UCL Bicentennial Projects : Wilkins Cloisters and Main Quad

Civil and Structural Design Report for Planning and Listed Building Consent Submission

Revision: 01
Date: July 2024
Document Ref: UCL-BDP-XX-XX-RP-S-000001

BDP.

REVISION RECORD

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Contents

1. Introduction

In 2026, University College London (UCL) will be celebrating its bicentenary. UCL have identified building legacy projects to be undertaken and completed in time to mark the occasion.

Building Design Partnership (BDP) have been appointed by UCL to advise on the Structural and Civil Engineering implications for the legacy projects which include remodelling of their Bloomsbury Campus including works to the Main Quad; the Wilkins Cloisters and adjacent rooms and the pedestrianisation and landscaping of Gordon Street.

UCL's Main Quad is the main entrance for the Bloomsbury Campus. Surrounded by Grade I listed buildings, and dominated by the Grade I Listed Wilkins Building, it is an iconic space, emblematic of the University.

This report summarises the Civil and Structural Engineering considerations for the development of the Wilkins Building and the Main Quad to support the architectural vision and requirements.

The architectural proposals for the Wilkin's Building broadly comprise:

- The North and South Cloisters are proposed to be reconfigured and refurbished including removing some internal partitions and forming arched openings through the masonry spine wall.
- New feature lighting is proposed in the main circulation spaces.
- The mechanical and electrical service are proposed to be upgraded and modernised with new service routes and roof plant.
- New stairs are proposed to the south-east of the Octagon from lower ground to a new landing leading into the Octagon. These are similar in form to the existing curved stairs that lead to the Donaldson Library from ground floor.
- A new platform lift is proposed from lower ground to carry people to Octagon and Whistler Room levels.
- To achieve these new access routes the existing stairs and floors from lower ground to upper ground in the area affected will be removed.

The architectural proposals for the Main Quad broadly comprise:

- Provision of accessible routes across the site including amended landscaping levels to provide level access to the primary building entrances of the Wilkins Building either side of the Portico and to the Slade building entrance.
- New hard and soft landscaping design with raised planter beds framed out by feature retaining walls/seating.
- Biodiversity enhancement: new approaches for biodiverse climate-adapted public realm landscapes including surface water management, biodiverse planting and using circular economy materials
- An opportunity to create a 'living lab' and integrated research and teaching environment for ecology and biodiversity.
- Improvement to lighting to enhance navigation and visual appeal.
- 'Temporary' lightweight bespoke tensile structures over stages for events and performances.
- New or upgraded below and above ground mechanical and electrical service routes to service the proposals.
- Improvements to the surface water drainage strategy such as the provision of attenuation tanks.

Areas to be developed as part of the bicentennial works (Burwell Architect's)

The purpose of this report is to:

- Describe the site constraints based on desktop studies and advice from other consultants.
- Describe the existing structure based on record drawings and visual surveys and further investigative work that is required to complete the design.
- Describe and advise on the capacity of the existing structure and its ability to support load from the reconfiguration works, based on preliminary calculations.
- Propose construction types for the reconfigured spaces and suggest work that will be required to allow the existing structure and underlying geology to carry the proposed loads.
- Comment on considerations for compliance with Historic England, and other regulatory bodies.

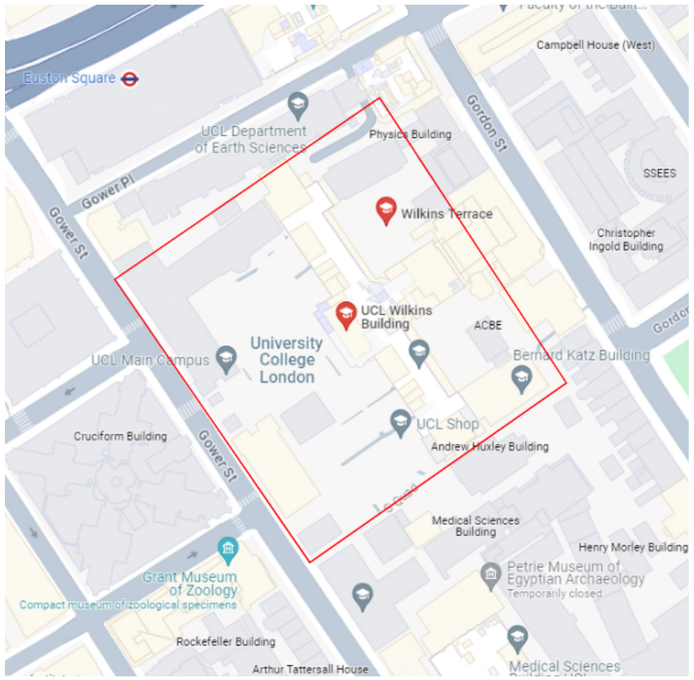
3D Render of proposed works to Main Quad (Burwell Architect's)

2. Site Context and History

Location

The project address is Gower Street, WC1E 6BT which sits within the London Borough of Camden. The approximate site boundary for the address is shown in red on the location plan below. The building is bounded immediately by:

- Gower Street to the South-West
- Gower Place to the North-West
- Gordon Street to the North-East
- UCL campus buildings to the South-East

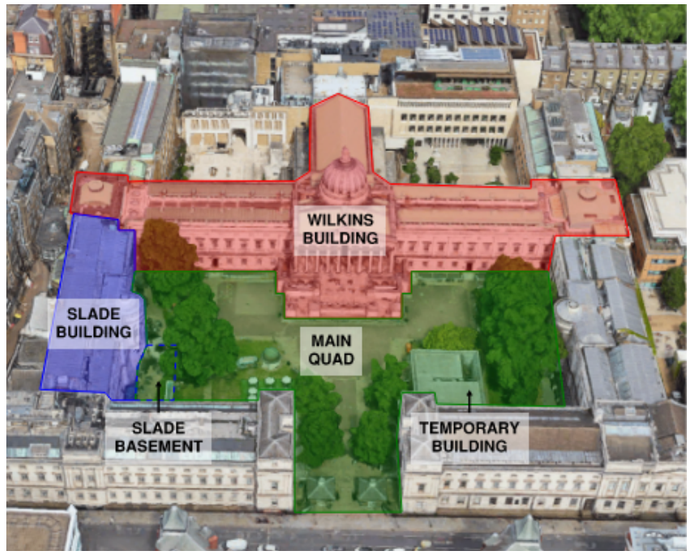


Plan (Google Maps)

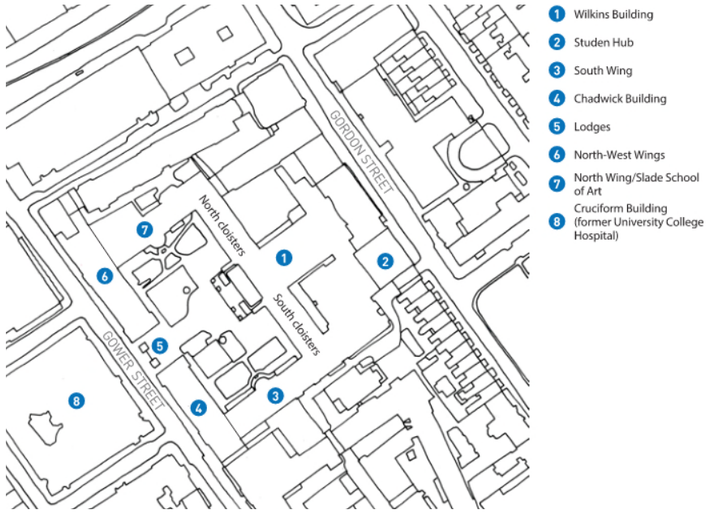
Site Configuration & Designation

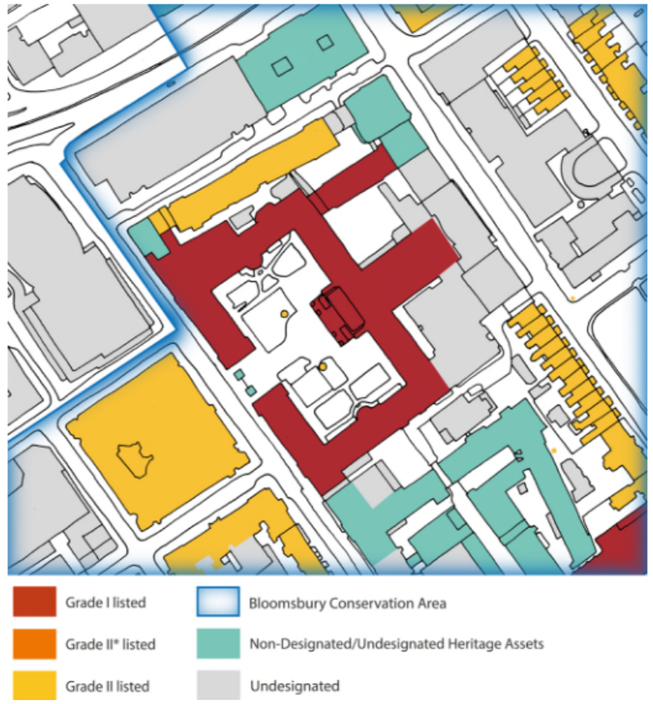
The Wilkins Building today is flanked by various linked, projecting wings which are referenced on the site plan below. These enclose the courtyard of the quadrangle which is reached via two entrance lodges directly on Gower Street. The quadrangle houses two, early twentieth century observatories and a contemporary 'pop-up' structure used as a teaching facility which sits in the southern courtyard.

The Wilkins Building; the North and South Wings and the Gower Street ranges are all Grade I listed. The observatories are Grade II listed.



Site Layout (Google Earth)





UCL Bloomsbury campus heritage designation (Alan Baxter Heritage Report)

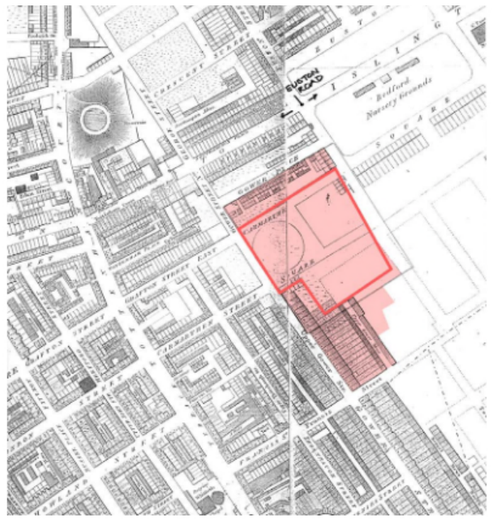
2. Site Context and History

Site History

UCL was founded in 1926 in the open fields in North London where the original Wilkins building was constructed. The building was named after its architect William Wilkins who's original conception for the building is shown below.

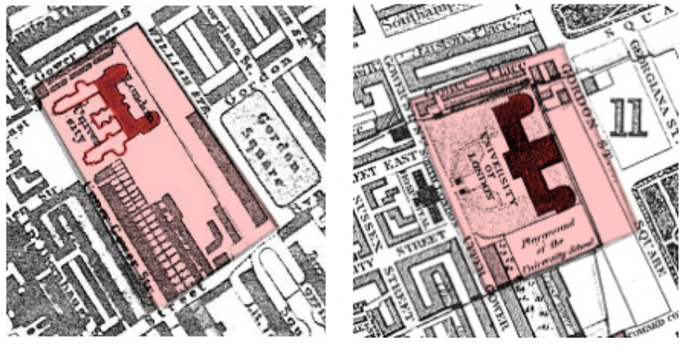
Artists impression of first concept (Alan Baxter's Heritage Report)

The image below shows the site in 1819. The surrounding area to the North and West was built up with predominantly terraced housing.



Map of site 1819 (Alan Baxter)

Wilkins' original scheme was not fully realised due to lack of funding and the constructed outcome was a revised design. Below shows OS maps from 1827, prior to the university opening, showing areas constructed and those not yet built; and another OS Map from 1836 showing how much of the scheme was actually built.



OS Maps 1827 and 1836 showing original construction

Visual of original as-built Wilkins Building

Over the next 100 years the surrounding area and university grounds were built up and by the early 19th century the main quad had become enclosed marrying up more closely to Wilkins' original vision as shown in the image below.

