Davies
Maguire
+Whitby

# Simon Community
## 129 Malden Road

**15-46**

**Structural Stage 3 Report**

DMagW-1546-S3
March 2016

Produced for Simon Community

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Davies Maguire + Whitby

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| | | | |

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**Seamus Maguire**
**Project Director**

# 1.0 INTRODUCTION

## 1.1 Appointment

Davies Maguire + Whitby were appointed by Simon Community in October 2015 to provide structural and geotechnical services for the renovation and extension of 129 Malden Road, Belsize Park, London NW5 4HS.

Other parties include:

| | | |
|---|---|---|
| ScottWhitbyStudios | - | Project Architect |
| AECOM | - | Project Cost Consultant |
| SWECO | - | Project Services Engineer |

## 1.2 Proposal

129 Malden Road is currently used as an outreach property for the homeless charity, Simon Community. It has facilities that provides meals to the homeless in the surrounding area, in-house bedrooms for residents and volunteers and an office for the admin staff. The existing property is a three storey terrace house with a one storey basement. The building is currently in poor condition, and doesn't have enough capacity to allow the charity to work efficiently.

The proposed scheme for 129 Malden Road is to refurbish the existing structure and extend both up and out; a single storey is to be added to the roof to provide additional bedroom space. At the rear of the property, a double storey extension will be created at basement and ground floor level to connect with the garden space and create a large communal kitchen.

# 2.0 SITE

## 2.1 Site Location

The Simon Community, 129 Malden Road is situated in Belsize Park, 0.5 miles from Belsize Park tube station and Kentish Town West over ground station. The property is one of a row of masonry terrace houses along the road.

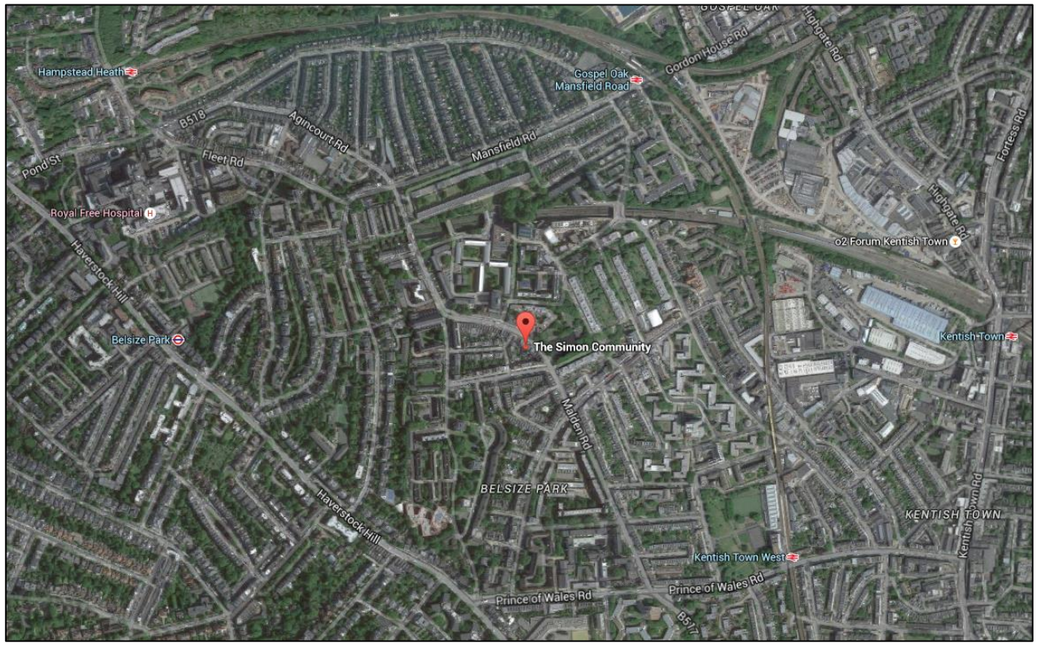


*Fig. 1 Location Map*

## 2.2 Ground Condition

The nearest borehole that has been undertaken in the surrounding area is roughly 40m away and was undertaken in 1960. The borehole was 12m deep and showed made ground up to 600mm below ground level, and then 11.4m of London Clay beneath this (the extent of the borehole).

