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ST GILES CIRCUS

RETAINED FAÇADE STRUCTURAL ENGINEERING REPORT

for

Consolidated Developments

4th December 2012

029-S-REP-004

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RETAINED FAÇADE STRUCTURAL ENGINEERING REPORT

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APPENDIX A PROPOSED RETAINED FAÇADE SYSTEM CONCEPT DRAWINGS

Revision History

Rev	Date	Purpose/Status	Document Ref.	Comments
00	04/12/2012	Final	029-S-REP-004	For Planning Submission

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Director

Reviewed & Approved by:

Clive Fussell
Director

1 INTRODUCTION

1.1 General

1.1.1 Engenuiti has been appointed to provide civil and structural engineering design services for the St Giles Circus redevelopment adjacent to Tottenham Court Road station for Consolidated Developments in conjunction with ORMS Architecture Design and Sampson Associates.

1.1.2 This report has been produced for the exclusive use of Consolidated Developments and should not be used in whole or in part by any third parties without the express permission of Consolidated Developments or Engenuiti in writing.

1.1.3 This report should not be relied upon exclusively by Consolidated Developments for decision making purposes and may require reading in conjunction with other documents and drawings produced by the design team.

1.2 Purpose of Report

1.2.1 This report has been prepared to support the planning application and describes the concept level design proposals for the retained façade on St Giles High Street.

1.2.2 Façade retention forms an integral part of the proposals ensuring the new additions fronting Andrew Borde Street knit comfortably into the existing fabric. The principal zones, where it is proposed to retain facades and accommodate new buildings behind is the northern end of St Giles High Street (York & Clifton Mansions) and the south-side of Denmark Place. This report deals with the façade retention of York & Clifton Mansions which is the most significant aspect of proposed retention work in the project.

1.3 Drawing Images

1.3.1 Extracts from drawings prepared by ORMS have been used in the preparation of this report. Photographs have been taken and prepared by Engenuiti.

Figure 1.1 Location of York & Clifton Mansion Retained Facade

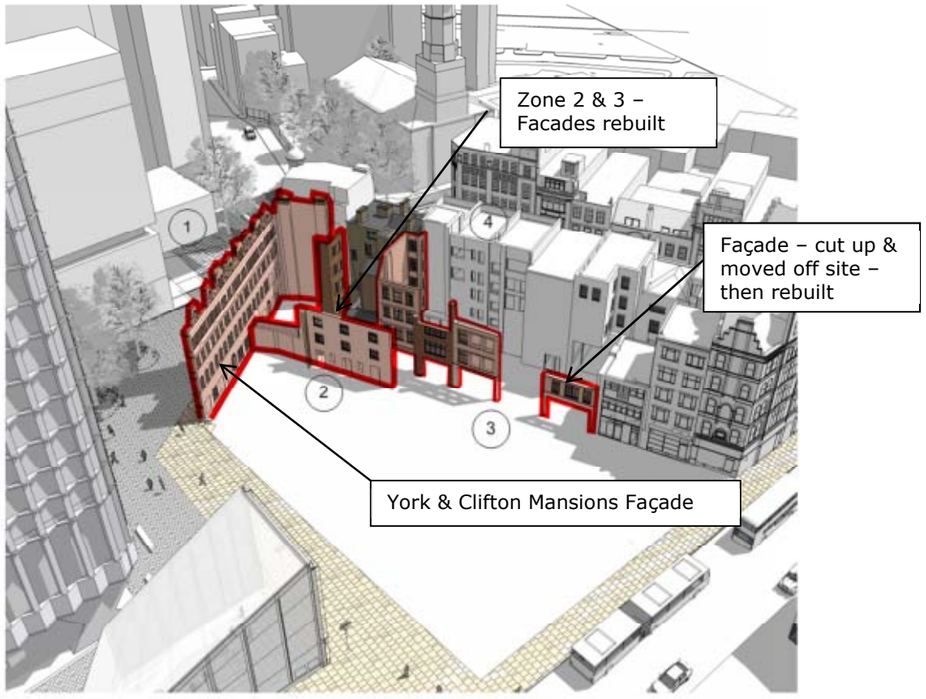


Figure 1.2 Visualisation of Retained Façade Elements

2 SURVEYS

2.1 General

2.1.1 At the time of writing, no detailed façade surveys have yet been undertaken on the building. The methodology included in this report is based on visual observations, desk studies and our experience of other buildings of this type.

2.1.2 A number of detailed surveys will be required to accurately assess the construction and condition of the building. These are explained in the following sections.

2.2 Site Investigation

2.2.1 A preliminary site investigation was undertaken in 2008 prior to London Underground occupying a large part of the site for the Tottenham Court Road upgrade project. A further detailed site investigation will be undertaken one LUL return the site to confirm the underlying ground conditions and existing foundation systems. This will include bore holes and trial pits. A number of these will need to be located in public areas (i.e. in the pavements) as access within the building perimeter is very restrictive. The relevant consents and licenses will need to be sought for these works.

2.3 Measured Surveys

2.3.1 This survey will accurately measure the existing building elements and identify their type (i.e. plasterboard, brick or concrete). This will include all elevations as well as floor plans, local to the facade. We recommend that a 3D laser survey is undertaken using point cloud technology to allow the existing building façade to be modelled in a Building Information Modelling system.

2.4 Condition Survey

2.4.1 This survey will identify the condition of the existing building fabric, and give recommendations for remedial works. This would include all building elements that will interface with the retained facade, including roofing material, structural frame, masonry, windows etc. This report will focus on the parts of the building to be retained, but an overall assessment will be required to assess the temporary works requirements during the partial demolitions. These surveys will be visual only, although access will be required to all areas. These surveys will also include adjacent structures.

2.5 Intrusive Structural Survey

2.5.1 The detailed design of the project will require additional structural information from that provided in the surveys above. This may include assessment of the thickness of walls, depth of floor joists, strength of masonry or concrete and the construction of elements hidden behind finishes. These intrusive surveys will be specified and scheduled on an "as-need" basis.

2.6 Monitoring during the Works

2.6.1 Before, during and after the work, a system of monitoring will be put into place. This will utilise targets, set at strategic locations, from which accurate survey information can be obtained. This will alert the design team to any movements outside that anticipated for remedial action.

2.6.2 Monitoring will commence prior to the actual works being commenced to pick-up seasonal and daily movements and assess the range of normal measurements. The scopes of all these surveys will be reviewed by the whole team. Refer to Section 6 Site Monitoring & Control of Movements for further detail.

3 EXISTING STRUCTURES & SITE CONSTRAINTS

3.1 Description of Structure

3.1.1 The façade to be retained along St Giles High Street comprises several retail units at ground floor level and dwelling space above. The parts of the façade to be retained relate to numbers 52 to 58 inclusive. No 59 is a Grade II listed building and is to be retained in whole as part of the overall redevelopment.

3.1.2 Some remodelling of the base building will be undertaken, but this is understood to be fairly nominal in nature and related to retail unit frontage. A desk study report for the site has been carried out and reviews available information regarding the existing basement construction. Numbers 52 to 55 have a one level basement whereas numbers 56 to 58 do not appear to have basements according to survey drawings.

3.1.3 The existing base building foundations could not be determined from the desk study review. It is assumed to comprise of load bearing masonry on corbelled strip foundations taken into the gravel formation. The buildings behind the façade typically have a ground and three upper floors and mansard roof. The structure of the floors has yet to be determined through an inspection of the building, from the date of the structure the floors are likely to comprise of timber joist spanning between masonry walls.

3.1.4 The buildings and façade along St Giles High Street was constructed mid to late 19th Century. The structure of these buildings appear to generally comprise of load bearing masonry, floors are likely to comprise of timber joists. Details of the construction will need to be determined by further investigation.

3.1.5 As determined from the desk study report it is likely that both buildings are supported on shallow foundations. Any available as-built drawings should be sourced and the extents of the existing basement foundations are to be determined by a site investigation which will include some / all of the following: visual inspection, trial pits, dynamic probing and possibly geophysical techniques.

3.1.6 The Eastbound Crossrail tunnel runs under the site and the proposed new basement construction for the development runs under the proposed façade retention. Crossrail have been contacted and the design of the basement and foundation structures will proceed in line with a Construction Design Statement (CDS) that will be reviewed by Crossrail.

Figure 3.1 Photograph of St Giles High Street Facade

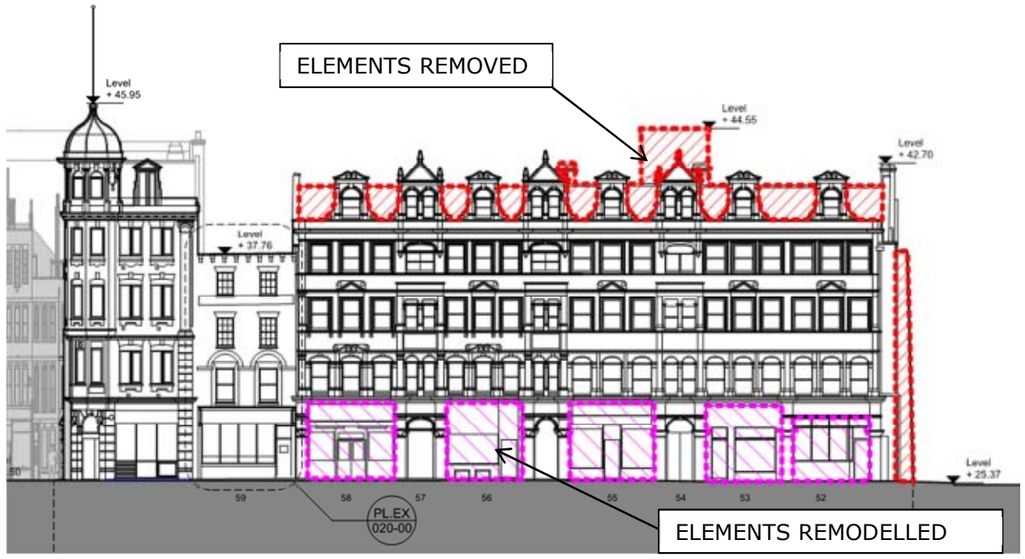


Figure 3.2 Elevation of St Giles High Street Facade

4 ADJOINING BUILDINGS

4.1 No 59 St Giles High Street

4.1.1 The property is a four storey masonry building with mansard roof to the rear, which the Camden listed building register dates from the early 19th Century. The top floor of the front facade is of slightly later masonry construction than the floors below. There are two windows in the front facade. The original masonry front facade has been removed at ground floor level and replaced with steel beam and column.

4.1.2 Modern floor finishes on the upper floors meant that it was not possible to confirm the direction of the span of the floor, however from the deflected shape of the floor it is likely that the first floor spans between the masonry party walls and is trimmed around the chimney breasts that are retained on the party wall to No. 28 Denmark Street.

Figure 9.1 Location of No 59 St Giles High Street

4.1.3 The mansard roof has a central valley that runs from the front facade to the rear where it drains to a gutter behind a parapet.

4.1.4 The timber stud wall around the stairs supports the rear portion of the upper floors and extends down to ground floor level. This wall is removed at basement level where a masonry wall is provided adjacent to the stairs. At basement level a masonry spine wall separated the front and rear portions of the building. In front of the building there is a former light-well that has been covered with a concrete slab supported by a steel beam to form the pavement above.

Figure 9.2 Front Elevation

4.2 Condition and Observed Maintenance issues

4.2.1 There is little sign of movement to the external masonry walls, the main maintenance issue relates to the mansard roof which is in poor condition. The slates to the rear elevation have been replaced with corrugated metal panels, there is a build- up of debris on the roof and behind the rear parapet and the flashings to the adjacent walls are incomplete. It was not possible to inspect the condition of the roof timbers.

