

Portico Library

Stage 3 MEP Report

P01

18 June 2025

MAX FORDHAM

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1.0 INTRODUCTION AND RESPONSE TO STAGE 2

1.1 Client Brief Development

The primary part of the brief that is relevant to this report is that the library will become the most sustainable historic library in the country.

As well as this, the protection of the collection is of prime importance, as is the comfort of staff and visitors.

The history of the building must be respected. And changes must enhance the features and spaces and undo any unsympathetic modern building services installations that currently detract from the space or limit future flexibility.

Since Stage 1, we have made the following advances which will be presented in the report:

- A better understanding of the building form and fabric such that passive measures have been reviewed and will be incorporated
- Roof structure and ventilation system to the main library space
- Access to the basement
- Developed an understanding of how the building is served by the various utilities
- Developed a better understanding of how spaces are required to be condition, including the library itself which does not require complex and expensive close conditioning
- A refined understanding of M&E services routes and distribution and how services can be concealed within the building fabric
- An understanding of how the building may be viewed under the Net Zero Carbon Building Standard (pilot version) in terms of operational energy

Portico have set out a set of tenets for which the building must meet when the project is complete, the following is how the mechanical and electrical concept responds to each of these tenets.

The Most Accessible Library

The biggest challenge for the libraries equitability of access is the fact that currently there is no access to the first floor for anyone other than those who can get there on foot. Even if people can get up there either through use of the rear stair lift or struggling up the staircase, there is no safe means of evacuating them in the event of an emergency, and these systems are still subject to an undignified arrival.

The new lift is proposed to be a full evacuation lift with appropriate controls, communication system and resilient backed up power supplies. This means that even people with spinal injuries or overweight people that cannot be lifted out of a wheelchair and taken down in an evacuation chair can be safely evacuated, so the upper floor and basement become truly accessible for all.

The mechanical systems will be designed to be inherently safe; this includes all heating with low surface temperatures due to the heat pump system and underfloor heating to prevent risk of burns and thermostatically controlled hot water outlet temperatures to prevent risk of scalds to vulnerable people.

The Most Dynamic Library

We are designing the electrical system to allow for dynamic uses of each of the spaces. This relates to the following:

Lighting – the main spaces will be provided with individually addressable dimmable luminaires. Each fitting can be set to have any output, and fittings can be grouped together in different zones. This means that each space can have different scenes set for different events and uses or can be split so that the lighting can suggest one behaviour in one half and another behaviour or use at the same time in the other half of the space.

AV – Each of the main spaces will be provided with fixed audio-visual infrastructure. This means that temporary or permanent sound and visual systems can be installed for a variety of uses in a variety of formats in each space, ranging from amplified spoken word, presentation and conference, wedding or live music could be performed in the future.

Heating and cooling – the ground floor space will be provided with a heating and cooling system that can handle high and low occupancy periods any time of the year.

The Most Sustainable Library

Portico Library is being designed to be ready for a net zero carbon future. This includes such measures as:

- Removal of all direct fossil fuel consumption on site through heat pumps and electric catering equipment instead of gas burning plant and equipment
- High efficiency heat pumps for heating and cooling with heat recovery where possible
- Mechanical ventilation with heat recovery where mechanical ventilation is required
- Improved fabric performance to protect the interior from hot summers and cold winters and minimise energy consumption during these periods. This includes roof insulation and enhanced thermal performance of glazing
- More dynamic control and considered configuration of lighting and heating system so that systems can work quickly and effectively, but also modulate or turn off automatically when not required.
- Enhanced provision of metering so that energy consumption can be understood in detail and future reductions can be well targeted.

These tenets tie in with the Art Council Investment Principles:

- Ambition and Quality
- Dynamism
- Environmental Responsibility
- Inclusivity and Relevance

1.2 Specific Area Brief

Archive

This should be moved to the basement and set up in a well-constructed, sealed mechanically controlled environment to meet the specific conditions required for paper storage:

- Relative Humidity
 - 50-60%RH
 - Maximum 10% cycle in 24-hour period
- Temperature
 - 19-23°C
 - Maximum 4°C cycle in 24-hour period

Having the archive in the basement removes its direct interface with the external environment. The space should be waterproof space, and ideally constructed as a new internal box to provide box-in-box conditioning. The internal box that houses the archive would ideally be constructed with masonry/concrete including thermalite type blockwork exposed internally as this porous material regulated humidity passively, and the thermal mass passively regulated temperature change. The exterior of this box should be insulated. Maximising the passive design provide low energy regulation, but also provides a time buffer if the mechanical plant should fail, or there be power cut.

Mechanical plant to heat/cool/humidify/dehumidify should be installed externally to the archive with conditioned air ducted into the space. This is to prevent damage to the collection should the conditioning plant fail and leak water.

Library

The main library space should be provided with a more responsible and better controlling heating system to stabilise the heat, and therefore the relative humidity. It appears that the current relative humidity in the space is lower than desirable. It may be worth considering some form of humidification if this is felt to be important to protect the collection.

It is not proposed to provide full close control conditioning of the space, due to the constraints of the project and the building. The measures proposed to the heating system and the fabric improvements will provide better regulation of temperature.

Any particularly precious artefacts could be displayed in specialist glass cabinets that have in-built climate control for the small volume that requires it, limiting running costs and associated carbon emissions.

