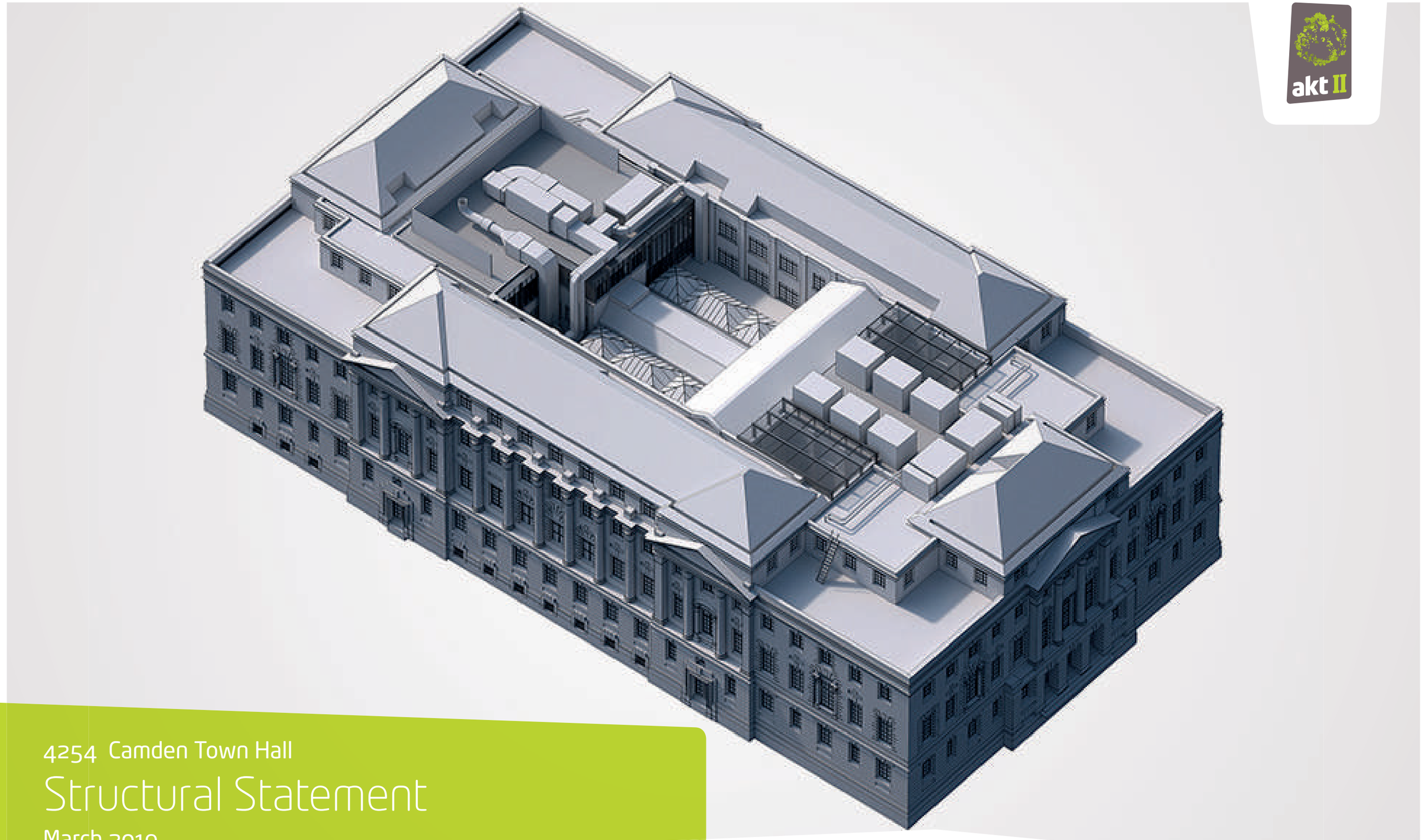
CAMDEN TOWN HALL

LENDLEASE CONSULTING (EUROPE) LTD ON BEHALF OF LONDON BOROUGH OF CAMDEN

STRUCTURAL STATEMENT
18 APRIL 2019

Camden

lendlease



4254 Camden Town Hall

Structural Statement

March 2019

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Appendices

Revision	Date	Status
	29/03/2019	
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Approved by:		

1 Introduction

This report covers the work undertaken during the developed design stage of the project. A description of the structural interventions is given along with the design criteria and parameters to which the detailed design of the project will be completed. It should be noted that this is preliminary and subject to refinement and amendment during the next stages of design. AKTII have been appointed by Lendlease to develop a Stage 3 report for the proposed refurbishment of the Camden Town Hall. The scheme has been developed alongside Purcell Architect, Arup (M&E Engineers) and AKT Envelopes (Facade Engineers).

2 The Project

Camden Town Hall is located in central London, within the London Borough of Camden. It is opposite the St Pancras Hotel, in close proximity to King's Cross station.

The Town Hall was built between 1934 and 1937 and designed by Architect A.J. Thomas. The existing building consists of a basement, ground floor and 3 upper floors and as of 1990 it is a Grade II listed building due to its special architectural features and historic interest. The majority of the building houses the Camden Council functions across all floors.

The proposed project is to refurbish the existing building and continue to house the Camden Council at ground floor, first floor and basement. The Camden Centre will be refurbished into an events venue while part of the basement would accommodate an SME workspace and the second and third floor will accommodate new commercial offices.

Figure 2.1 Photo of the Entrance of the Town Hall at Judd Street

3 The Existing Structure

3.1 Overview

The existing building was built in the 1930s by architect A.J. Thomas to house the Camden Council and its required functions. The existing structure is rectangular on plan and comprises one basement level, ground floor and 3 upper floors.

The existing structure can be discussed in the following key elements.

- Substructure
- Superstructure

The information regarding the existing building comes mainly from the following sources:

- Archive architectural drawings
- Archive photos
- Site visits
- Experience of the traditional building practices of the time.

3.2 Substructure

The building has a single storey basement which covers the full footprint of the upper floors. The architectural plan of the basement can be seen in the Figures as well as the foundation plan. The foundation plan is the only structural related information that is available. From it the following information can be obtained:

- The foundation layout is formed by pad footings connected with ground beams.
- The sizes of the pad footings are prescribed. It should be noted however that the as-built foundations may differ from this archive drawing.
- The location of the columns can be identified.
- The columns of the building are founded on steel grillages encased in concrete pad footings bearing directly onto the soil (as shown in Figure 4.1).