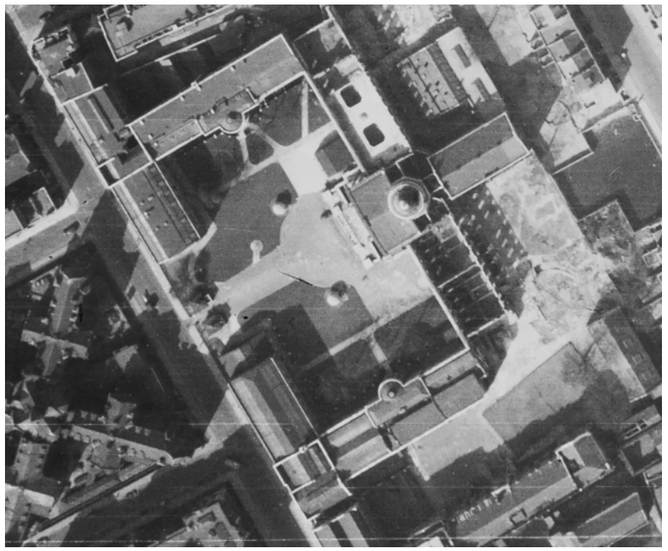
Photo of Wilkins building before WW II

During World War II the Wilkins Building and the surrounding area was exposed to a significant amount of bombing during the Blitz causing severe damage to the site, in particular the Wilkins Building, as shown by the purple shading - 'Damage beyond repair'

WW II bomb damage

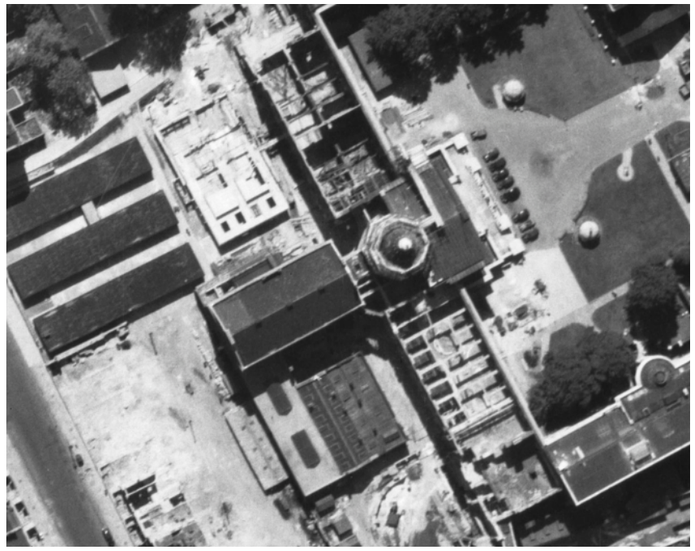
2. Site Context and History

Historic England's Aerial Photo Explorer shows the extent of damage caused during the Blitz. The photo below from April 1946 shows significant damage to the North & South Cloisters as well has damage to the central Octagon on the far side of the quad. The photo also suggest that some temporary propping had been implemented to the North Cloister most likely to stabilise the external walls.



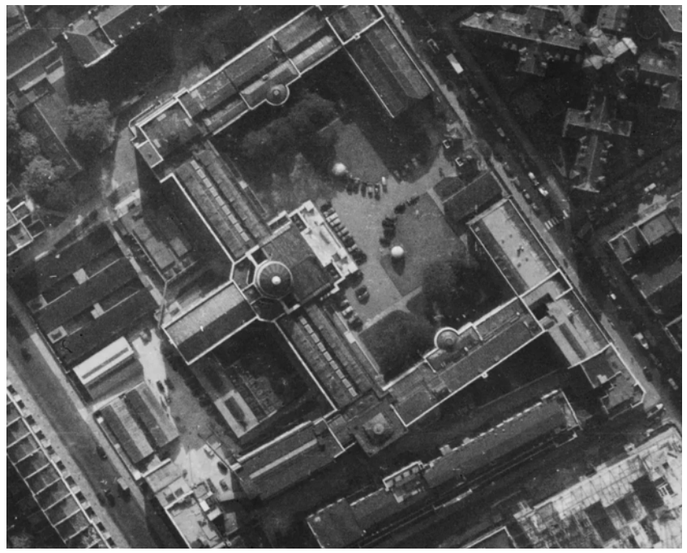
Aerial footage of Bloomsbury Campus 1946 (Source: Historic England)

Reconstruction appears to have began sometime around early 1948 as confirmed by the following photo from May 1948 showing the area in construction. The photo also shows the removal of the propping to the North cloister.



Aerial footage of Bloomsbury Campus 1948 (Source: Historic England)

By 1955 reconstruction of the Wilkins building and the surrounding area was complete.



Aerial footage of Bloomsbury Campus 1955 (Source: Historic England)

Refer to the latest heritage assessment dated July 2024 for a more detailed understanding of the site's history.

3. Site Constraints

Geotechnical Investigation

At the time of writing no project specific Geotechnical Investigation (G.I.) has been carried.

An Intrusive Site Investigation including a G.I has been scoped (Doc ref: UCL-BDP-XX-XX-SP-S-000001-P02) with the proposals submitted for listed building consent. It is understood that this is planned to be carried out later in the programme

The survey includes trial pits, boreholes and geotechnical testing which will be crucial in assisting the design team to discern enough about the ground conditions/capacity, basements and existing foundations to finalise the design.

A previous Geotechnical Investigation in the Quad was carried out by Murray Rix Ltd (MR) in March 2017 as part of the 'UCL main Quad Teaching Facility' works. This report along with information from British Geological Survey (BGS) website has been used to inform the proposals.

Ground Conditions

Geology

Information from the BGS website indicates the site lies on a varying thickness of Made Ground underlain by a bedrock layer of London Clay Formation and superficial deposit of Lynch Hill Gravel.
A series of 6 exploratory holes to 6m max. depth located in the southern part of the Quad from the MR G.I align to the BGS information. The boreholes also indicates a significant amount of made ground below the topsoil layer. The findings are summarised in the following table

	Max Depth (MBGL)	SPT (N)	Notes
Made Ground	0-3.55	5-25	
Disturbed Ground	2.72-3.62	15	
Lynch Hill Gravel	5.10-5.27	30-116	
London Clay	Not proven	7	Very High Plasticity

BOREHOLE LOG - MURRAY RIX GEOTECHNICAL — HOLE NO. WS3, Sheet 1 of 1

CLIENT: WILDE CARTER CLACK LTD — SITE: UCL MAIN QUAD

DATE OF FIELDWORK	SCALE	LEVEL/POSITION	OPERATOR	LOGGED BY	JOB NO.
05/01/17	1:50	AS LOCATION PLAN	GE	TF	VSJOB/16-2583

SAMPLE DEPTH	RECORD TYPE	SPT N (Cu-kN/m²)	Standp/ Piezo	DESCRIPTION OF STRATUM (thickness)	DEPTH	LEGEND
0.00 - 1.00	L			Turf over MADE GROUND. Firm very dark brown slightly gravelly silty sandy gravelly clay. Gravel is red brick, mortar and cinder fragments with rare pottery, glass, coal, wood and oyster shell fragments. (1.00)		
0.80 - 0.90	D					
1.00 - 1.45	C	26		MADE GROUND: Dense becoming medium dense with depth red brick and mortar fragments with occasional oyster shell fragments and rare glass, coal, pottery and wood fragments in a reddish brown, black and dark grey slightly clayey sand matrix. (2.00)	1.00	
1.00 - 2.00	L					
1.50 - 1.60	D					
2.00 - 3.00	L					
2.00 - 2.45	C	12				
2.50 - 2.60	D					
3.00 - 4.00	L					
3.00 - 3.45	C	15		DISTURBED GROUND: Stiff grey mottled yellowish brown slightly gravelly CLAY. Gravel is rare black and white fine to coarse angular to sub rounded flint. (0.62)	3.00	
3.40 - 3.50	D					
				Dense orange brown slightly gravelly fine to coarse SAND. Gravel is black, brown and white fine to coarse angular to sub rounded flint. [Lynch Hill Gravel Member] (0.18)	3.62	
4.00 - 5.00	L			Very dense greyish brown slightly gravelly silty fine to medium SAND. Gravel is black and white fine to medium sub angular to sub rounded flint. [Lynch Hill Gravel Member] (0.90)	3.80	
4.00 - 4.45	C	66				
4.50 - 4.70	D					
4.75 - 5.00	D					
5.00 - 6.00	L			Very dense orange brown gravelly fine to coarse SAND. Gravel is black, brown and white fine to coarse angular to rounded flint. [Lynch Hill gravel Member] (0.57)	4.70	
5.00 - 5.45	C	7				
				Firm yellowish brown mottled orange brown CLAY. [London Clay Formation] (0.29)	5.27	
5.70 - 5.90	D			Firm becoming stiff with depth dark greyish brown CLAY. [London Clay Formation] (0.44)	5.56	
				Borehole completed at 6.00m	6.00	

Ground Water

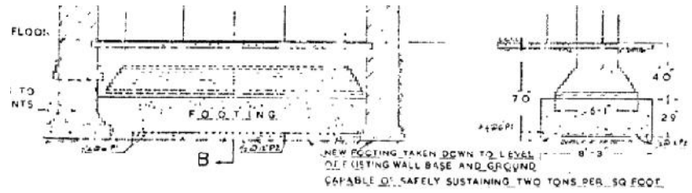
Standing water was encountered in 'WS3' at 4.6 mbgl within the gravels.

GROUNDWATER AND CASING INFORMATION						BORING METHOD AND REMARKS
DEPTH STRUCK	DEPTH CASED	ELAPSED TIME	WATER LEVEL	DEPTH SEALED	REMARKS ON GROUNDWATER AND CASING	
5.00	1.00		5.00		Groundwater seepages encountered.	Windowless sample hole cased to 1.(
5.00	1.00		5.00		Water level at finish of boring.	Hand dug to 0.40m
4.60					Water level when casing removed.	Hole collapsed back to 5.00m

Groundwater log from Murray Rix Ltd G.I

Bearing Pressures

Archive drawings from 1948 of underpinning work below the Wilkins Building's foundations likely within the firm Clay (7ft bgl) show an assumption at the time that the ground at this depth has a safe bearing of 2 tons/ sq. foot (~215 kN/m²).



Collins and Mason foundation drawings

The MR G.I suggests an undrained shear strength of 35kPa at 5mbgl which can be used to indicate an upper clay strength at this depth of 70 kN/m²(2Cu).

In addition, the report states the following:
'It is thought that the made ground has been in place for around 150 years and the in-situ test results indicate the upper made ground is reasonably compact but the materials appear more loose with depth. For lightly loaded structures consideration could be given to founding in the made ground although relatively high settlement cannot be discounted.

As a guide a bearing pressure of up to 50kPa would be considered for a pad bearing 1m into to the made ground. If founding on the fill is proposed, careful inspection of foundation conditions will be needed to ensure that no deleterious and otherwise unsuitable materials are present and the formation would best be proof rolled.'

3. Site Constraints

Contamination

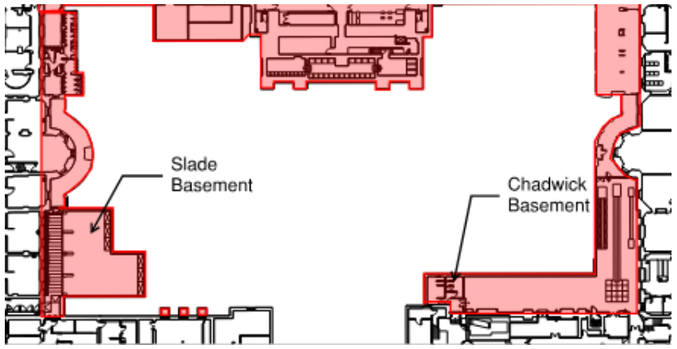
No visual or olfactory evidence of contamination was noted in the samples recovered in the MR G.I. However, the presence of a significant thickness of highly variable made ground below the Quad could be a source of ground gases and other contaminants.