Another borehole 200m from the site was completed in 1946 and was investigated to a depth of roughly 100m. It showed that the London Clay went to a depth of 65m and below this Reading Beds and then Chalk were discovered. From these boreholes the water level was shown to be around 8m below ground level.

This information should be validated by undertaking trial pits around the site to ensure the ground conditions are as expected.

## 2.3 Site History

The brick terrace property at 129 Malden Road was constructed on the site in the early 1900s and was a residential property until it was donated to the Simon Community in the 1960s. Internal non-structural alterations have taken place in the past, but much of the building structure remains the same.


*Fig. 2. 1892-1905 OS Map*

# 3.0 EXISTING STRUCTURE

## 3.1 General Description of Existing Building

### 3.1.1 Structural Form and Load Path

The existing building is a three storey masonry terrace house with a single storey basement. The main load carrying structure is the masonry walls, which make up all four perimeter walls, two of which are party (shared with the neighbouring property). The floors are made of timber joists supported on the internal and external walls, which carry the load down to the existing foundations. Site investigations have not yet been completed, but the foundations are assumed to be mass concrete strip footings, with a brick corbel to spread the load.

*Fig. 3 Front Elevation*

### 3.1.2 Existing Stability

The masonry party and external walls provide the stability to the building, with the internal walls breaking the span and propping the party walls.

### 3.1.3 Existing Structural Condition and Structural Capacity

Little investigation has taken place on the existing structure, however from a visual survey of the building, the masonry walls appear to be in good condition – with only minimal movement cracking visible. The timber floor joists have not been inspected, but it has been determined that they must be a minimum of 75mm x 225mm @ 400mm c/c to take the loading for the residential use. It is also crucial to check the timber for rot or other damage.

The building would have historically been designed for a floor loading of 2.6-3.2kN/m$^2$ so it is assumed, until further investigation has been completed, that the building has the capacity to take the loading as a modern residential dwelling.

# 4.0 PROPOSED STRUCTURAL ALTERATIONS

## 4.1 Description of Proposed Structural Works

### 4.1.1 Staircase Steel Frame

Internal masonry walls, which currently provide the stability to the building, are to be removed and replaced with a steel frame that will go up through the building from new pad footings below the basement slab level. The frame will consist of four columns, which will go from basement up to roof level. These will be connected to the party masonry walls with beams, the same size as the columns. From these, windposts will be resin fixed into the walls and connected to the beams top and bottom, to spread the load from the masonry wall. To put this frame into place, the existing timber floor joists will be propped and cut back to create the void for the staircase and the party walls will need to be propped until the frame is in place.

The existing timber joists will need then need to be reconnected to the steel frame, this can be done with either timber sections or steel channels, bolted to the ends of the existing timber to extend them to the correct length. The new staircase can then be constructed in the void in the steel frame, and could either be a timber or steel structure.

### 4.1.2 Double Storey Height Steel Frame

To form the double height atrium space from basement and first floor, whilst supporting the original back masonry façade above, a new double height steel picture frame will be used. This will be made up of steel columns and beams, strapped to the adjacent walls, with a ground steel beam concreted into a new strip footing. To put this frame into place, the back masonry wall will need to be firstly propped and then demolished, and the new steel frame should be packed tight to the existing structure before propping is then removed.

### 4.1.3 Glazed Basement to First Extension

At the back of the building, a glazed, sloping timber extension is proposed along one half of the rear façade. This will be formed with timber fin beams and columns and infilled with either glass or ply. To form perimeter wall to this space, a new brick and brick cavity wall will need to be constructed close to the adjacent party wall. Site investigations will need to be undertaken to determine the existing condition of this wall and its foundations, but the worst case solution would be to underpin their foundations, to a maximum of 200mm depth, and then build our strip footing adjacent to it.

### 4.1.4 Masonry Clad Basement to Second Extension

On the other side of the glazed and timber extension, another extension will be formed, in the location of an existing smaller brick structure. Depending on the desired cladding, it is likely that most of the existing structure will be demolished. To replace it, a new steel frame will be used to provide the stability, using steel beams and columns supported on padfootings. Edge steel beams will be connected to the columns to connect the frame back to the main building. The floors and roof will be formed with timber joists with ply on top, and the walls can be formed with an infill structure, such as Metsec panels, and then clad accordingly.