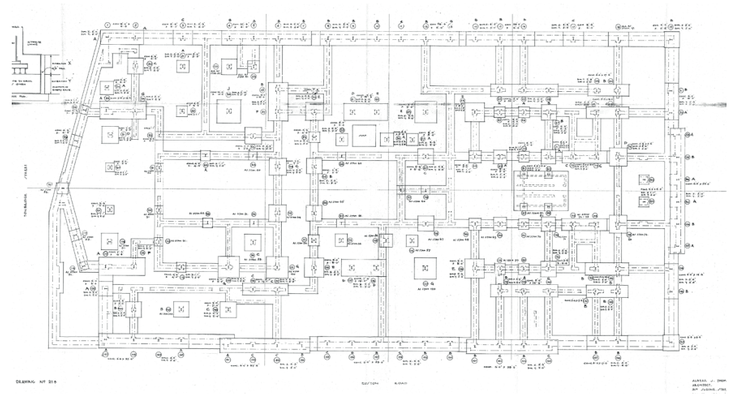


Figure 3.1 Archive drawing showing foundations layout

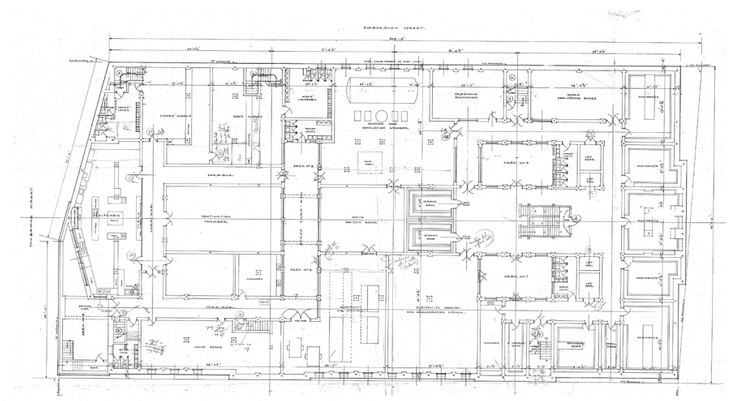


Figure 3.2 Archive Drawing showing Basement floor plan

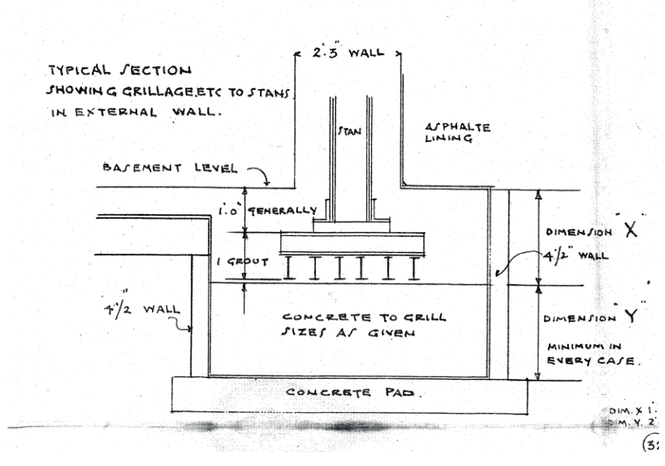


Figure 3.3 Existing structural drawing of pad foundations showing steel grillage system

3.3 Superstructure

There is no information available regarding the lateral stability system of the building and there is no record of cross bracing for vertical frames. It is understood from the archive photos that the type of connection between beams and columns has limited moment capacity. Therefore the horizontal stability of the building is likely to rely on secondary elements of the buildings such as internal partitions, floor buildups, building facade etc.

3.3.1 Typical Superstructure Floor

The superstructure floors are typically a filler-joist slab typology where secondary beams (joists) span between primary beams. The infill between the secondaries is most likely unreinforced concrete.

The column steel locations are shown on the original architectural drawings however this is in an indicative way and no steel sizes are provided. These drawings give a good indication of the location of the existing columns on each floor level. It is apparent that there is no regular column layout across the building.

The assumed location of the existing steel columns combined with the available archive photos during construction provide an understanding of the beam layout. Examining the archive photos it becomes evident that each column on the external facade supports a primary beam.

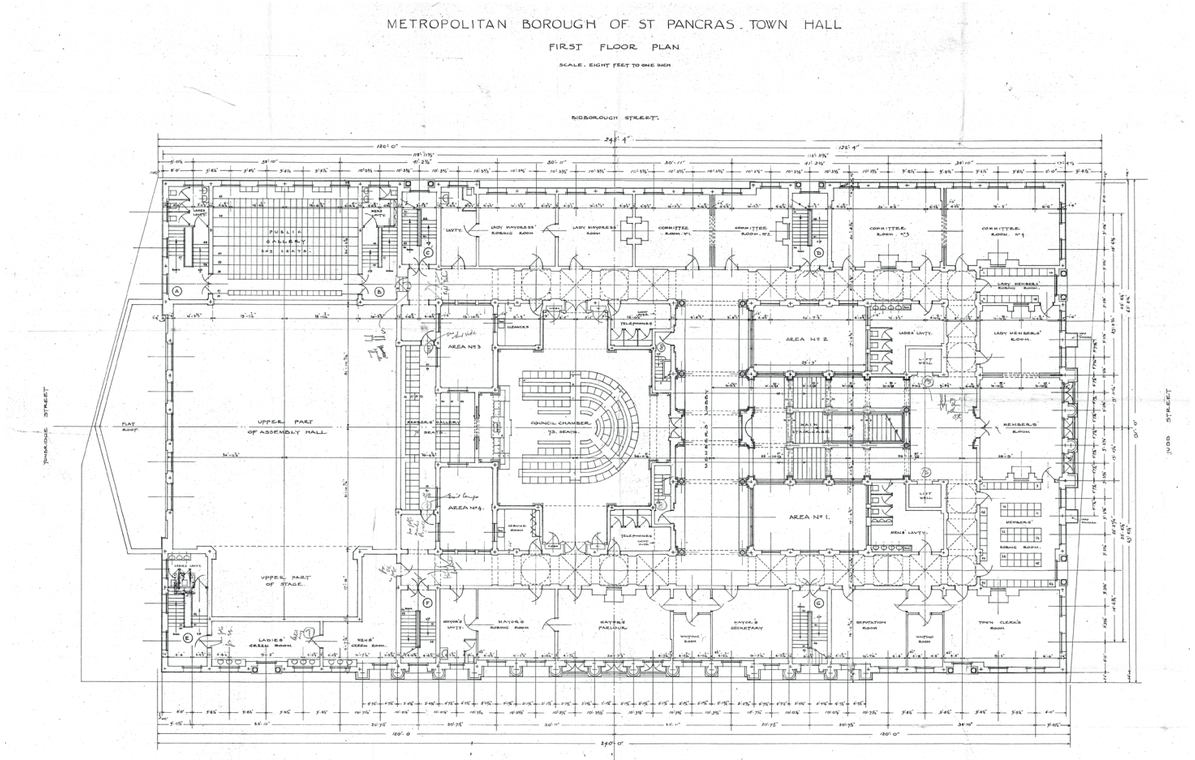


Figure 3.4 First Floor archive architectural plan

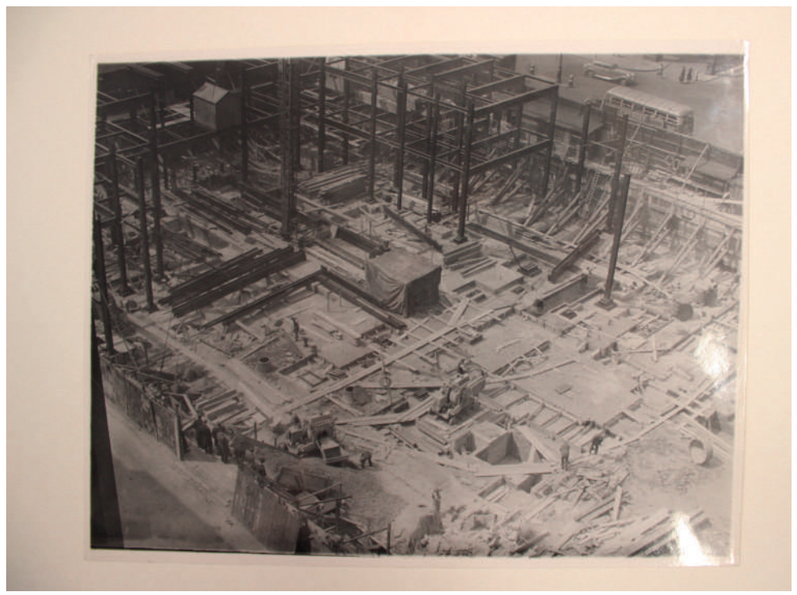


Figure 3.5 Photo taken during construction of steel frame and foundations

Figure 3.6 Photo taken during construction of steel frame

3.3.2 Camden Centre and Council Chamber

The Camden Centre (Assembly Hall) is located at the east side of the building. It is a columnless space, approximately 25m by 25m on plan and has a free height from Ground floor to L02. Due to its big volume a number of big transfer beams has been built along the large spans that are picking the columns from above. Due to its complex structure it is pursued from the design team to minimise as much as possible the interventions associated with the Camden Centre.

The Council Chamber is a feature of the building of special heritage significance. It is located centrally in the plan of the first floor and is approximately 15m by 15m open space. Long Span beams were built to form the geometry of the chamber roof.

