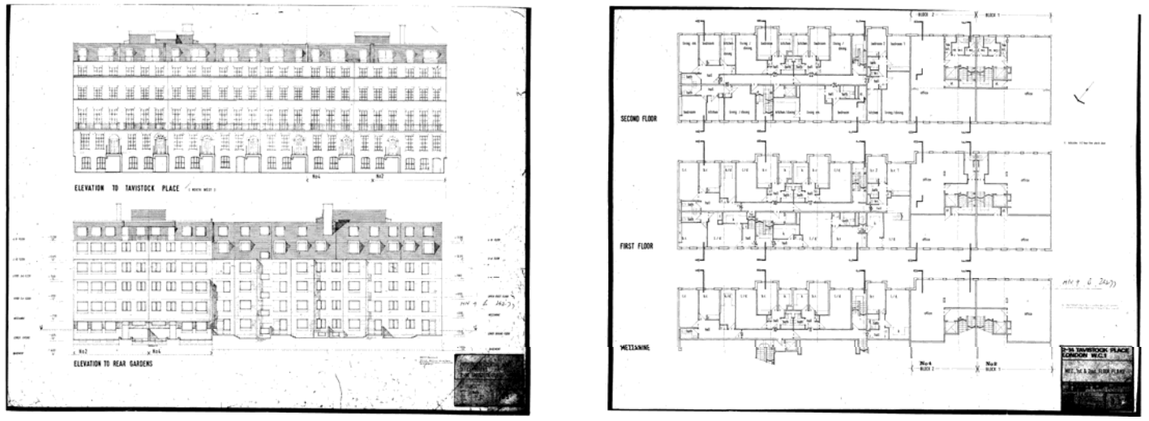

Figure 2: Examples of Historic Plans

Ground Conditions/Geology

According to British Geological Survey (BGS) map sheet 256**3** the site is underlain by the Lynch Hill Gravel Member over the London Clay Formation. In this area, it appears that the London Clay Formation is relatively thin (approximately 10-12m), and is underlain by the Lambeth Group at approximately 12mOD. The Lambeth Group is recorded to be approximately 15m thick and is underlain by the Thanet Sand Formation at approximately -5mOD, which in turn is underlain by the Chalk Group.

CGL Ltd have undertaken a Basement Impact Assessment which should be read in conjunction with this report. Within their report they identify a number of historical ground investigations within 200m of the site the logs are summarised below and are generally consistent with each other and the geology described above:

- Made Ground ranging in thickness from absent to between 0.2m and 2.4m.
- Lynch Hill Gravel Member beneath between 3.0m to 4.6m thick.
- London Clay was encountered between 3.2 to 5.9 metres below ground level.
- Lambeth Group was encountered at between 16.5 and 18.7mbgl

Generally shallow groundwater was encountered within the Lynch Hill Gravel Member resting above the top of the impermeable London Clay Formation. This concurs with CGL's previous experience in the area.

Site Information

Boundary Conditions

The site is situated on the southern side of Tavistock Place within the rebuilt terrace. It is adjoined by Number 2 Tavistock Place to the west and Number 6 Tavistock Place to the east.

North (Front) Boundary

- The northern boundary along the front of the site is with Tavistock Place. This boundary is not impacted by the proposed works which are all to the rear of the site.

South (Rear) Boundary

- Along the rear of the site a masonry wall at the back of the garden forms the southern site boundary with the parking bays serving Thackeray House.
- The wall is approximately 3.5m high. It is freestanding, and it runs the length of the adjoining boundaries also.
- Refer to pictures 2, 3, 4, and 5 opposite.

West Boundary

- Internally the western boundary with Number 2 Tavistock Place is formed by an RC wall. At this stage prior to intrusive investigations we assuming that the wall is founded on a mass concrete strip footing. During the recent refurbishment of Number 2 the planning drawings that we have been able to review indicate that the internal lower ground floor slab has been dropped by 300mm. This would appear consistent with the assumption of an existing strip foundation.
- The external area to the rear of Number 2 has been lowered from the original level to the lower ground floor level in exactly the same manner that we are proposing. Confirmation of the details is subject to investigations on site although this was almost certainly achieved with reinforced L shared underpinning designed to retain the earth (on our site) behind.
- Refer to pictures 4, and 5 opposite which show the fence positioned above the underpinning.

East Boundary

- Internally the eastern boundary with Number 6 Tavistock Place is formed by an RC wall. At this stage prior to intrusive investigations we assuming that the wall is founded on a mass concrete strip footing.
- The external area to the rear of Number 6 has not been lowered so there is no level change across the boundary which is formed by a wooden fence sat in front of a masonry wall approximately 2.0m high.
- Refer to pictures 1 and 6 opposite.

Figure 3: Photographs Indicating the Rear Boundary Conditions

Development Proposals

Subterranean Construction

The proposals involve extending the existing lower ground floor level back in to the rear garden area which will be lowered throughout to provide level access to the external area. The structural proposals are described on the drawings contained within Appendix A of this report. They have been developed by Form SD in conjunction with the architects to address the specific site constraints and characteristics including:

- The ground conditions
- The support to the proposed structures above
- The stability of the neighbouring boundary retaining walls
- Health and Safety considerations
- The physical site constraints

Retaining Boundary Structures

To construct the external lower different structural solutions have been identified for the design and construction of the retaining walls along each boundary. These solutions are described below and described in detail on the structural drawings.

The Western Boundary – Mass Concrete Underpinning

As it is proposed to excavate to a level slightly below the current level at Number 2 it will be necessary to install underpinning beneath the existing underpinning that was installed to retain the earth on our site.

These underpins will extend up from a level below our proposed formation level to the underside of the existing underpins. As the depth of these underpins is less than 1.0m the lateral earth loading will be limited and therefore it is possible to provide unreinforced simple mass concrete underpins that are restrained from sliding and overturning by a combination of the new lower ground floor slab and the vertical load from the structure above..

All underpinning will be carried out following a fixed hit and miss sequence agreed beforehand and designed to consider all the necessary propping to the underside of the wall and the shoring of the excavations that will be required in the temporary condition.

The works will be carried out by an experienced groundworker to best practice and in accordance with the Form SD drawings. On this basis we would not expect significant movements and the structures above will therefore remain stable and unaffected by the works. A contractor's method statement will be required at this stage for comment by the engineer and party wall surveyors.

The Eastern Boundary – RC Retaining Wall

As it is proposed to excavate a to a full storey height below the current level at Number 6 (which unlike Number 2 has not been previously lowered) it will be necessary to install underpinning beneath the existing masonry boundary wall. The underpinning will be installed in a sequential manner exactly as the underpinning along the western boundary. The underpinning is designed to take the load of the retained masonry wall above and all lateral loading from the retained earth behind.

Construction of the underpinning will be in short sections carried out in a fixed hit and miss sequence agreed beforehand. In the temporary condition shoring to the excavation will ensure that stability is maintained. In the permanent condition the RC underpins are designed to act as a cantilever to ensure minimal deflection at the head. The connection to the new lower ground floor slab will act to prevent sliding.

The Northern Boundary – Inset RC Retaining Wall

Rather than install underpinning beneath the existing boundary wall foundation it is proposed to construct an RC retaining wall in the same manner as described for the eastern boundary. This wall will also be installed in a sequential manner in short sections in the same manner as the underpinning. The wall is designed to take all lateral loading from the retained earth behind and a surcharge due to the weight of the boundary wall.

Construction of the wall will be in short sections carried out in a fixed hit and miss sequence agreed beforehand. In the temporary condition shoring to the excavation will ensure that stability is maintained and there is no movement to the boundary wall foundation. In the permanent condition the RC wall is designed to act as a cantilever to ensure minimal deflection when connected to the new lower ground floor slab which also acts to prevent sliding.

Temporary Works

The previous sections describe the methods for the construction of the basement and the associated temporary works required to maintain the stability of the excavation and the adjacent properties.

The temporary works will be designed by a specialist. No works on site requiring the installation of any temporary works will commence on site without all the necessary drawings, calculations, and method statements in place which will require approval from the Structural Engineer. The envisaged construction sequence including the installation and removal of all temporary works is outlined on the Outline Construction Sequence drawings contained within Appendix A of this report.

Potential Ground Movement

The underpinning and retaining wall installation described in the previous section may cause localised movement to the earth adjacent along the boundaries.

As it is not proposed to excavate beneath the existing lower ground floor level the risk of earth movement is limited to the rear boundary wall only. This is expected to be minimal and movement will be suppressed by the stiffness of the wall above. Furthermore from experience this can be mitigated by appointing a suitably experience Contractor familiar with propping techniques and sequential operations.

As a result we anticipate that should any damage occur to the wall it will be limited to Category 0 (Negligible; hairline cracks of less than 0.1mm) based on the Boscardin and Cording / Burland and Potts Building Damage Classification Table found within Appendix B of this report.

Site Management

This section of the report has been produced at planning stage and before the main contractor has been fully appointed. It sets out the systems and procedures that the Contractor will utilise in controlling the construction operations on site, to ensure progress of the project in the most safe and efficient manner possible and to minimise impacts on the local environment and surrounding amenity.