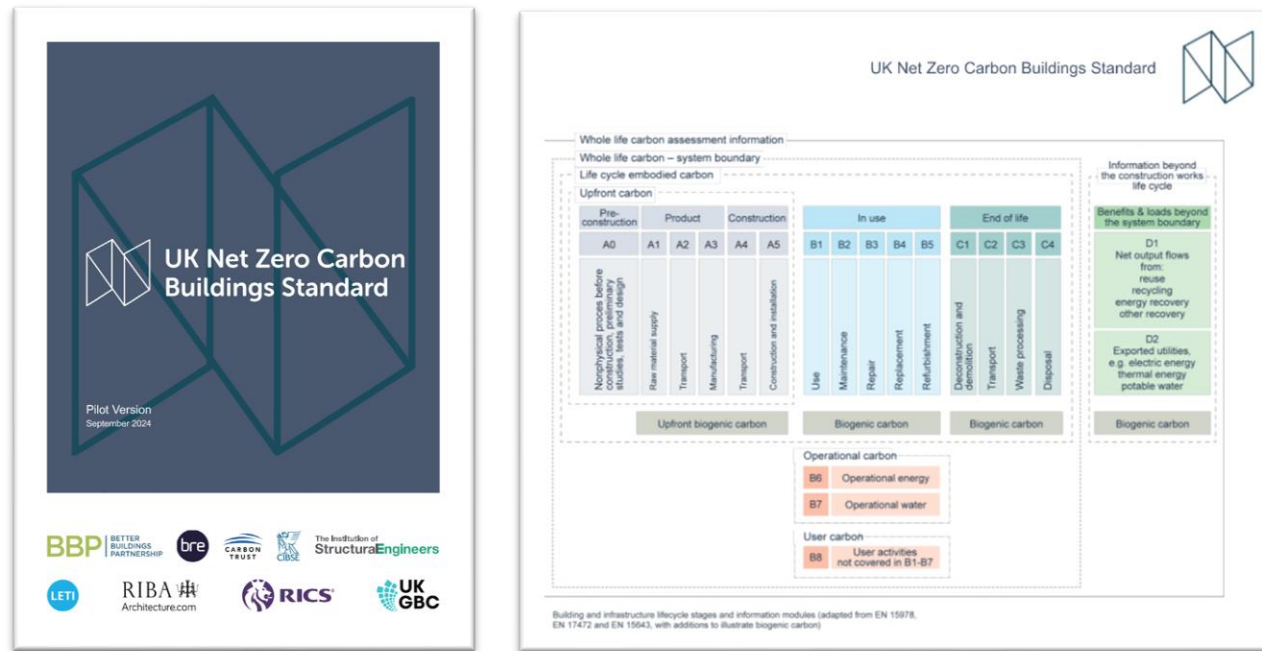
1.3 Members Consultation

We joined a consultation evening with the Members of the Library on the 11th December 2024. These are individuals who pay an annual or life membership to the library to use its facilities regularly and are familiar with the building and its challenges and foibles. The main relevant issues that arose that were pertinent to the M&E systems were:

- Provision of **equitable access and building use**, including level access, lifts, induction loops and accessible WCs
- Cold internal temperatures during winter
- Poor lighting, especially for reading
- Safe access to the roof for maintenance of the new plant, but also for gutters

2.0 APPROACH TO NET ZERO CARBON

The Net Zero Carbon Building Standard (NZCBS) pilot was released for industry review recently. While this document is not regulatory, and far exceeds any mandatory regulation in the UK, it provides the most credible set of guidance and metrics for a building to be considered Net Zero Carbon. The document covers the full carbon life cycle but our scope covers the 'B6-Operational energy in use'.



Within it, it sets targets for buildings of different types that would need to be achieved for a building to be considered Net Zero Carbon. Each year the target reduces on the basis that technology and understanding improves.

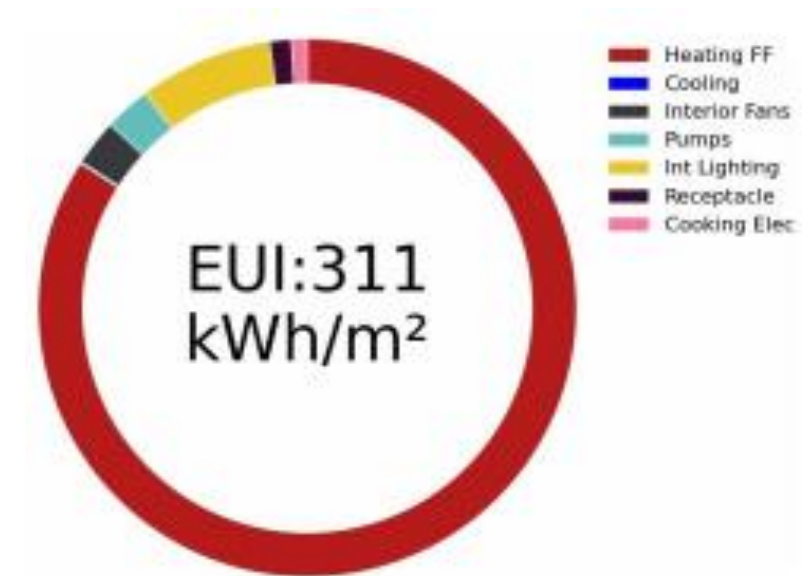
The following targets are relevant to the Portico assuming a start on site in 2027:

Space type	kWh/m ² /yr target for 2027	Approximate Area	Total consumption
Culture – collections	96	866	83,136kWh/yr
Food and Beverage with catering	425	110	46,750kWh/yr
Area weighted target	133	976	129,866kWh/yr

2.1 Baseline

We don't have complete existing energy data for the existing building as the data is not available for the ground floor tenant. We have modelling the building to determine a baseline.

For reference, with gas boilers and the fabric as existing the building currently has an EUI (Energy Use Intensity) of 311kWh/m² according to our modelling.