### 4.1.5 Garden Room and Garden Retaining Structure

The existing level of the garden area will be lowered around the basement extensions to form space for a courtyard and a garden library/office. To form this space, a new concrete retaining wall, rough 6m long, will be required with 300mm thick walls, using waterproof caltite concrete, or similar. Additionally, depending on the levels, some underpinning will be required of the adjacent party wall foundations. A new 150mm thick concrete slab will be needed here, to form the new floor level, and restrain the base of the retaining walls and underpinning.

To create the library/office space, a single steel beam will be connected to the concrete wall and span back towards to new frame for the above extension. This can then support a timber roof, made up of timber joists with ply on top.

### 4.1.6 Third Floor Extension

A new level will be added to the roof, to create more living space within the building. To create this, the existing roof will have to be removed the masonry party walls extended up on either side. Two new edge steel beams, 152UC37s, will be put into place along the front and rear facades. These will either be resin anchored into the new masonry party walls or bear onto new padstones. The new roof will then be constructed out of timber joists. Glazing or lightweight cladding, can be then used to form the walls.

### 4.1.7 Balcony Structure

To form the balcony structure around the atrium, CHS steel hangers will be connected to tripled-up joists or steel beams above at 1.4m intervals. These will be connected to a timber edge joist, which will in turn supports the timber balcony joists. Where the hanger meets the existing timber structure above, this joist will have to be doubled or even tripled up.

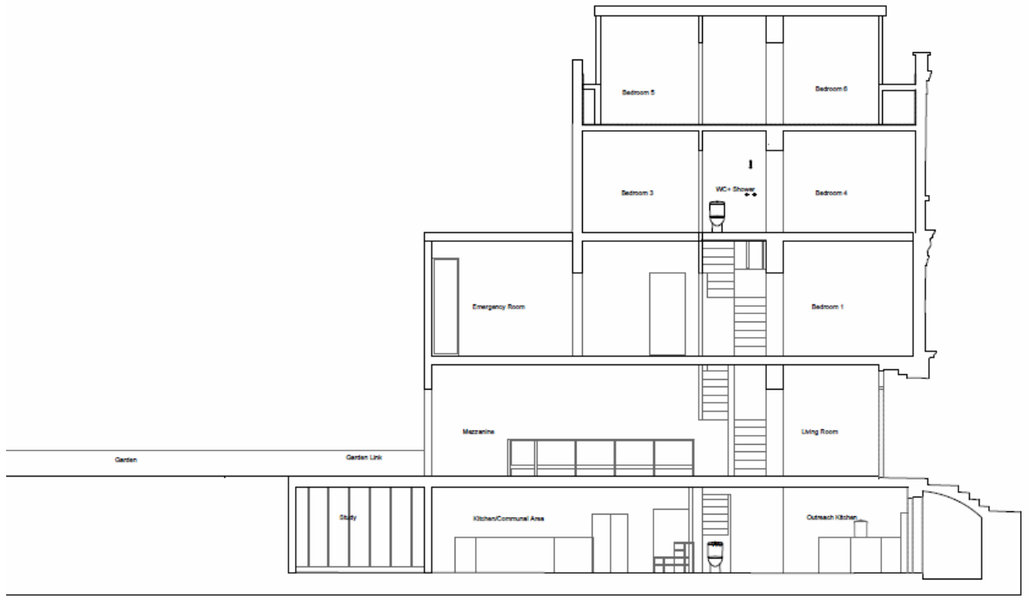


*Fig. 4 Section through Proposed Structure*

# 5.0 DESIGN LOADS

The following loads have been assumed for design:

| Location | Imposed Load | Superimposed Dead Load |
|---|---|---|
| Residential – Bedrooms | 1.5kN/m$^2$<br>+1kN/m$^2$ Partition Allowance | Ceiling and Services 0.2kN/m$^2$<br>Finishes 0.3kN/m$^2$ |
| Residential – Communal Rooms | 2.0kN/m$^2$<br>+1kN/m$^2$ Partition Allowance | Ceiling and Services 0.2kN/m$^2$<br>Finishes 0.3kN/m$^2$ |
| Residential – Corridors and Staircases | 3.0kN/m$^2$ | Ceiling and Services 0.2kN/m$^2$<br>Finishes 0.3kN/m$^2$ |