Figure 3.7 Photo of the Camden Centre

3.3.3 Rooftop Additions

After the completion of construction of the Town Hall, two structures were added to the building at the roof level. The first one took place in the 1940s where an extension of the third floor was made to increase the available office space. In the 1990s the building went through another addition where a conservatory was built on the third floor. The conservatory is a lightweight steel and glass structure that sits above the Camden Centre and was used as an event space. Both structures can be identified in the Figures.

3.4 Fabric Survey Brief

A fabric survey brief has been developed to identify the structural layout and give information about the structural elements and their properties in the areas where structural interventions are required. The fabric brief can be found at Appendix 2.

Figure 3.8 Arhcive photo of the council chamber

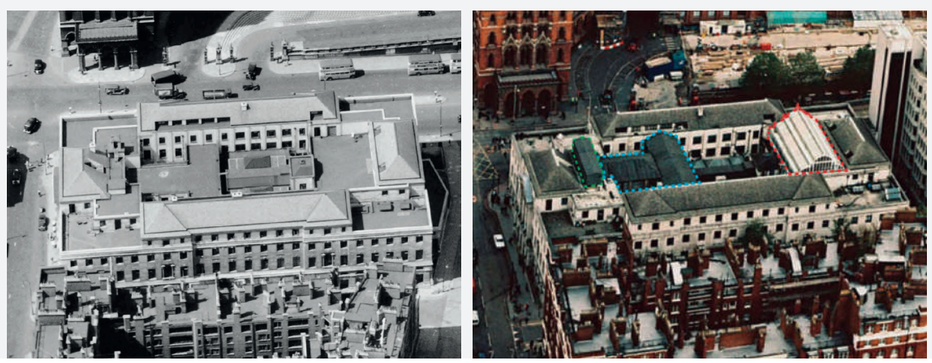


Figure 3.9 Photo showing the two later additions at the roof

4 Structural Interventions

4.1 Overview

Due to the Grade II listing of the existing Camden Town Hall the scheme encompasses a light refurbishment to repurpose the Town Hall Building. This involves isolated pockets of structural alterations primarily to accommodate a separate access to the SME office in the basement and commercial offices on second and third floor,to allow a separate tenant to the Camden Centre and maintain the council civic functions.

The proposed refurbishment does not alter the global behaviour of the structural frame. There are no major massing additions or removals that could change the horizontal behaviour of the building or the wind loading applied to the frame. Thus the lateral stability of the structure is expected to remain as per the current condition. The general load paths of the structure are also unaltered with no strengthening or alterations of the existing foundations foreseen.

The structural interventions are therefore limited to localised adjustments of the existing floor plates and the replacement of two volumes at the roof level that were not part of the original 1930s structure. The structural interventions can be summarised as the following:

- Lowering part of the ground floor
- Replacing the 1990s conservatory at roof
- Replacing the 1940s extension at roof
- New lifts
- Relocating column at SE lightwell
- Builder Work Holes for services distribution
- Tonbridge Walk alterations
- Foundations works

4.2 Lowering part of the ground floor slab

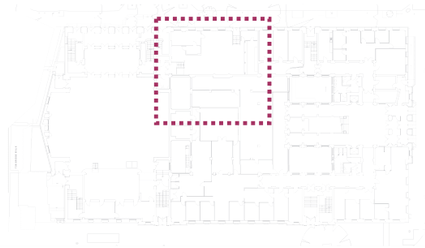
The design intent is to remove part of the Ground floor slab and form a new slab at a lower level to create the entrance for the lobby of the new offices at Bidborough Street. This intervention is required to generate a new access location to the building at street level, as well as to provide additional daylight to the basement.

As already discussed the existing floor plate is most likely a filler-joist slab typology with primary and secondary beams. In order to assess the extent of the slab that needs to be removed an estimation of the existing beam layout based on the archive photos and column locations was carried out. A drawing showing the extent of slab to be removed is shown in Figure 4.1. Please note that all the beams that fall inside the hatched area are to be removed. The ones which sit on the perimeter of the shown area will be retained.

The new slab will be a reinforced lightweight concrete slab on profiled metal deck sitting on steel beams. The new floor will be supported on the existing columns, minimising any alterations to the existing load path of the structure. The existing columns will most likely require strengthening, the extent of it is subject to the results of the structural surveys. The new floor will be tied back to the existing structure in order to transfer the lateral loads. Temporary works will be required to restrain both the retaining wall and columns while the new GF slab is built. The proposed new slab structure is shown in Figure 4.2.

Construction sequence

A proposed construction sequence to form the new slab is shown in Figure 4.3 Initially, temporary propping will be required, followed by demolishing the defined GF slab. In that stage any potential strengthening of the double height columns will take place. Finally, the new slab will be created and the props will be removed.



Ground Floor Plan

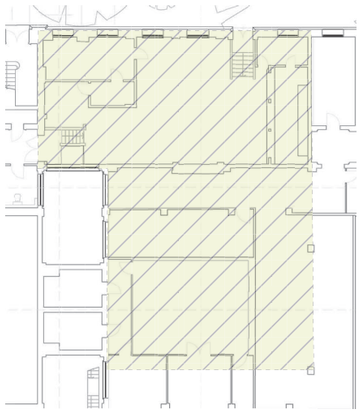
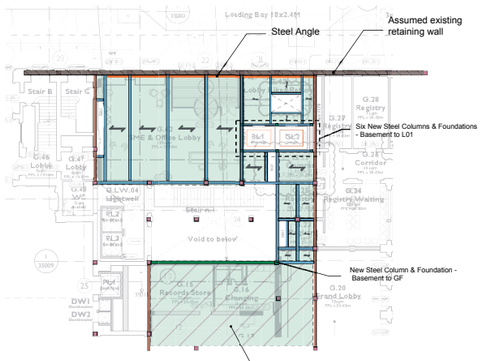


Figure 4.1 Extent of ground floor slab to be removed



Proposed New Ground Floor Slab

Figure 4.2 Proposed new GF slab

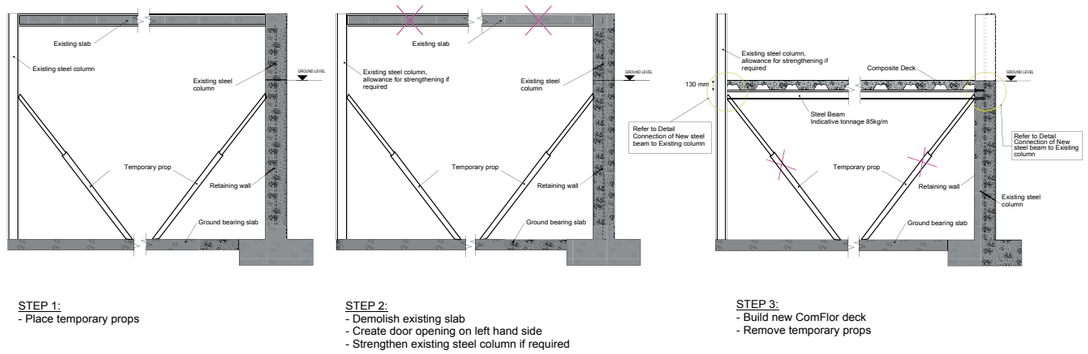


Figure 4.3 Construction sequence for new GF Slab

4.3 Replacement of the Conservatory

The architectural scheme proposes the steel and glass conservatory, which was added in the 1990s, to be removed and a new mass/structure to be rebuilt using lightweight construction. The roof of the new structure will also accommodate plant and mechanical services.

The existing steel and glass conservatory sits on the third floor above the Camden Centre roof. The hall of the Camden Centre is formed by long span transfer beams that pick up the columns which support part of the existing conservatory. In order to minimise the opening up works of the complex structure associated with the Camden Centre, a load-balance approach is proposed as shown in Figure 4.6. The goal is to assess the weight of the structure that is being removed and form a new structure that will cause similar loading conditions to the existing.

The proposed lightweight roof deck will be comprised of a trapezoidal steel deck sitting on steel beams as shown in Figure 4.4. The new roof will be supported on the existing columns as well as new columns which will be located above the columns at the level below. The lateral loads will be transferred by tying the new structure back to the existing building. Currently there is a raised floor at the area of the new structure which is going to be removed in order to provide level access to the corridors of the third floor.