Tendering contractors will be made aware of the contents below (alongside any planning conditions). Once planning permission is granted, the appointed contractor will be responsible for the submission of a Construction Traffic Management Plan prior to commencement of development.

Excavation of Soil

The soil will be excavated and removed using micro excavators and a conveyor system running to street level. Refer to the Marek Wojciechowski Architects; Construction Management Plan for further details.

Prior to works commencing, all neighbouring occupiers will be consulted to ensure that the construction process results in minimal disruption/disturbance. In particular, all reasonable endeavours will be made to organise vehicle arrivals/departures to avoid peak usage for neighbours i.e. early mornings, and early evenings.

The street adjacent to the Tavistock Place will remain open to the public throughout. It will be cleaned each evening and the frequency of vehicle movement will be confirmed by the chosen contractor and approved by the council before works commence.

Prior to the commencement of the works the specialist ground works contractor will provide detailed method statements for all aspects of the construction for approval by the engineer. These statements will address:

- All the site specific procedures described in the previous sections to necessary to minimises any noise and vibration that may affect the neighbouring properties.
- Construction requirements for temporary propping, movement monitoring, and waste disposal.

Throughout the duration of the works the engineer will also make site visits at regular intervals to ensure that construction is being progressed safely and in accordance with the agreed methods and design information.

Rubbish Removal and Recycling

An important part of the site management process involves site cleansing, rubbish removal and recycling.

To reduce and manage site waste:

- We will ensure that all material removed from site is taken to waste recycling stations and separated for recycling where possible. Records of the waste recycling will be provided by the recycling stations.
- Segregate waste types to facilitate recycling activities.
- Ensuring that all Duty of Care and other legal requirements are complied with during the disposal of wastes.
- Consulting with suppliers to determine correct / appropriate disposal routes for waste products and containers.
- It will be the responsibility of each contractor to keep the site area under his control safe from build-up of rubbish.

Local Environmental Considerations

The contractor will join the Considerate Contractors scheme.

Construction operations are likely to have impact on residential amenity on a day to day basis, it is our intention to minimise the impact that the construction process could cause to the Local Environment and the neighbouring community. All care will be taken not to cause the primary environmental nuisances, noise and dust pollution. Below are actions that will be carried out to abate these problems.

Reduction in noise disruption will be achieved by:

- Coordinated delivery times to avoid peak traffic times.
- Ensuring all plant has sound reduction measures (mufflers, baffles or silencers)
- Strict adherence to the site working hours.

Reduction in dust pollution and other airborne debris will be achieved by:

- Ensure that all materials transported to and from site are in enclosed containers or fully sheeted.
- During dry periods the works are to be damped down to control the generation of dust.
- Ensuring materials have a minimum of packaging.
- Ensuring all polystyrene and similar lightweight materials are weighted down
- Making sure all dust generating materials are adequately packaged.

In addition to the above provisions the following measures will be taken to reduce any further negative effects on the environment:

- Ensuring all contaminants kept on site are safely stored with the necessary procedures put in place for leaks and spillages etc.
- All temporary lighting, whether for the construction itself or for construction traffic, will be directional to ensure minimal light spillage across the site. The lighting will only be used as necessary during operational working hours.

Environmental issues must be treated seriously and must demonstrate good management practices are implemented to minimise the effects of noise and dust on the environment and local community.

Appendix A

Preliminary Form Structural Drawings

Document No.	Title	Revision
142264 L(00)01	Existing Lower Ground Floor Plan	P1
142264 L(23)01	Proposed Lower Ground Floor Plan	P1
142264 A(23)01	Existing and Proposed Boundary Sections 01 and 02	P1
142264 A(23)02	Existing and Proposed Boundary Sections 03 and 04	P1
142264 A(23)03	Existing and Proposed Boundary Sections 05 and 06	P1
142264 A(23)04	Existing and Proposed Boundary Section 07	P1
142264 TW01	Outline Construction Sequence Sheet One	P1
142264 TW02	Outline Construction Sequence Sheet Two	P1

Appendix A

Preliminary Form Structural Drawings

Document No.	Title	Revision
142264 L(00)01	Existing Lower Ground Floor Plan	P1
142264 L(23)01	Proposed Lower Ground Floor Plan	P1
142264 A(23)01	Existing and Proposed Boundary Sections 01 and 02	P1
142264 A(23)02	Existing and Proposed Boundary Sections 03 and 04	P1
142264 A(23)03	Existing and Proposed Boundary Sections 05 and 06	P1
142264 A(23)04	Existing and Proposed Boundary Section 07	P1
142264 TW01	Outline Construction Sequence Sheet One	P1
142264 TW02	Outline Construction Sequence Sheet Two	P1

Notes

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PARKING TO 1 - 50 THACKERARY HOUSE
OFF HERBRAND STREET

BOUNDARY WALL

PARTY WALL

PARTY WALL

BOUNDARY WALL

EXTG RC UNDERPINNING TO REAR LIGTHWELL

LIGHTWELL

EXTG RC UNDERPINNING TO REAR LIGTHWELL

EXTG RC COLUMN

ASSUMED GROUND BEARING RC SLAB

EXTG FFL +21.54

EXTG LIFT SHAFT

6 TAVISTOCK PLACE LOWER GROUND FLOOR

2 TAVISTOCK PLACE LOWER GROUND FLOOR

LOW

HIGH

UP

DOWN

EXTG FFL +22.05

ASSUMED GROUND BEARING RC SLAB

UP

UP

EXTG FFL +22.05

Manhole

BOUNDARY

BOUNDARY

TAVISTOCK PLACE

6 TAVISTOCK PLACE

4 TAVISTOCK PLACE

2 TAVISTOCK PLACE

PARTY WALL

PARTY WALL

EXISTING LOWER GROUND FLOOR PLAN

SCALE 1:50 @ A1, 1:100 @ A3

0m 1.0m 2.0m 3.0m 4.0m 5.0m

NOT FOR CONSTRUCTION

Rev.	Date	Amendment	Drawn	Chkd
P1	06.02.15	PRELIMINARY ISSUE	SPM	SP

Drawing Status: PRELIMINARY

Form

Job Title
4 TAVISTOCK PLACE
HOLBURN
WC1H 9RA

Drawing Title
EXISTING
LOWER GROUND FLOOR PLAN

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Date	Scale	Drawn	Checked
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Job No.	Drawing No.	Revision
142264	L(00)01	P1

X DENOTES RC 'L' UNDERPINS. TO BE INSTALLED IN A HIT AND MISS SEQUENCE (UNO) AS SHOWN ON PLAN. MAXIMUM WIDTH 1m. UNDERPINNING TO SUIT WIDTH OF WALL

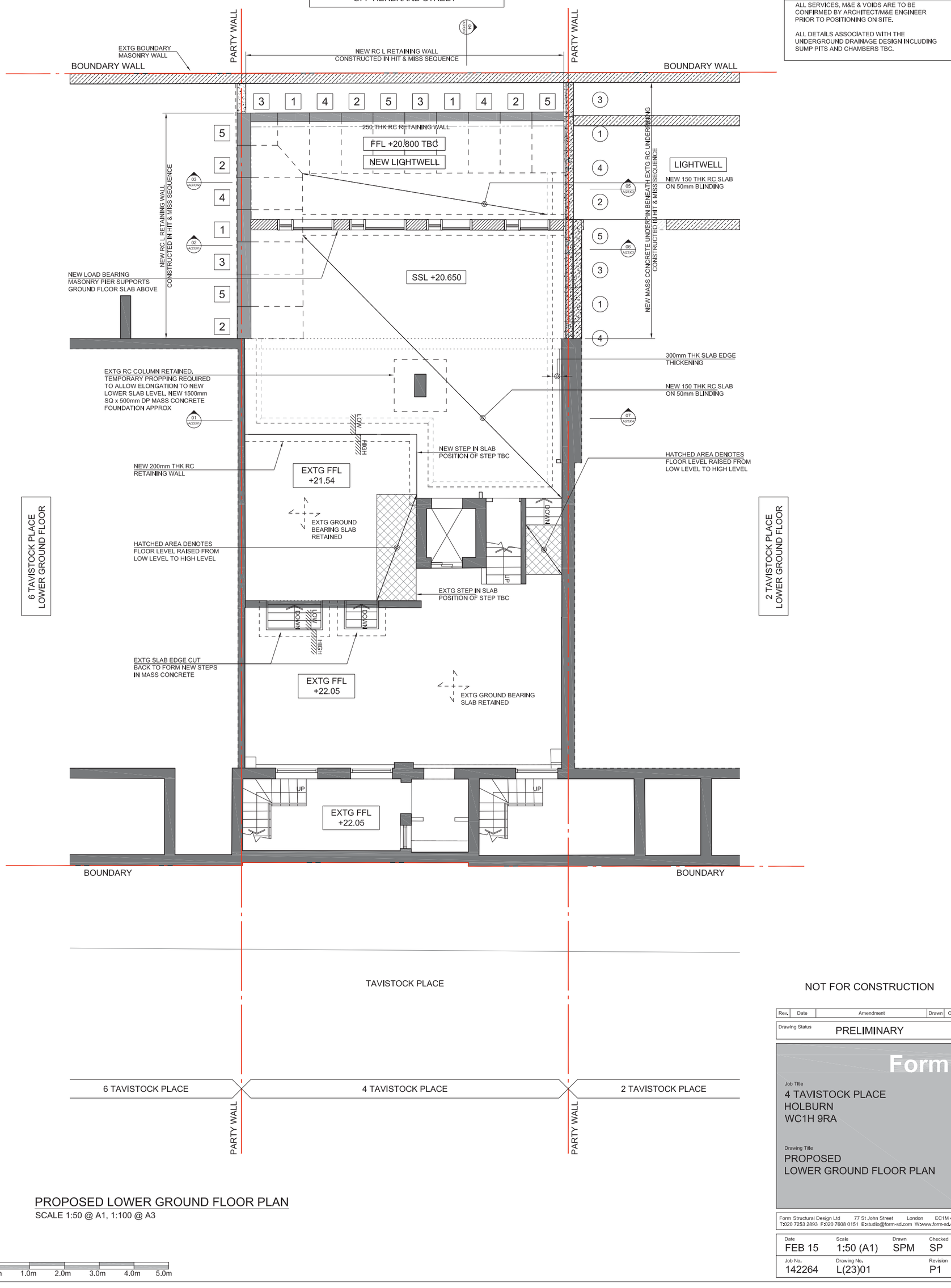
(X) DENOTES MASS CONCRETE UNDERPINS. TO BE INSTALLED IN A HIT AND MISS SEQUENCE (UNO) AS SHOWN ON PLAN. MAXIMUM WIDTH 1m. UNDERPINNING TO SUIT WIDTH OF WALL