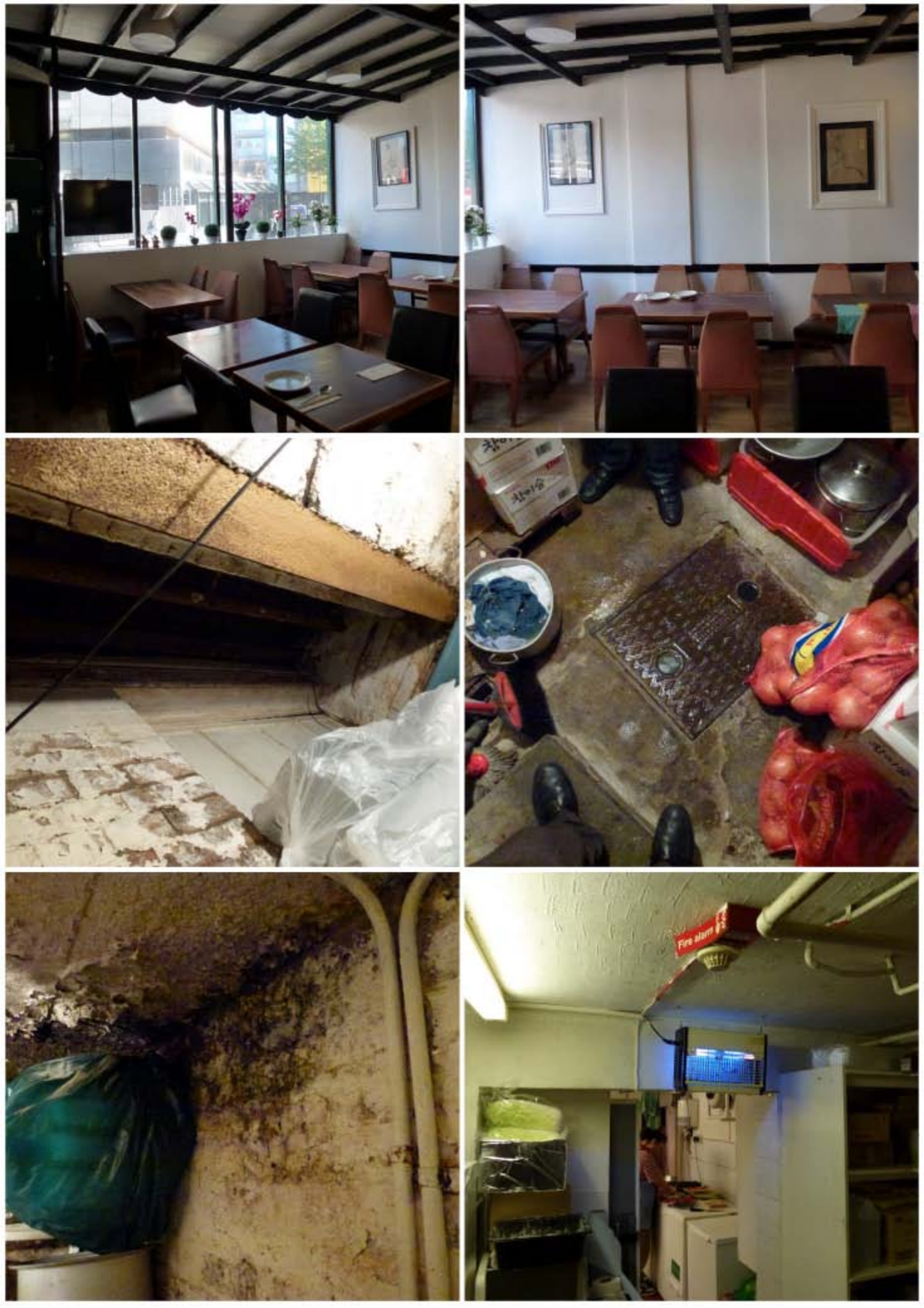
4.2.2 Internally the first floor structure was slightly springy when walked upon and the plaster finishes to the stud wall around the stair have been removed at first floor level to expose the studs. These studs are therefore lacking any fire protection and have inadequate restraint.

4.3 Refurbishment

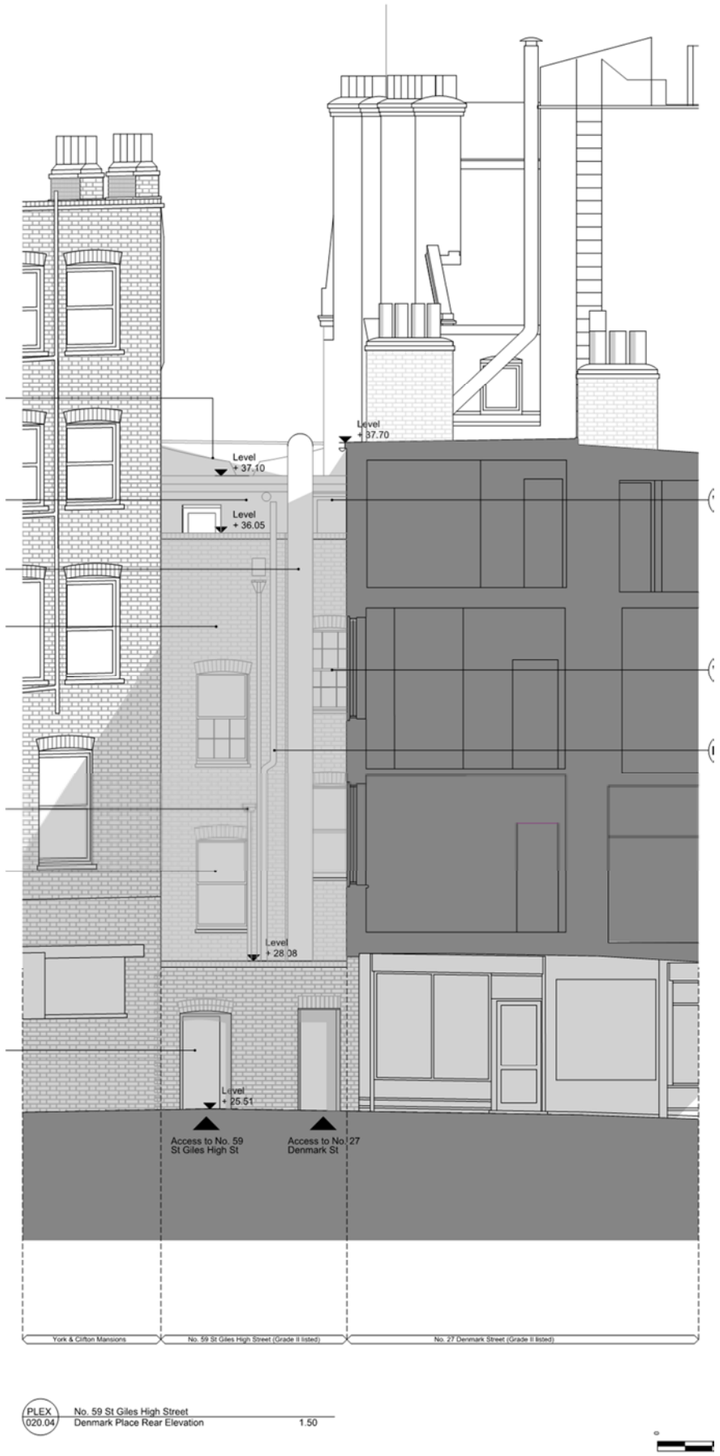
4.3.1 Floor structures: as the floor structures were hidden behind finishes it was not possible to comment on their condition, however it is likely that the cumulative effect of existing service penetrations in the floors will limit the potential for cutting new service penetrations in the floors. Where floor boards are lifted during the refurbishment works it is recommended that the opportunity is taken to inspect the condition of the junction between the timbers and the supporting party or load bearing stud walls.

4.3.2 The load bearing exposed timber stud walls around the stairs need to be provided with noggins to restrain the studs against buckling and provided with fire protection.

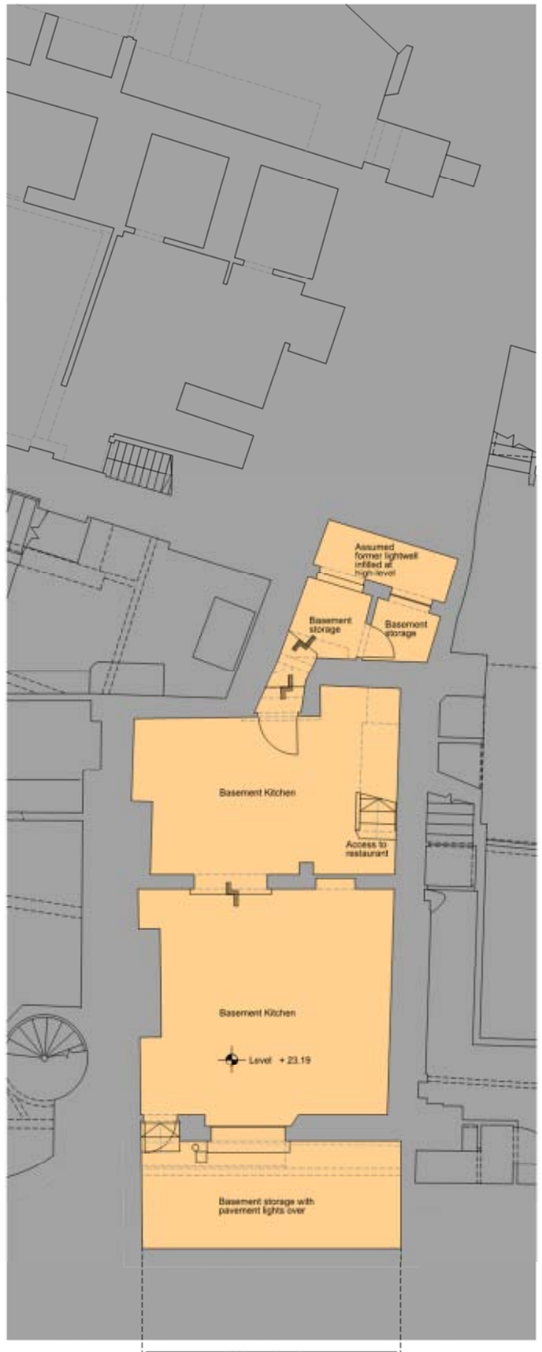
4.3.3 Roof structures: maintenance is required to the mansard roof. All debris must be removed. Consideration should be given to removing the slates, inspecting the condition of the timber and installing a breather membrane over the rafters before replacing the slates. The corrugated panels should be replaced with slates. Flashings to chimneys, parapets and gutters should be repaired or replaced where missing.



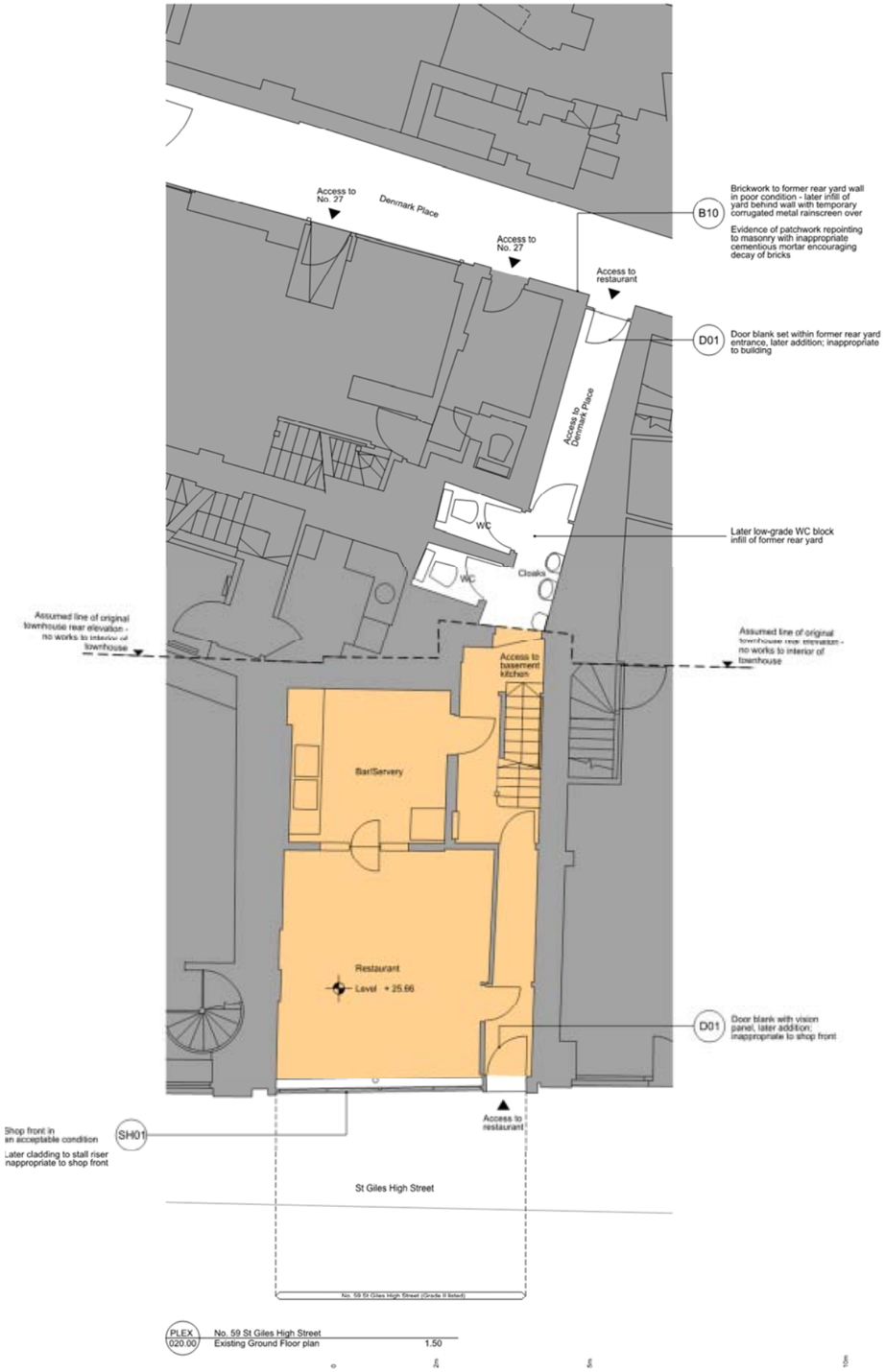
EX-B 020.03 No. 59 St Giles High Street Elevation 1.50