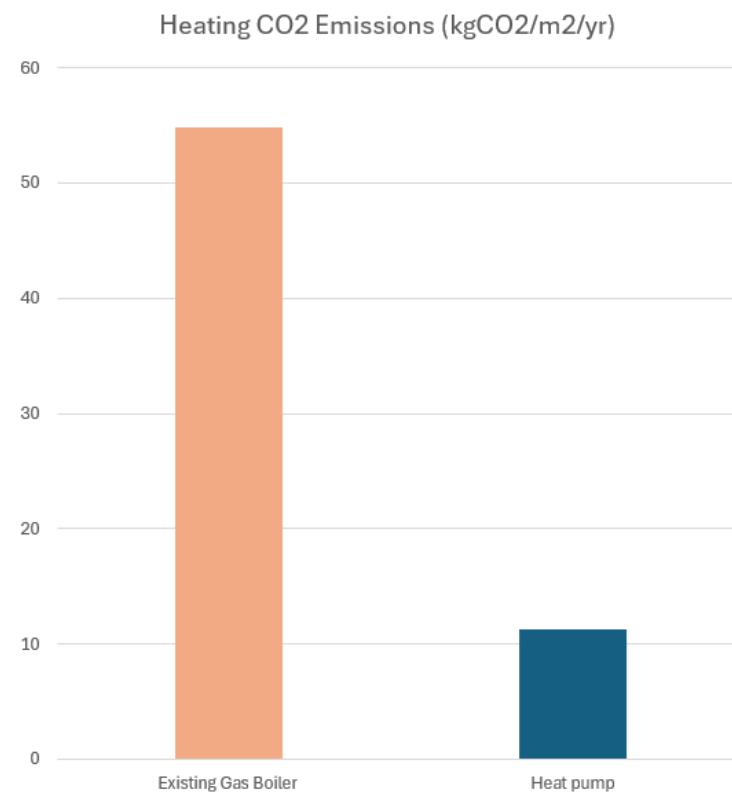
2.2 Fabric Improvements

The following section sets out that energy improvements for a the upgraded thermal elements are minimal because the reduction in heat loss, is similar to the reduction in beneficial solar gain in winter. Overall a reduction of 2kWh/yr is achieved for providing roof insulation, and the same for glazing upgrades.

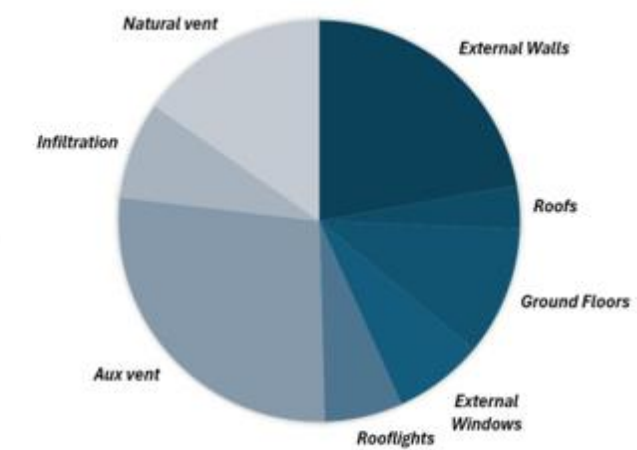
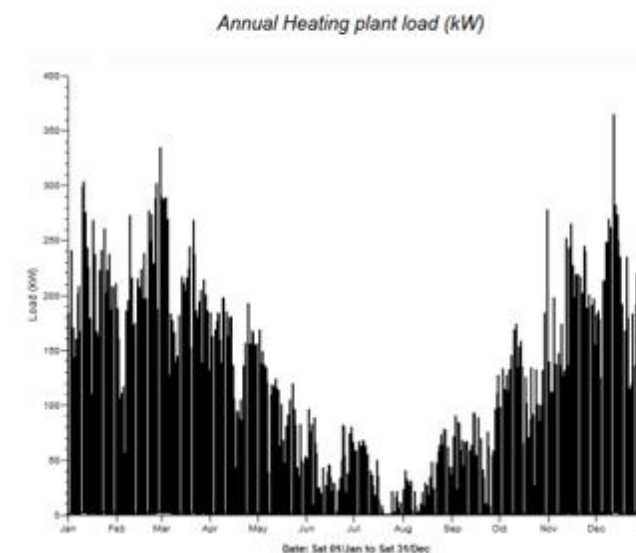
2.3 Heat Source

While the carbon/energy savings by passive fabric improvements are minimal, the major reduction in carbon comes from removing the gas fired boilers, and replacement with air source heat pumps.

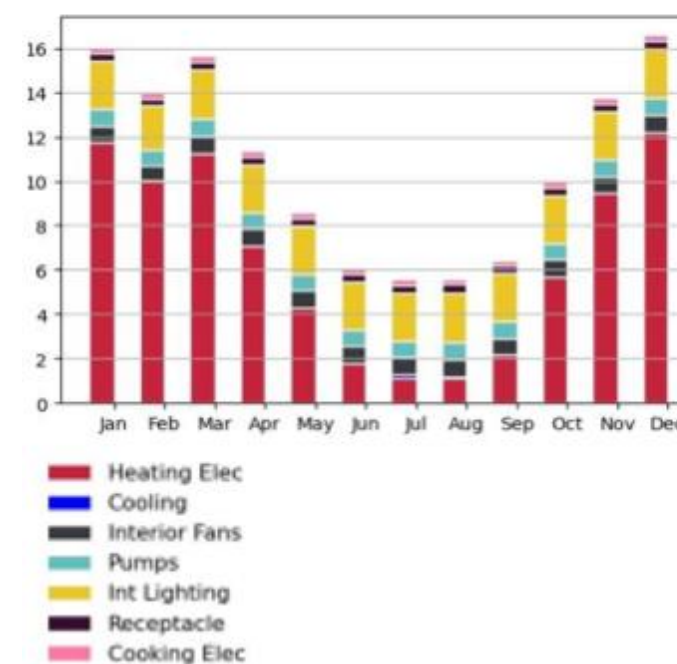
This sees a reduction in energy from the baseline down to an EUI of 124kWh/(m².yr). The following graph shows the reduction in carbon just by replacing the boilers with air source heat pumps.