SERVICES

ALL SERVICES, M&E & VOIDS ARE TO BE CONFIRMED BY ARCHITECT/M&E ENGINEER PRIOR TO POSITIONING ON SITE.

ALL DETAILS ASSOCIATED WITH THE UNDERGROUND DRAINAGE DESIGN INCLUDING SUMP PITS AND CHAMBERS TBC.

PARKING TO 1 - 50 THACKERARY HOUSE OFF HERBRAND STREET



PROPOSED LOWER GROUND FLOOR PLAN

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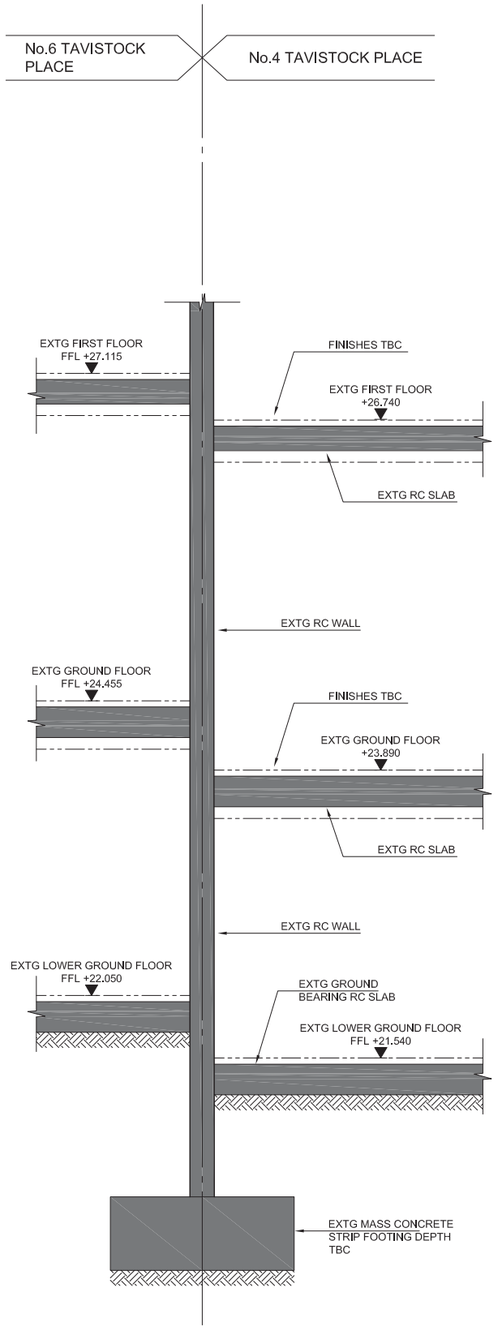

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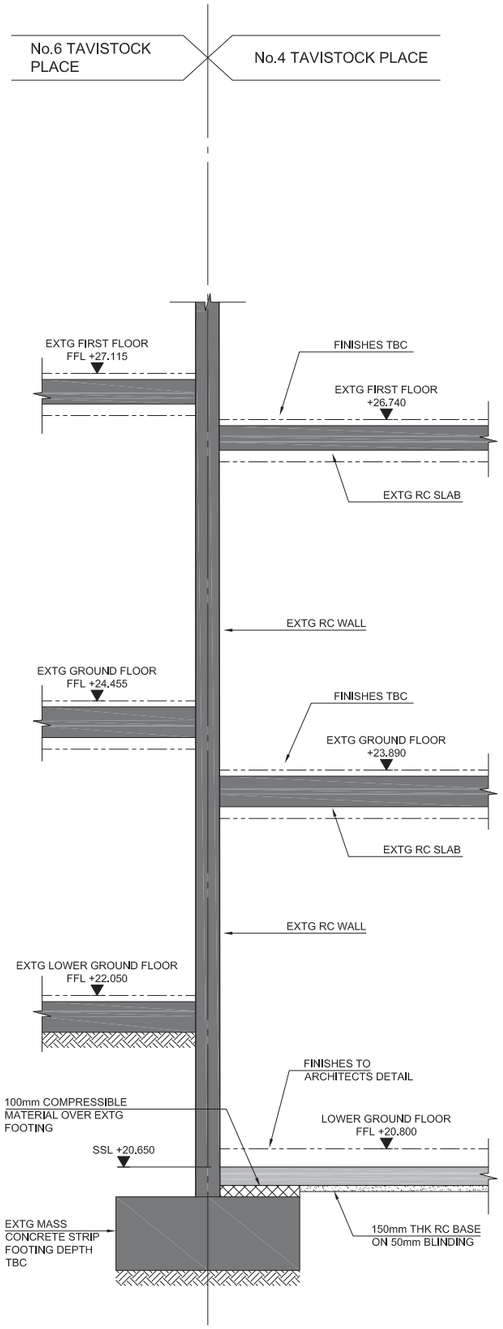

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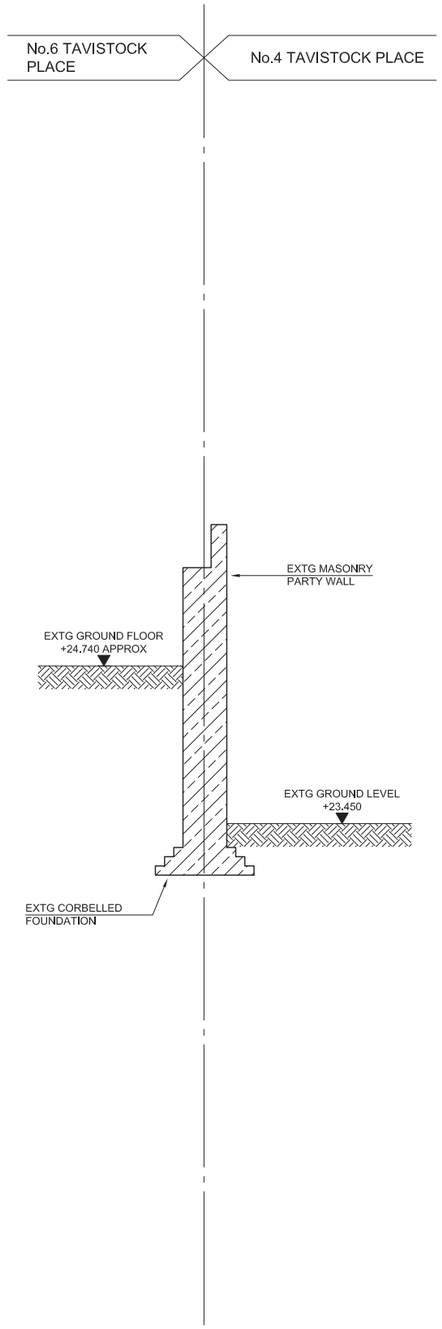