PLEX 020.04 No. 59 St Giles High Street Denmark Place Rear Elevation 1.50



PLEX 020.00 No. 59 St Giles High Street
Existing Basement plan 1.50



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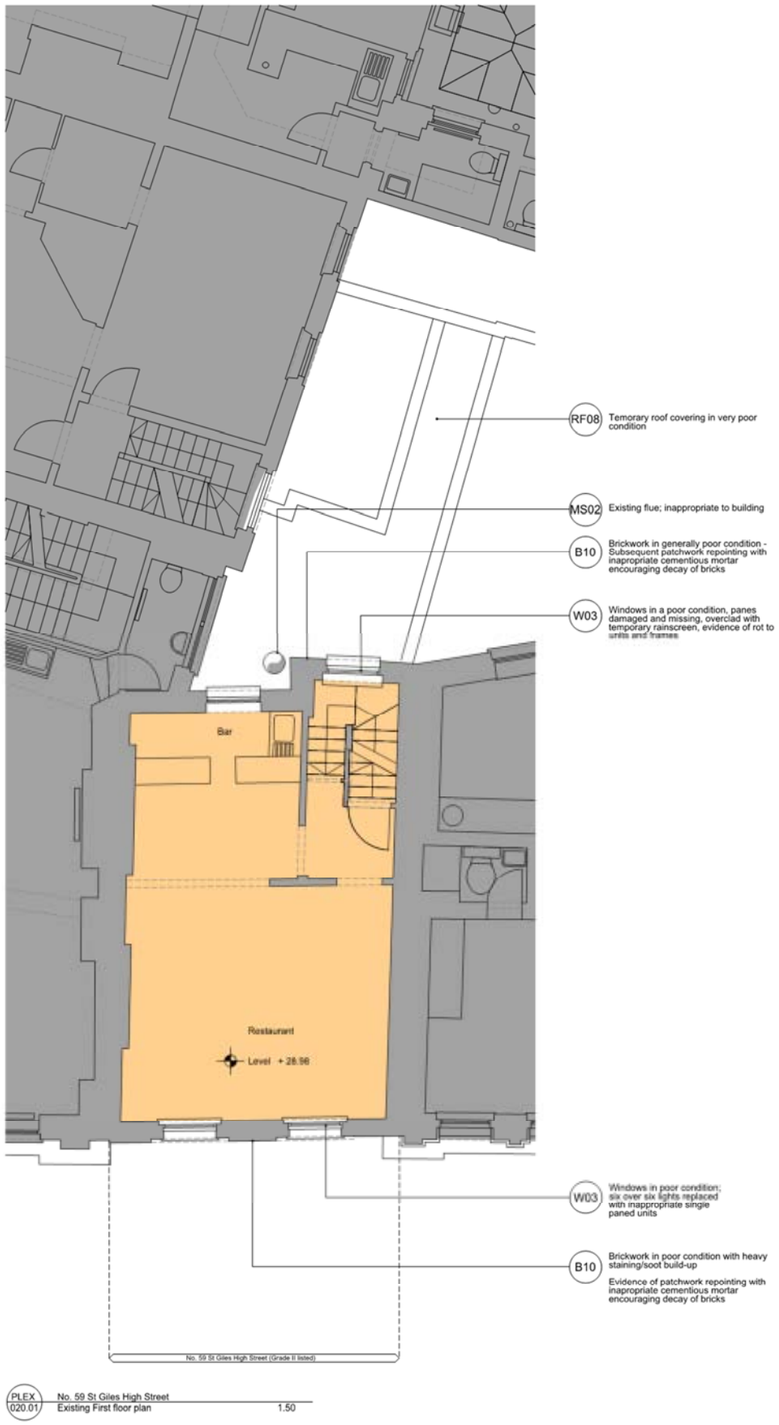
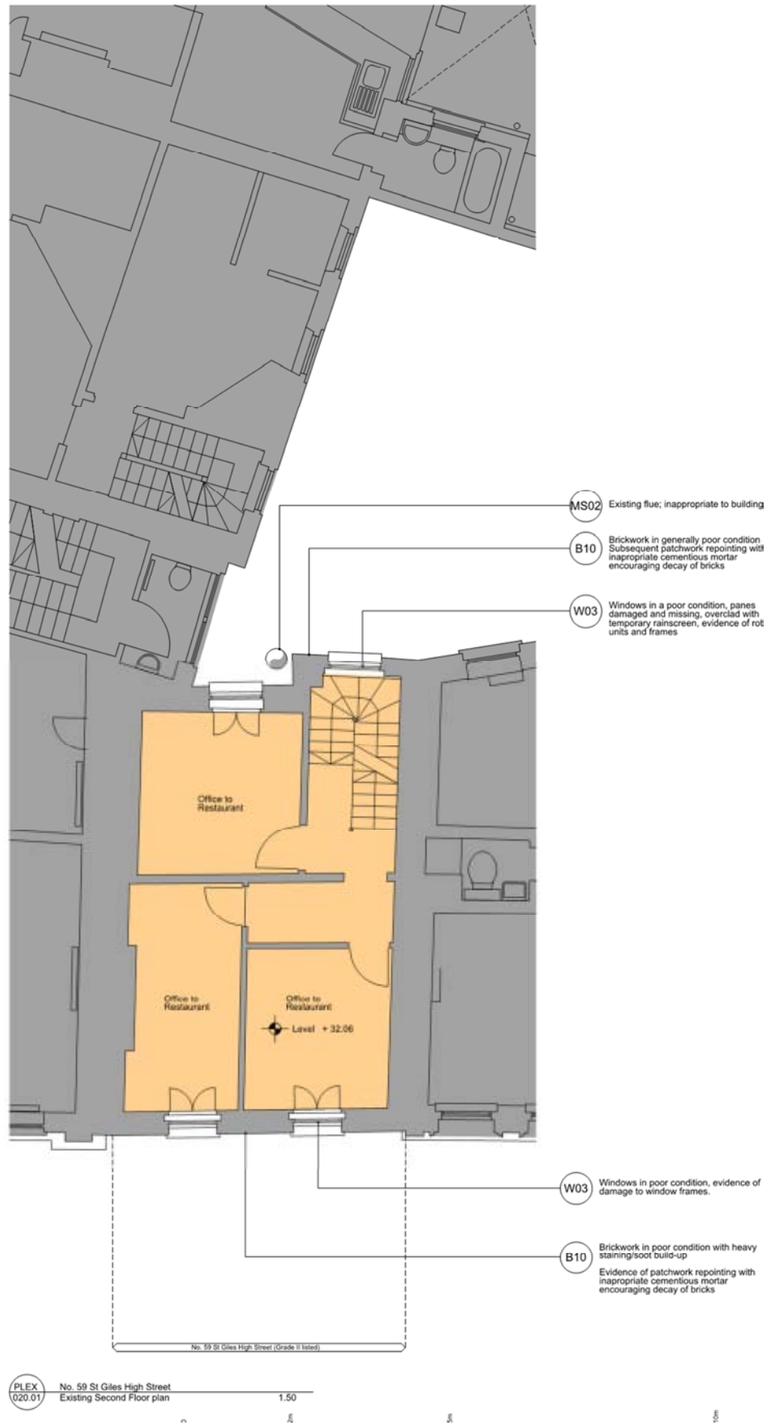
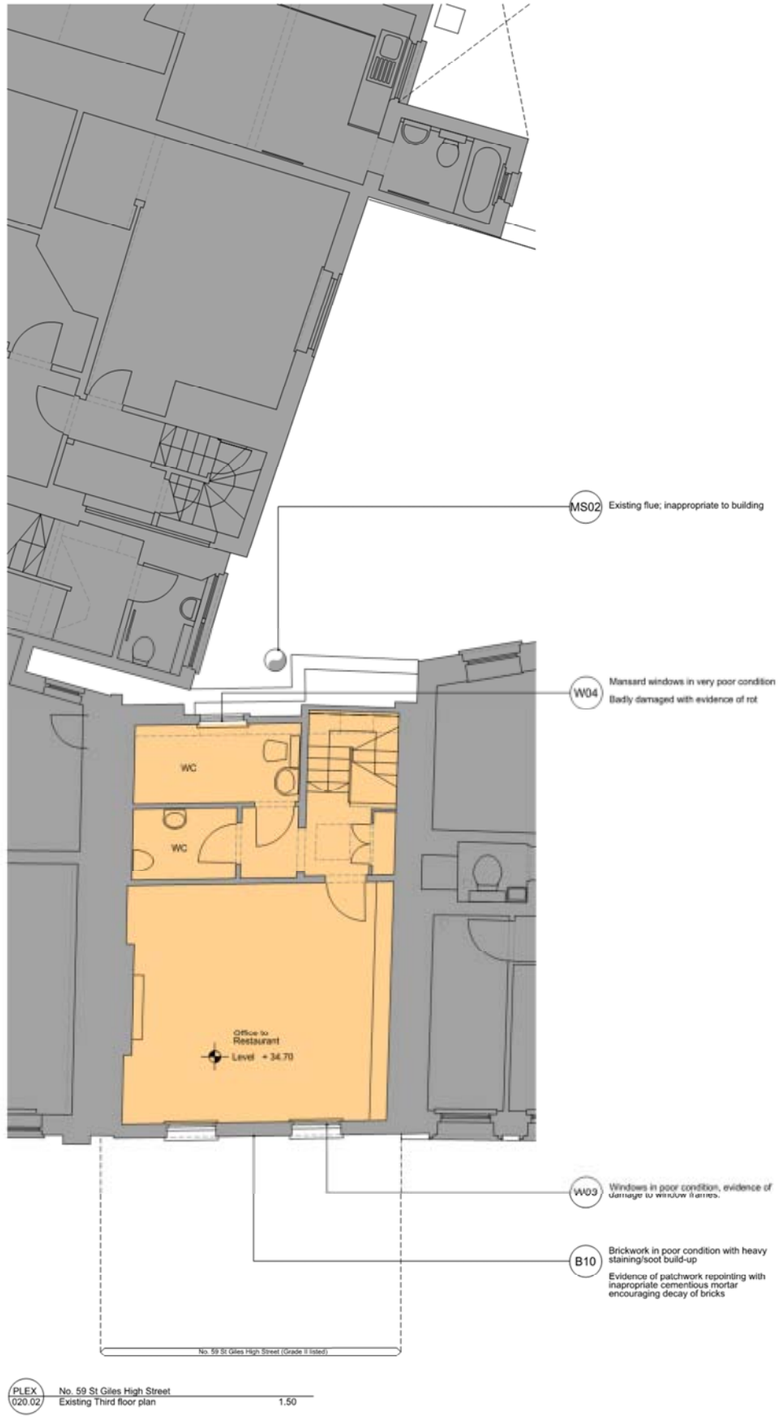
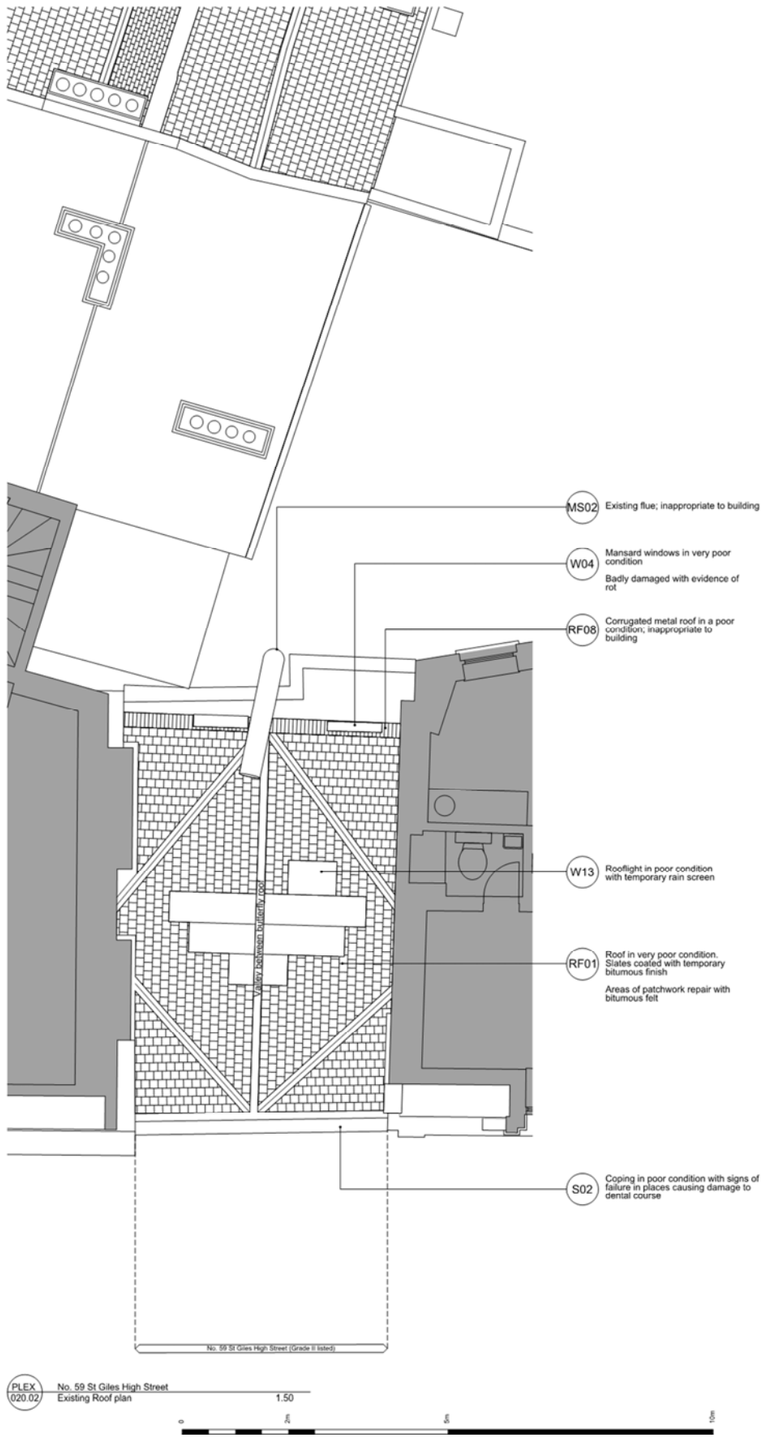
Existing Ground Floor plan 1.50


