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**NEW APARTMENTS, WARREN COURT, LONDON N1**

Structural Engineer's Feasibility Report, Structural Alterations and Extensions

December 2022


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**CONTENTS**

## 1.0 INTRODUCTION

This report presents Michael Barclay Partnership LLP's proposals, as Structural Engineer, for the extension and refurbishment of the top floors of Warren Court, Warren Street, London N1 and:

- records the design criteria and performance parameters to which the new structure will be designed;
- reports on investigations and studies that have been carried-out;
- details our proposals and specification for the structural works;
- forms the Structural Statement, required by the London Borough of Camden at planning stage.

## 1.1 THE BRIEF

Our proposal is based on the planning drawings prepared by the architects, HUB, planning issue 2022, the Client's brief and design discussions with the project team. The existing building is to be retained and extended with the removal of the existing set-back single storey at 6th floor level, and reconstruction of a new single storey at 6th floor in lightweight construction which encompasses a footprint more than twice the size of the existing 6th floor, providing new apartments.

## 2.0 THE SITE

## 2.1 LOCATION

Warren Court (WC) is located on the north side of Warren Street, at the junction with Tottenham Court Road. The property is an apartment block, built with a primary structural frame, but clad in traditional brickwork, at the beginning of the1930's. The block is built above the Warren Street underground station.

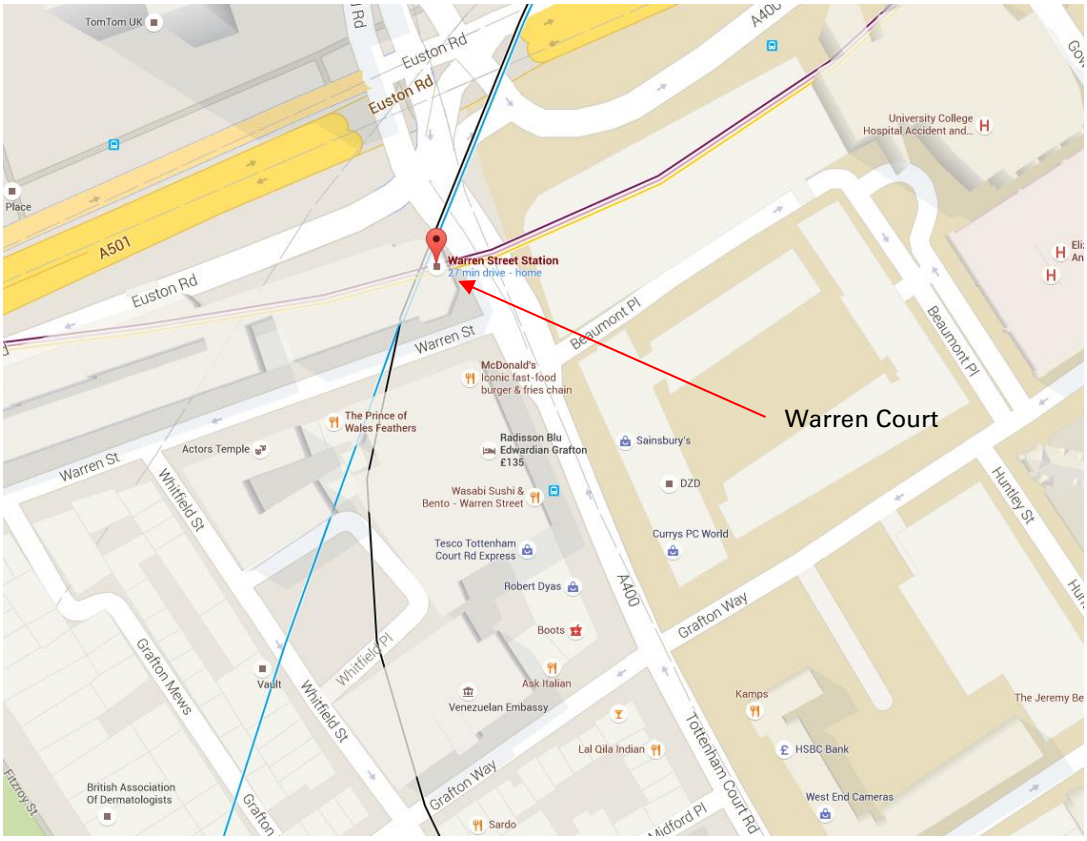


Figure 1: Site Location

## 2.2 SITE GEOLOGY

Although the proposals do not include any works to the foundations of the property, and it is envisaged that there is no net increase on the foundation loads of the apartment block, we have carried out a basic search on the geology of this area of London. The Geological Survey map of the area, Figure 2, indicates an area of Lynch Hill gravels local to Warren Court. Our experience of this material is that it is a high quality foundation material.