One observation is that the main heat loss is through the auxiliary ventilation system, this is the kitchen supply and extract system as it extracts large volumes of air with no heat recovery (it is not possible recover heat due to the contaminates and fire risk of grease build up in the extract air). The can be reduced by providing a recirculating system that filters the air rather then exhausts it. Cooling will be required but this uses far less energy that full exhaust.



	Existing U values (W/m.K)
External Windows	5
Internal Windows	5
Roof Windows	5
Roof	1
Wall	1.72
Ground Floor	1.3



The result is that the Net Zero Carbon target of 133kWh/m² is achievable with the proposed measures on paper.

In reality, the target is dependent on many other variables that are beyond the design process and the designers control. These include:

- Actual visitor use in real life. We have made assumptions on the use profile, but this is a huge variable. More catering will use more energy for example.
- Commissioning. The building will be commissioned before handover when the building is empty, this is not reflective of the building in use, and it is also not possible to identify shortcomings in the commissioning, for example lighting that is not well set up, heating systems that are running too hot. These can only be identified

when the building is in use through a process called ‘Soft Landings’ or ‘Post Occupancy Evaluation (POE)’. This process takes place over a period of one or two years and can be quantitative and qualitative. It can pick up anomalies of poor commissioning and also unexpected behaviour that wasn’t predicted or briefed during the design and construction phase.

- Weather. We design for a ‘typical’ year. This is an average year, but the year after handover might be particularly warm, or cold, or windy. All have an impact on energy use and comfort.
- User behaviour. We regularly discover that user behaviour (by staff) is not as we expected. Either poor training or carrying on using the building as they previously had. This might mean plugging in electric heaters to heat the space to an unreasonably warm temperature, leaving lights on or windows open. These can be picked up during POE, and either accommodated or training provided.

3.0 FABRIC IMPROVEMENT MODELLING

The first approach to reducing energy consumption and improving thermal comfort in the building is to review the performance of the building envelope.

The existing building is a stone façade with no insulation. The glazing is single glazing throughout with steel frames, and the tiled roof is uninsulated over the main library space with large single glazed rooflight. The roof over the front portico has been provided with insulation.

We have made the following assumptions on thermal performance:

Element	Assumed average U-value W/(m2.K)
Wall	1.72
Glazing / rooflights	5
Roof	1

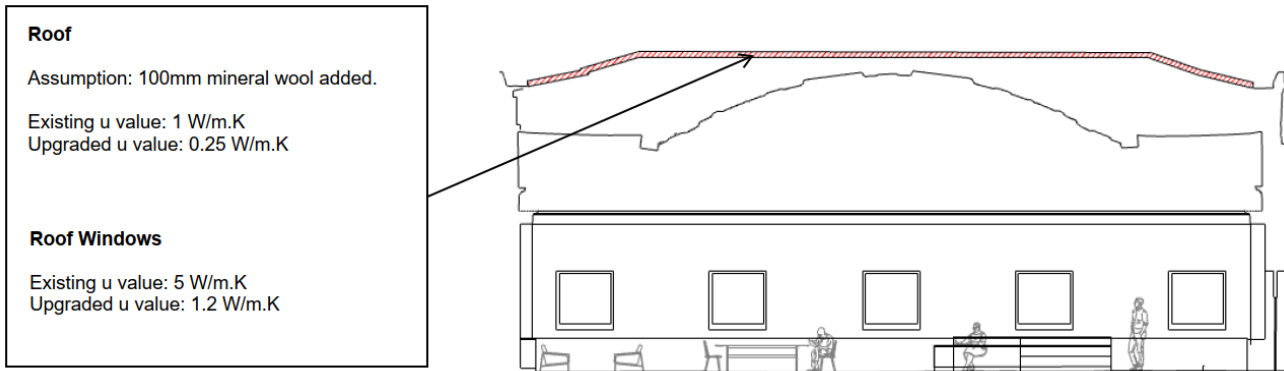
Assuming no other changes to the building than changing the heating system from gas fired boilers to Air Source Heat Pumps, the Energy Use Intensity is 124kWh/(m².yr) as identified in the previous section.

We have looked at the following improvements:

- Insulating the roof at roof level (between the joists directly below the tiles) and doubling glazing the rooflights
- Insulating the roof at loft level (laying insulation on top of the plaster ceiling)
- Providing double glazing