Existing Structures

Basements

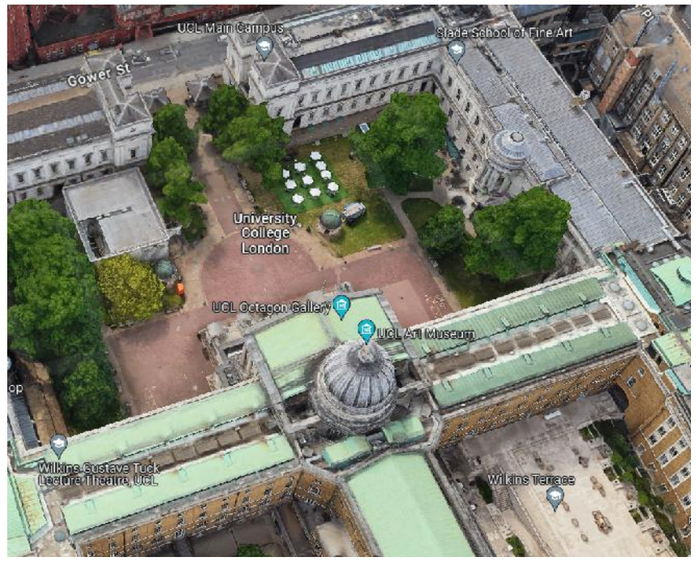
Basements that extend out below the Quad are highlighted red in the figure below.

These are a key consideration in the development of the Quad and the overall project construction logistics plan and are described in more detail the following sections.



Above Ground Structures

The existing above ground buildings and hard landscaping/roads constrain the site and will be a key consideration in the Contractor's construction methodology which is discussed later in the report.



Above ground structures (Google Maps)

Photo showing structures within Quad

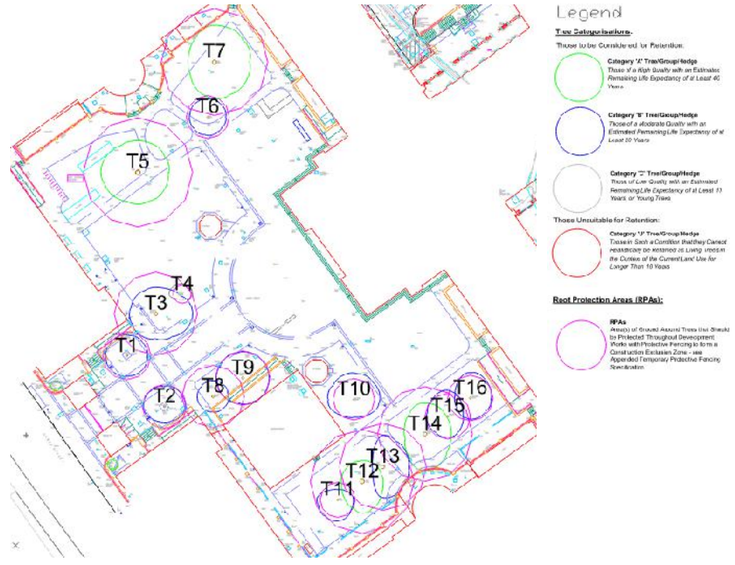
Trees

An Arboricultural Impact Assessment and Method Statement was carried out by BDP in April 2024.

A total number of 20 arboricultural items were recorded within the study area.

The appraisal identified various elements of the development that are proposed within and close to the Root Protection Areas (RPAs) and canopy spreads of several retained trees. As such, various special working and protection methods and materials are required in accordance with current government guidance.

This has implications for the proposed topography, substructure, buried services, and hard and soft landscaping design strategies.



Tree constraints plan

3. Site Constraints

Unexploded Ordinance

A detailed UXO Threat and Risk Assessment was carried out by 6 Alpha Associates Ltd. (Client Reference: C12-3772538) and concluded that there is a 'high' risk of UXO being present across the site.

The site of the Wilkins Building was located within an area of very high density bomb strikes during WWII and the building and surrounding area sustained bomb and blast damage from several high explosive bombs.

Based on the site ground conditions, the average BPD (Bomb Penetration Depth) for a 250kg high explosive bomb is approximately 7m below ground level, with a maximum BPD considered to be approximately 16m below ground level. The report states:

'In general it is considered likely that any UXO contamination within ground that has been disturbed since WWII would likely have been discovered and removed but a potential UXO risk pathway could be generated by intrusive works within any remaining areas of ground that have not been disturbed since the time it might have been contaminated with UXO.'

The report recommends that the UXO risks are reduced ALARP (As Low As Reasonably Practicable) to 'all previously undisturbed ground' in accordance with the following table.
For work into previously undisturbed ground mitigation measures may include:

'Blind' intrusive works e.g. boreholes and piling: magnetometer survey is recommended

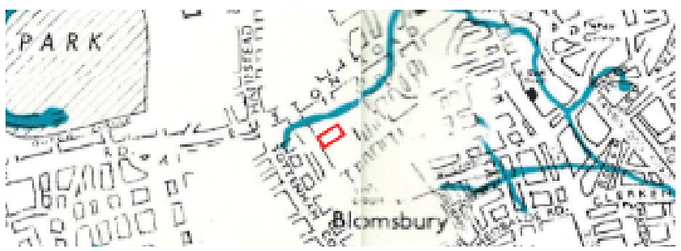
'Open' intrusive works e.g. excavations for trial pits, foundations to retaining walls and installing build-ups to hard landscaping: 'Watching brief' - EOD Engineer to be present to monitor works.

UXO Risk Mitigation Measures Overview							
Proposed Intrusive Works		Emergency Response Plan	Safety and Awareness Briefings	On-Call EOD Engineer	UXO Watching Brief	Non-Intrusive UXO Survey	Intrusive UXO Survey
Open Works	Trial Pits	✔	✔	✘	✔	✘	✘
	Excavations	✔	✔	✘	✔	✘	✘
	Trenching	✔	✔	✘	✔	✘	✘
Blind Works	Boreholes	✔	✔	✘	✘	✘	✔
	Window Sampling	✔	✔	✘	✘	✘	✔
	Piling	✔	✔	✘	✘	✘	✔
Residual UXO Risk Rating		ALARP					

UXO mitigation methods (6 Alpha UXO report)

Lost Rivers

The Lost Rivers of London map is presented as below. This indicates that there are no lost rivers running under the site though an offshoot of the River Fleet does pass close by to the north.



Lost Rivers of London with site marked in red

Buried Services/Utilities

An underground utility survey was undertaken by Plowmen Craven in December 2016 (Job Ref.: 37128).

More recently, a topographical survey and buried utilities survey was undertaken by EDI Surveys Ltd in February 2024 (Job Ref.: 21616).

The latter has been used to inform the design within the Quad. This shows that services run extensively below ground in multiple locations with a notably congested region in the central part of the quad between the observatories.

A gas pipe seen in the photo below, running parallel to the Chadwick building in the south Quad was identified during some recent construction work which the Contractor should be made aware of.

Existing gas main

4. Existing Structure - Wilkins Building

Archive Information

BDP's structural team have conducted a thorough search to obtain information about the existing building and its structure.
Relevant record drawings have been obtained from the following historic phases of construction:

Wilkins Building
1820s - Original Architectural Plans of the Wilkins Building
Architect : William Wilkins
Source: UCL culture collections online
1940s - Post War Reconstruction Architect's and Engineer's Drawings of some areas.
Architect : A E Richardson
Engineer: Collins and Mason
Source: UCL microfiche

Slade Building
2000s - Sculpture Studio
Architect: Gaunt Francis Architects
Source: BA

Chadwick Building
1980's basement works(?)
Architect: Cassom Condor & Partners
Source: UCL microfiche

'Temporary' teaching facility
2017 - Construction drawings
Architect : Fowler Martin Tender
Engineer: Wilde Carter Clack
Site Investigation: Murray Rix Ltd (MR)
Source: BA

Quadrangle Waterpoofing Project
2018 - Tender Drawings
Project Managers : Faithful Gould
Source: BA

Alan Baxter Heritage Assessment

Refer to Alan Baxter's 'Initial Heritage Assessment' Dated April 2024 for more information about the history of the existing building.

Visual Site Survey

BDP visited the site to visually inspect UCL Wilkins Building & Main Quad on a number of occasions in March and April 2024 prior to any intrusive investigations to help verify some of the information shown on the record drawings.
During the survey, any structure that was visible or indicated by the finished surfaces was recorded on BDP's existing structural drawings.

Intrusive Site Investigation

An Intrusive Site Investigation has been scoped (Doc ref: UCL-BDP-XX-XX-SP-S-000001-P02) with the proposals submitted for listed building consent. It is understood that a survey is being planned.

A number of trial pits and exploratory holes have been specified which will be crucial in assisting the design team to discern enough about the existing structure, and superficial build-ups to finalise the design.

Collation of Information

What is known about the characteristics of the key structural elements from non-intrusive survey work carried out to date, limited archive information or assumed based on experience, is described in the following section and in the existing drawings contained in the Appendix .

Construction Phases

Construction of the Wilkins Building started in 1827 shortly after the founding of UCL according to the drawings of the architect William Wilkins. There were several construction phases of the building relevant to the current works:

- 1827-1829 Cloisters, Portico, Octagon and Dome
- 1849 Donaldson Library (Following fire destruction to Great Hall)
- 1869–1874 South Wing
- 1870-1881 North Wing
- Post 1945-50(?) Octagon, cloisters(post war)
- 1912-85 West Side

Cloisters

Superstructure (Original)

The original cloisters building was three storeys including a Lower Ground floor.

Much of the original fabric of the building was destroyed during World War II. RAF photos during the war - provided in the previous section - show that the damage from bombing destroyed much of the roof and the upper floors. Photos appear to indicate that only the external walls up to roof, some of the portico and the North & South cloister central spine walls up to first floor survived the bombing.

The original vertical structural elements appear to have been predominantly load bearing masonry walls with some cast iron columns. The original floor construction, as is typical for the period is assumed to generally be suspended timber joist flooring and timber trussed roofs. The original Wilkin's drawings below appear to indicate these construction forms.
The original ground floor below the cloisters is thought to remain largely intact and appears to be of brick arch construction possibly with a similar form to the diagram below.

4. Existing Structure - Wilkins Building

Construction Phases

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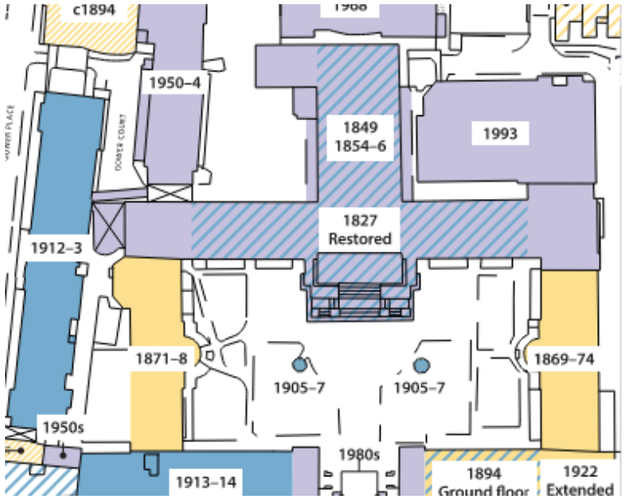
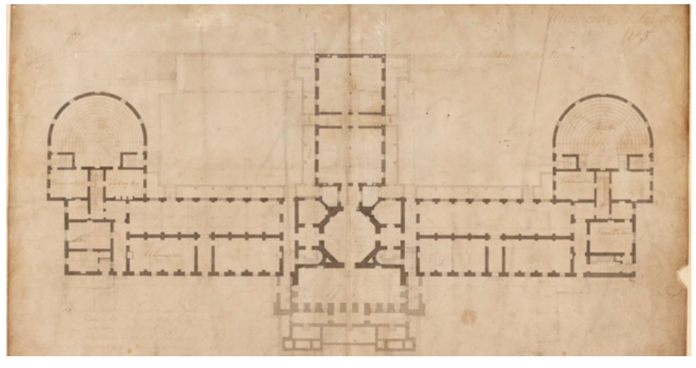


Construction time line of site



Original Wilkins Building GFL GA(UCL)