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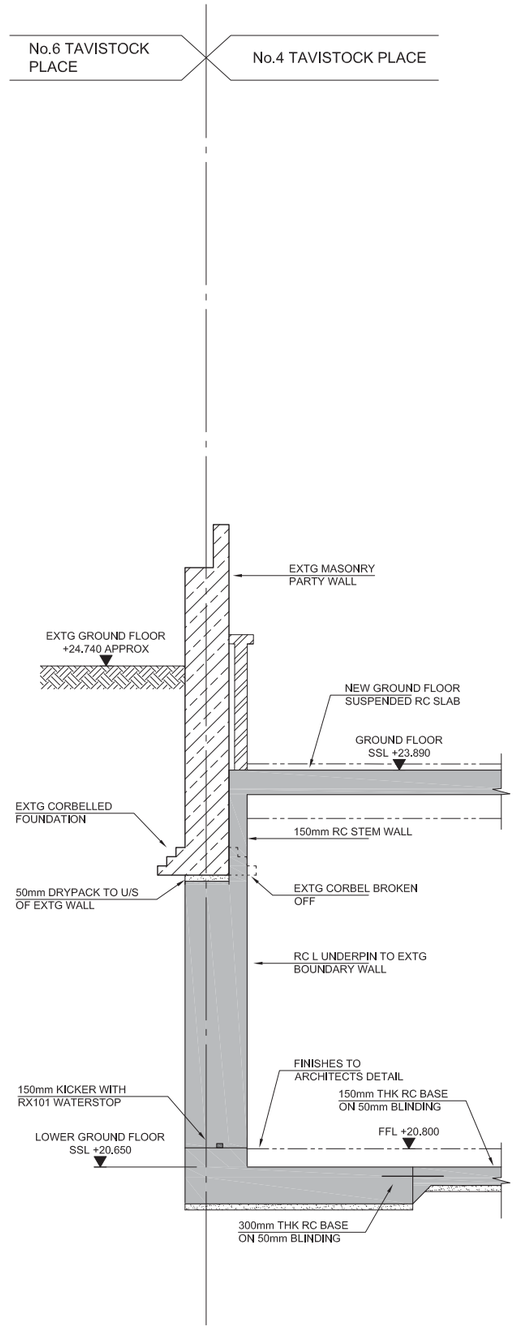

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WC1H 9RA

Drawing Title
BOUNDARY WALL SECTIONS 01 & 02

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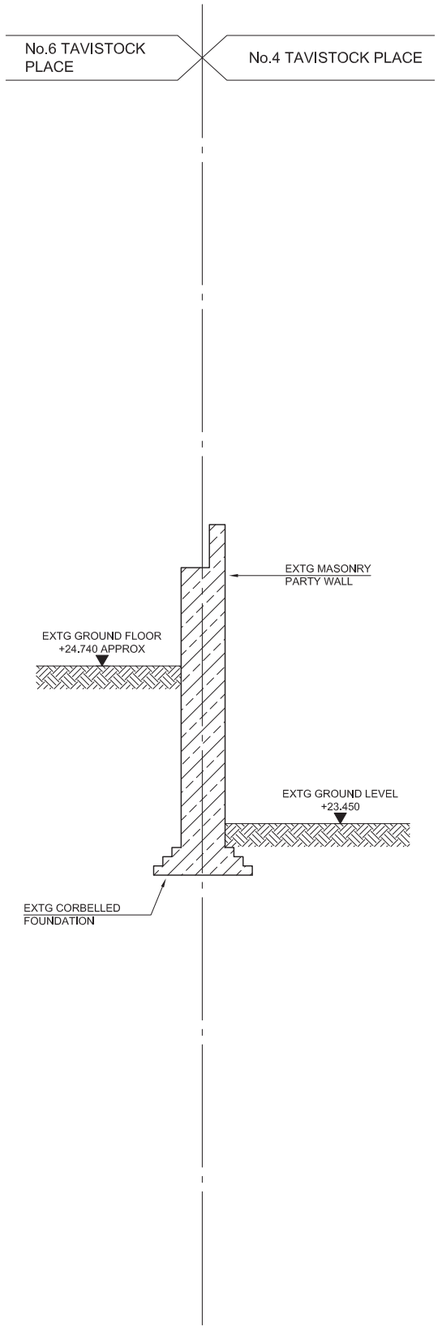
142264	A(23)01	P1



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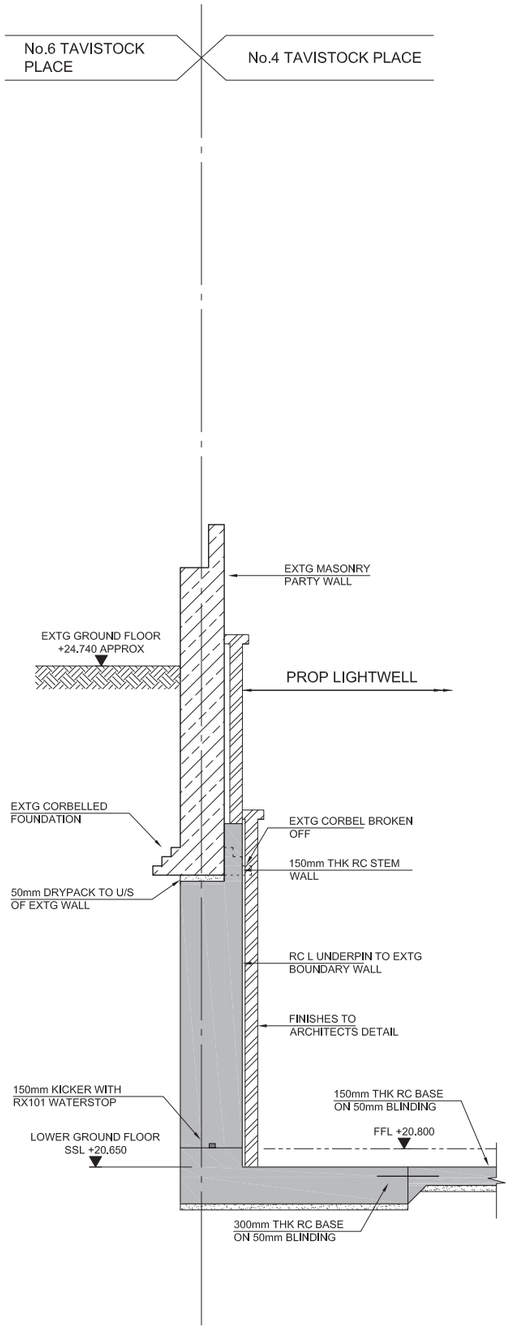

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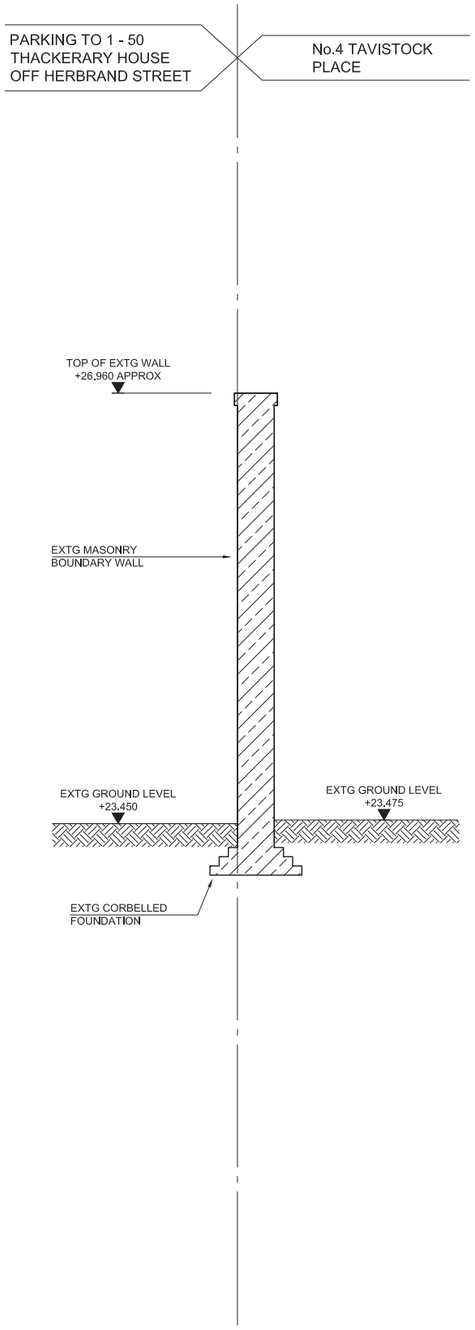