*Table 1. Design Loads for Proposed Structure*

# 6.0 MATERIALS

## 6.1 Concrete

### 6.1.1 Grades

| Location | Designated Mix to BS 8500 | Characteristic cube strength |
|---|---|---|
| Substructure<br>• Underpinning<br>• General RC Foundations | <br>RC35<br>RC40 | <br>35 N/mm$^2$<br>40 N/mm$^2$ |

*Table 2. Concrete Grades*

### 6.1.2 Material Properties

| | | |
|---|---|---|
| Density | 2400kg/m$^3$ | (normal weight) |
| | 1900kg/m$^3$ | (light weight) |
| Young's Modulus | 28kN/mm$^2$ | (Short term) |
| | 10kN/mm$^2$ | (Long term) |
| Poissons Ratio | 0.2 | (allowing for creep and shrinkage) |
| Coefficient of Thermal Expansion | 12 x 10$^{-6}$ per $^o$C | |

### 6.1.3 Covers

All covers to be in accordance with BS EN 1992-1-1:2004 + UK NA. Nominal cover to all reinforcement shall be as follows unless noted otherwise on the drawings

| | |
|---|---|
| Substructure - | Near Face 35mm |
| | Far Face 50mm |

### 6.1.4 Cast-in Fixings/Holes/Chases

It is the responsibility of the Main Contractor to determine locations of all cast-in fixings, holes and chases required for cladding and services and any other fixings as required by the Architect.

## 6.2 Steelwork

### 6.2.1 Steel Grades (BS 4360 and BS 5950)

Grades of steelwork/bolts are to be as follows (unless noted otherwise on the drawings)

| | |
|---|---|
| All steelwork | S275 |
| All bolts | Grade 8.8 |

Material Properties – the following properties have been used in the design:

| | |
|---|---|
| Density | 7850kg/m$^3$ |
| Young's Modulus | 205kN/mm$^2$ |
| Poisson's Ratio | 0.27 |
| Coefficient of thermal expansion | 11.7 x 10$^{-6}$ per $^o$C |
| Shear modulus | 80kN/mm$^2$ |

## 6.3 Timber

### 6.3.1 Timber Sourcing

Timber (including timber for wood based products) should be obtained from well-managed forests and/or plantations in accordance with:

- The laws governing forest management in the producer country or countries.
- International agreements such as the Convention on International Trade in Endangered Species of wild fauna and flora (CITES).

Documentation – provide either:

- Documentary evidence (which has been or can be independently verified) regarding the provenance of all timber supplied.
- Evidence that suppliers have adopted and are implementing a formal environmental purchasing policy for timber and wood based products.
-

### 6.3.2 Timber Grades

All timber members are to be grade C24 to BS 5268 unless noted otherwise. Timber to be pressure-impregnated with preservative and cut ends brush treated.

Material Properties – the following properties have been used in the design:

| | |
|---|---|
| Density | 400 – 600 kg/m$^3$ |
| Shrinkage | 3 – 4% |
| Bending parallel to grain | 7.5 N/mm$^2$ |
| Tension parallel to grain | 4.5 N/mm$^2$ |
| Compression parallel to grain | 7.9 N/mm$^2$ |
| Min. compression perpendicular to grain | 1.9 N/mm$^2$ |
| Shear parallel to grain | 0.7 N/mm$^2$ |
| Min. modulus of elasticity | 7200 N/mm$^2$ |

### 6.3.3 Workmanship

All work to be in accordance with BS 8000-5: 1990: Workmanship on Building Sites – Code of Practice for Carpentry, Joinery and General Fixings, and Section 7 of BS 5268-2: 2002.

Sundry fixings:

- All plugging is to be executed in hardwood.
- Nails are to comply with BS 1202.
- Wood screws are to comply with BS 1210.
- Metal bolts and nuts are to comply with BS 4190.
- Rag bolts are to comply with BS 1494.