Cloisters

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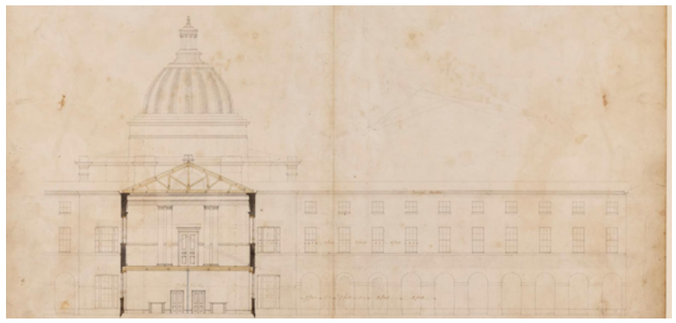
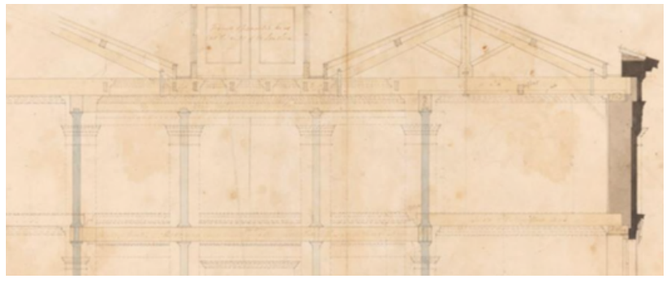
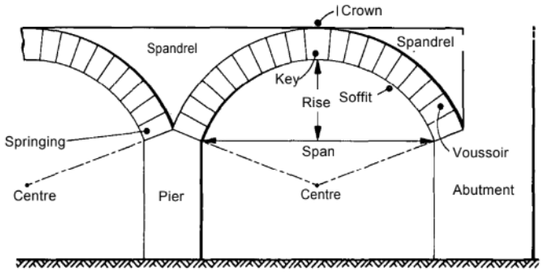


Original Wilkins Building Section through Great Hall (UCL)

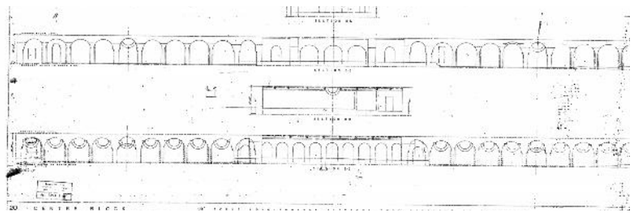


Original Wilkins Building Section through Cloisters(UCL)

The original vertical structural elements appear to have been predominantly load bearing masonry walls with some cast iron columns. The original floor construction, as is typical for the period is assumed to generally be suspended timber joist flooring and timber trussed roofs. The original Wilkin's drawings below appear to indicate these construction forms.
The original ground floor below the cloisters is thought to remain largely intact and appears to be of brick arch construction possibly with a similar form to the diagram below.



Assumed construction of lower ground arches (Ciria Report 111)



Section through original LG arches of Cloisters (C&M Engineers)

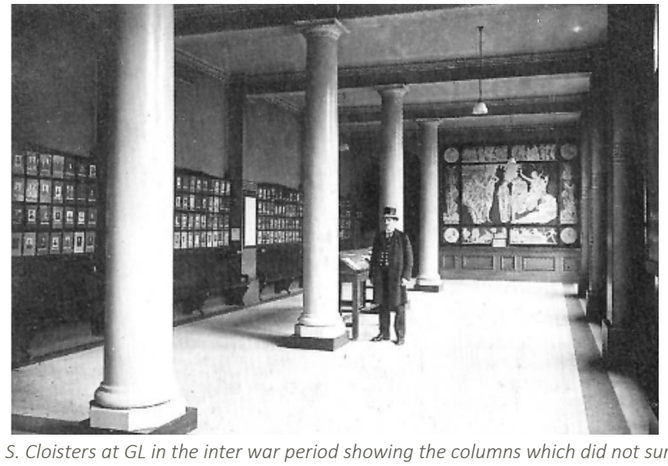
4. Existing Structure - Wilkins Building

Photo of lower ground arches

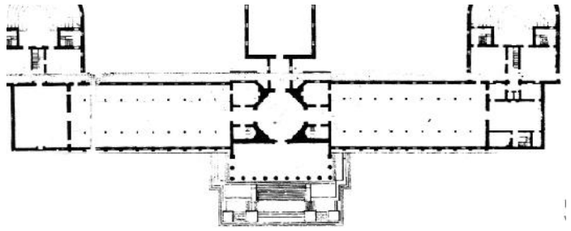
The lower ground floor is assumed to be a ground bearing slab.

The external walls vary in thickness across the building with the archive information showing walls reaching up to 3’ 1” in thickness at lower ground.

The original double row of central columns flanking the library at 1st and 2nd floors was wider apart and in the South Cloisters there were cast iron columns at ground floor aligning with the columns above as evidenced by pre-war photographs and the original plans.



S. Cloisters at GL in the inter war period showing the columns which did not survive.



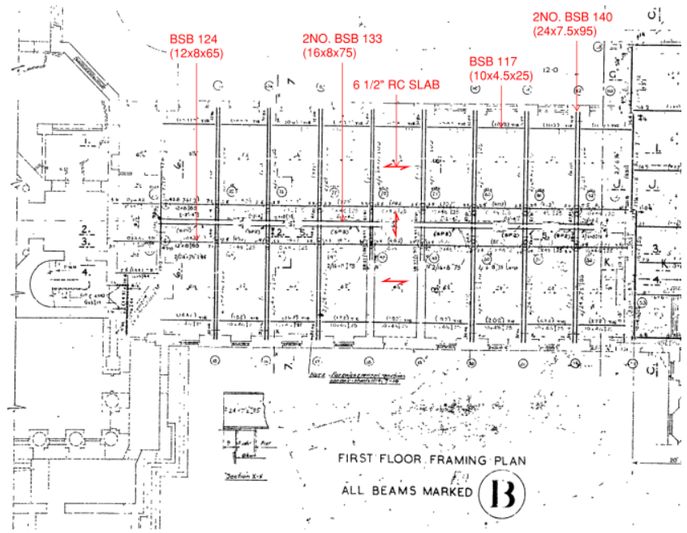
Wilkin’s 1st floor plan showing original columns flanking library

Superstructure (Post War)

After World War II, the building was reconstructed with 3 new storeys over the existing ground floor as evidenced by the archive drawings from this period.

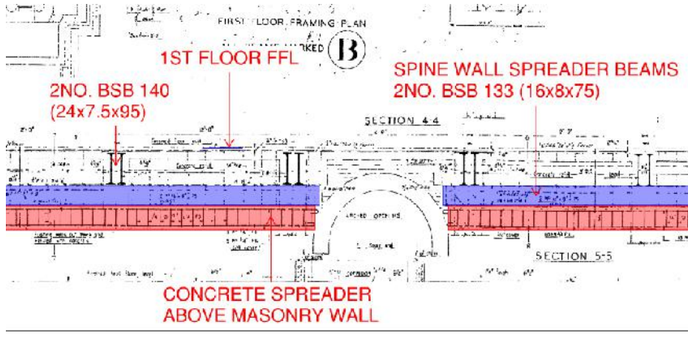
Cloisters at Ground Floor showing current column free configuration

First floor steel beams were supported by load bearing masonry walls at ground floor which incorporated piers. The structure of the 1st appears to consist of one way spanning concrete slabs supported off concrete encased steel beams.



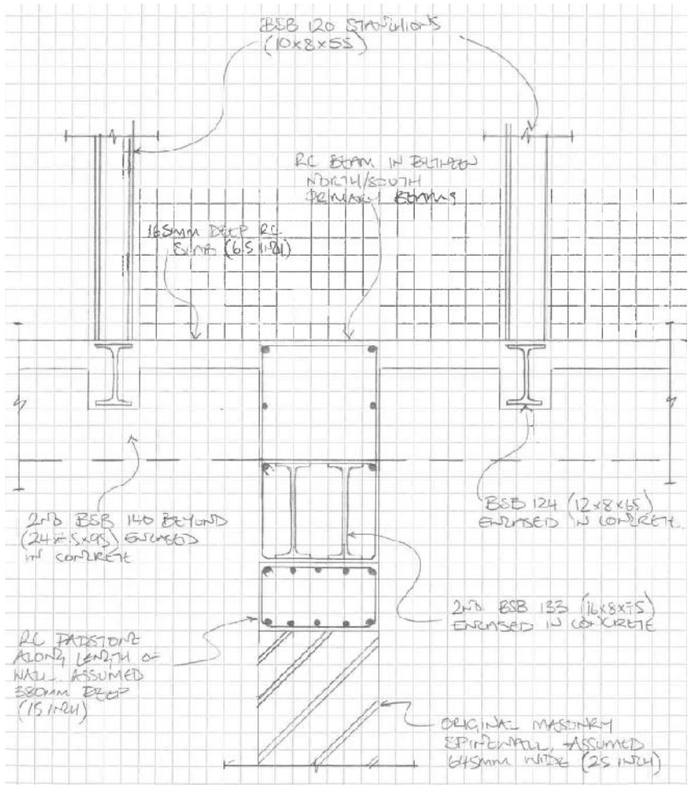
1st floor steelwork plan in South Cloister (C&M Engineers)

Embedded within the ground floor masonry spine walls are reinforced concrete spreader beams which provide bearing for the steel spreader beams that support the 1st floor beams.



Elevation of double spreader over Cloister spine wall and 1st floor transfer doubled up beams (C&M Engineers)

4. Existing Structure - Wilkins Building



Section through Cloister spine wall at 1st floor

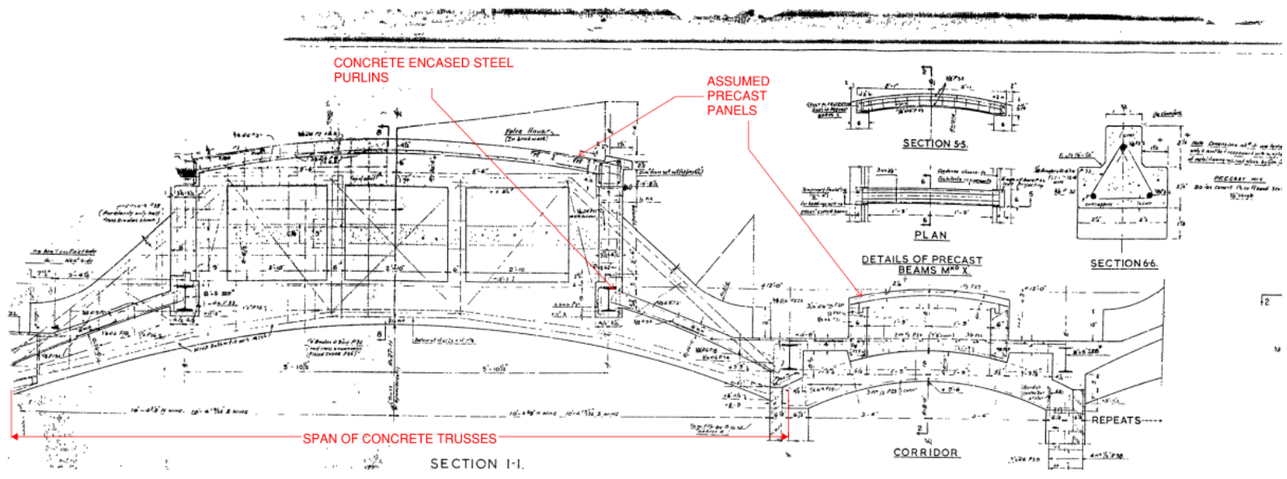
The concrete and steel beam spreaders were included to distribute the floor beam loads evenly over the existing brickwork. It is assumed that the strength of the brickwork (possibly original 1826) was a concern for the post war design engineer and hence the requirement for spreader beams.

1st floor transfer beams span between the spine wall and external wall. These provide support for internal columns which align with the corridors walls at 1st and 2nd floors.