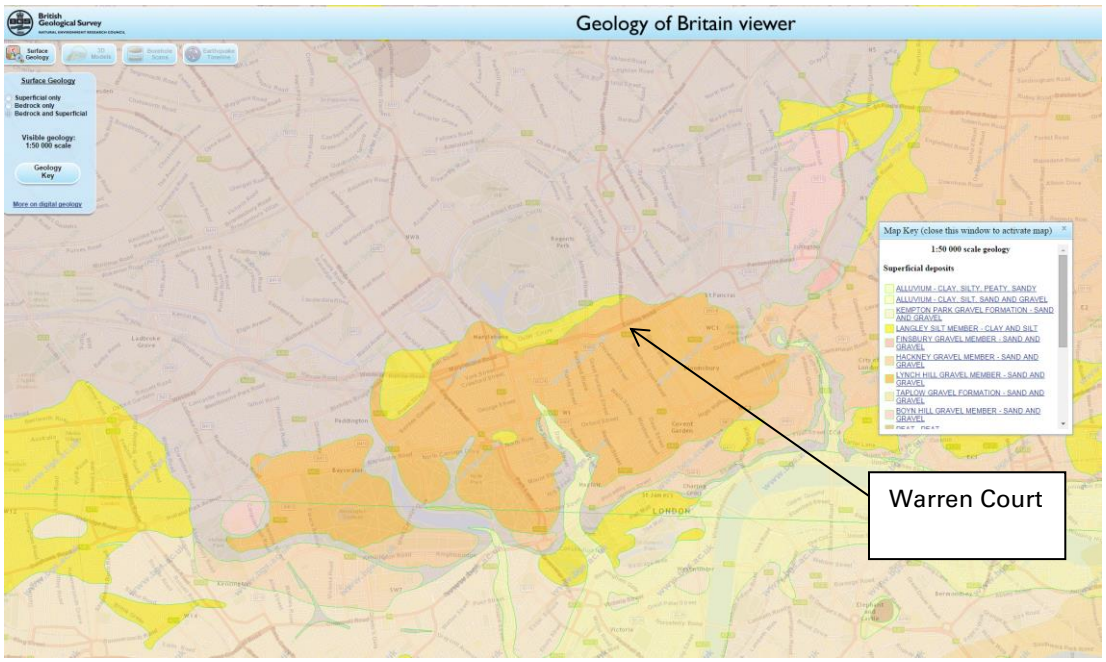


Figure 2: Extract from BGS maps indicating area of Lynch Hill Gravels..

## 2.3 BOUNDARIES AND ADJOINING STRUCTURES

The apartment building sits alone on its site but is abutted by the terrace of properties in Warren Street and Euston Road. The apartment block is built over the London Underground station at Warren Street. Two ventilation shafts extend from the station up to the existing roof level of the block.

## 3.0 OVERVIEW OF THE PROPOSED SCHEME

The proposed scheme comprises the demolition of the existing single storey 6th floor of solid masonry and concrete roof and floor slab construction, to be replaced with a new larger footprint single storey 6th floor to be constructed using modern lightweight steel framing techniques. This new 6th floor will contain four apartments and be covered by a sedum roof. The new layouts will be structured so as to transfer the new loads back into the primary structural lines of the existing apartment building. These lines have been determined by examination of existing floor plans and visits to the property.

## 3.1 EXTENSION CONSTRUCTION GENERALLY

The proposed 6th floor is to extend over a larger footprint than the existing and will be almost the same size as the floor below, being set-back from all perimeter walls, including those of the central lightwell.

As we are aiming to have a zero impact on the building below, the parameters considered in selecting a structural solution have included:

- ability to transfer all vertical loads from the new construction into the fabric of the existing building
- ability to transfer all horizontal loads from the new construction into the fabric of the existing building

The favoured method of constructing for the extension is to construct a transfer deck using hot-rolled steel beams and light-gauge steel (LGS) cold formed joists, fixed down to the existing frame structure. The walls and roof construction of the new 6th floor will be predominately LGS (metsec SFS framing or similar) with hot rolled steel elements introduced as required.