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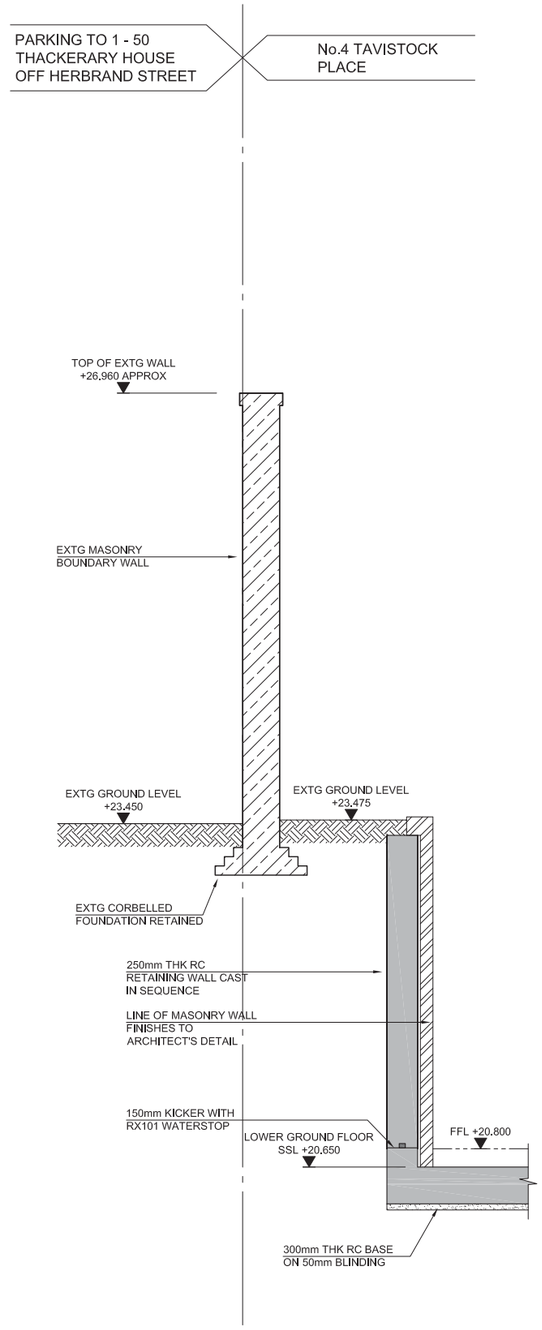

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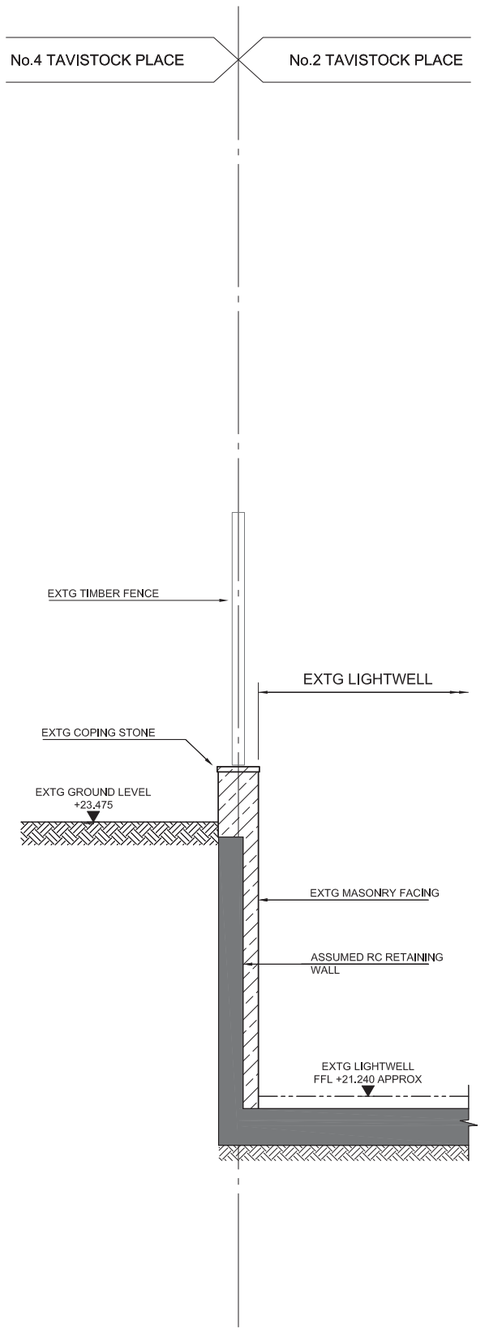

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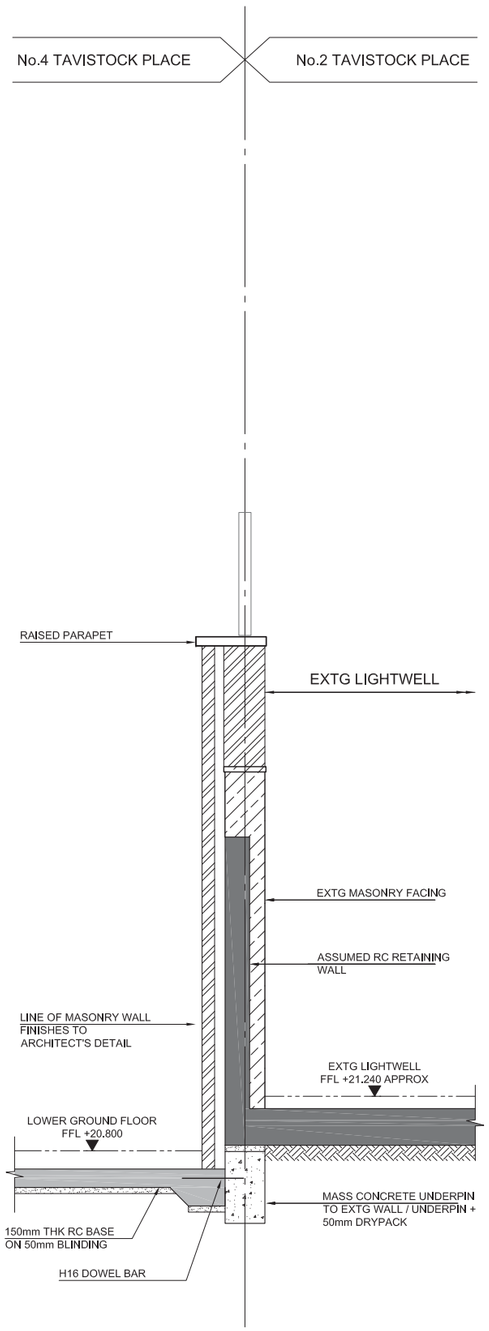

SECTION 05 - PROPOSED

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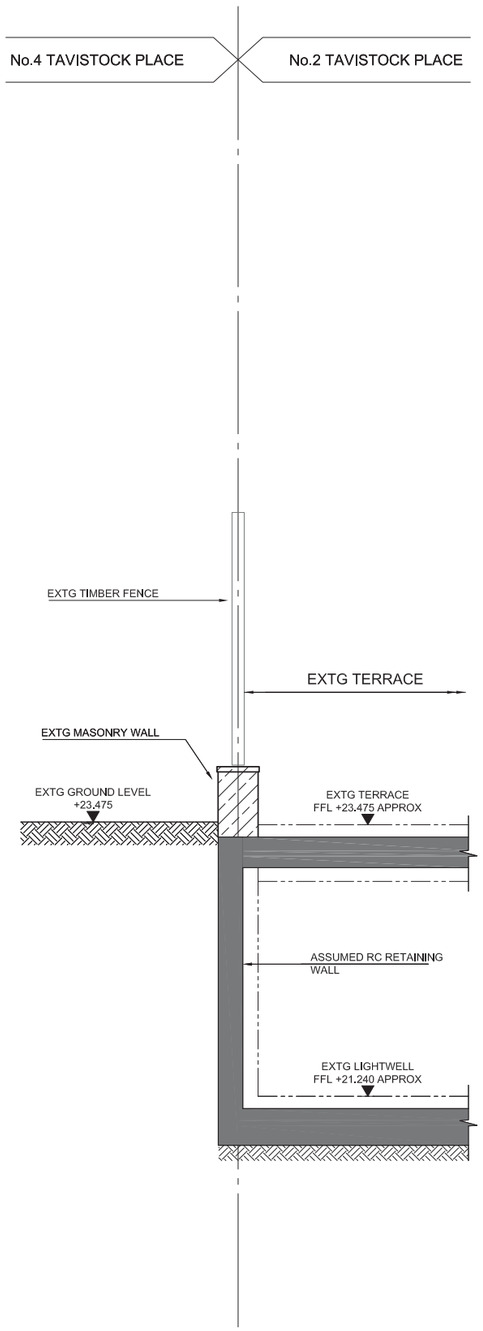

SECTION 06 - EXISTING

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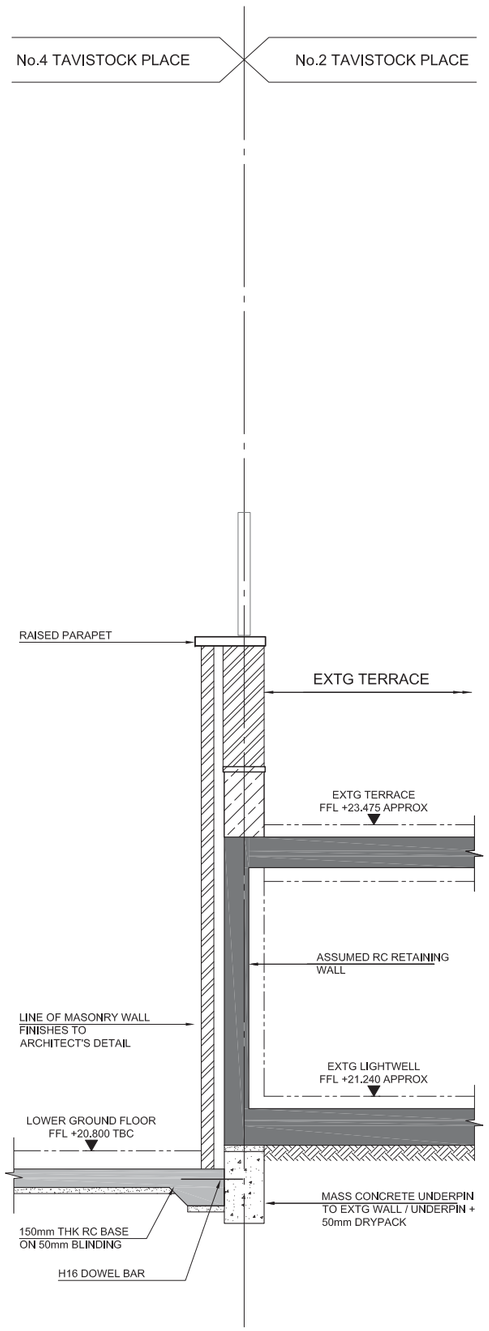