Joists marked DJ are to be doubled joists, TJ are to be triple joists, bolted together using M12 grade 8.8 bolts at centres along span to be specified by the Engineer.

All bolts into timber are to have 50sq x 3 thick ms washers below nut.

Solid blocking or herringbone strutting to be provided between all timber joists or rafters as follows:

- 2.5m to 4.5m span: midspan and at each end support.
- Spans longer than 4.5m: two rows equally spaced in span and at end supports.
- Outer joists or rafters to be blocked solidly to perimeter walls.

## 7.0 REINFORCEMENT ESTIMATES

| Element | Reinforcement Estimate, kg/m$^3$ |
|---|---|
| RC Pad Foundations | 175 |
| RC Strip Foundations | 120 |
| Ground floor slab | 150 |

*Table 3. Preliminary Reinforcement Quantities*

Please note the following items:

- No allowance has been made for laps, loose reinforcement or chairs.
- These estimates are to be revised/revisited as part of the detailed design phase and, as estimates, a contingency should be applied to these figures.

## 8.0 FIRE PROTECTION

DMagW have been informed that the building requires a 60 minutes fire protection rating for the residential/shared occupancy use. This will be attached using intumescent paint on all exposed structural elements.

## 9.0 HEALTH AND SAFETY

### 9.1 CDM Regulations

The role of Davies Maguire + Whitby on this project is that of designer as defined by CDM regulations. As such, the design will be considered for foreseeable hazards and associated risks. The design has been developed and, where possible, the risks identified will be reduced or eliminated. The CDM Co-ordinator / Principle Designer for this project is responsible for co-ordinating the Health and Safety plan. Health and Safety issues relating to the construction of the buildings and materials used will be identified in the plan. However, this item should in no way be considered as a complete and final list. The Contractor's normal Health and Safety obligations still apply when undertaking constructional operations on and off site.

Refer to Davies Maguire + Whitby Quality Manual for further details of procedures.

## 10.0 DESIGN LIFE

The design life of a building can be defined as the period of use intended by the designer as agreed with the client. It should be noted that the design life of a building's components may not be the same as the design life of the building. As such two categories arise for defining durability of building elements:

- Maintainable – with periodic treatment will last the life of the building
- Lifelong – will last for the life of the building

With a design life of 60 years the Simon Community be categorised as 'normal life' to BS 7543.

## 11.0 REFERENCES

The following Eurocodes, British Standards, Codes of Practice and References have been applied:

| | |
|---|---|
| **Eurocodes** | |
| BS EN 1990:2002 + UK NA | Basis of Structural Design |
| BS EN 1991-1-1:2002 + UK NA | Eurocode 1: Actions on Structures – Part 1-1: General Actions |
| BS EN 1991-1-3:2003 + UK NA | Eurocode 1: Actions on Structures – Part 1-3: General Actions - Snow Loads |
| BS EN 1991-1-4:2005 + UK NA | Eurocode 1: Actions on Structures – Part 1-4: General Actions – Wind Loads |
| BS EN 1991-1-6:2005 + UK NA | Eurocode 1: Actions on Structures – Part 1-6: Actions during Execution |
| BS EN 1992-1-1:2007 + UK NA | Eurocode 2: Design of concrete structures - Part 1-1: General – Common rules for building and civil engineering structures |
| BS EN 1993-1-1:2005 + UK NA | Eurocode 3: Design of steel structures – Part 1-1: General rules and rules for buildings |
| BS EN 1995-1-1:2005 + UK NA | Eurocode 5: Design of timber structures – Part 1-1: General — Common rules and rules for buildings |
| BS EN 1997-1-1:2004 + UK NA | Eurocode 7: Geotechnical Design – Part 1-1: General rules |

| | |
|---|---|
| **British Standards** | |
| BS 7543 | Durability of Buildings and Building Elements, Products and Components |
| BS 5950 | Structural Use of Steelwork in Buildings |
| BS 6399, Pts 1, 2, 3 | Loadings for Buildings |
| BS 6180 | Barriers in and Around Buildings |
| BS 648 | Schedule of Weights of Building Materials |
| BS 8298 | Design and Installation of Natural Stone Cladding and Lining |
| BS 5328 | Concrete Specification |
| BS 639 | Standard Weights of Materials |