Photo from 1st floor corridor

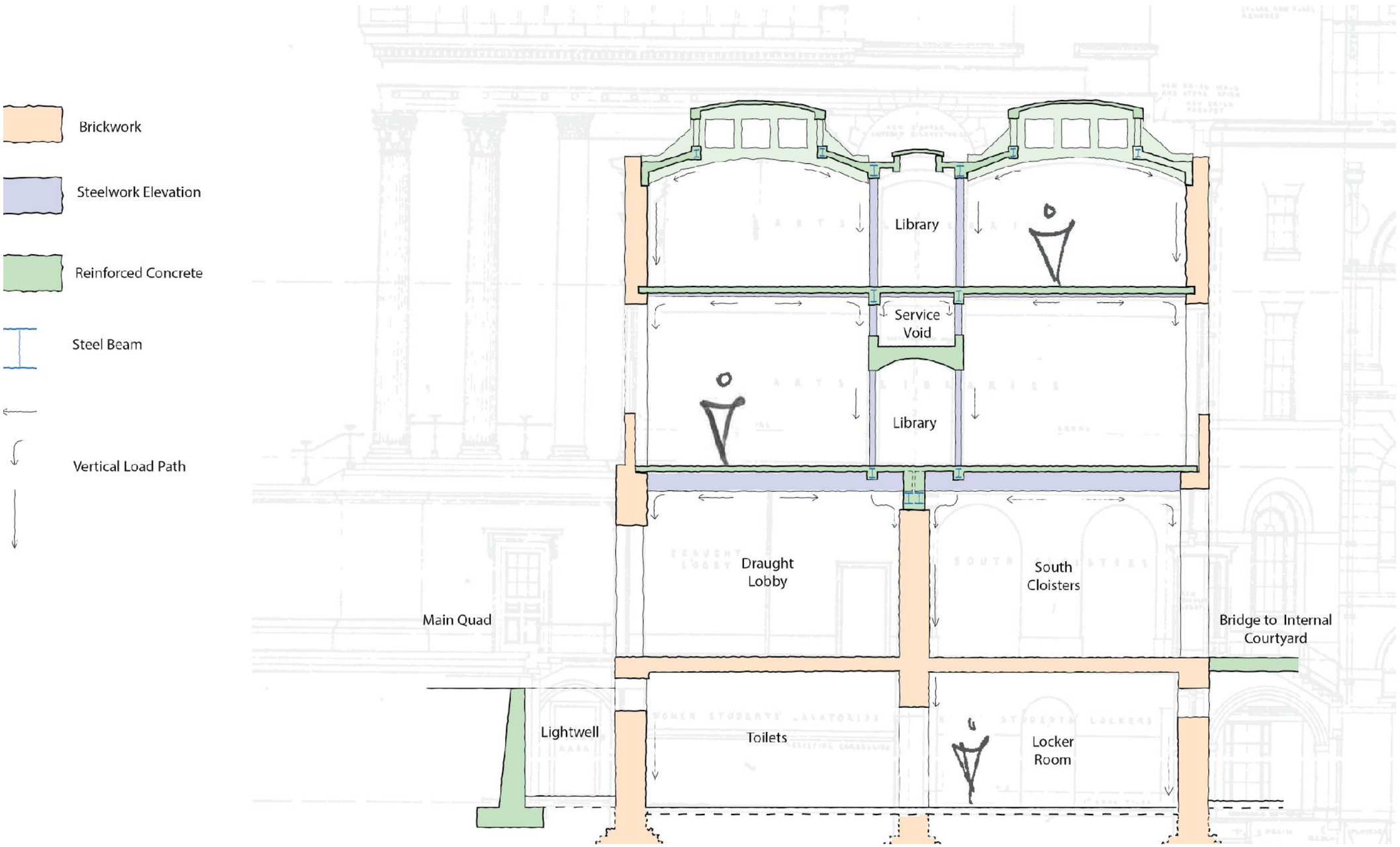
At roof level concrete trusses appear to span from the external walls to internal 2nd floor columns restrained by concrete encased steel purlins. There are a number of precast concrete elements at roof level. It is assumed that the curved slabs at roof are precast panels

Photograph of South Cloister roof



Section through Cloister roof (C&M Engineers)

4. Existing Structure - Wilkins Building



Section though South Cloisters showing current Structural Configuration and Vertical Load Path

4. Existing Structure - Wilkins Building

Substructure

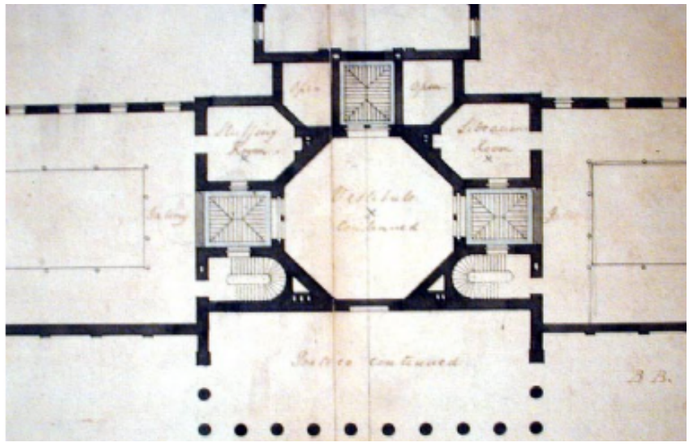
Limited information on the substructure of the cloisters has been recovered. However, given the period of original construction and what is evidenced on the post-war foundation drawings of the Octagon, it is assumed that corbelled brick strip foundations support masonry load bearing walls.

Underpinning may have been installed during the post-war reconstruction works to support additional loads from heavier structure and additional storeys similarly to the Octagon.

Octagon & Surrounding Areas

Superstructure (Original)

The original structure is thought to have been similar to the Cloisters with load bearing masonry walls and timber floors and roofs.

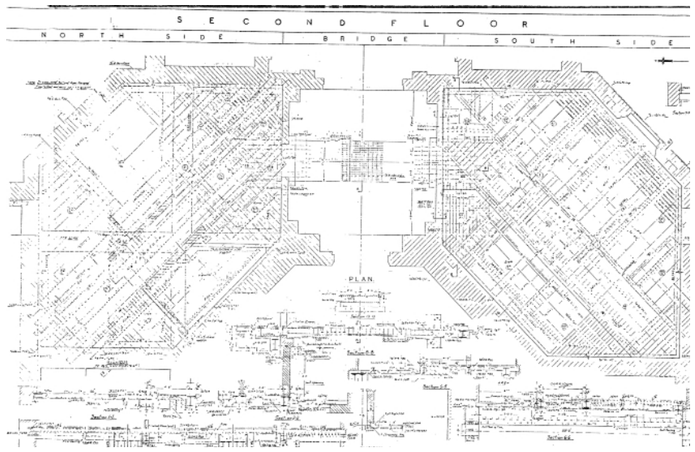


Original as-built plan of Octagon and surrounding areas.

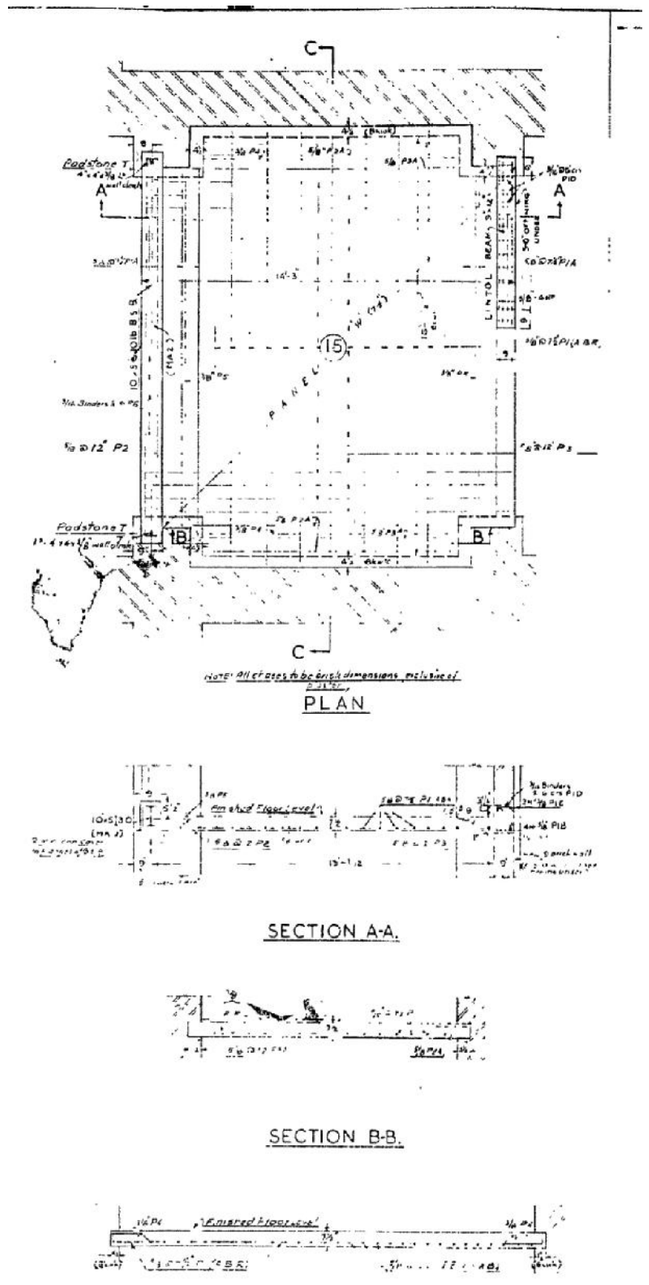
Superstructure (Post War)

In the central Octagon area of the Wilkins building the full extent of bomb damage is unknown, but archive drawings show that where reconstruction has occurred the floors are reinforced concrete supported off masonry walls and new steel beams.

Where the floors were reconfigured for access, the existing RC drawings confirm that the floors were re-constructed in concrete.



2nd Floor RC detailing plan in Octagon(C&M Engineers



Mezzanine floor RC detailing in Octagon(C&M Engineers)

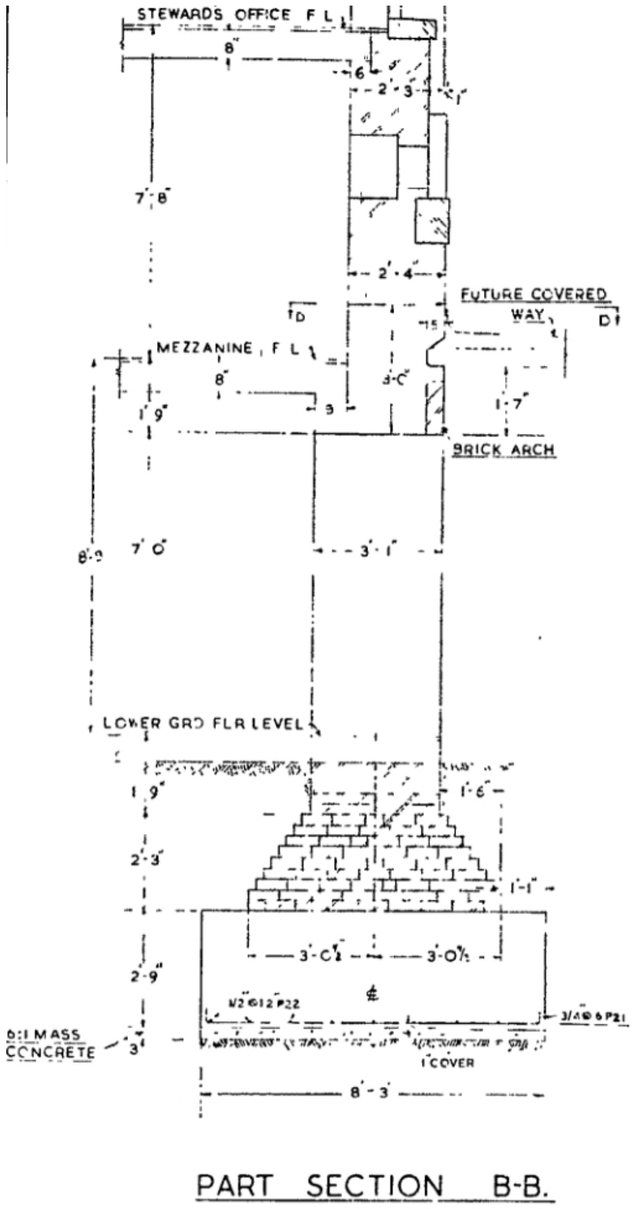
4. Existing Structure - Wilkins Building

It it noted that a curved reinforced concrete stair exists in the opposite access route leading to the Donaldson Library.