RF08
Temorary roof covering in very poor condition
MS02
Existing flue; inappropriate to building
B10
Brickwork in generally poor condition - Subsequent patchwork repointing with inapropriate cementious mortar encouraging decay of bricks
W03
Windows in a poor condition, panes damaged and missing, overclad with temporary rainscreen, evidence of rot to units and frames
Bar
Restaurant
Level +28.98
W03
Windows in poor condition; six over six lights replaced with inappropriate single paned units
B10
Brickwork in poor condition with heavy staining/soot build-up
Evidence of patchwork repointing with inapropriate cementious mortar encouraging decay of bricks
No. 59 St Giles High Street (Grade II listed)
PLEX 020.01
No. 59 St Giles High Street
Existing First floor plan
1.50


MS02
Existing flue; inappropriate to building
B10
Brickwork in generally poor condition Subsequent patchwork repointing with inapropriate cementious mortar encouraging decay of bricks
W03
Windows in a poor condition, panes damaged and missing, overclad with temporary rainscreen, evidence of rot units and frames
Office to Restaurant
Office to Restaurant
Office to Restaurant
Level +32.06
W03
Windows in poor condition, evidence of damage to window frames.
B10
Brickwork in poor condition with heavy staining/soot build-up
Evidence of patchwork repointing with inapropriate cementious mortar encouraging decay of bricks
No. 59 St Giles High Street (Grade II listed)
PLEX 020.01
No. 59 St Giles High Street
Existing Second Floor plan
1.50



PLEX 020.02 No. 59 St Giles High Street
Existing Third floor plan 1.50



PLEX 020.02 No. 59 St Giles High Street
Existing Roof plan 1.50

5 PROPOSED CONCEPT & CONSTRUCTION SEQUENCE

5.1 Proposed Concept

5.1.1 The scheme comprises the retention of the facade at no.52 to 55 and 56 to 58 St Giles High Street and the construction of a new building and two-level basement behind the retained section. A façade retention system will be required as part of an enabling works contract prior to the demolition of the buildings behind the façade. The part of the new development on the site of 56 to 58 is generally known as Building D.

5.1.2 Building D is a typically a 4 storey concrete framed structure that is designated for A3/A4 use and houses the building services plant that serves the majority of the project. A concrete flat slab structure spanning up to 7m between columns is utilised to provide the maximum clear height for the services and provide a robust structure with sufficient mass to void vibration problems.

5.1.3 The northern part of the building houses kitchens and plant associated with building B and is connected to building B. As this part of the building is above the box in box construction it is proposed to frame this building in steel with composite floors to minimise the loads that need to be transferred over the box in box structure. The new concrete structure of Building D stops short of the retained facade on St Giles High Street. Stability is provided by a combination of concrete shear walls adjacent to the party wall, sway frame action of the closely spaced columns behind the existing façade and bracing around the steel framed lift shafts.

5.1.4 A grillage of steel columns and beams will be installed behind the façade. The columns are located behind brick piers and the beams will be immediately above or below the existing floors. The grillage will not be visible in the external elevations. The grillage will be tied back to the steel frame and concrete frame; provision for relative vertical movement will be incorporated in the connection detail.

5.2 Assessment of Temporary Restraint System

5.2.1 Two methods are feasible for restraint of the façade:

- Internal
- External

5.2.2 An internal system will enable the façade to be tied back without impacting upon the pavement or requiring a license for temporary structure. However, an internal façade restraint system will require complex coordination with the basement and superstructure. In order to complete some of the basement piling works modification of the façade restraint system will be necessary. This will impose constraints upon the Contractors undertaking the works that could have programme, and health and safety implications.

5.2.3 An external façade retention system will however require a license, but will remain in place during the contract works. Construction of the basement and superstructure can be undertaken without the requirement to make adjustments to the restraint system. Adopting this system will reduce risk to the contractor and any trades that cross between works phasing.

Figure 5.1 Proposed Elevation Concept for Retained Facade

Figure 5.2 Proposed Overall Concept for Retained Facade

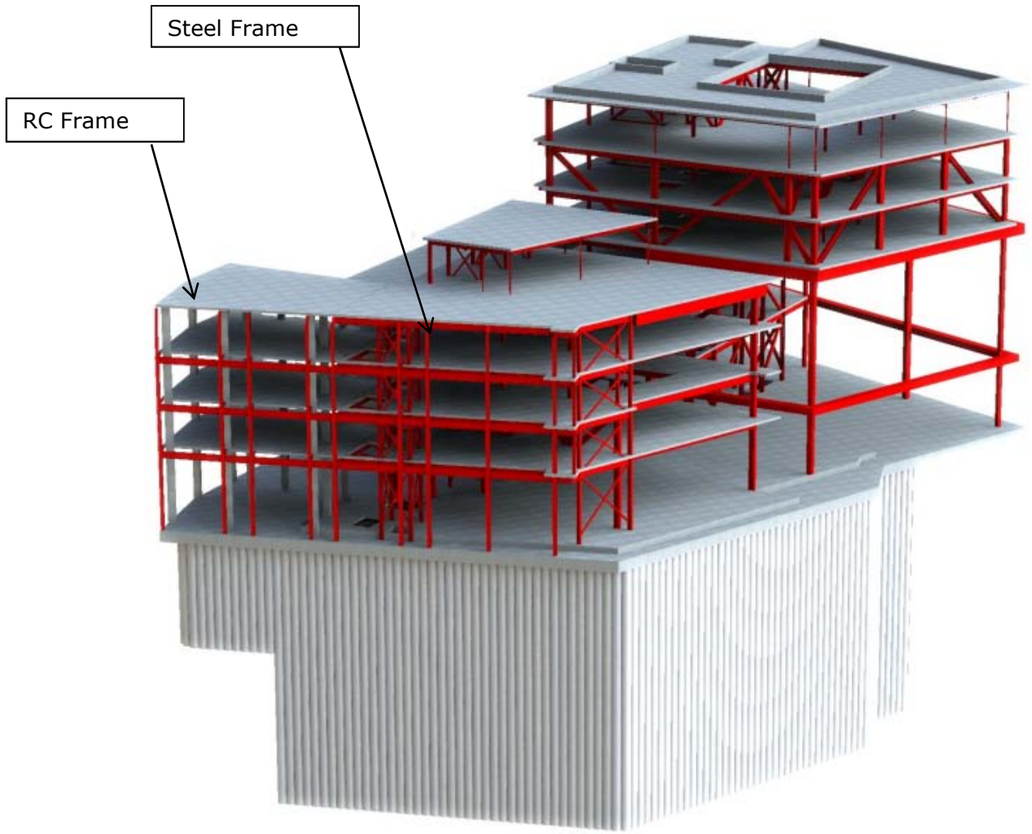


Figure 5.3 Structural Frame View 1

Figure 5.4 Structural Frame View 2

	Internal Retention	External Retention
Pros	Avoids site works over pavement. No additional planning permission required	Provides opportunity for site office to be incorporated. Provides clear access to site. Reduces health and safety risks by requiring less coordination for site works, and specifically reduces risk during demolition by removing temporary works out side the site. Does not require alteration of temporary works inside site for basement wall and ground floor slab construction.
Cons	Phasing of works constricted; including demolition, temporary conditions, basement, and superstructure. Time and programme effects. Restricts piling rig movement around site. Access to site from will require greater coordination with retention frame positioning.	Planning permission required from Planning Authority. Reduces pedestrian pavement space.

5.2.4 We recommend that temporary structure is located externally to reduce site congestion and complication of phasing site works. This will give greater flexibility to the construction programme as the site will be clear for the contractor. Health and safety risks are also reduced by locating the retention scheme outside the site. This also mitigates complex phasing works required for an internal temporary works solution.

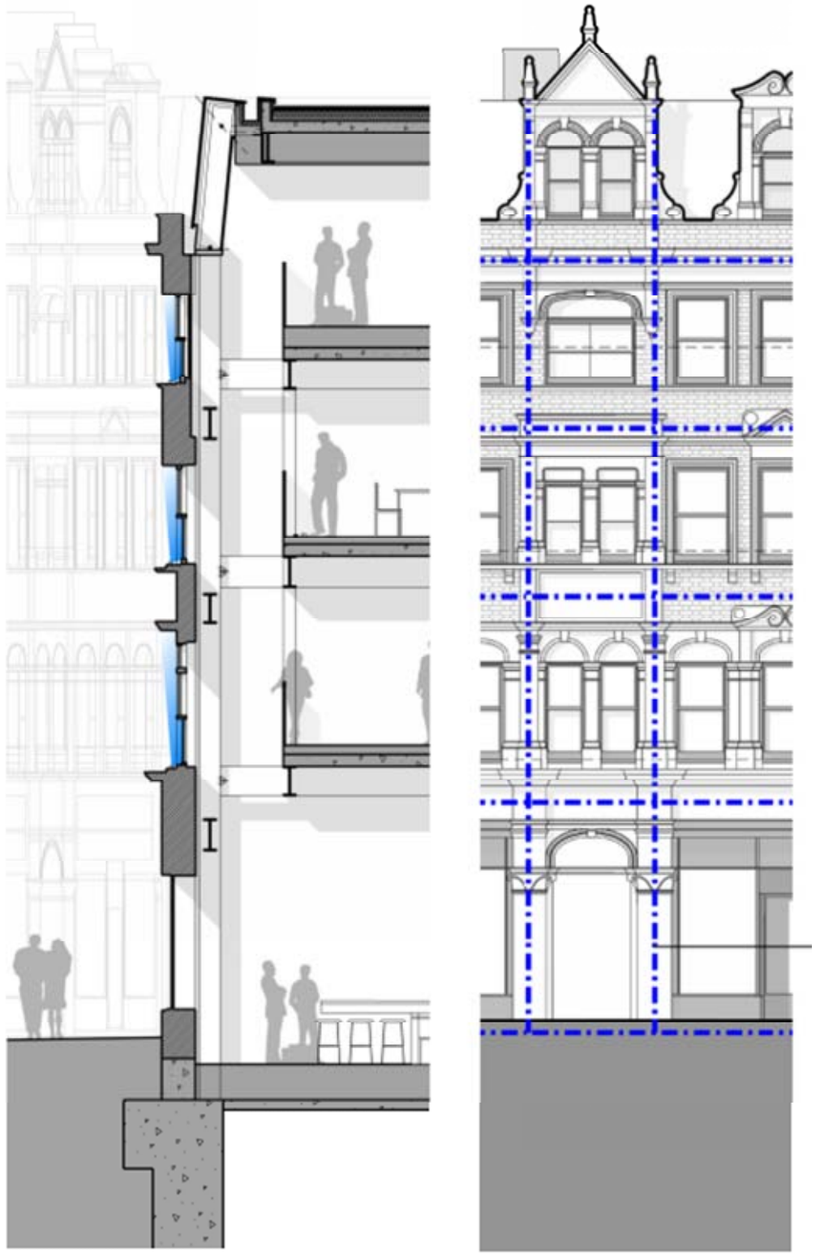


Figure 5.5 Section Through Retained Facade

5.3 Permanent Façade Retention

5.3.1 The permanent solution to the existing façade retention will be coordinated with the temporary structure. This is required to ensure that the permanent structure can be connected to the existing façade whilst in the temporary state and then the temporary structure can be deconstructed. The proposed method of connecting the new structure to the existing wall is with permanent ties. The permanent connection will allow for relative vertical movement between the retained façade and proposed new structure. The new structure will not vertically load the existing wall.

5.4 Foundation Solution

5.4.1 The foundation solution developed in the concept design is dependent on the constraints imposed by both the existing ground conditions and the surrounding infrastructure. Different foundation solutions have therefore been developed for the following areas:

- Around the Eastbound Crossrail tunnel.
- Above the NLEB.
- The remainder of buildings A, B and C.
- 4 Flitcroft Street and 1 Book Mews.
- The refurbished buildings.

5.4.2 The major concern is control of movements, especially due to changes in load on the London Clay and earth pressures on the proposed basement retaining walls. Allowance shall be made for underpinning the retained façade to reduce risk of movement prior to piling. New buildings and steel grillage are to be supported on the piled retaining wall capping beam.