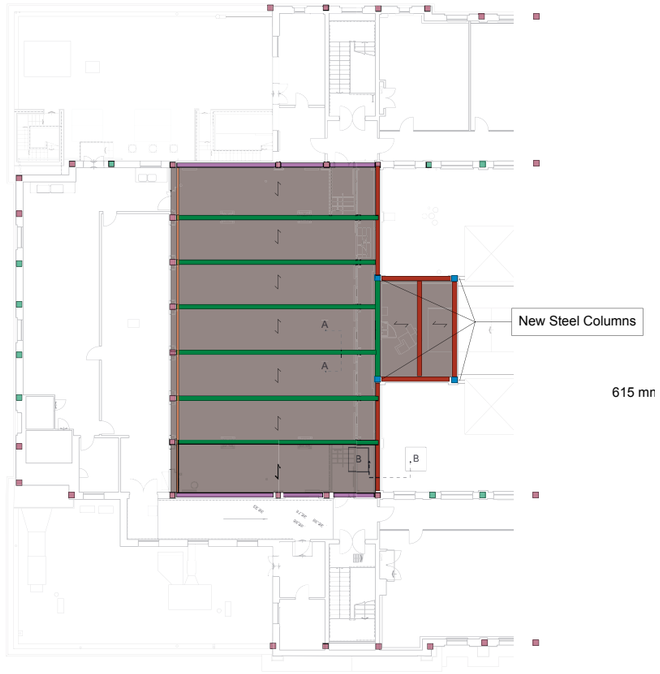


Figure 4.4 Proposed new pavilion structure

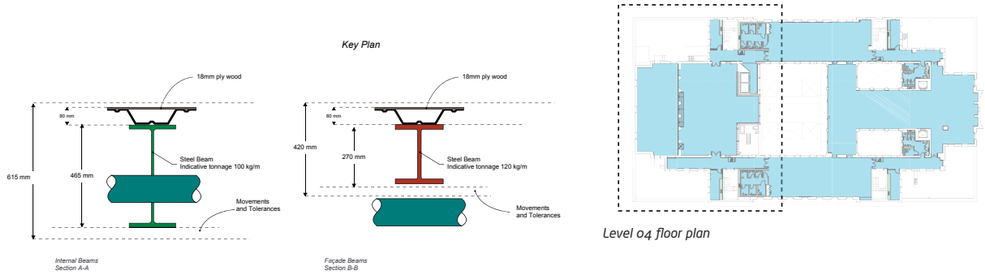


Figure 4.5 Proposed steel sections for paviliion structure

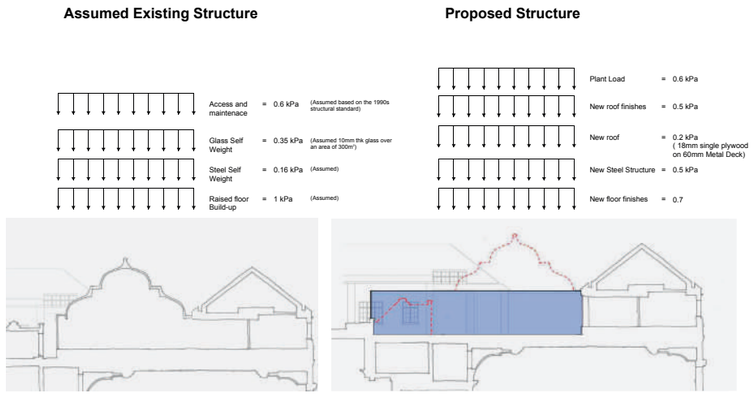


Figure 4.6 Load Balance Assessment for new pavilion

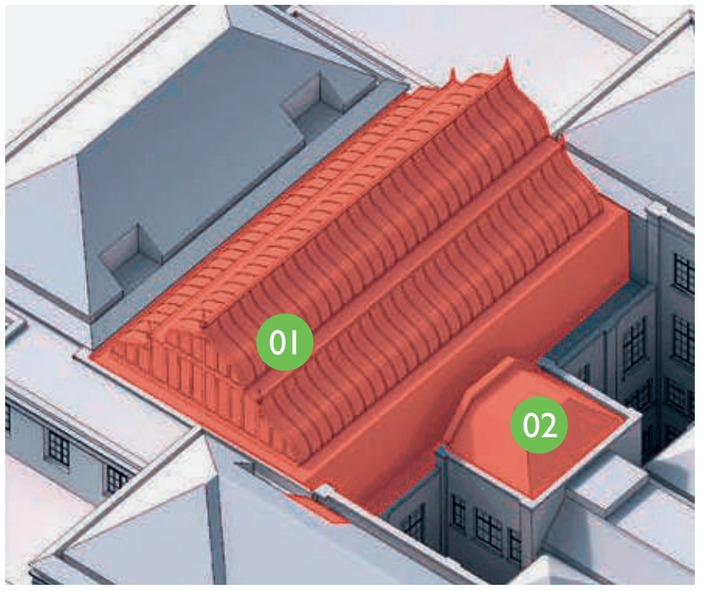


Figure 4.7 Existing Conservatory Structure

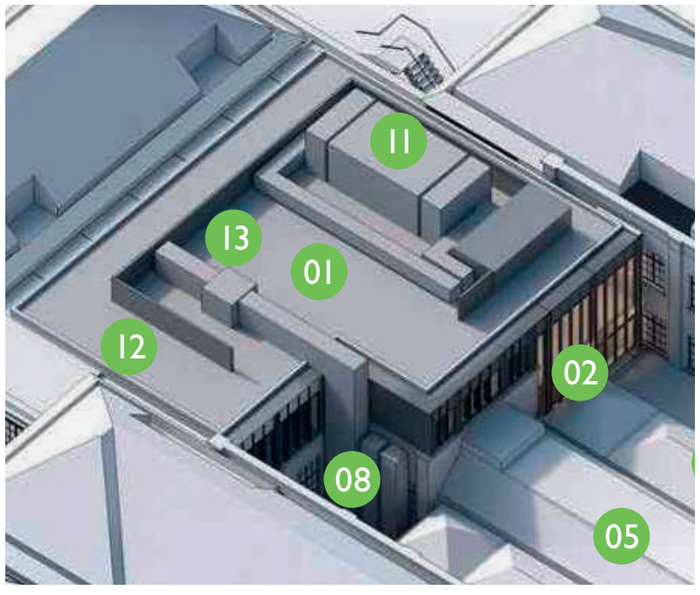


Figure 4.8 Proposed paviliion structure

4.4 Replacing the 1940s pitched roof

A part of the existing pitched roof which was a 1940s addition is planned to be removed and replaced with a new roof to accommodate new plant equipment. The new roof will be formed by a reinforced lightweight concrete slab on profiled metal deck supported with steel beams. The new steel beams will be connected to the existing steel columns located on the perimeter of the massing. This proposal will not affect the existing load path of the structure. However, an assessment of the existing columns will be required to identify if strengthening works are required. The results of the fabric survey will inform further the extent and the design, should the strengthening works be required.