Render of curved stair leading to Donaldson Library(BA)

Substructure

The archive plans appear to indicate original corbelled foundations supporting masonry load bearing walls which would be expected of a building of this age. The drawings also appear to indicate that during the post war reconstruction some underpinning was carried out. This may have been due to increased loads from additional storeys and heavier concrete floors replacing the original timber construction. It is assumed that both the underpinning and the corbelled footings bear on to the London Clay formation at approx 4.5 mbgl and 5.3 mbgl respectively (where ground level = Main Quad ground level).



Section through Octagon wall with underpinning(C&M Engineers)

Stability

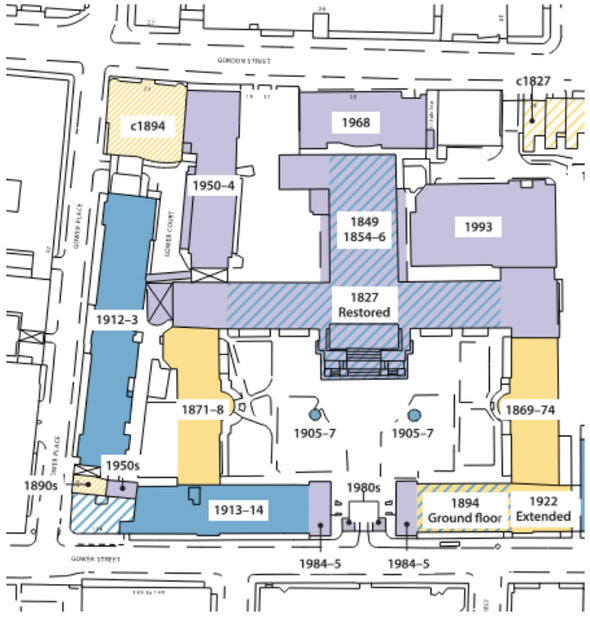
Stability of the Wilkins building is provided by masonry walls in two orthogonal directions supporting concrete floors acting at diaphragms at each level to restrain the external walls against lateral loads.

5. Existing Structure
Main Quad

Construction Phases

Construction of the Wilkins Building started in 1827 shortly after the founding of UCL according to the designs of the architect William Wilkins. There were several construction phases of the building relevant to the current works:

- 1827-1829 Cloisters, Portico, Octagon and Dome
- 1849 Donaldson Library (Following fire destruction to Great Hall)
- 1869–1874 South Wing
- 1870-1881 North Wing
- 1905-1907 Observatories
- Post 1945-50 Octagon, cloisters(post war)
- 1912-85 West Side
- 2007 Slade basement
- 2017 ‘Temporary’ teaching facility.



Construction time line of buildings on site

The Observatories

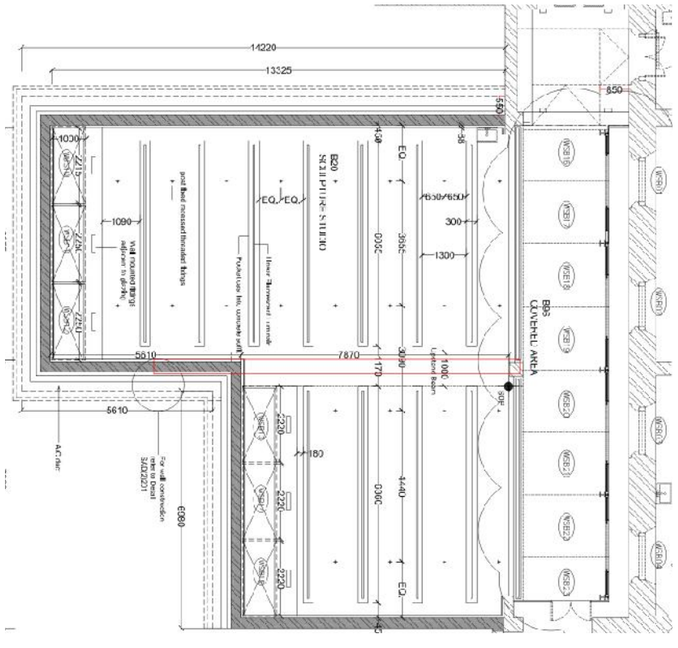
No archive information has been found showing how the conservatories may have been constructed.
The structures are a single storey and are thought to be solid load bearing brickwork walls on corbelled foundations which was typical for the period (early 1900’s). The facade appears rendered with likely faux stone columns expressed at regular intervals around the perimeter and a copper roof.

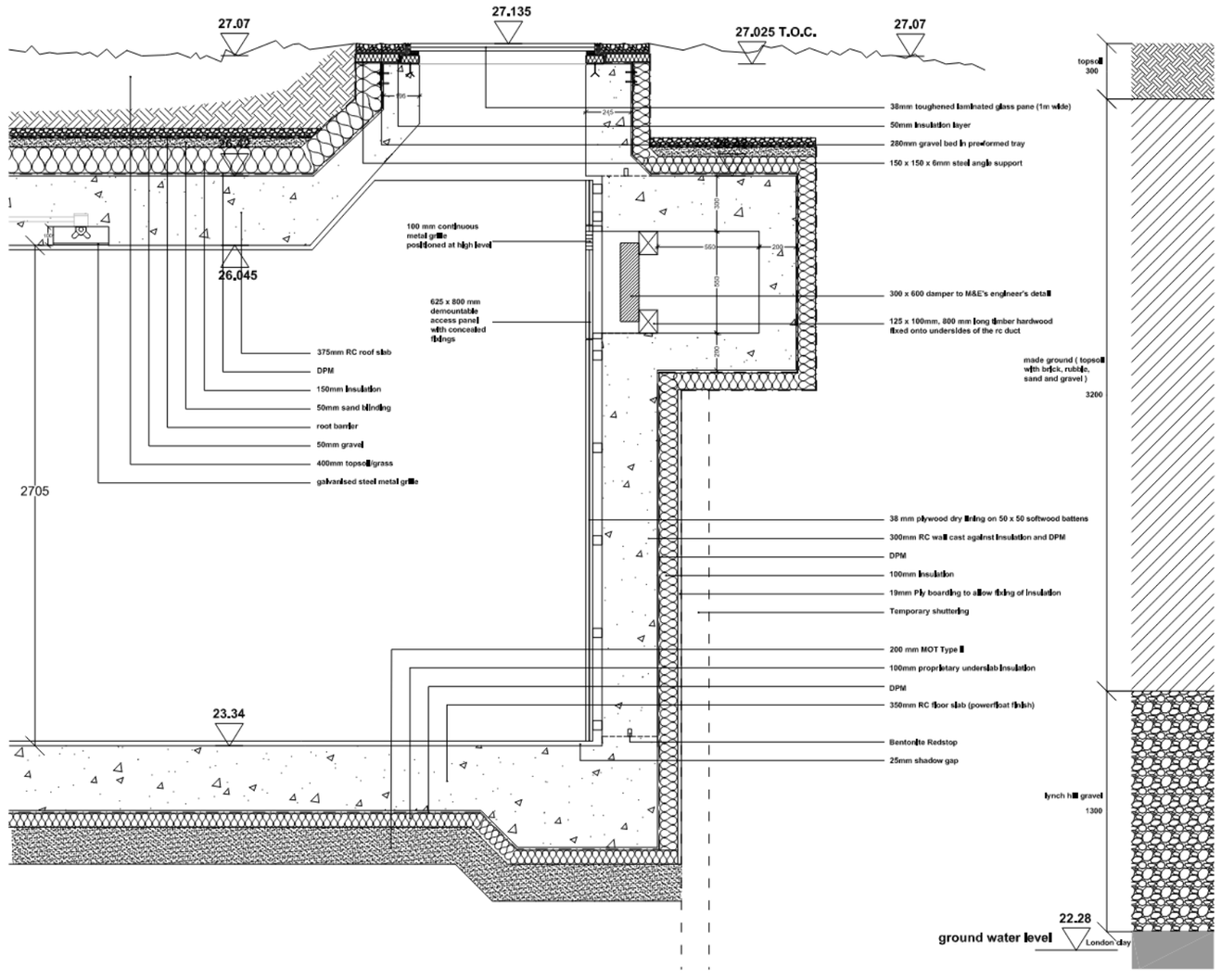
5. Existing Structure
Main Quad

Slade Building Basement

The basement of the Slade Building extends under the main quad area, with two roof lights visible from the courtyard. The existing ground level appears to run flush with the roof lights.

Archive architectural drawings indicate the basement was built circa 2004, and is a reinforced concrete box supported on a 350 mm thick raft slab bearing into the gravels close to or within the London Clay. The 300 mm thick basement walls act as retaining walls and are propped at the top by the 375 mm thick basement roof slab or span horizontally between return walls where light wells exist. Above the roof slab is a build up of blinding, gravel insulation and topsoil with a root barrier to protect the slab waterproofing. Recesses in the roof slab soffit and an upstand beam suggest that the slab spans east west.

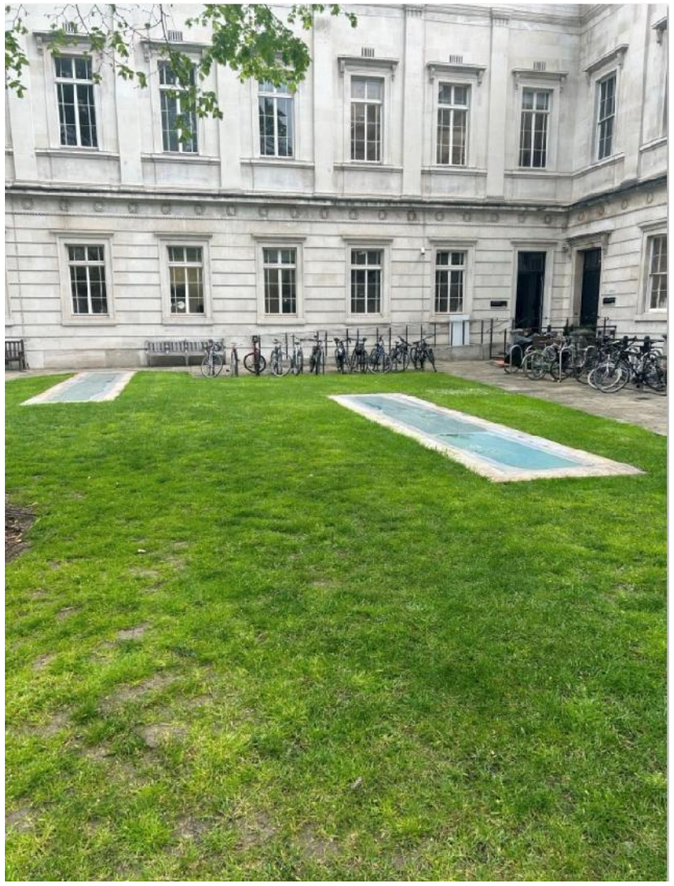




Section Through Sculpture Studio

Slade Building Construction drawings (Gaunt Francis Architects)