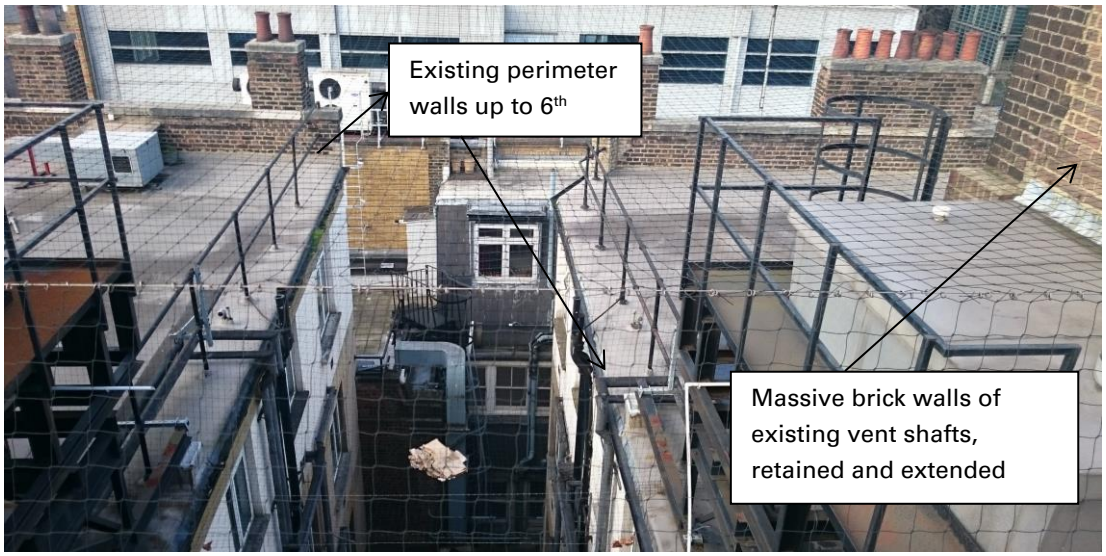


Photo 1: Existing light well and walls

Michael Barclay Partnership has considerable experience of the design and construction monitoring for roof extensions of the type suggested above. Recent projects have included the construction of a single level of penthouse accommodation on the top of similar blocks on the west side of Lowndes Square, Photo 2 and 5, and duplex penthouses on the east side of the same square. Both of these examples were carried out with neighbours in occupation below, the 5th floor having been vacated.

Photo 2: New penthouses above Lowndes Square

### 3.2 CO-ORDINATION OF EXTENSION AND EXISTING BUILDING

The construction of the new extension will be built off the new steel transfer beams within the structural zone of the existing 6th floor level that support the new lightweight extension. The existing concrete 6th floor, and masonry walls of the 6th floor, will be demolished. The transfer structures will pick up on the existing load paths between the 5th and 6th floor and send the loads down through the existing framing of the apartment block to the foundation level. The new extension will experience the same environmental loading and therefore the framing will not need to be altered or strengthened. However, a visual inspection by the structural engineer will be made at the start of the enabling works on site to ensure that any defects in the existing framing are rectified before the new extension is installed. A study will be made of the existing original wall and flues before the main works commence, to ensure that there is no disruption to the service of the apartments below.

### 3.3 MANAGEMENT OF THE WORKS

Our experience suggests that a degree of prefabrication is often advantageous in these situations. By using wall and floor panels the amount of time needed to get the larger structural construction materials from the street up to the terrace level will be reduced. A volumetric approach will also be considered during the detail design stage, however this may not be practical given the very central location.

Photo 3 and 4: Recent MBP volumetric extension in West London

## 4.0 DESIGN AND PERFORMANCE PARAMETERS

### 4.1 OCCUPANCY LOADS

The new structure elements have been designed in accordance with current British Standards, Codes of Practice and Building Regulations. The general design imposed loads for the buildings are as follows:

| Category | Use | Uniformly distributed load* (kN/m²) | Concentrated load* (kN) |
|---|---|---|---|
| A | All usages within self-contained single Family dwelling | 1.5 | 1.4 |

* defined by BS6399: PT 1

### 4.2 ENVIRONMENTAL LOADS

The buildings new walls and framing will be designed to support loads from the wind in combination with the occupancy loads scheduled above.
The wind net lateral load onto the structure was determined as 0.75kN/m$^2$ based on a worst case south-westerly wind direction.