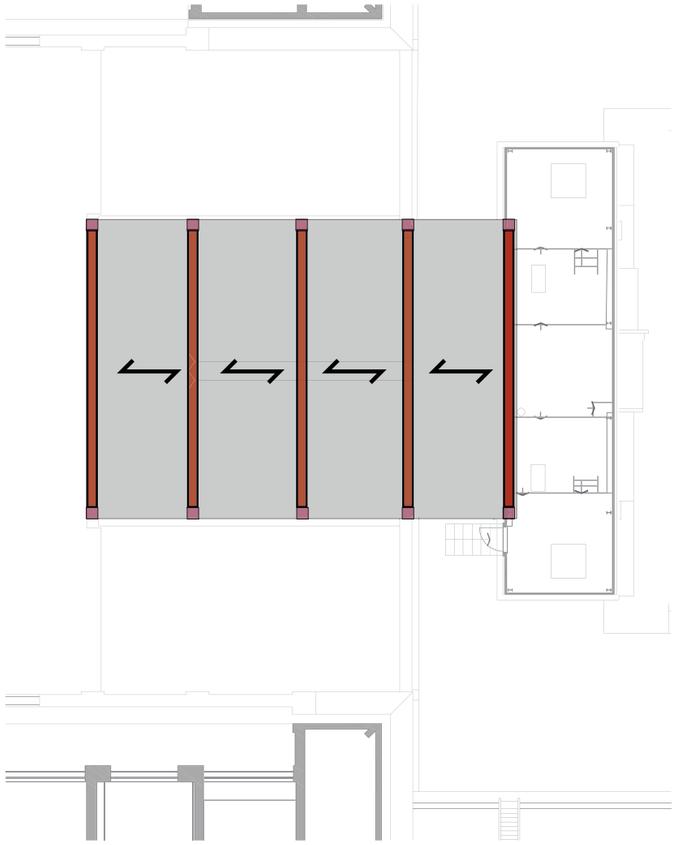
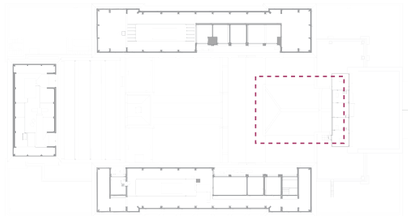


Figure 4.9 Proposed structure on 1940s roof



Level 04 floor plan

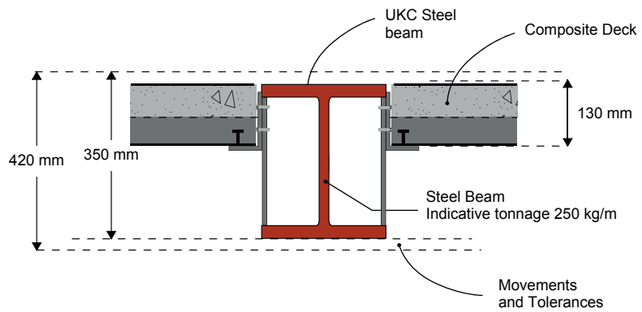


Figure 4.10 Proposed steel sections for new roof

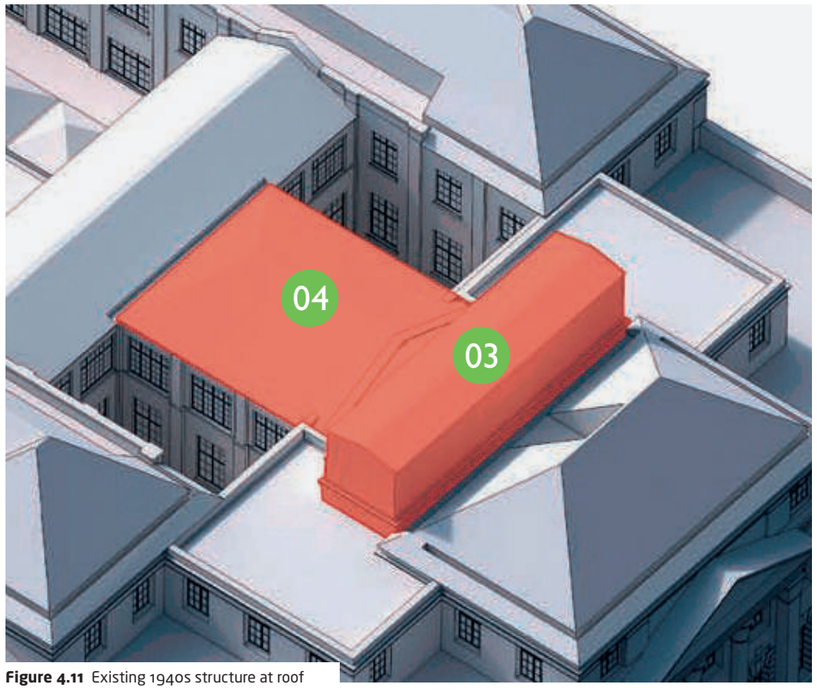


Figure 4.11 Existing 1940s structure at roof

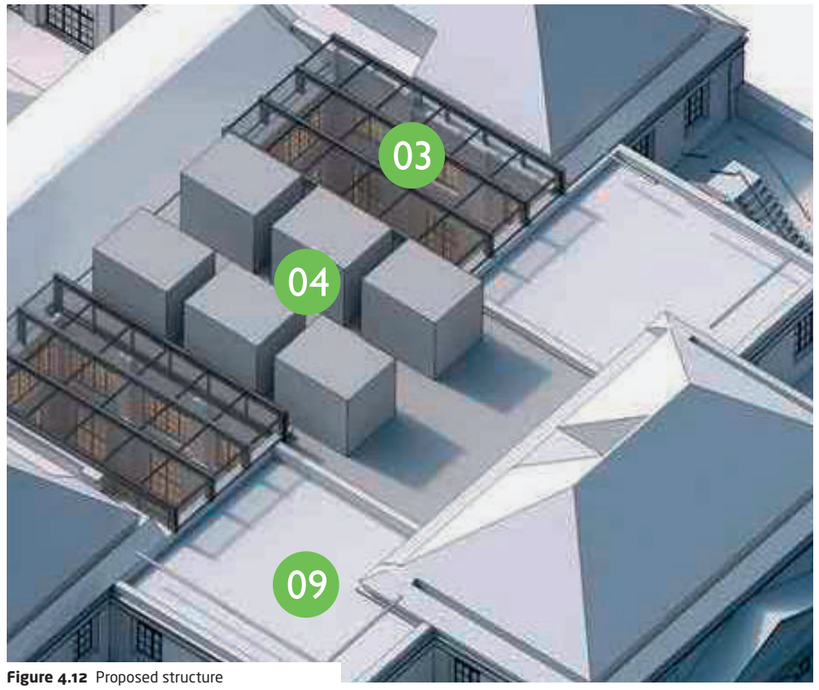


Figure 4.12 Proposed structure

4.5 New Lifts

As part of the refurbishment the vertical circulation of the building is to be improved and a number of new lifts introduced as described below.

South East Lightwell Lift

Two new passenger lifts will be located in the South East lightwell to provide access to all floors.

The two lifts will be an independent structure inserted within the existing structure of the lightwell.

The lift shafts are to be formed by six new steel columns placed within the lightwell. The columns support on each level a new steel beam layout which cantilevers from the lift structure that forms the landing. The proposed landing structure is a reinforced lightweight concrete slab on profiled metal deck sitting on the steel beams.

The six new columns will be founded on concrete pads at the foundations level which have been placed to avoid hitting the existing pads and ground beams.

New Lifts between lightwells

Three more lifts, one passenger lift and two dumb waiters have been introduced between the SE and NE lightwell. The three new lifts run through the GF and Lo1 slab and it is suggested to demolish the bays in these two areas and form a new steel frame that supports a new slab as shown in the Figures. The lifts will be supported by new steel columns for which new foundations will be formed.

Other Lifts

Two new goods lifts and a bike lift will be also created to serve Basement and GF. They will be framed with steel beams and supported by new steel columns with new foundations formed.