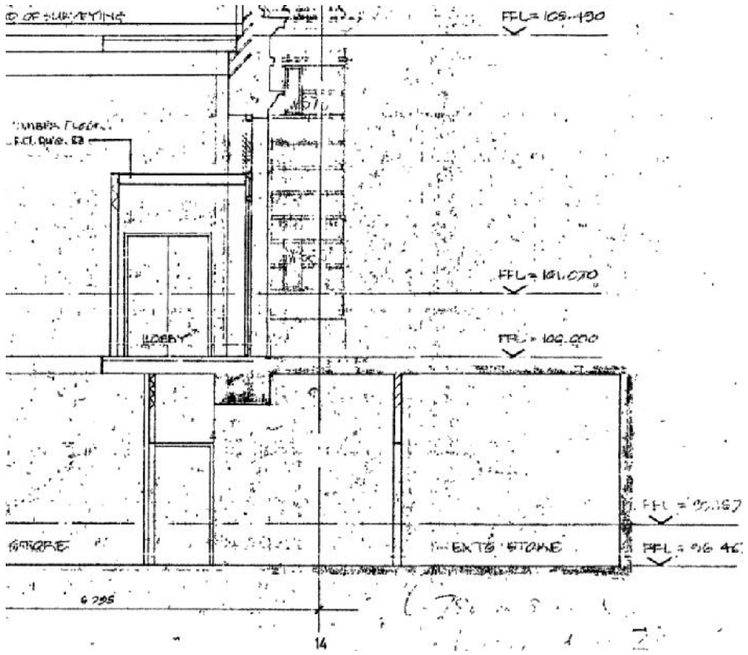
5. Existing Structure
Main Quad



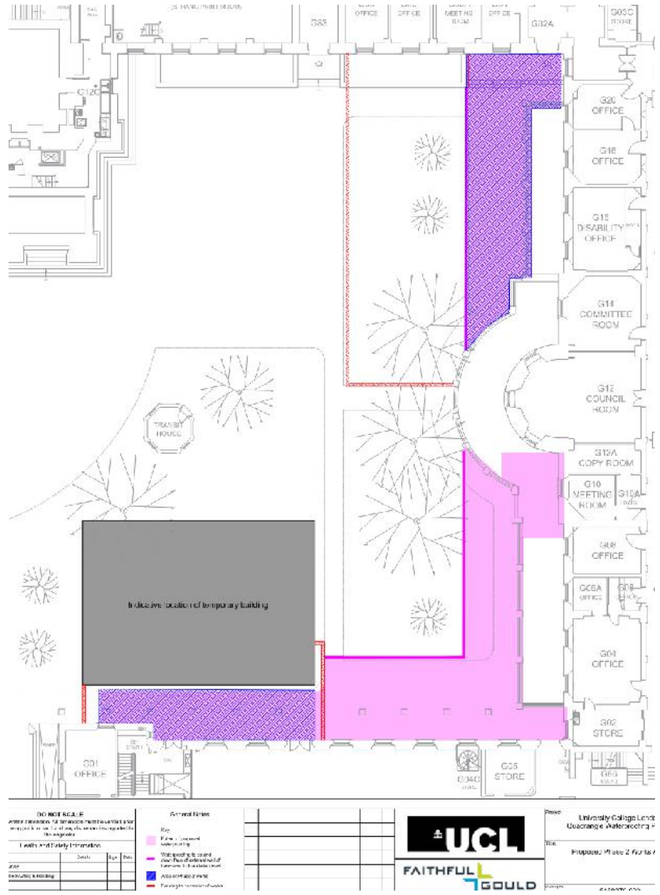
Slade basement roof lights

Chadwick Building Basement

The basement of the Chadwick Building extends under the quad in its south west corner. An extract from what is thought to be the architect's drawing at the time of construction is shown below.

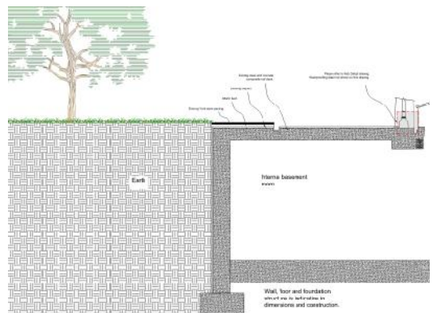


Chadwick basement Construction drawings (Cassom Condor & Partners



South Wing and Chadwick basement waterproofing drawings (Faithful Gould)

Two trial pits (TP1 and TP2) from the MR G.I were excavated to determine the extent of the roof of the Chadwick Building basement. The depth of the basement roof was recorded as 0.29mbgl. The thickness of the basement roof does not appear to have been included in the report.
Waterpoofing work to the Chadwick basement and basements extending under the quad from the South Wing appear to have taken place in 2018 as indicated by the following drawing.

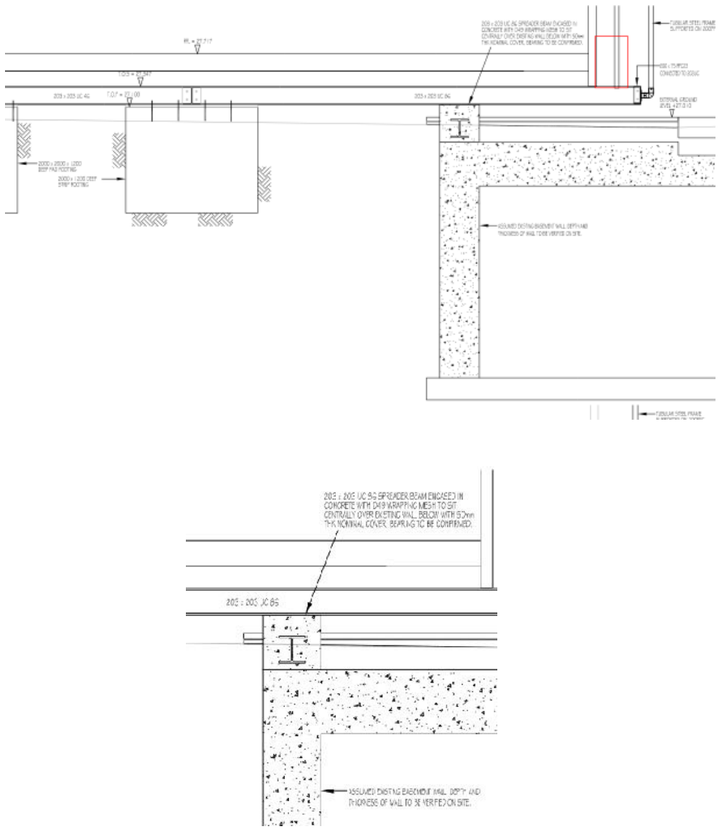


5. Existing Structure
Main Quad

‘Temporary’ Teaching Facility

A two storey modular building currently exists in the south west corner of the quad built circa 2017 according to archive drawings. The building appears to be steel framed supported off pad foundations bearing into the Made Ground with an Assumed Ground Bearing Pressure of 50kPa. The footings are 1.2m deep and project slightly above ground.

The building cantilevers over the Chadwick basement using the existing basement wall as a prop support via a concrete encased steel spreader.



Teaching Facility Foundations (Wilde Carter Clack)

‘Temporary’ teaching Facility and observatories

6. Structural Proposals
Wilkins Building

Cloisters

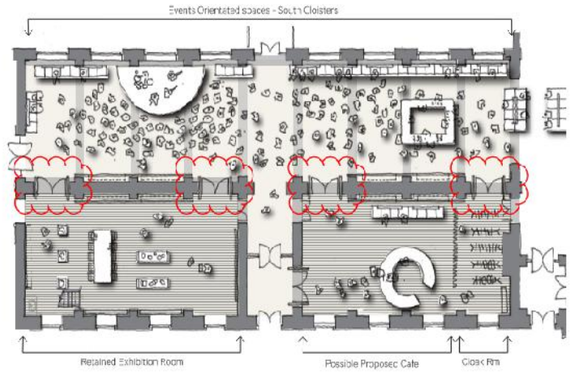
New Door Openings in Spine Wall

In the North and South Cloisters new arched door openings (8no. total) through the spine wall are proposed to provide versatility to the spaces.

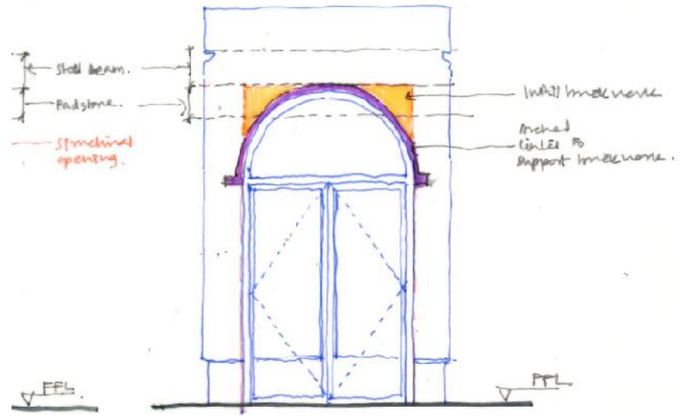
In order to keep structural intervention to a minimum, it is proposed that new door openings are set out vertically to avoid clashing with the existing steel spreader beams built in to the top of the spine wall. When forming the openings, brickwork should be carefully removed. Furthermore, damage to the retained steel spreader beams must be avoided.

The following isometric illustrates the existing structural build up above the spine wall, with sizes and dimensions for structural elements and the location of the proposed door opening.

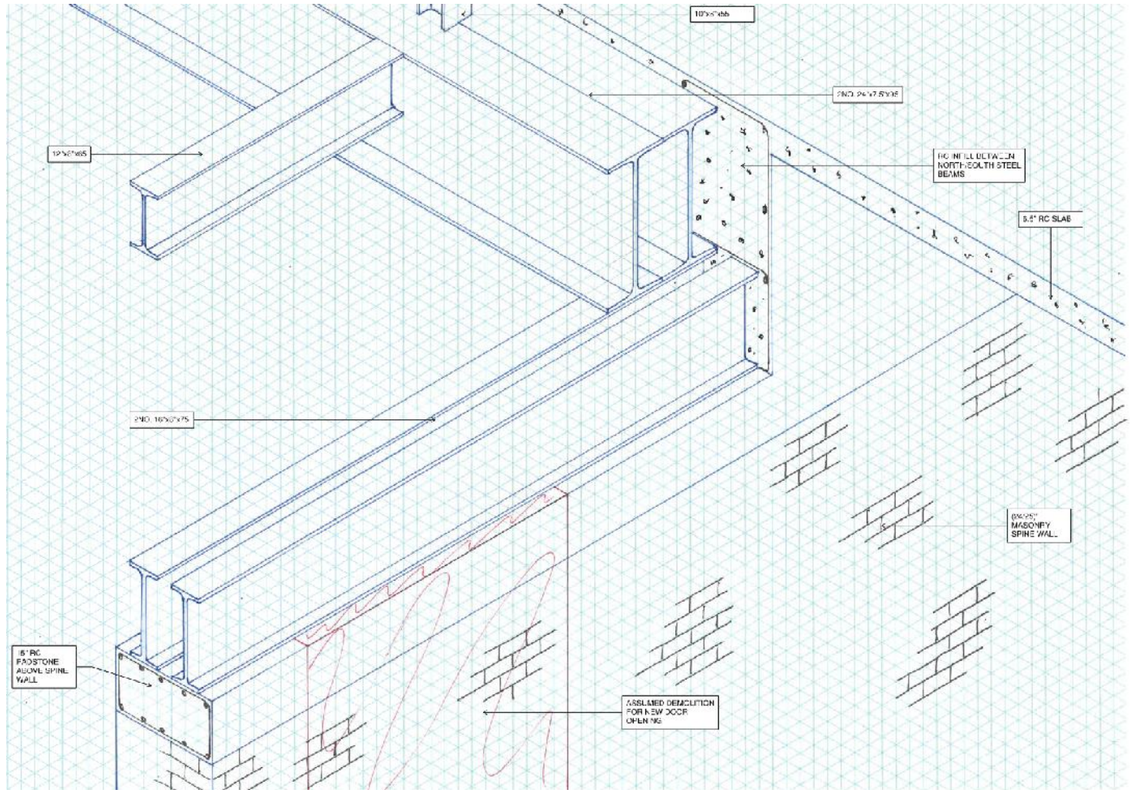
Render of openings in cloister spine wall (Source: Burwell's)



New door openings in cloister spine wall (Source: Burwell Architects)