### 4.3 PERMISSIBLE DEFLECTIONS

The design of new constructional steel elements will limit deflection and displacement in accordance to the following criteria:

| Steel Elements | Limit – under full load |
|---|---|
| Simple Beams | Span / 360 |
| Cantilever Beams | Span / 360 |

The above criteria must be read in conjunction with any performance specifications produced by MBP for individual works packages. Where brittle finishes are required the allowable deformations will be reduced.

### 4.4 FIRE RATING

The new structure is to be designed and detailed to achieve the minimum period of fire resistance required by Approved Document B, Table A2, i.e. 60 minutes for load-bearing, structural elements (beams columns framing). The roof structure, i.e. rafters and sheeting, does not carry a fire rating.

### 4.5 DISPROPORTIONATE COLLAPSE

The performance of the main apartment block will not be affected by the larger extension. In line with good practice the new transfer deck installed at 6$^{th}$ floor will be capable of supporting the collapse load of the 6$^{th}$ floor walls and roof.

### 4.6 SITE CONSTRAINTS

Warren Street is a wide street, but subject to parking on both sides of the road. It is a two way street. Vehicular access for site deliveries is limited and in addition the proposed building occupies the whole of the site. This means that there is no external space on the site to locate site accommodation and materials storage. In order to overcome the above constraints, a strategy will be developed in conjunction with the contractor and local authority to minimise the disruption to both vehicular and pedestrian traffic during the duration of the works. As mentioned earlier the use of prefabricated components may prove very helpful in this endeavour.

### 4.7 DESIGN CODES AND STANDARDS

The following documents are used:

- BS648 - Schedule Of Weights Of Building Materials
- BS6399 Pt 1 - Code of Practice for Dead and Imposed Loads
- BS6399 Pt 2 - Code of Practice for Wind Loads
- BS6399 Pt 3 - Code of Practice for Imposed Roof Loads
- BS5268:Pt 2 - Code of Practice for Structural use of Timber
- BS5628:Pt 1 - Code of Practice for Structural use of Masonry
- BS5950: Pt 1 - Design of Steel Structures
- The Building Regulations 1991 - Approved Documents A, B, C, E, H, K & N

## 5.0 STRUCTURAL PROPOSAL

## 5.1 EXISTING STRUCTURE

### 5.1.1 DEMOLITION

The existing building at 6th floor will be carefully taken down with the materials arising being stored on site in the first instance. The ventilation shafts will remain. The existing 5th floor area will be waterproofed and covered with additional layers of timber and plywood to form a "crash deck", which will store the materials. A hoarding line will be installed at the stair access points from the main body of the apartment block and secure doors installed.

### 5.1.2 TRANSFER FRAMING

The existing 6th floor structure will be removed, item 5.1.1 above, and the new transfer structure incorporated into the new 6th floor construction. The junctions of these elements will be exposed and inspected as part of an enabling works package for the extension project. Any strengthening or repair of defects required will be carried out before the construction of the extension commences.

### 5.1.3 BEARINGS OF THE TRANSFER FRAMING

The junctions of the existing transfer steelwork and the perimeter masonry structure, the bearings, will also be inspected at this early stage. You will see from Photo 1 that the bearings are above the terrace level, so this can be carried out without disruption to the property below. Any repairs will be carried out prior to the construction of the new extension.

## 5.2 NEW SUPERSTRUCTURE

### 5.2.1 FLOORS AND WALLING, NON-VOLUMETRIC OPTION

The floors and walls of the new proposed 6th floor will be formed in modern lightweight construction clad to suit the architectural elevations. The walls around the exterior perimeter will be clad in brick slips, with a structural liner panel formed using cold formed steelwork to keep weight to a minimum but still achieving the required stiffness. A similar approach will be used for the roof and floor panels of the new 6th floor.

### 5.2.2 STABILITY

Lateral stability for the extension is to be provided by the new structural framing above 6th floor level fixed down to the existing structure mentioned in item section 5.1. The existing framing will have new elements attached to it to take into account the slight change in the plan area of the extension. All of this will be done within the 6th floor level. Once complete the new stability frame will transfer all of the lateral forces safely back into the bearings of the original transfer structure.