SECTION 06 - PROPOSED

SCALE 1:25 @ A1, 1:50 @ A3

0m 0.5m 1.0m 1.5m 2.0m 2.5m

Notes

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Job Title
4 TAVISTOCK PLACE
HOLBURN
WC1H 9RA

Drawing Title
BOUNDARY WALL SECTIONS
05 & 06

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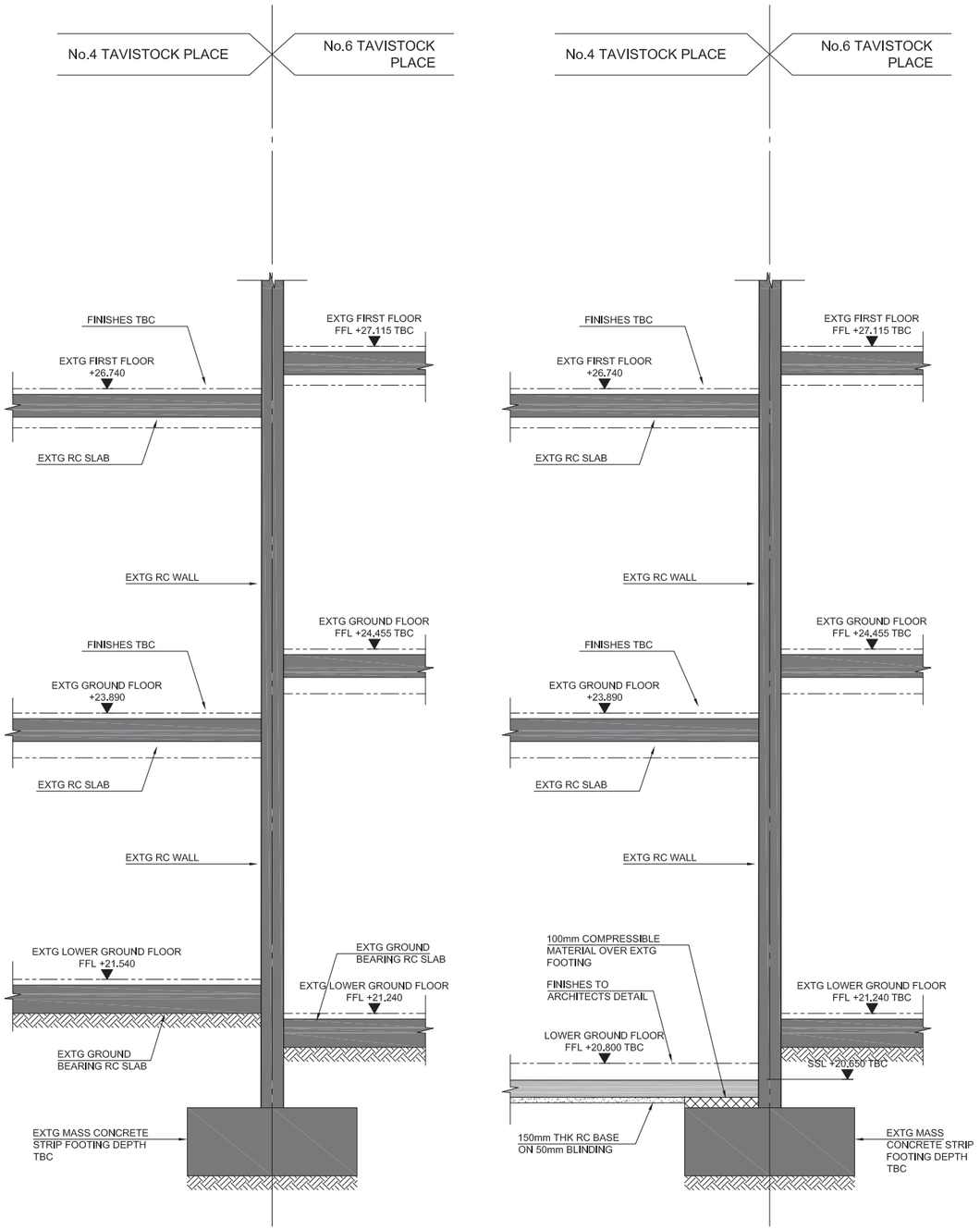
142264	A(23)03	P1



SECTION 07 - EXISTING

SCALE 1:25 @ A1, 1:50 @ A3

SECTION 07 - PROPOSED

SCALE 1:25 @ A1, 1:50 @ A3

0m 0.5m 1.0m 1.5m 2.0m 2.5m

Notes

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4 TAVISTOCK PLACE
HOLBURN
WC1H 9RA

Drawing Title
BOUNDARY WALL SECTION 07

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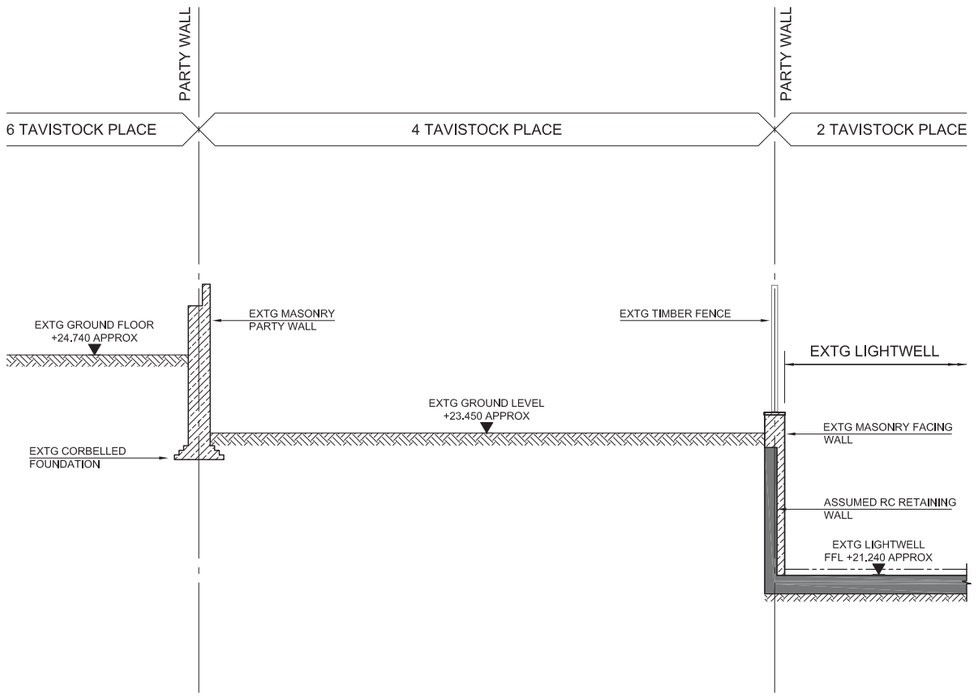
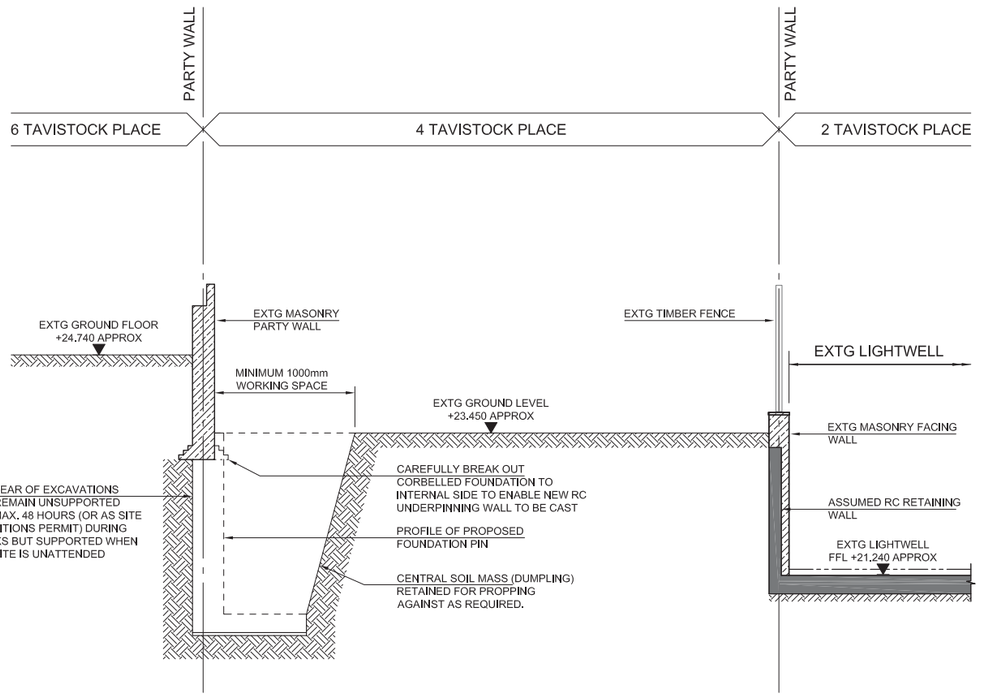
142264	A(23)04	P1