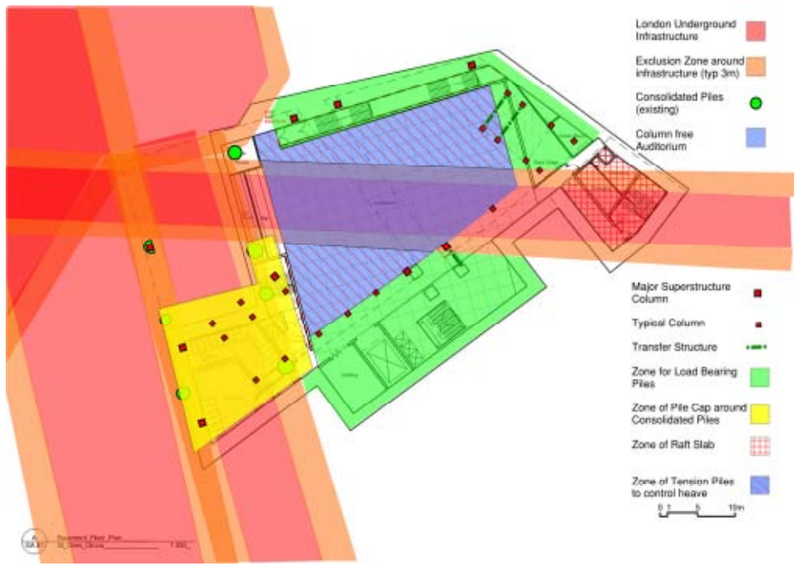


Figure 5.6 – Site Constraints

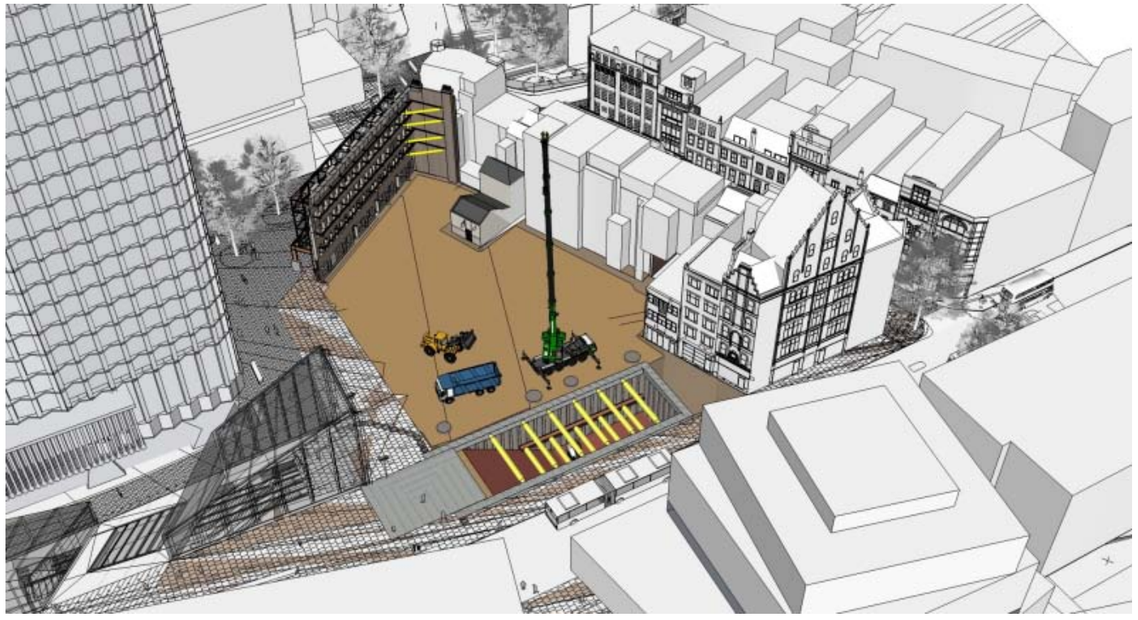
STAGE 1 – DEMOLITION, ENABLING WORKS & FAÇADE RETENTION

STAGE 3 – LUL ESCALATOR BOX CAPPING BEAM PROPS INSTALLATION

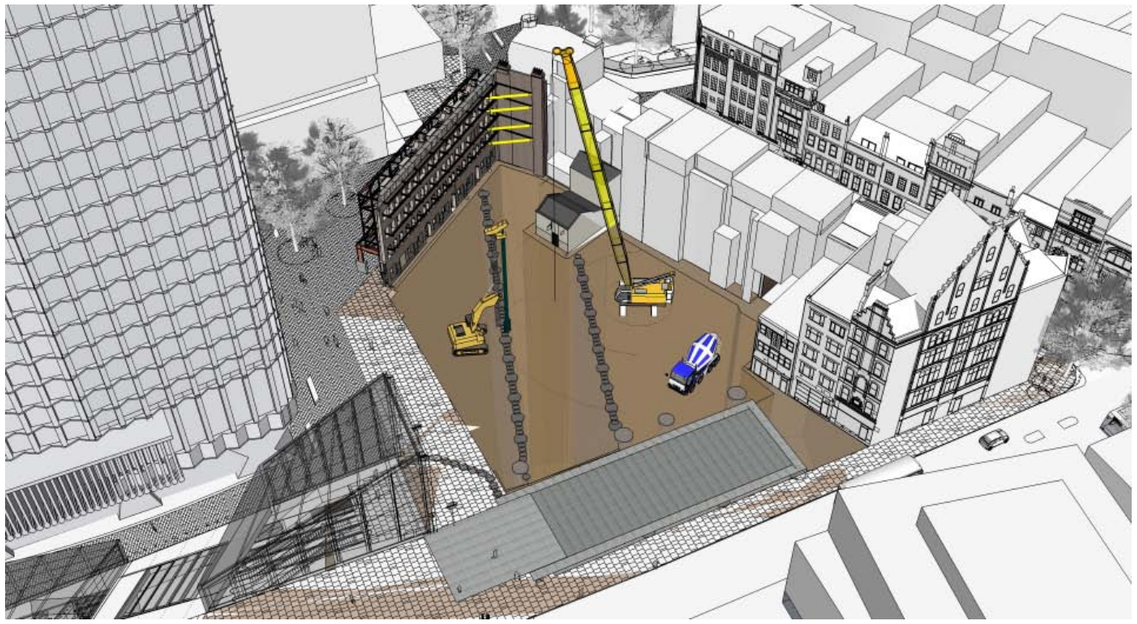
STAGE 2 – LUL ESCALATOR BOX BREAKOUT & STAGE 1 EXCAVATION

STAGE 4 – LUL ESCALATOR BOX STAGE 2 EXCAVATION

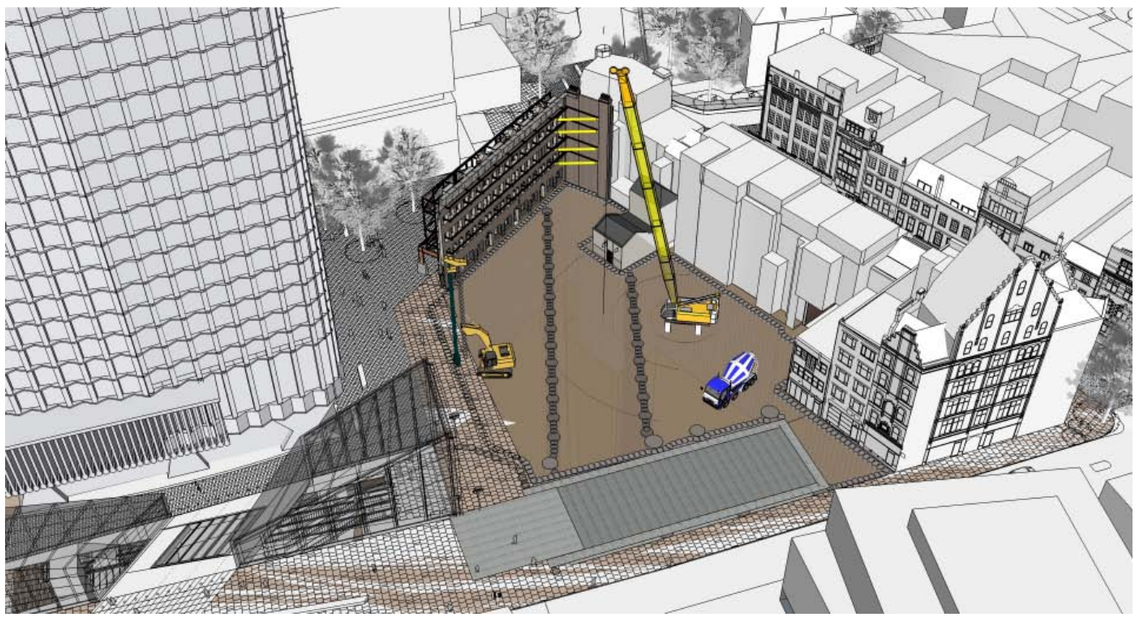
STAGE 5 – LUL ESCALATOR BOX STAGE 2 PROPS INSTALLATION



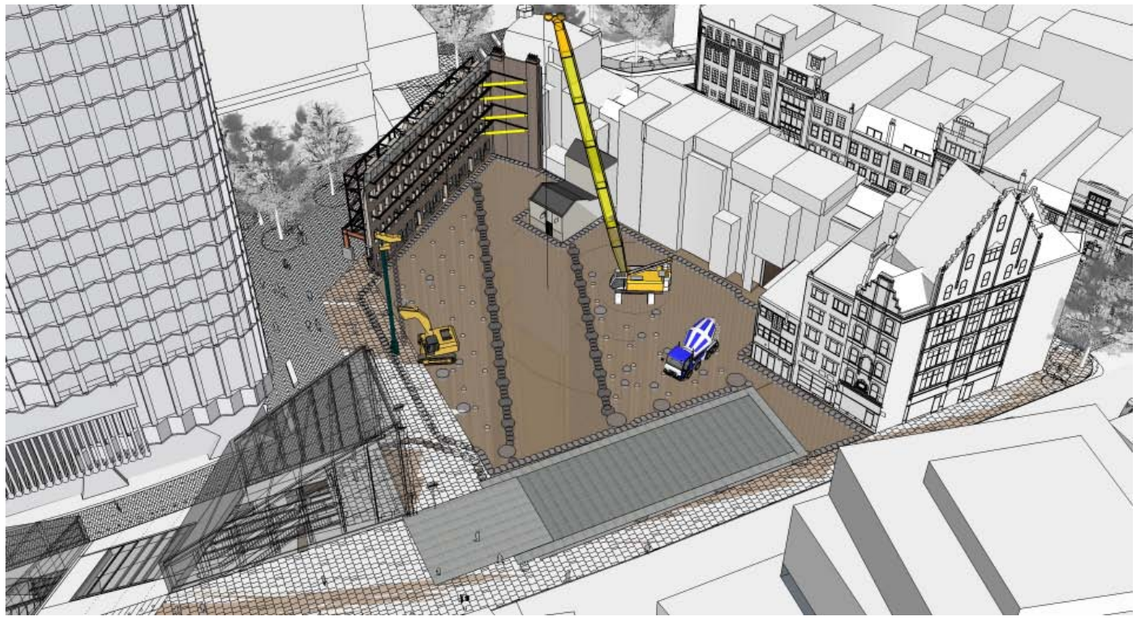
STAGE 6 – LUL ESCALATOR BOX STAGE 3 EXCAVATION



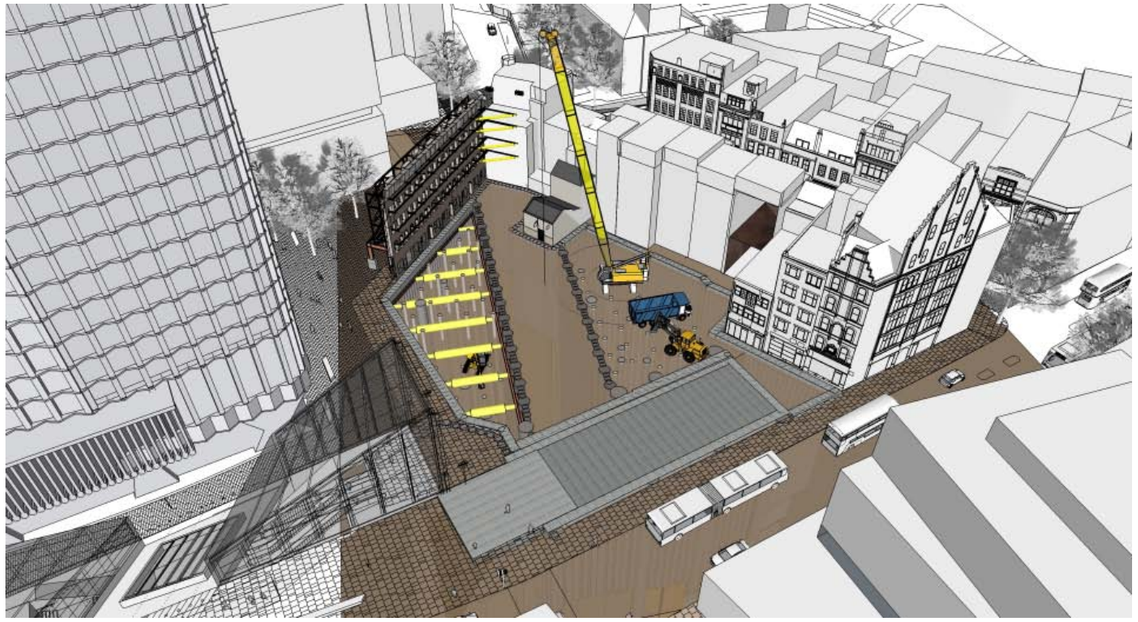
STAGE 7 – PILED WALL CONSTRUCTION TO CROSS RAIL TUNNEL