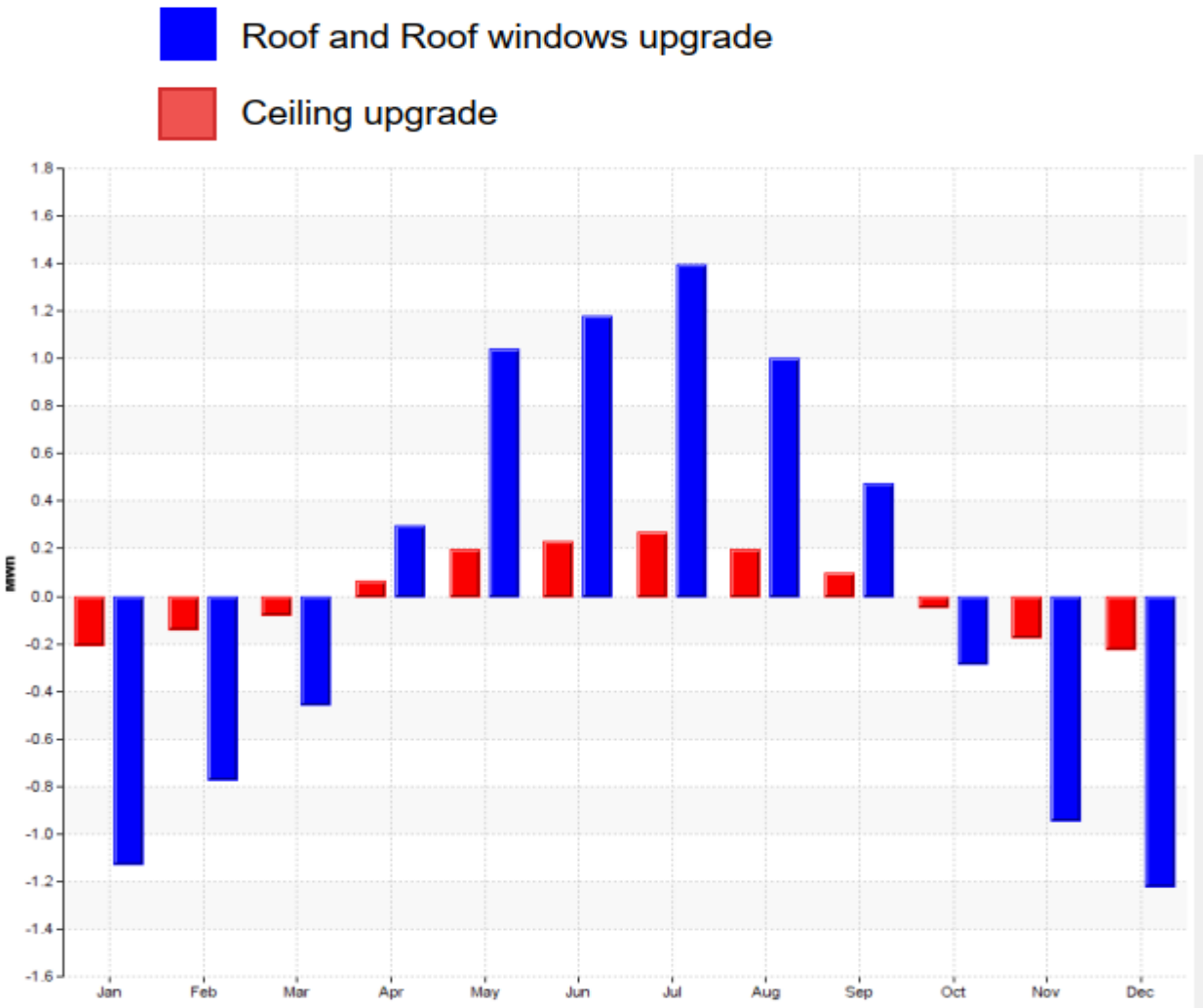
3.1 Insulating the roof at roof tile level with double glazing rooflights

Upgrading both the roof and roof glazing has limited improvement in thermal performance due to the presence of an unconditioned void between the ceiling and the external roof structure. This space is highly susceptible to temperature fluctuations and during periods of low external temperature, particularly at night, conductive and convective heat losses occur from the occupied exhibition space to the uninsulated void resulting in increased heating loads.

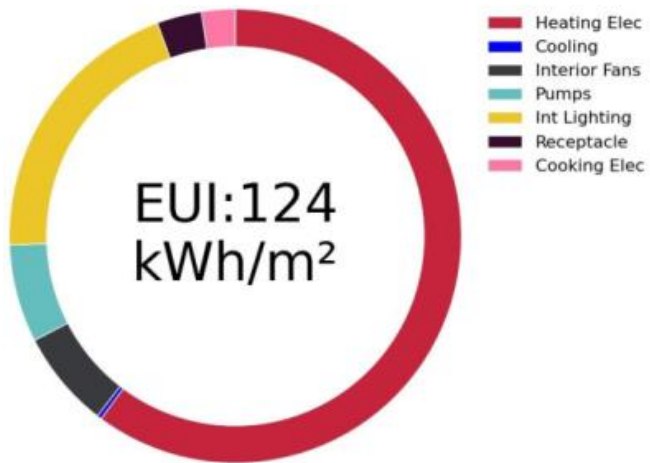


The graph below illustrates the net heat transfer—comprising both losses (negative values) and gains (positive values)—for two scenarios: the roof and roof windows upgrade, and the ceiling upgrade. During the heating season, the roof and roof windows upgrade scenario exhibits greater overall heat loss through the ceiling compared to the ceiling upgrade scenario, due to insufficient thermal resistance at the ceiling plane. In the summer months, this configuration results in

unbeneficial heat gains, contributing to elevated internal temperatures and increased risk of overheating within the library space.

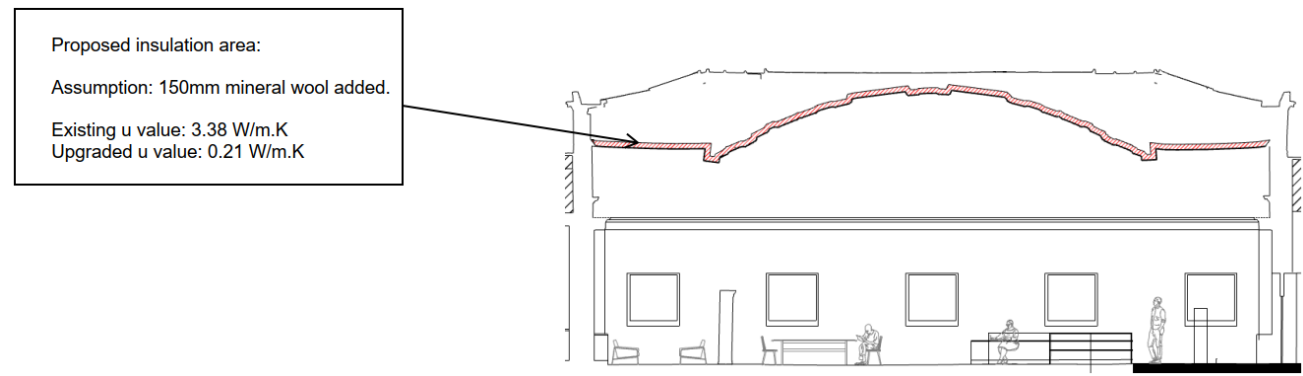


The overall result is a net zero impact on energy consumption:

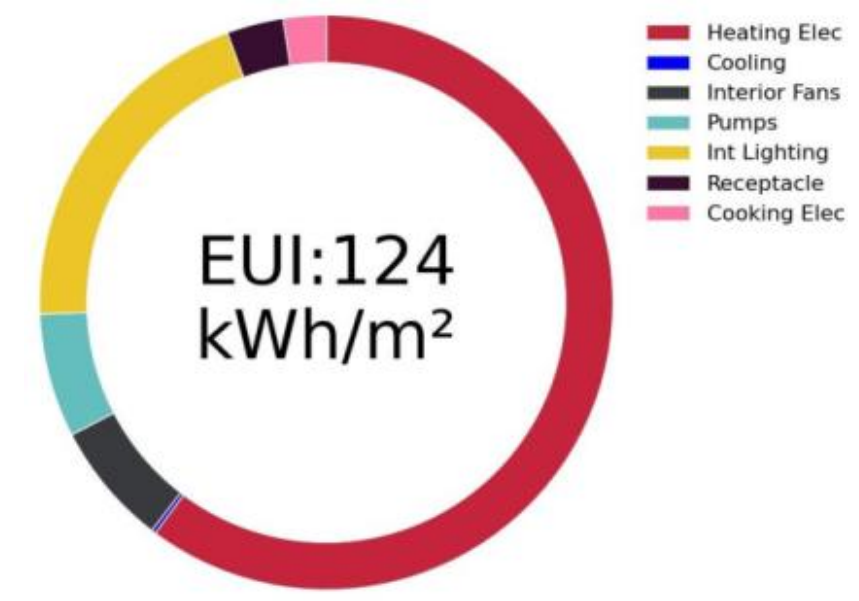
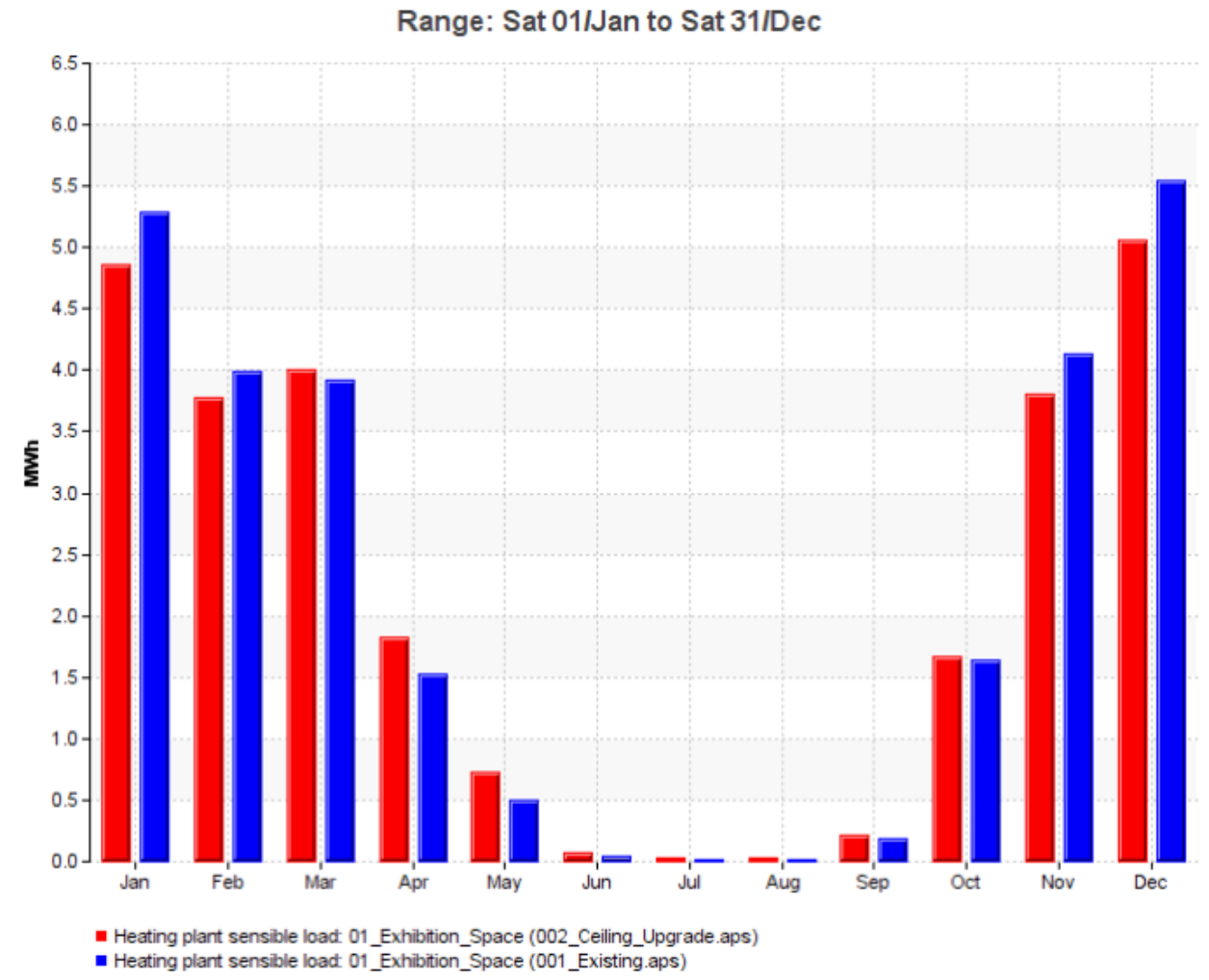


There are particular concerns with this approach as double glazing would add a significant load to the existing roof structure with a major cost and risk implication.