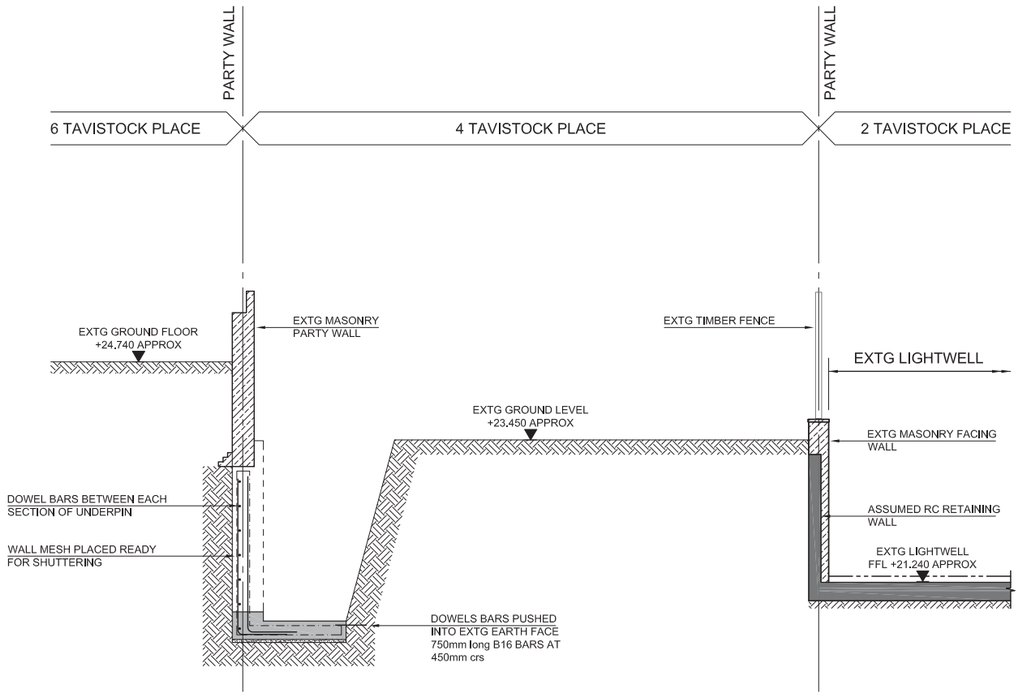
EXISTING CROSS SECTION

SCALE 1:50 @ A1, 1:100 @ A3



STAGE 1 - EXCAVATE UNDERPIN PITS

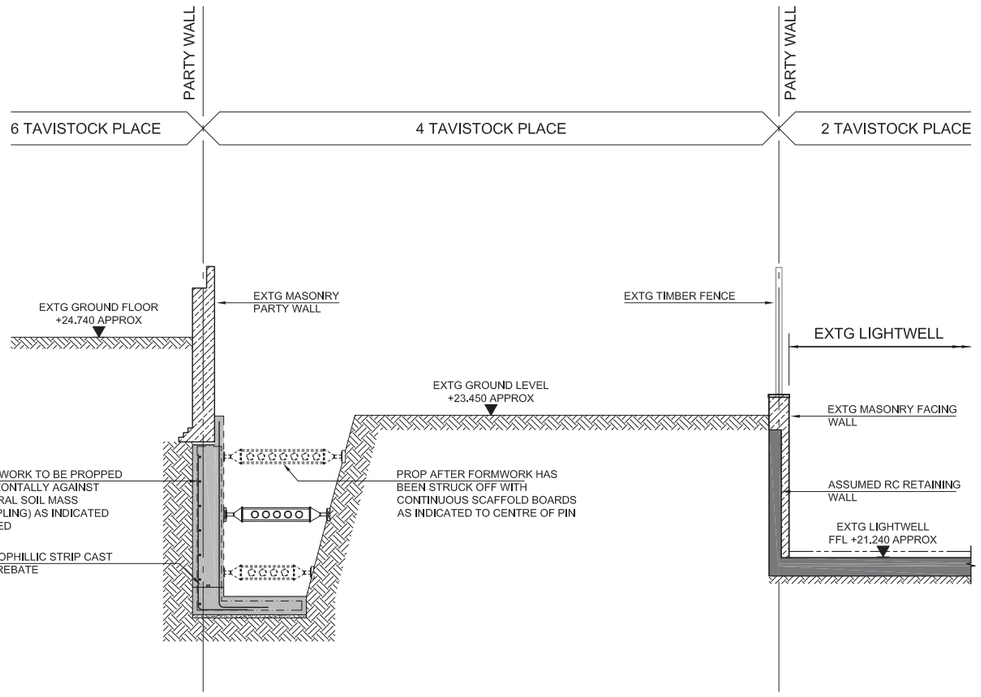
SCALE 1:50 @ A1, 1:100 @ A3



STAGE 2 - UNDERPIN REINFORCEMENT

SCALE 1:50 @ A1, 1:100 @ A3

0m 1.0m 2.0m 3.0m 4.0m 5.0m



STAGE 3 - CAST UNDERPIN

SCALE 1:50 @ A1, 1:100 @ A3

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Form

Job Title
4 TAVISTOCK PLACE
HOLBURN
WC1H 9RA

Drawing Title
OUTLINE CONSTRUCTION
SEQUENCE SHEET ONE

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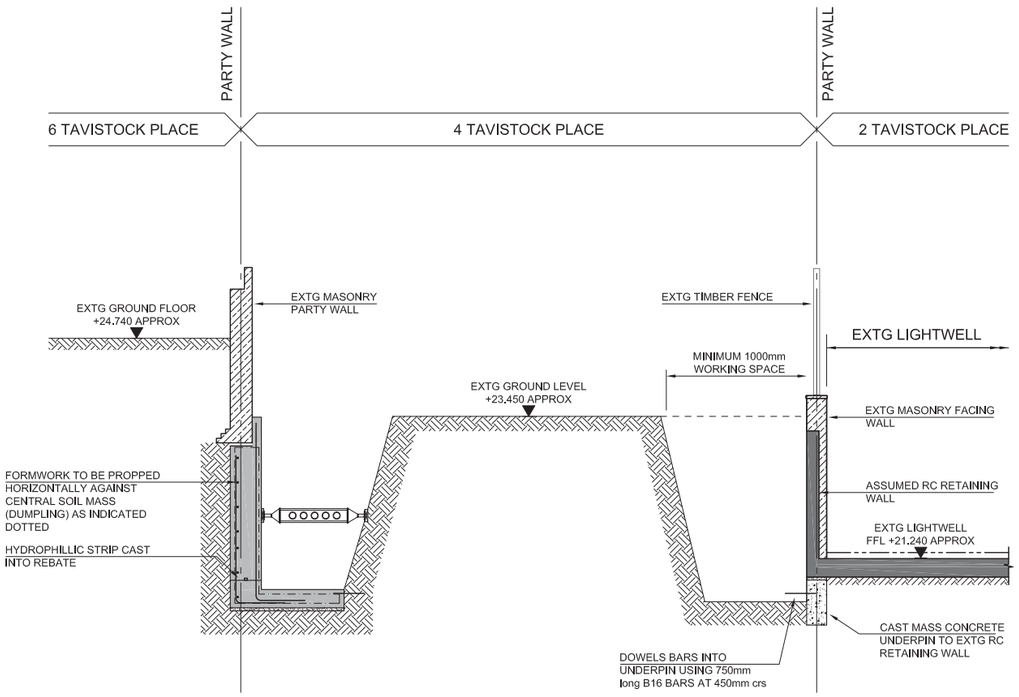
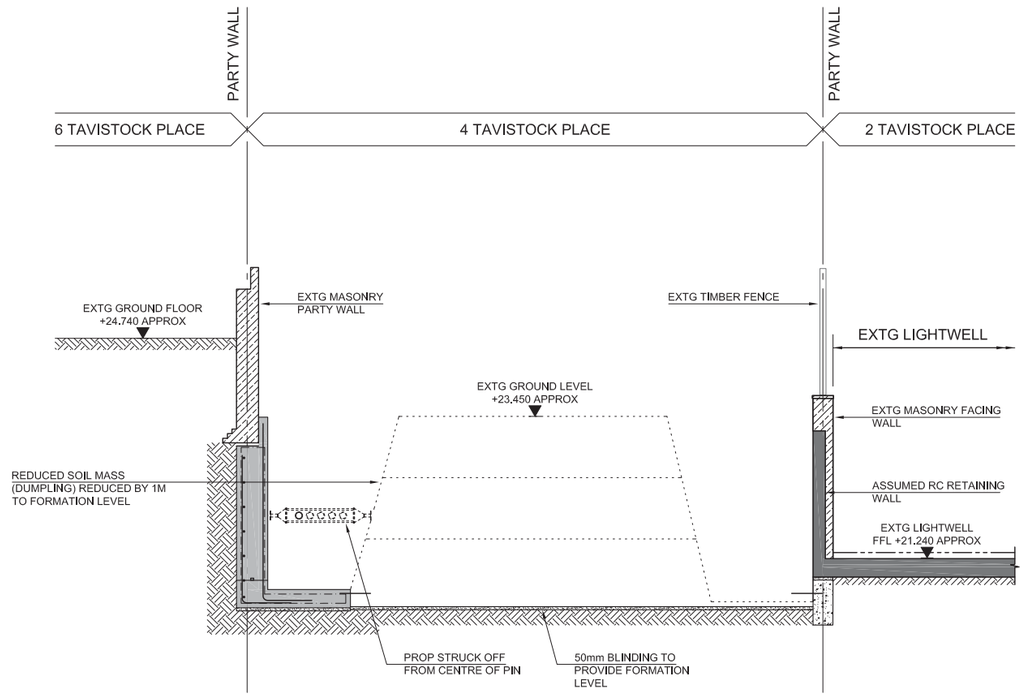
142264	TW01	P1