STAGE 8 – PILED WALL CONSTRUCTION TO BASEMENT PERIMETER



STAGE 9 – MAIN PILES AND TENSION PILES INSTALLATION

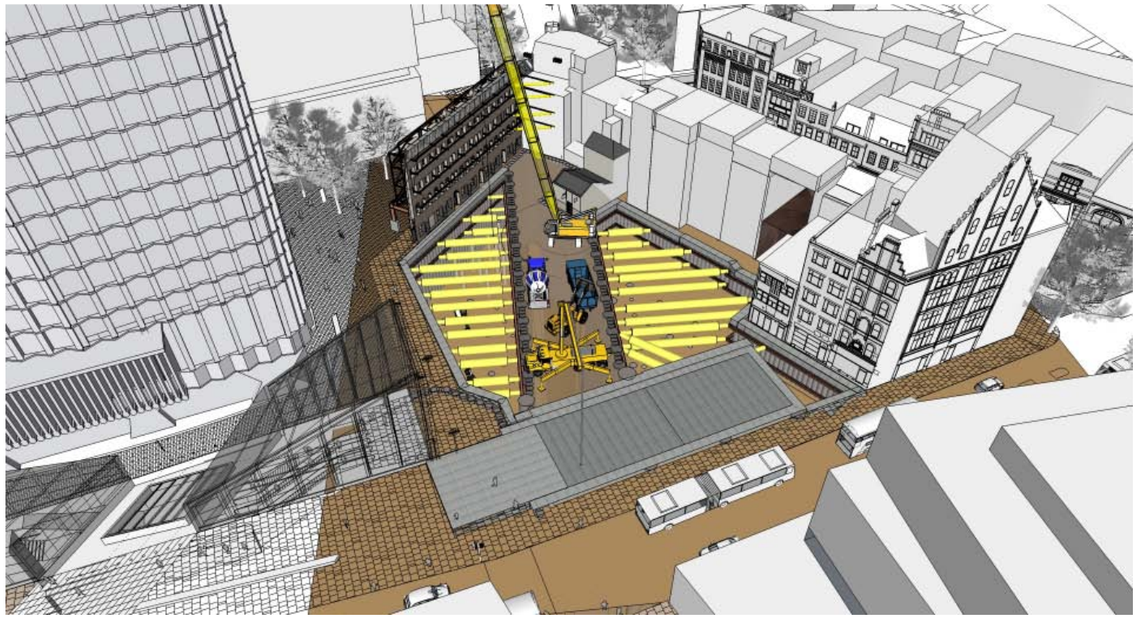


STAGE 10 – EXCAVATION OF NORTHERN BASEMENT STAGE 1

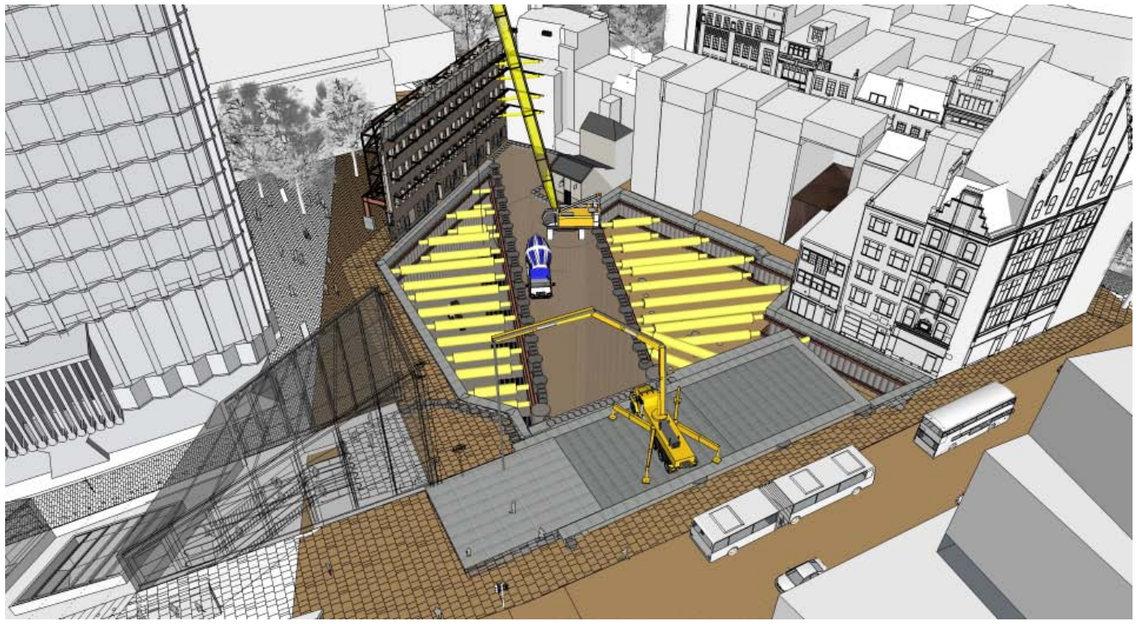
STAGE 11 – INSTALL TEMPORARY PROPS IN NORTHERN BASEMENT

STAGE 12 – EXCAVATION IN SOUTHERN BASEMENT STAGE 1

STAGE 13 – INSTALL TEMPORARY PROPPING IN SOUTHERN BASEMENT

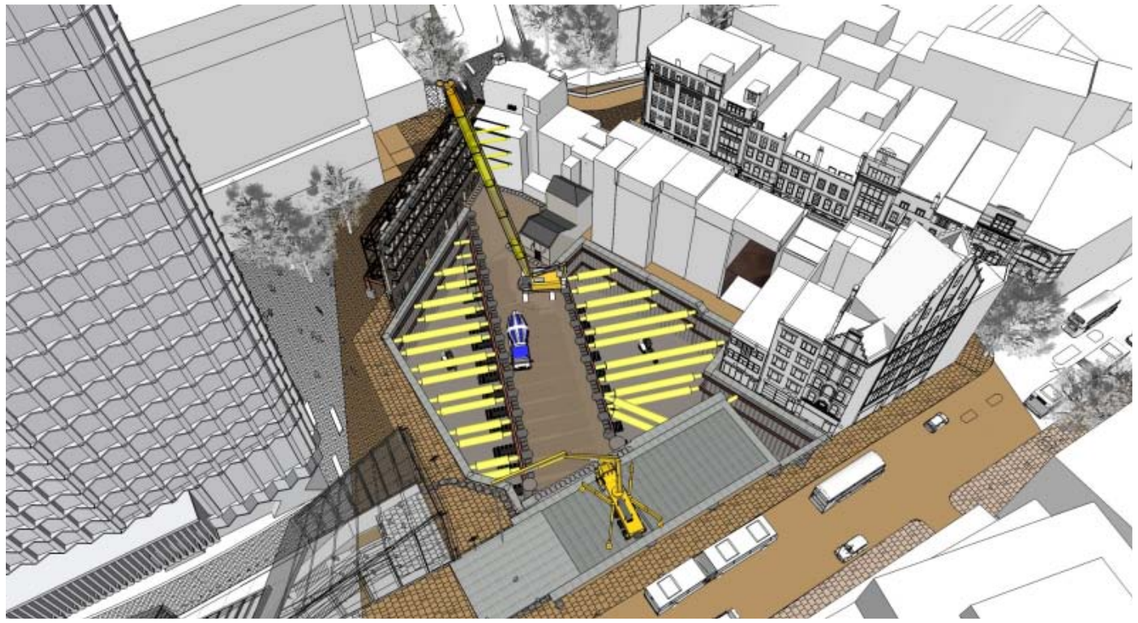


STAGE 14 – NORTHERN BASEMENT EXCAVATION STAGE 2



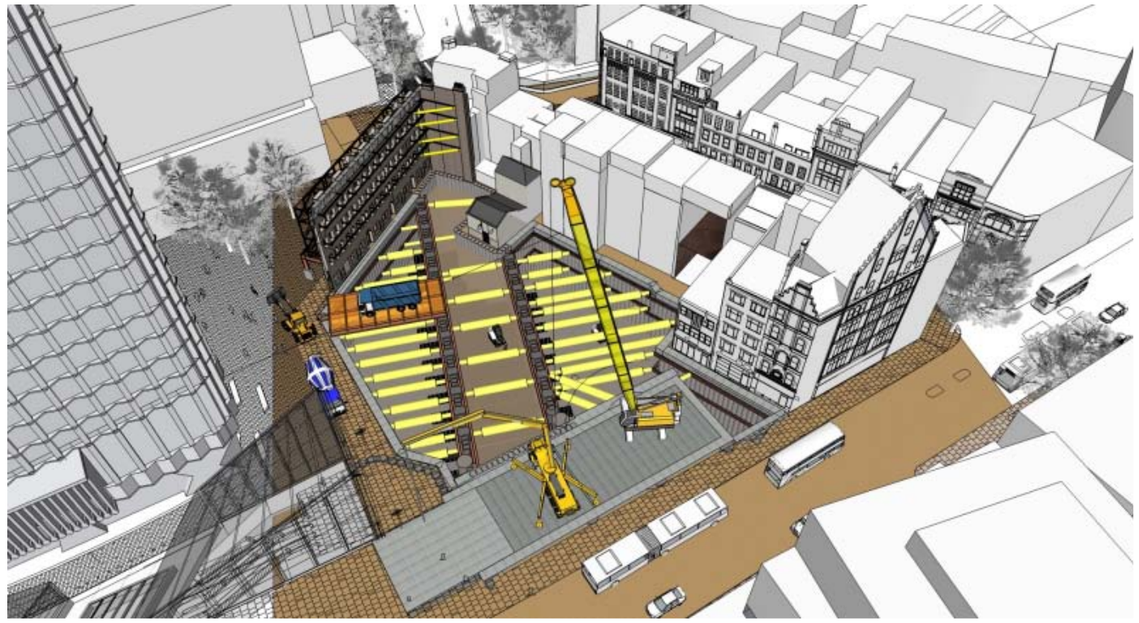
STAGE 15 – NORTHERN BASEMENT SLAB AND ADITS