3.2 Insulating the roof at loft level (laying insulation directly above the plaster ceiling)



While the ceiling upgrade yields a net reduction in annual heating load, the magnitude of this reduction is relatively marginal. This is primarily because there are specific periods (particularly during the shoulder seasons) when solar gains transmitted through the existing roof contribute beneficial internal heat to the exhibition space below. These passive gains can offset heating demand during cooler transitional months, suggesting that the thermal performance improvements to the ceiling may, in some cases, reduce the advantageous solar gain.



However, during the summer months, the solar gains transmitted through the existing roof construction contribute significantly to the risk of overheating within the exhibition space. The percentage of occupied hours during which the internal temperature exceeds 26°C is approximately doubled in the absence of a ceiling upgrade, highlighting the importance of improved thermal insulation during the summer months.

		Dry resultant temperature (°C) - % hours in range
		> 26.00
Existing	01_Exhibition_Space	15.1
Ceiling insulated	01_Exhibition_Space	7.6

In summary, this option does not have a measurable impact on energy consumption, but it does have a big impact on internal temperature stability in the summer and in the winter, providing a better environment for the collection and for occupants.

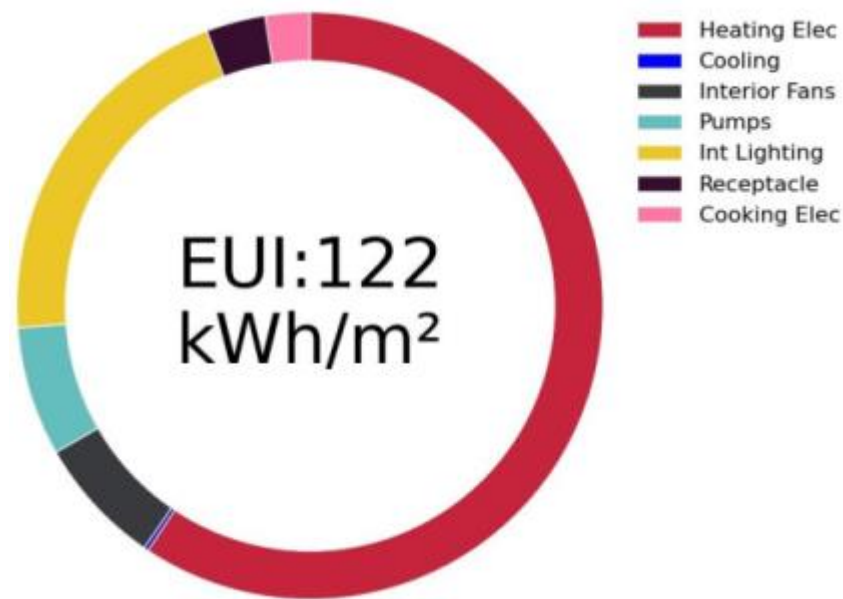
3.3 Providing double glazing

This option sees the existing single glazing throughout the building replacing with new double glazing. We have assumed that the U-value improves from 5(W/m²).k to 1.2(W/m².K). The assumption is also that the ground floor windows are new sash windows with high and low level openings, and the first floor is provided with centre pivot openings that provide a large free area, rather than the existing bottom hung inward opening windows that have limited free open area due to the depth of the recess that they open in to.

The outcome of the thermal modelling is that double glazing has only a minor impact on reducing energy consumption as the reduction in heat loss is offset by the useful solar gain in winter, there is a reduction in running costs by around £800 per year.

	Existing	Double Glazing	Annual Cost saving
Heating Load (kWh)	77913	75189	£ 817
Cooling Load (kWh)	260	226	£ 10

		Dry resultant temperature (°C) - % hours in range > 26.00
Existing	00_Cafe/Bar/Events	1.9
Double Glazing	00_Cafe/Bar/Events	0

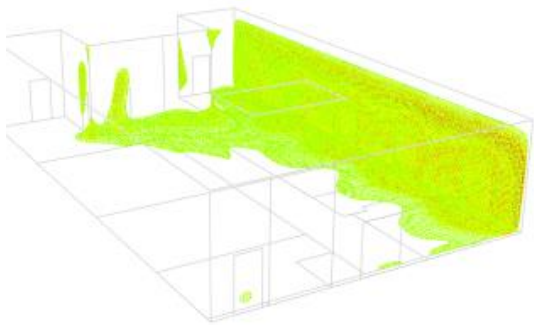


The primary benefit of improving the thermal properties of the glazing is more related to comfort and consistency of environment across each of the main spaces.

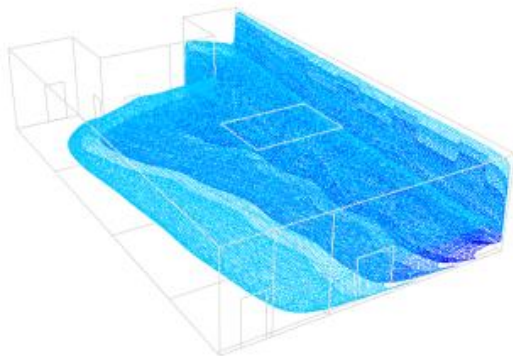
Downdraught Impact

Analysis of the thermal imagery indicates that double glazing markedly reduces local air velocities in the zones adjacent to the window surface. This reduction is attributed to the improved thermal resistance of double-glazed units, which results in elevated inner surface temperatures compared to single glazing. Consequently, the temperature gradients driving convective downdraughts are reduced. The extent of low-temperatures closest to the floor is also significantly reduced, thereby improving local thermal comfort conditions for occupants situated near the façade.