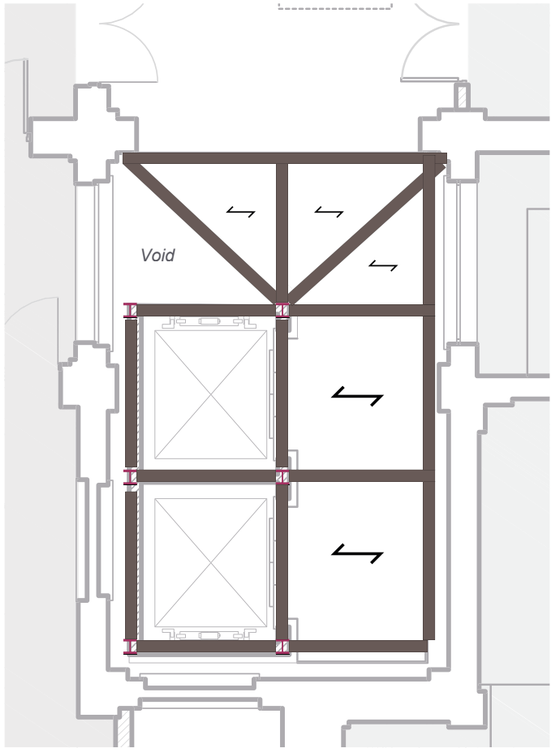


Figure 4.13 Proposed lift structure in SE lightwell

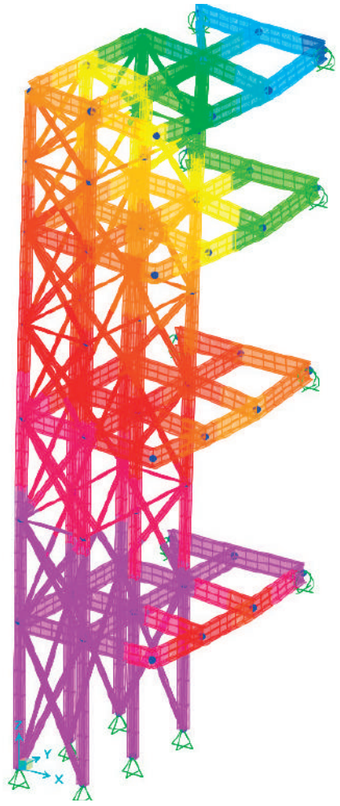
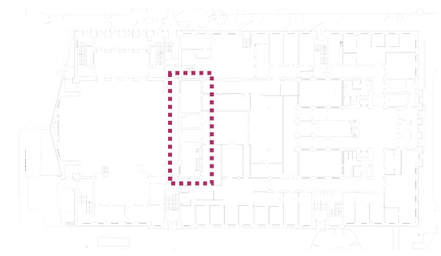
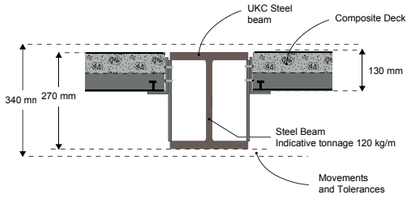


Figure 4.16 Deformed shape of finite element model of the lift structure



Ground floor plan



Steel Beams

Figure 4.17 Proposed steel section for new lift structure

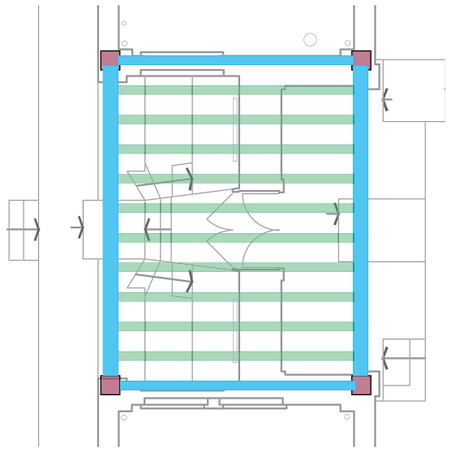


Figure 4.14 Existing assumed structural layout at PL1 area

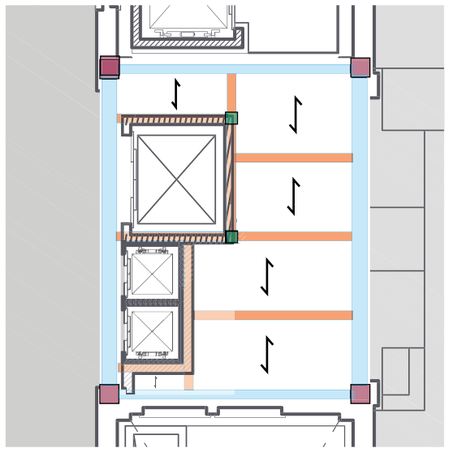


Figure 4.15 Proposed structure for new lifts at PL1 area

4.6 Relocating column at SE Lightwell

In order to provide access to the new lift located in the South-East lightwell, two columns at L02 and L03 need to be removed. Two new steel columns and two new steel beams will be introduced in order to restore the structure's load path as shown in the Figures. The anticipated change in the loading of the existing column is less than 10% and is deemed to be within the inherent capacity of the existing column and foundations. The existing beams L02 and L03 will more likely required to be strengthened as highlighted in the Figures.

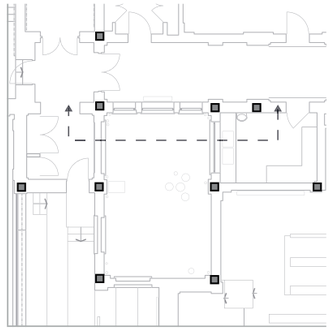


Figure 4.18 Existing column layout at SE lightwell - L01

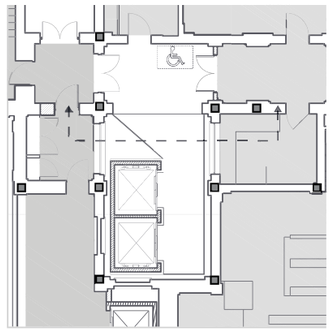


Figure 4.19 Proposed column layout at SE lightwell - L01

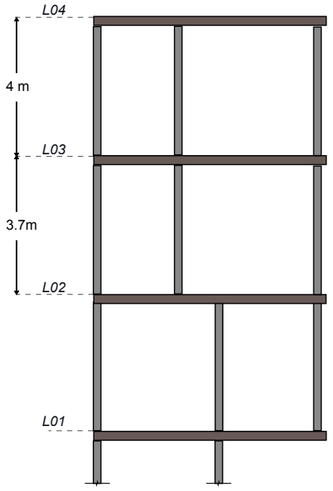


Figure 4.20 Existing elevation at SE lightwell

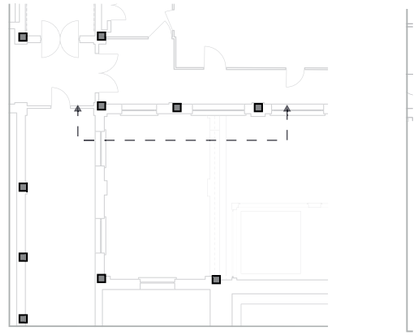


Figure 4.21 Existing column layout at SE lightwell - L02

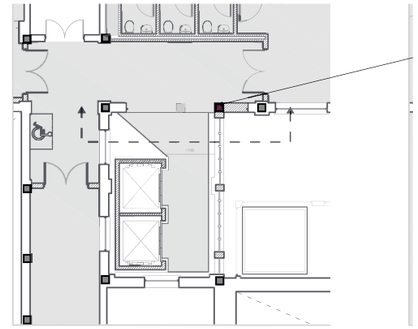


Figure 4.22 Proposed column layout at SE lightwell - L01

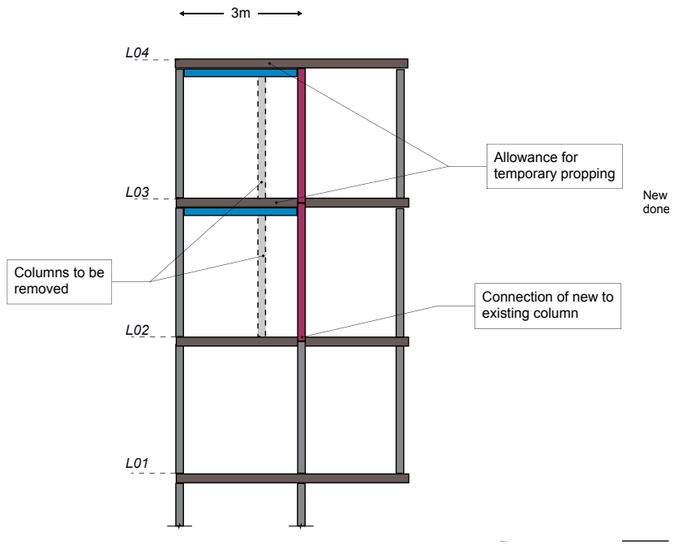
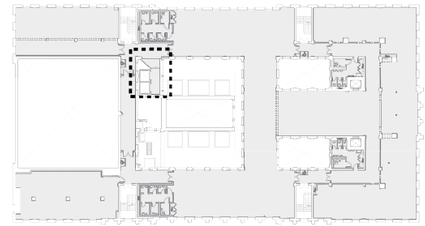
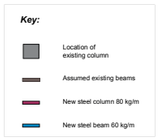