STAGE 16 – SOUTHERN BASEMENT EXCAVATION STAGE 2



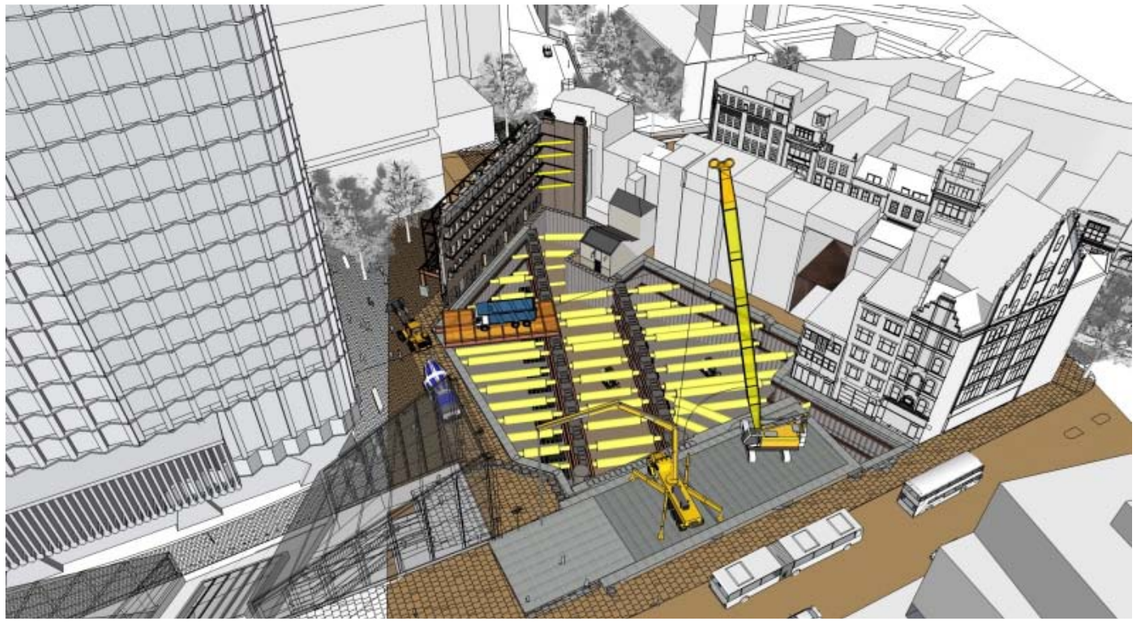
STAGE 17 – ADIT BEAM CONSTRUCTION

STAGE 18 – CROSSRAIL OVER BASEMENT EXCAVATION STAGE 1

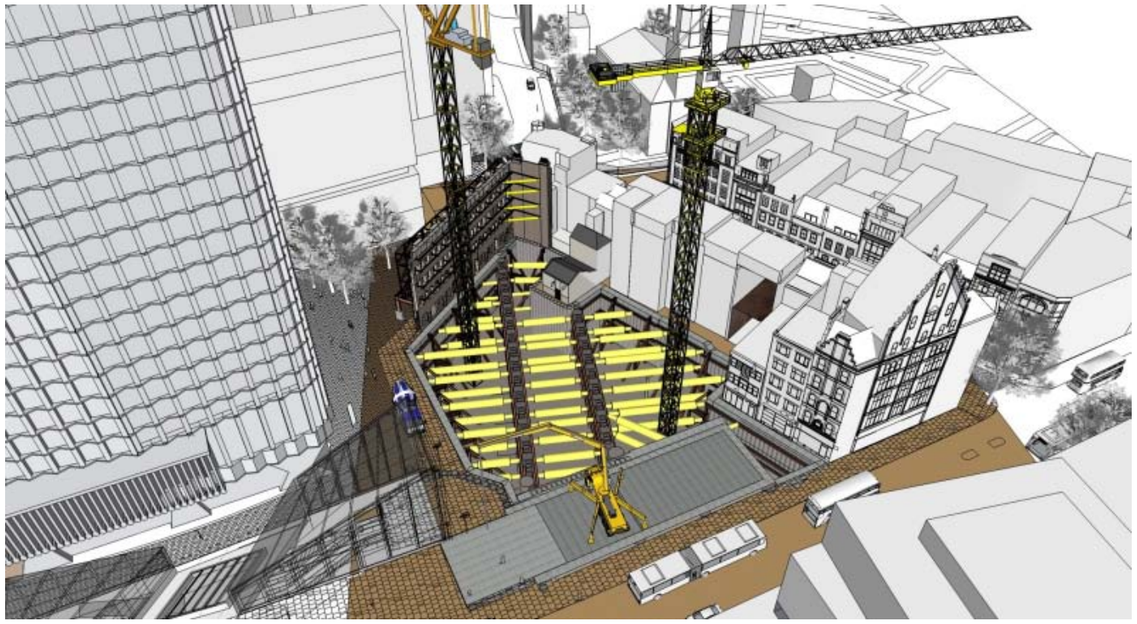


STAGE 19 – CROSS RAIL OVER BASEMENT TEMPORARY PROPPING

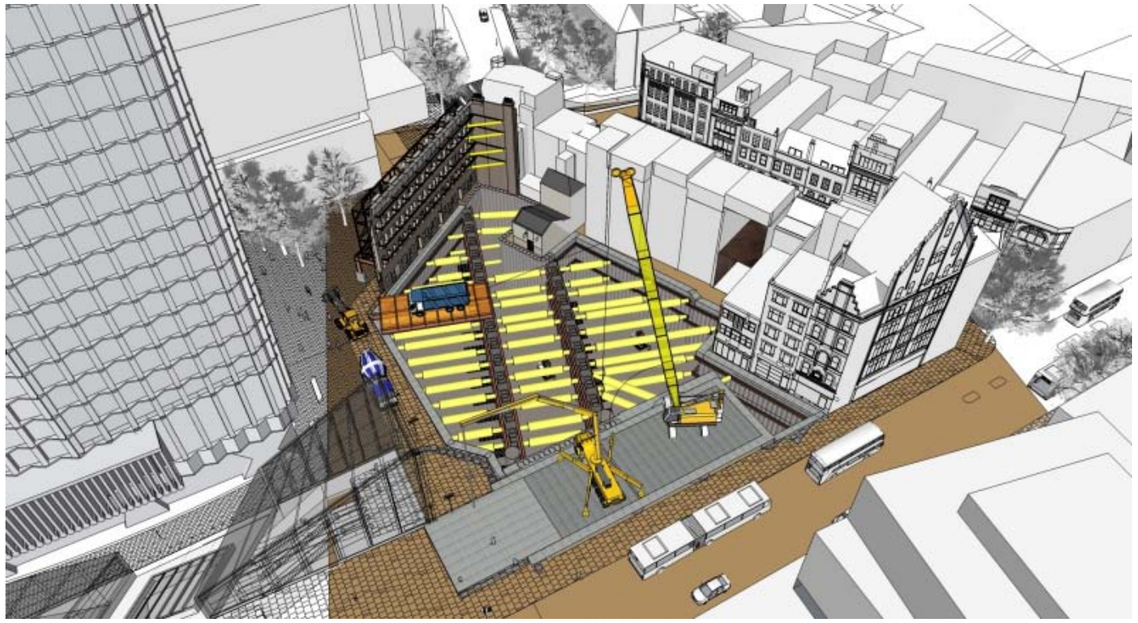
STAGE 20 – CROSSRAIL OVER BASEMENT EXCAVAVTION STAGE 2



STAGE 21 – CROSS RAIL OVER BASEMENT TEMPORARY PROPPING



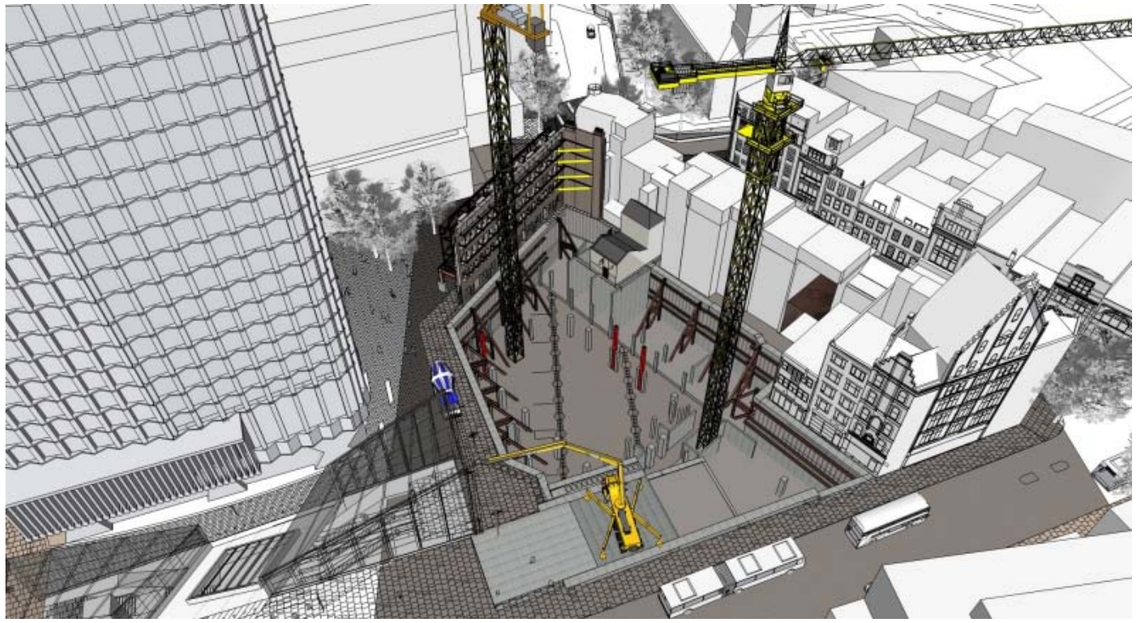
STAGE 23 – CONSTRUCT BASEMENT LINER WALLS & INSTALL PERIMETER RAKING PROP SYSTEM



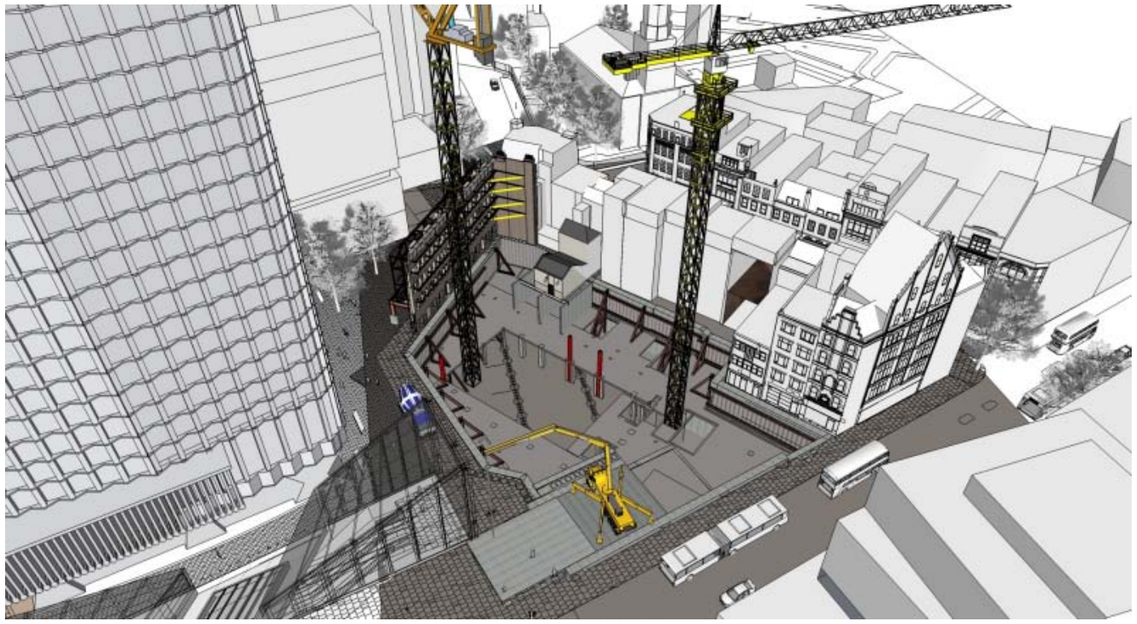
STAGE 22 – EXCAVATE TO ADIT BEAM LEVEL AND CONSTRUCT SLAB

STAGE 24 – REMOVE ALL HORIZONTAL PROPPING SYSTEMS

STAGE 25 – DEMOLISH CROSSRAIL TEMPORARY PILES & BREAKOUT LUL BOX

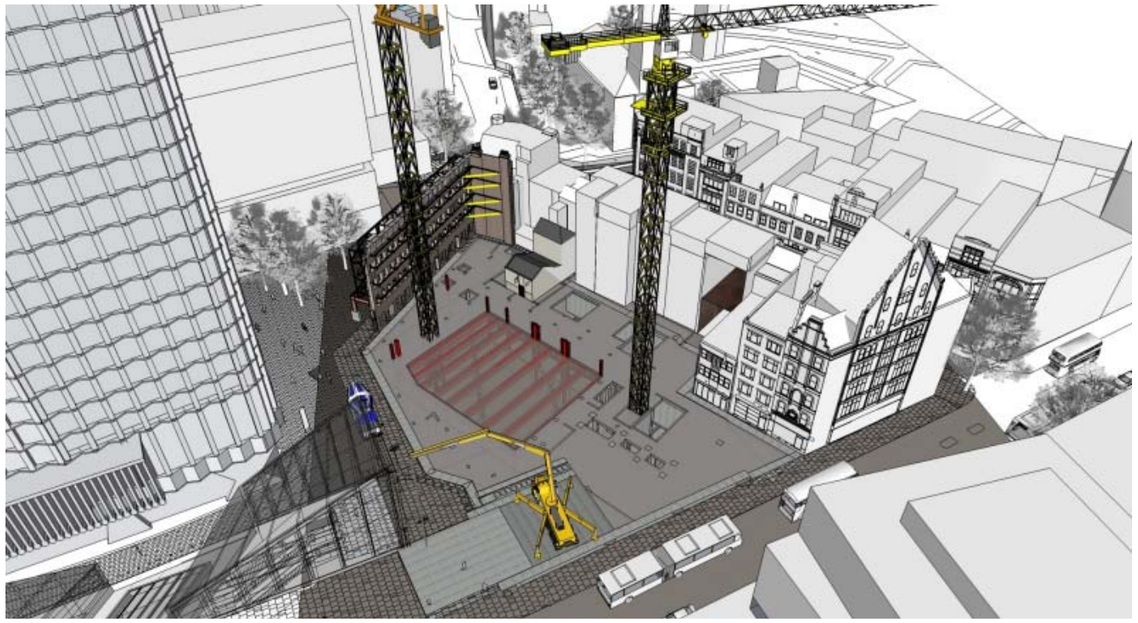


STAGE 26 – CONSTRUCT BASEMENT TO MEZZANINE FLOOR WALLS AND COLUMNS



STAGE 27 – CONSTRUCT BASEMENT MEZZANAINE SLAB

STAGE 28 – CONSTRUCT BASEMENT MEZZANAINE TO GROUND FLOOR WALLS & COLUMNS



STAGE 29 – CONSTRUCT GROUND FLOOR SLAB AND REMOVE RAKING PROPS

6 SITE MONITORING & CONTROL OF MOVEMENTS

6.1 General

6.1.1 Due to the nature of the proposed basement construction and the proximity of the listed structure and adjoining masonry structures it will be important to have a robust monitoring system in place. Monitoring stations will be set up on key structures within the site and on adjacent structures as agreed with the adjoining owners. A base set of readings to be taken prior to demolition of the buildings. The frequency of the readings will be tailored to suit the stage of work. Frequency will increase during bulk excavation to ensure any adverse effects as a result of the excavation are picked up and any remedial works can be implemented before proceeding with the excavation.

6.2 Monitoring and Control of Movement of Existing Buildings

6.2.1 It is proposed to demonstrate that there will be negligible effect on the adjacent properties. This will likely comprise of extensive and regular monitoring during demolition and construction to ensure movements are within acceptable limits (to be determined by the design team and signed off by all parties concerned).

6.2.2 The proposed site investigation will determine the extents of the building foundations on and adjacent to the site so that a safe and workable solution can be developed. Prior to the results of the site investigation being available, the design will be progressed using all existing / available information and/or assumptions made. The design will also consider the likely construction method, sequence and period. The proposals will likely include underpinning and/or retention using the proposed secant pile retaining wall.

6.2.3 The design of temporary works will have an important influence on limiting movements. We have assumed that detailed temporary works design will be carried out in detail by the Demolition Contractor once appointed. The Demolition Contractor will need to demonstrate that their design is within the acceptable limits agreed by all parties concerned.

6.2.4 Monitoring the movement of structures within the zone of influence of construction will be required on this site. Targets and levelling studs (where appropriate) will be attached to the structures likely to be affected and limiting movements set. It is likely that a traffic light system will be required where green is 'movements within allowable limits', amber is 'continue works but revise methodology as movements are towards the upper end of allowable limits' and red is 'all work must be stopped and the Engineer to assess the situation and advise on appropriate action'. For sensitive buildings, the movement limits will be set by an assessment of damage caused by potential movements. The limits would be set such that in the normal course of events, no significant damage is caused to the building. Possible measures available to limit movement include jacking party walls and grouting.