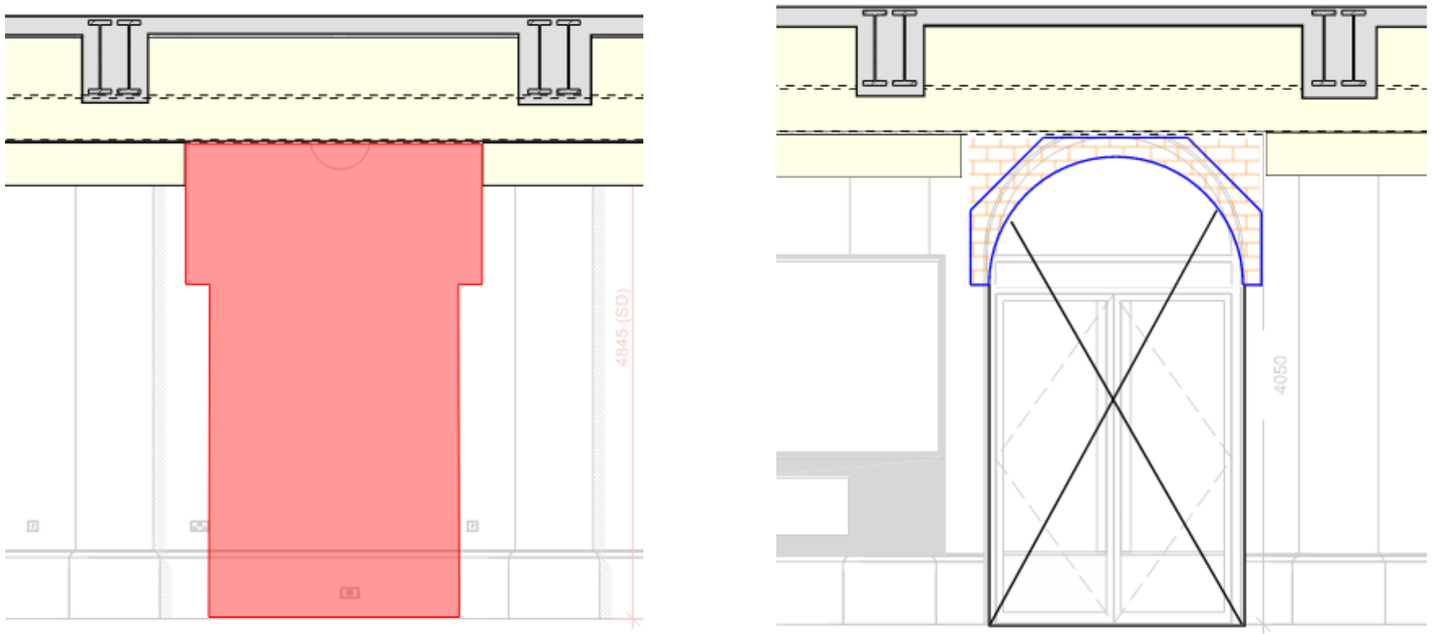


Coordination elevation showing relationship between new opening and existing structure (Source: Burwell Architects)



Isometric of structural existing structural elements in cloister spine wall

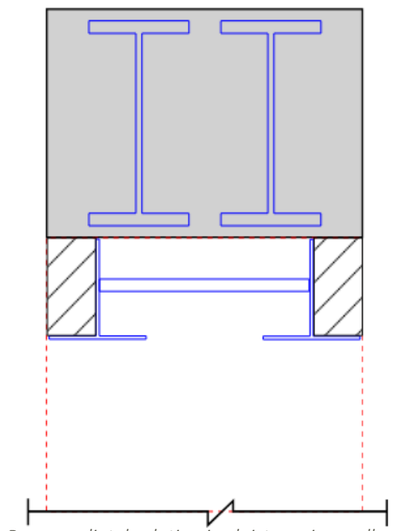
6. Structural Proposals
Wilkins Building



Elevations showing proposed demolition and structural solution

An overbreak of the brickwork will allow for the arched lintels to sit on a recessed ledge. The following image shows the demolition extent and new arched lintel sitting directly beneath the existing beam. The door height is governed by the required upstand height of the arched lintel, a deflection head above the lintel and the proposal to keep the existing steel spreader.

Two arched lintels are required, one at the front and one at the back of the 25 inch thick brickwork wall. The lintels are to be tied together to provide stability and reduce torsional effects caused by eccentric brickwork loads.



Proposes lintel solution in cloister spine wall

Lighting

Architectural render of proposed light fittings

As part of the update to lighting within the Wilkins building new pendants are to be installed in the Cloisters and 'Level Access Zone'. It is understood that these are to be timber and therefore relatively light The pendants are to be fixed to the underside of the existing 6 1/2 inch thick 1st floor RC slab.

These could be fixed using mechanical or resin anchors. This will require scanning for embedded re-bar to avoid clashes and pull out testing to verify that the expected loads can be supported.

6. Structural Proposals
Wilkins Building

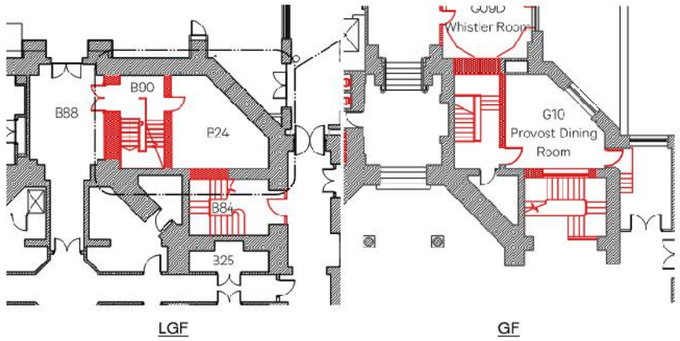
Level Access Zone

To provide level access through the Wilkins Building a reconfiguration of the ground and lower ground floor to the south east of the Octagon has been proposed.

The scheme involves the removal of:

- The existing stairs providing access from the lower ground floor to the mezzanine/office and Provost Room
- The Provost Dining Room floor
- The mezzanine/office floor
- The existing stairs between the lower ground corridor and Octagon
- The existing walls within these spaces.

The proposed demolition is shown in the image below.



Proposed demolition in level access zone (Burwell Architects)

The space is to be reconfigured to include:

- A new ‘column free’ curved staircase from lower ground to ground through what is currently the Provost Dining Room.
- A platform lift in order to provide level access to the Jeremy Bentham Room which will carry occupants between lower ground floor, ground floor and upper ground floor

Architectural render of level access zone (Burwell Architect’s)

Movement Joints

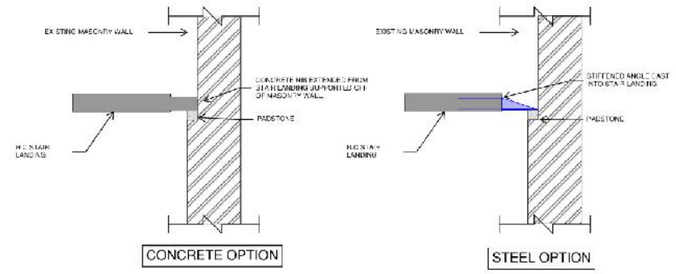
The new floor plates and curved stair at ground floor and upper ground floor are to be supported directly off the existing masonry walls and trimmed out around the lift shaft.

This will allow the new platform lift to be isolated vertically from the landing floor plates and existing structure to simplify foundation work.

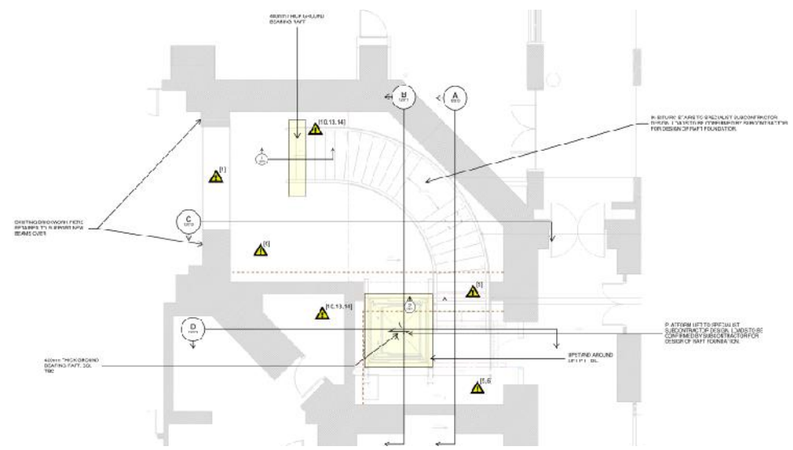
Curved Stair

To achieve the architectural intent, the structure of the stairs is proposed as insitu reinforced concrete. The limited access routes through the building makes a precast concrete option impractical.

The stairs are to be supported off a new RC raft foundation at lower ground floor and the top of an existing brick wall at ground floor level. A support is also proposed at mid-flight off the existing masonry wall using a steel bracket or RC ledge cast into the landing. The bearing onto the existing brick ledge will help limit loading onto the main supports and allow for a reduction in stair throat thickness.



Stair mid-flight support

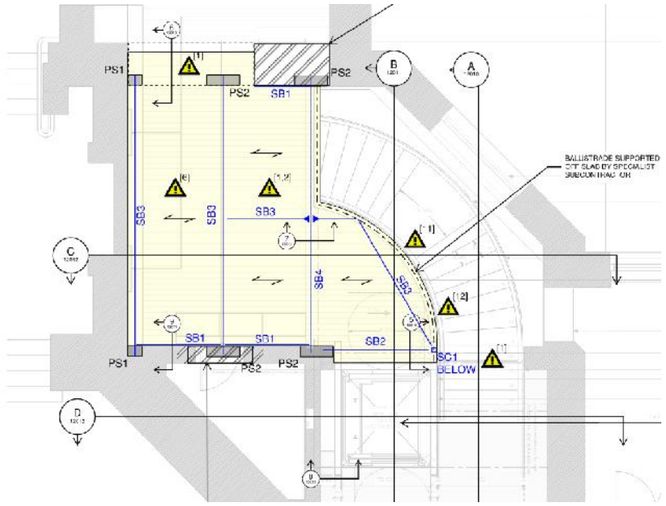


Lower ground floor and foundation GA

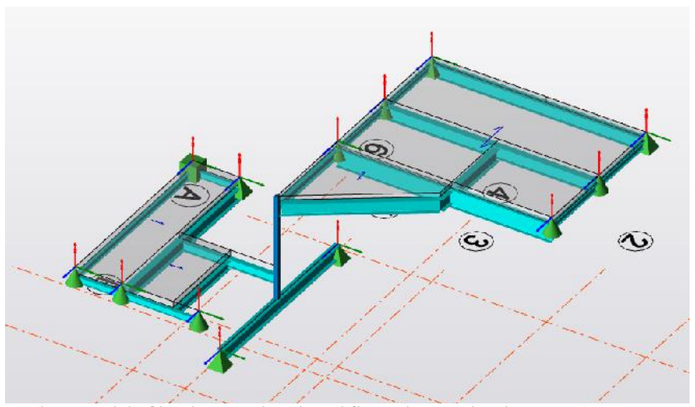
6. Structural Proposals
Wilkins Building

Landings

The landings are 150mm thick composite slabs supported off steel beams built into the existing masonry walls. Edge supports to the composite slabs are provided by steel angles fixed to the walls for stability. The new and existing slabs are tied together over existing brickwork walls with dowel bars cast in and resin fixed respectively.



Upper ground floor GA



Analysis model of landing steelwork and floor plates in level access zone

As part of the architectural proposal there is a curved cantilever platform outside of the lift at upper ground floor level. The concrete deck's curved slab edge cantilevers over an angled beam which in turn is supported by a propped cantilever on one end, and a stub column on the other.

This arrangement keeps the slab cantilever to below 500mm to simplify the temporary works (standard edge details can be utilised without additional propping) and helps to reduce landing deflections.

Stability to the landings is provided by the composite slab acting as a diaphragm tied back to the existing masonry walls and into the foundations.

Retained Floors

Below 1st floor new beams are required to replace the support to the slabs previously provided by the removed walls. These are to be built into existing and reconstructed masonry walls.

Platform Lift

The platform lift subframe is to be designed by a specialist lift manufacture. It is understood that the lift shaft will house its own self-supporting structure, but BDP are to provide the foundations and horizontal restraint for overall stability. Exact loading points and magnitudes are required for BDP to complete the design of these elements.

The platform lift is founded on a new 400mm thick reinforced concrete raft foundation expected to bear on to the London Clay (TBC by geotechnical survey). A 'shallow' foundation option has been sought to reduce excavations in a confined space and to reduce the risk of impacting nearby foundations.

The vertical separation between the shaft and the surrounding new and existing structure described earlier is intended to help reduce the loading gradient applied across new raft and reduce the risk of uneven settlement and unacceptable horizontal displacements/verticality of the lift sub-frame.

The foundations of the internal brick wall that is planned to be removed are locally grubbed out to allow for installation of the raft.

A proposed trial pit in this area is intended to provide insight into the existing foundations, ground conditions and levels and help finalise the design.

The image below is an example platform lift from a potential lift supplier showing unpropped bracing which provides stability to the lift in one direction and a horizontal tie into existing brickwork to provide stability in the other direction. A similar philosophy can be utilised for the proposed platform lift with the exception that the bracing will require a high level prop to reduce uneven raft loads and displacements.

At ground floor level and upper ground floor the composite slabs can act as a diaphragm to help restrain the platform lift, if necessary, and transfer any lateral loads back to the existing masonry walls.