Figure 4.23 Proposed elevation at SE lightwell



L02 Key Plan



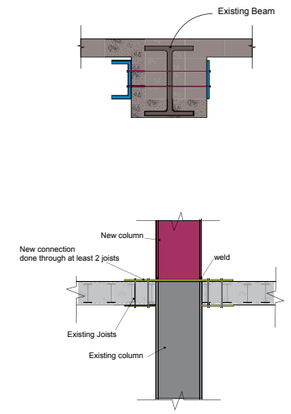


Figure 4.24 Indicative connections and strengthening details

4.7 Builders Work Openings

Due to the requirement of upgrading the building services to meet the modern standards a number of penetrations/risers are required.

The required openings can be found in various locations across all floors of the structure as shown in Figure 4.25.

In order to accommodate the required openings an understanding of the existing structural beam layout needs to be established. This will inform the extent of the structural interventions required.

As already discussed, the available information about the existing structural elements is limited. Based on the archive photos and the existing column layout the arrangement of the primary beams in the perimeter of the building can be determined. However, the location of the secondaries on the perimeter remains unknown and is to be verified with surveys. Given the irregularity of the column layout ,the primary and secondary beam configuration for the inner bays of the structure is also unknown.

Considering the above an attempt has been made to overlay the existing assumed beam layout with the required services openings. This is done for every floor, highlighting the assumed beam layout on the locations where an opening is indicated.

It becomes evident that the services openings clash with the beam layout in a range of cases which can be summarised as follows:

- Case 1: Opening parallel to secondaries.
- Case 2: Opening perpendicular to secondaries
- Case 3: Opening clashes with primary beam
- Case 4: "L" Shape opening

These cases and the proposed structural interventions are discussed in more detail below.

Figure 4.25 Existing GF plan with required penetrations

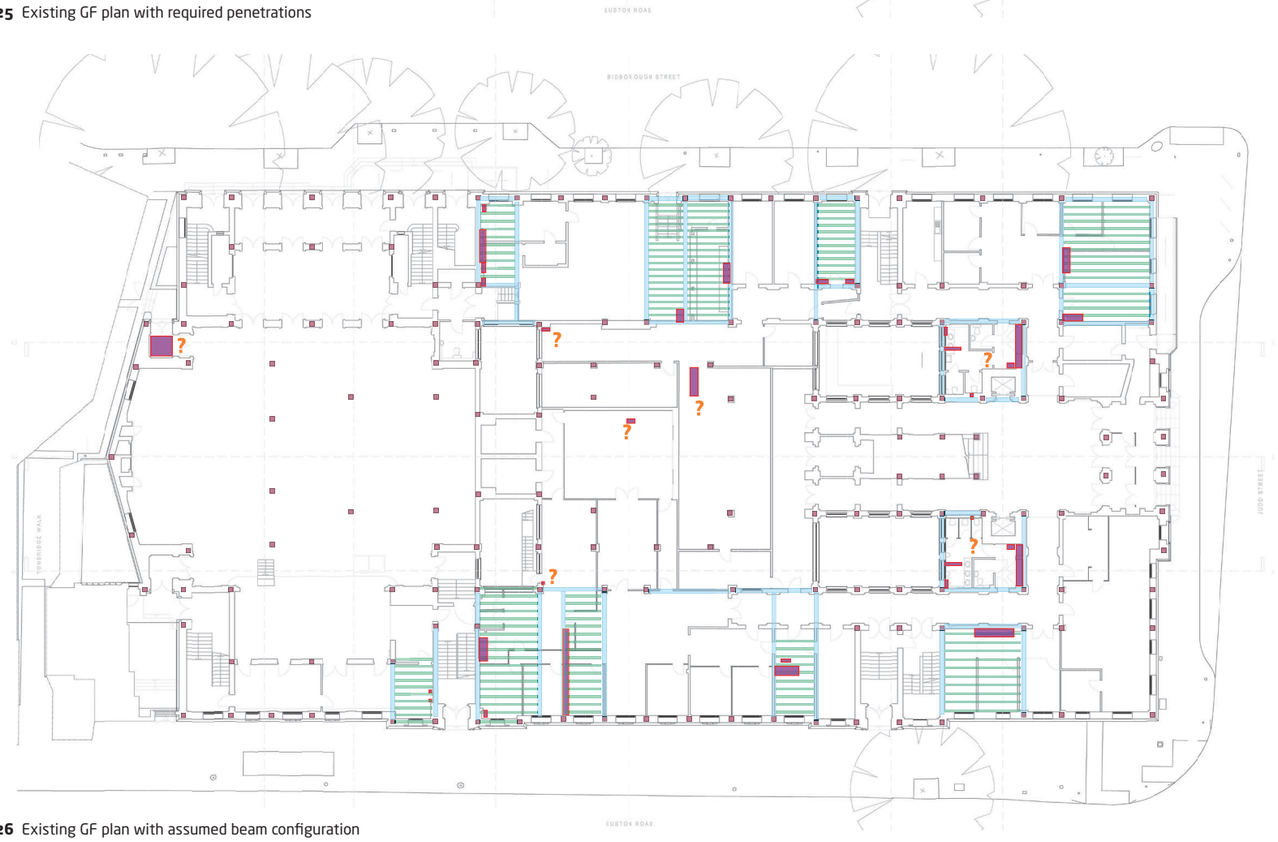


Figure 4.26 Existing GF plan with assumed beam configuration

4.7.1 Case 1 - Openings parallel to secondary beams

Under this first case the required opening is in a parallel configuration with the secondary beams. Considering however that the location and spacing of the secondaries is unknown two sub-cases can be identified.

Case 1a

In this first sub-case the required services penetration can be accommodated between the secondaries. The opening can be formed by removing the infill between the slab to the desired shape and the required structural works are minimal.

Case 1b

In the case where the opening clashes with the secondaries there are two available options. The first one is to shift the location of the opening in order to fit between the secondaries. This can be treated similarly to the Case 1a as explained above.

In the second option the position of the opening remains unaltered and the structure is modified in order to accommodate the opening. The secondary beam that interferes with the opening is trimmed and new steel beams are introduced connected to the adjacent secondaries which may require strengthening. The new steel beams cane be formed below or flush with the existing structure as depicted in the Figure.