6.3 Assessment of Building Movements

6.3.1 Movement of structures on soil is generally assessed using analysis packages such as Vdisp from Oasys. This is a linear-elastic program that uses Boussinesq's theory to assess likely movements both under the loaded (or unloaded) area and at any distance or depth from the area under consideration. This approach has been found to give reasonably accurate results, especially in relatively well understood materials such as the London Clay, where correlations have been developed by experiment and observation. The loading history and proposed loading will be assessed and a model developed and analysed that includes

- Loadings from the current development;
- Unloading due to demolition and basement excavation;
- Loadings due to construction;
- Long-term loading effects of the proposed development.

6.3.2 If these analyses reveal that anticipated movements are excessive or that the adjacent listed building could be significantly affected, 2-D or 3-D finite element (FE) packages can be used to assess the movements in greater detail and determine appropriate design solutions.

APPENDIX A

PROPOSED RETAINED FAÇADE SYSTEM CONCEPT DRAWINGS

INFORMATION ONLY

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE
2. REFER TO GENERAL NOTES DRAWING 029-S-000

REVISION / DESCRIPTION	DRAWN	CHECKED	DATE
P1 PLANNING ISSUE	PG	PG	07/12/12
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PROJECT TITLE
ST GILES CIRCUS
LONDON

DRAWING TITLE
ST GILES HIGH STREET
FACADE RETENTION
CONCEPT - SHEET 1

SCALE
NTS

DATE
07.12.12

PROJECT NUMBER
029

DRAWING No
029-F-010

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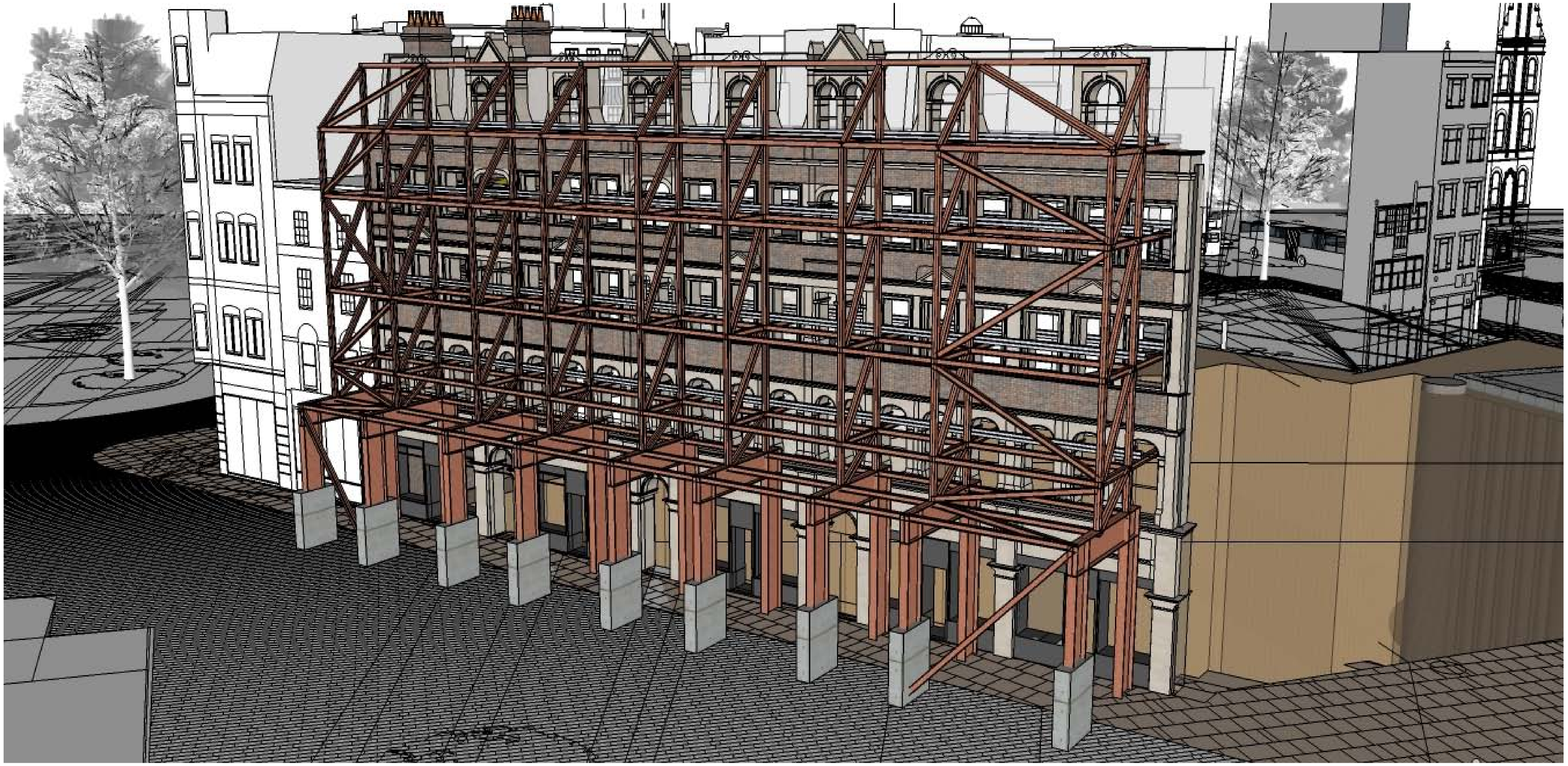

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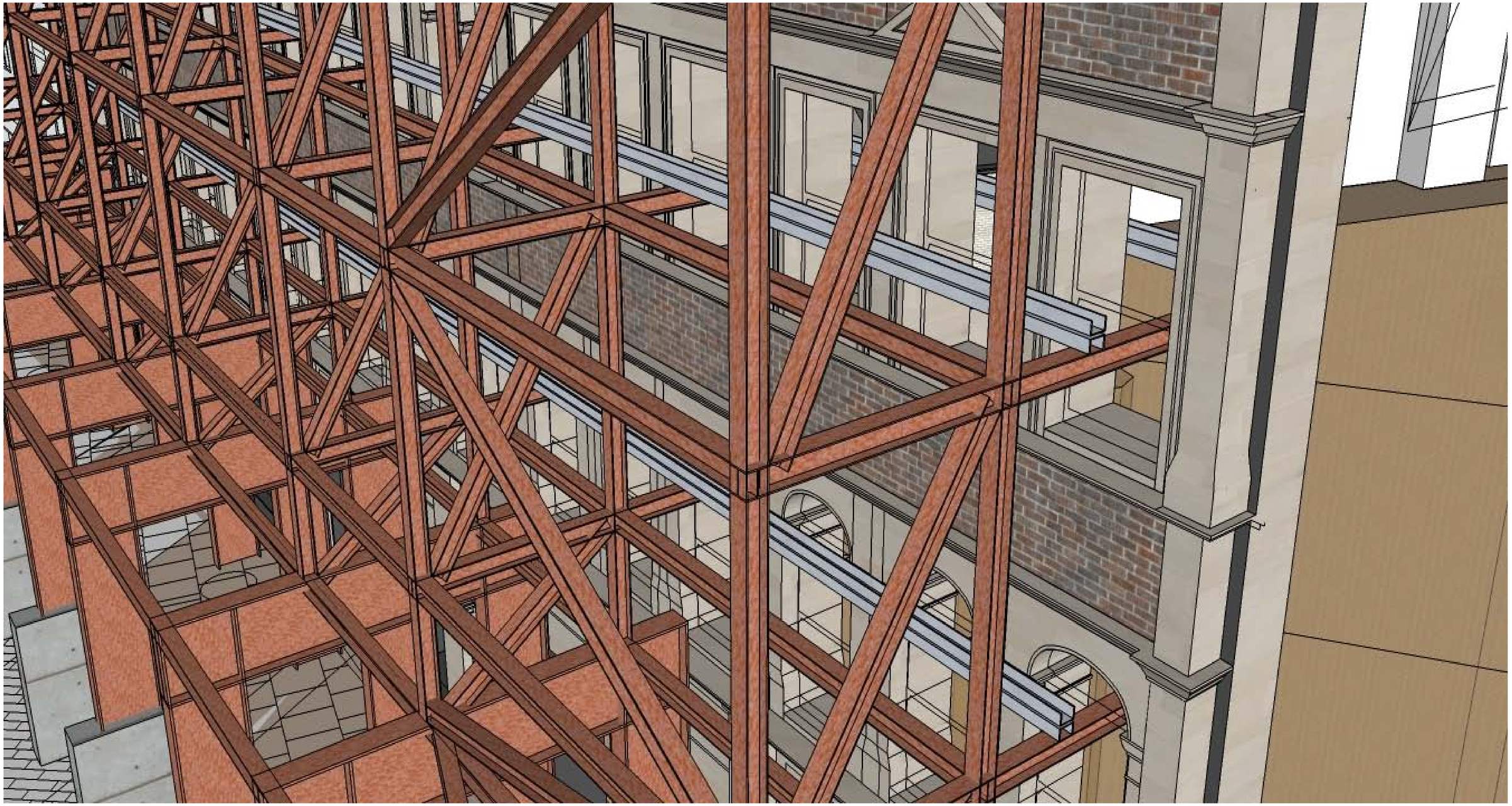

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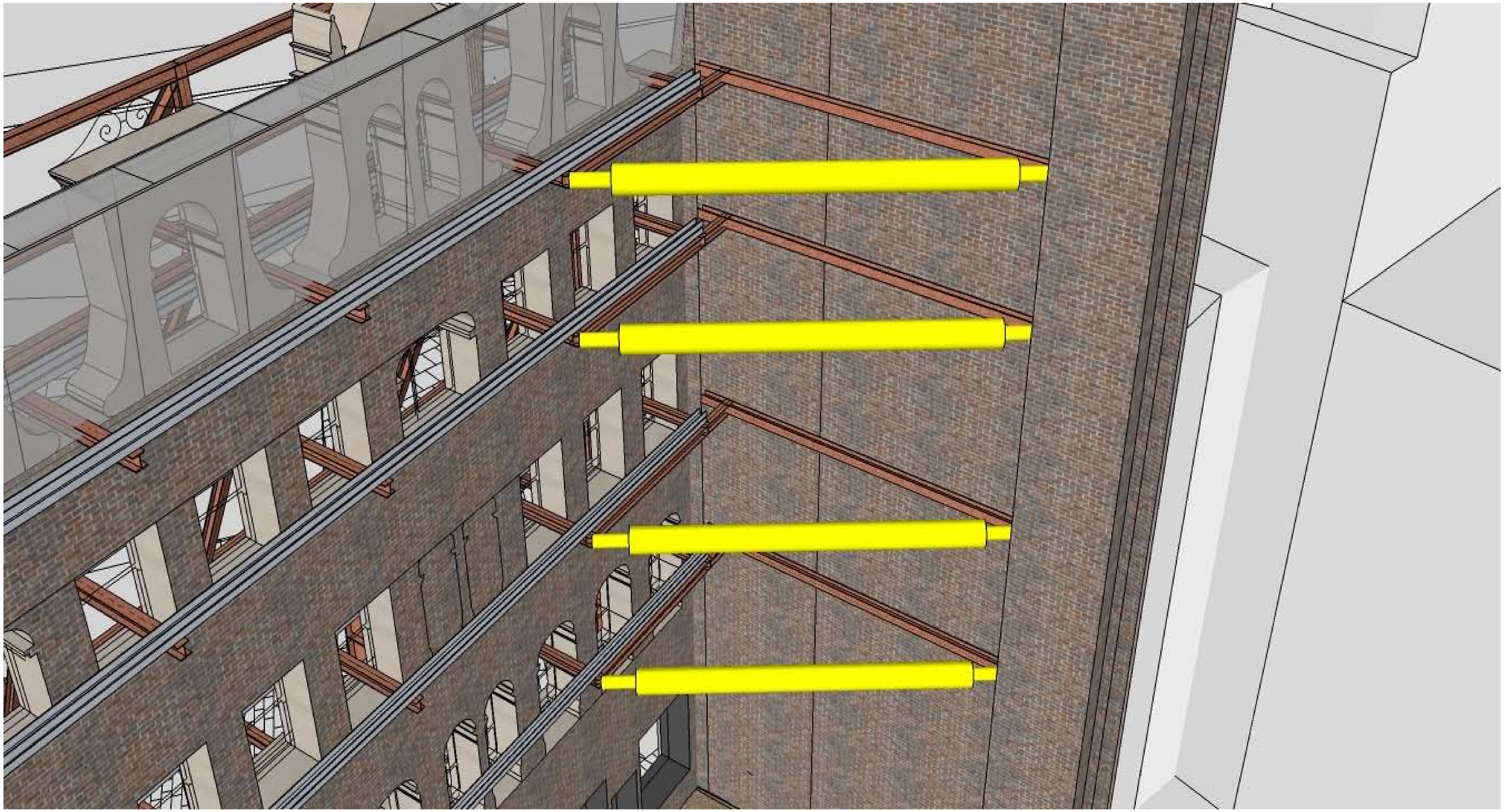

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CONCEPT - SHEET 5

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