Photo 5: Primary structure erected above transfer deck on MBP's Lowndes Square penthouses

#### 5.2.2 STRUCTURAL COMPUTER MODEL

A structural model was built in Robot Structural Analysis (RSA) to better understand the expected deflections of the proposed transfer deck beams and loads from these beams onto the masonry walls of the existing building. The figure below is an extract from the RSA model. Refer also to drawings 310 and 311 in the Appendix to this report.

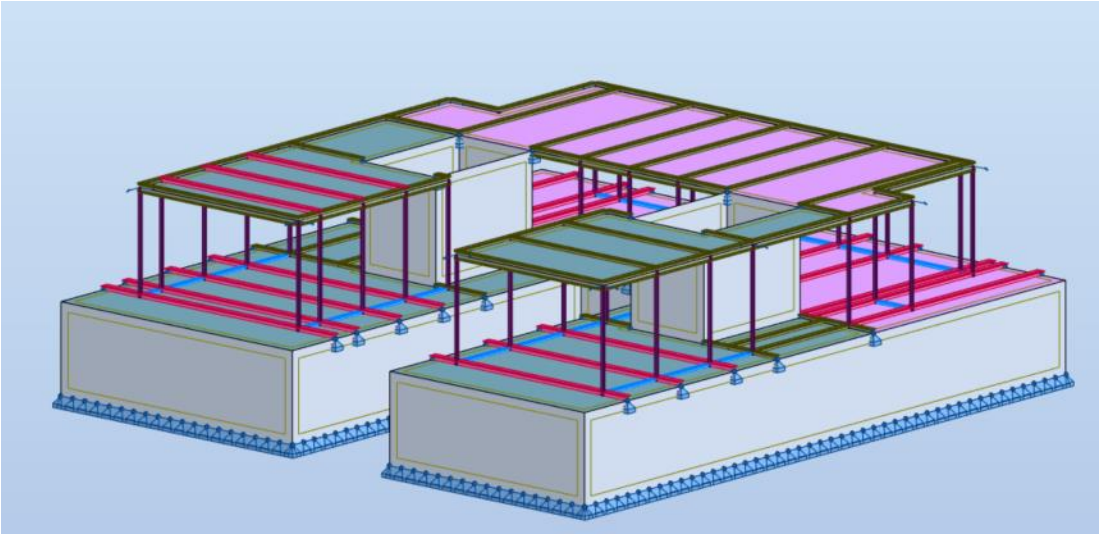

Figure 3: Extract from RSA model

## 6.0 CONSTRUCTION HAZARDS

The proposed construction has standard materials and components and is of common form within the construction industry. Nevertheless MBP will produce a separate document that will be developed as the detailed design proceeds

## 7.0 SPECIFICATION

The proposed construction materials, components, workmanship etc. will be specified using the National Building Specification documents and a separate performance specification. Those sections that MBP will schedule are:

| | |
|---|---|
| Structural steel framing | G10 |
| Carpentry/timber framing/first fixing | G20 |
| Holes/chases/covers/supports for services | P31 |

It is Michael Barclay Partnership's practice to specify materials and construction-practices that do not cause undue harm to the environment. For example, timber used in temporary and permanent works must be obtained from a certified sustainable source, and be identified as such. The paint specification will avoid red lead, zinc chromate or coal-tar content and have a low solvent (VOC) content and offer manufacturers with an Environmental Policy in operation. The Contractor will be encouraged to use Portland cement replacement materials for the reinforced concrete elements.

## 8.0 DRAWINGS

A set of schematic plans have been produced for the scheme that indicate the principals of the proposed development. These are appended to this report in Appendix A.

## 9.0 SUMMARY

The new rooftop extension to Warren Court will be formed using modern lightweight methods of construction, successfully carried out by MBP on other projects in Central London. The weight of the increased volume of the rooftop extension will be offset by the removal of the heavy walls above 6th floor, and the existing heavy 6th floor and roof. The ventilation shafts, and lift shafts will remain. The existing primary load paths will be used to support the new apartments and any repairs necessary will be carried out to ensure the long term security of the building fabric. As the loading on the existing fabric will be essentially the same, and the top level represents a small portion of the building as a whole, the proposed development will not have an adverse impact on the apartments below or the London Underground infrastructure at ground floor level and below.

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Date: 17th December 2022

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Issue 3 - Planning Issue

Appendix A - Michael Barclay Partnership's schematic drawings

MBP - 6356 – 111
MBP - 6356 – 113
MBP - 6356 – 310 and 311 – Structural modelling schematics