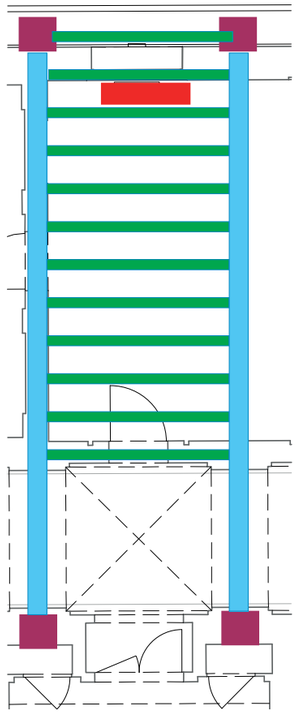


Figure 4.27 Case 1a - Opening paraller to joists

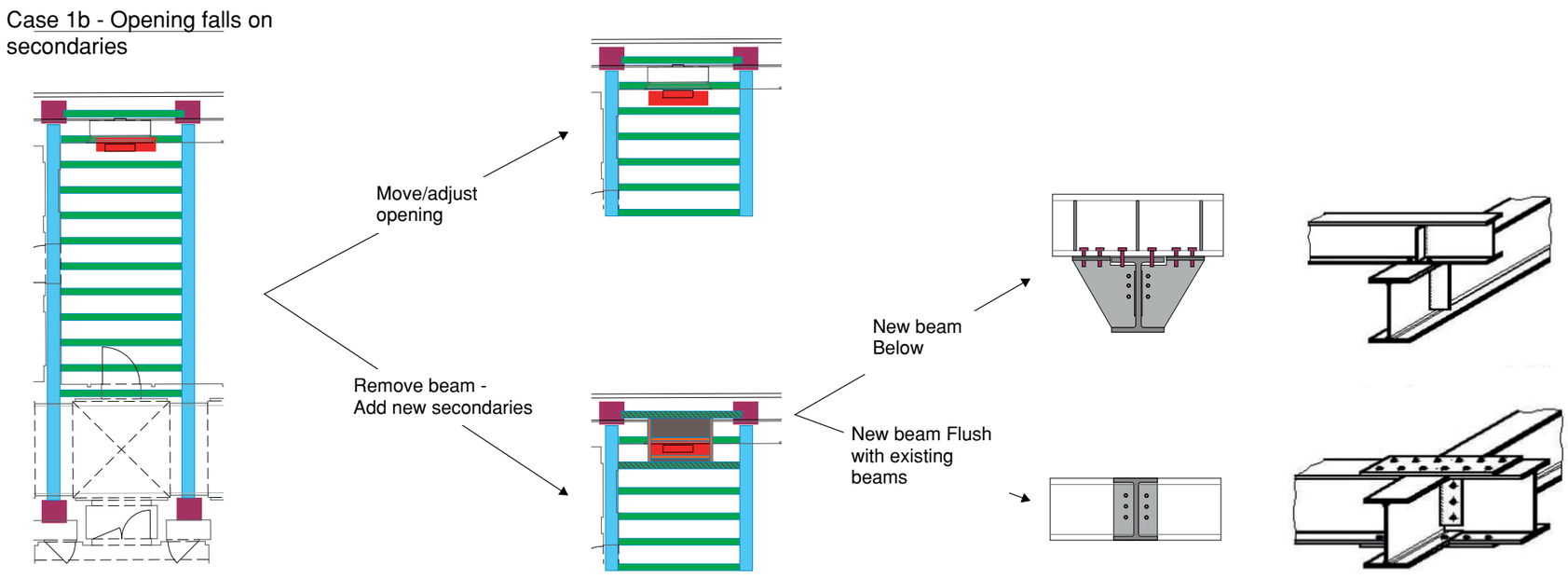


Figure 4.28 Subcase 1b -Potential Structural interventions

4.7.2 Case 2 - Openings perpendicular to secondary beams

The second case that has been identified is when the required opening shape is orientated perpendicular to the secondary beams.

Two ways to treat such configuration has been proposed as explained below.

Case 2a

In this case the required opening is divided into a number of smaller openings that can fit within the secondaries as depicted in Figure 4.30. It is apparent that the feasibility of such an option depends on the outcome of the fabric survey which will inform about the available clear space between the joists.

Case 2b

Where case 2a is not feasible then the existing structure needs to be adjusted to accommodate the required riser.

A number of secondaries need to be trimmed and new steel beams introduced in order to frame the opening and provide support to the trimmed secondaries. Similarly to case 1b the new steel beams can be placed below or flush with the existing beams.

It should be noted that for both cases the global load path of the building would remain unaltered.

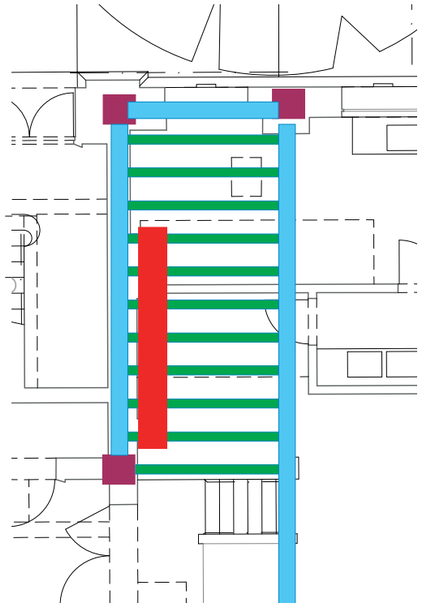


Figure 4.29 Case 2 - Opening perpendicular to joists

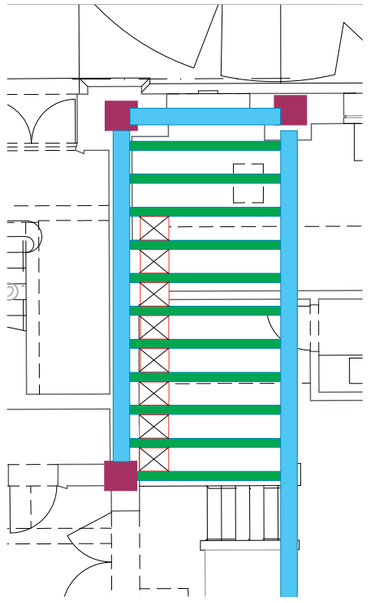


Figure 4.30 Case 2a - Adjust opening between the joists

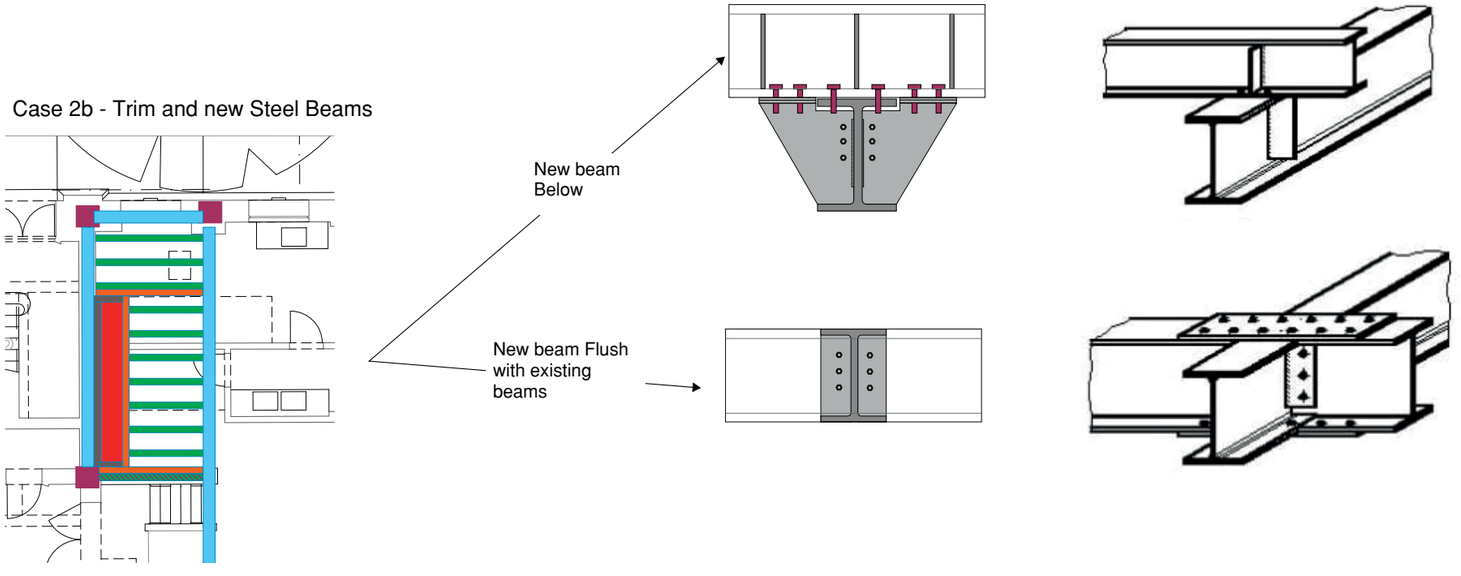


Figure 4.31 Case 2b -Potential structural interventions