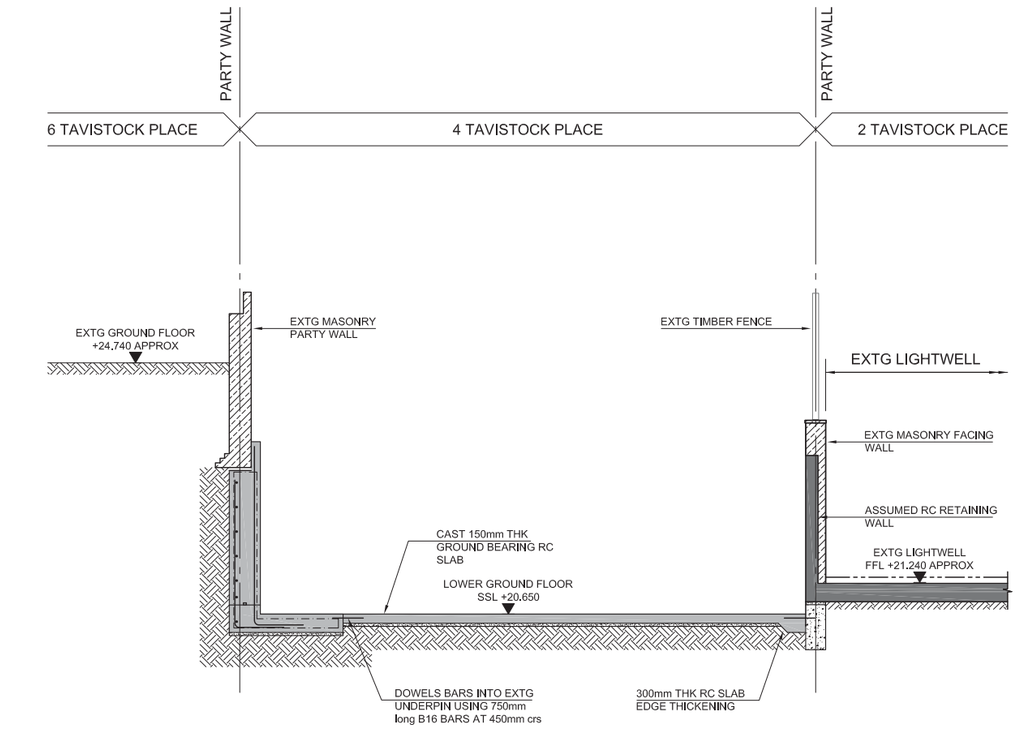
STAGE 4 - MASS CONCRETE UNDERPIN

SCALE 1:50 @ A1, 1:100 @ A3



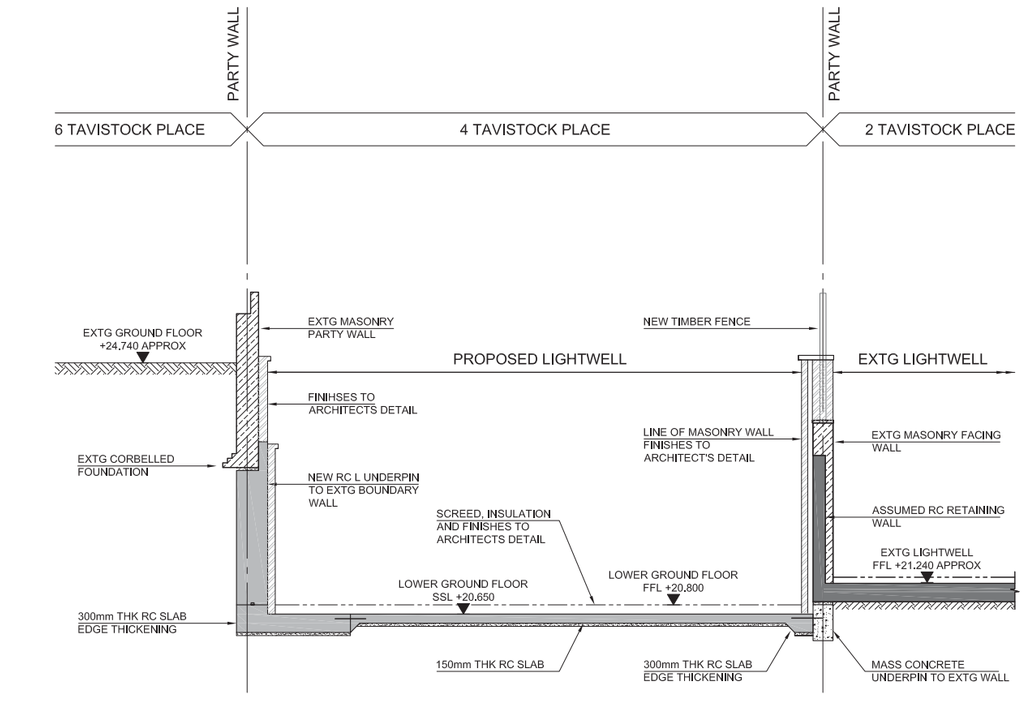
STAGE 5 - CENTRAL SOIL MASS EXCAVATION

SCALE 1:50 @ A1, 1:100 @ A3



STAGE 6 - CAST NEW SLAB

SCALE 1:50 @ A1, 1:100 @ A3



PROPOSED CROSS SECTION

SCALE 1:50 @ A1, 1:100 @ A3

0m 1.0m 2.0m 3.0m 4.0m 5.0m

Notes

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HOLBURN
WC1H 9RA

Drawing Title
OUTLINE CONSTRUCTION
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Job No.	Drawing No.	Revision
142264	TW02	P1

Appendix B

Building Damage Classification Table

During the later detailed design phases of the project a geotechnical specialist will undertake a ground movement analysis to confirm the foundation widths and limit movement to within the trigger values agreed under the Party Wall awards. Monitoring will be undertaken during the works to ensure these values are not exceeded.

Classification of visible damage to walls (after Burland et al*, 1977, Boscardin and Cording, 1989; and Burland, 2001)*

Category of damage	Description of typical damage (ease of repair is underlined)	Approximate crack width (mm)	Limiting tensile strain ε_{lim} (per cent)
0 Negligible	Hairline cracks of less than about 0.1 mm are classed as negligible.	< 0.1	0.0–0.05
1 Very slight	Fine cracks that can easily be treated during normal decoration. Perhaps isolated slight fracture in building. Cracks in external brickwork visible on inspection.	< 1	0.05–0.075
2 Slight	Cracks easily filled. Redecoration probably required. Several slight fractures showing inside of building. Cracks are visible externally and some repointing may be required externally to ensure weathertightness. Doors and windows may stick slightly.	< 5	0.075–0.15
3 Moderate	The cracks require some opening up and can be patched by a mason. Recurrent cracks can be masked by suitable linings. Repointing of external brickwork and possibly a small amount of brickwork to be replaced. Doors and windows sticking. Service pipes may fracture. Weathertightness often impaired.	5–15 or a number of cracks > 3	0.15–0.3
4 Severe	Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Windows and frames distorted, floor sloping noticeably. Walls leaning or bulging noticeably, some loss of bearing in beams. Service pipes disrupted.	15–25 but also depends on number of cracks	> 0.3
5 Very severe	This requires a major repair involving partial or complete rebuilding. Beams lose bearings, walls lean badly and require shoring. Windows broken with distortion. Danger of instability.	usually > 25 but depends on number of cracks.	

Notes

1. In assessing the degree of damage, account must be taken of its location in the building or structure.
2. Crack width is only one aspect of damage and should not be used on its own as a direct measure of it.