Existing glazing

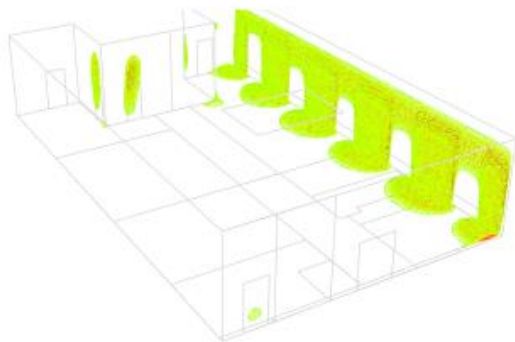


Areas of Highest Air velocity

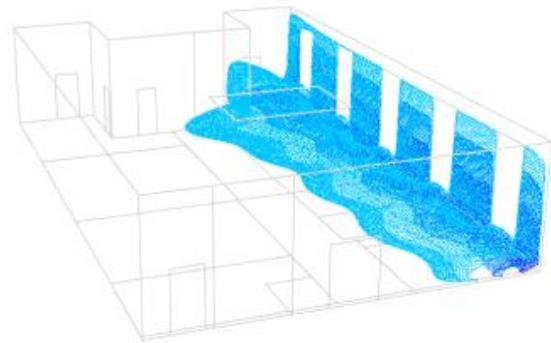


Areas of Coolest air temperature

Double Glazing



Areas of Highest Air velocity



Areas of Coolest air temperature

3.4 Summary and Recommendations

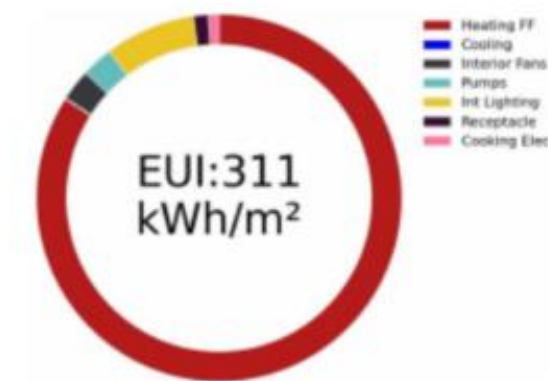
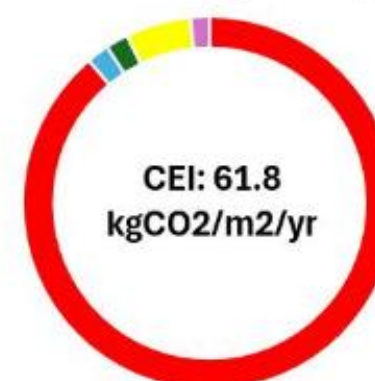
While the fabric improvements don't have a dramatic impact on energy consumption, they do have a fairly huge impact on the quality of the internal conditions. This is particularly relevant due to the collection of books that are sensitive to changes in temperature (and so relative humidity).

Our recommendation would be to provide roof insulation directly on to the plaster ceiling as this provides a more stable temperature and reduces the experience of overheating in summer.

We also recommend that the windows are replaced with new double-glazing units. This further stabilized the indoor environment, particularly in winter. It also has a small energy and carbon benefit. Additional benefits of replacing the glazing include:

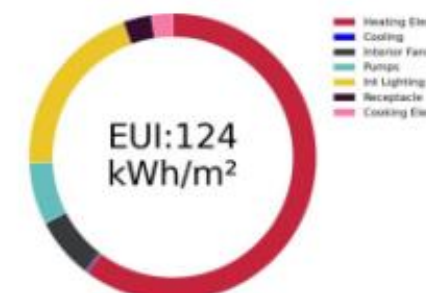
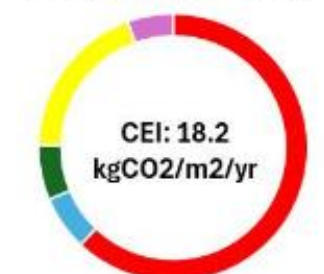
- The option for improved acoustic performance
- The option to improve the airflow through the windows
- The option to select glass to reduce UV and solar gain

CO2 Emissions (kgCO2/m2/yr)



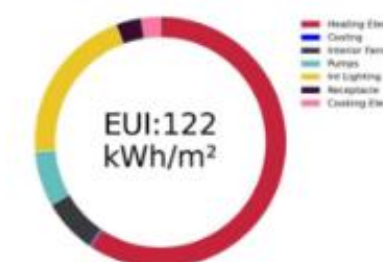
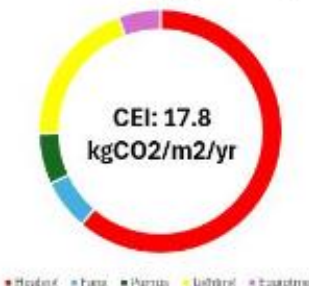
Replace gas
fired boilers
with Air Source
Heat Pumps

CO2 Emissions (kgCO2/m2/yr)



Fabric
improvements:
Replace
Windows
Loft insulation

CO2 Emissions (kgCO2/m2/yr)



4.0 UTILITIES

The building is served by utilities that are split between the two demises. There are alterations required to bring the building back in to one single use.

4.1 Gas

There are two gas meters that serve the pub, and a third one that serves the library.

Pub meter MPRN's:

- 8095707
- 8095808

Library meter MPRN:

- 5060042801

We have lodged applications with Cadent to have all these gas meters removed and the building disconnected from the network as the building will no longer require a gas supply due to the decarbonisation approaches taken.

4.2 Water

There are independent water connections are currently for both buildings. One will be disconnected by application to United Utilities in order to reduce the standing charges that would be a regular ongoing cost to the client.

4.3 Electricity

There are two connections to the building, one for the pub that enters from Moseley Street and one for the library that enters at the corner of the building below the library entrance in the gents WC.

Pub MPAN:

- 1600000057327

Library MPAN:

- 1610000059491

We have made applications to Electricity North West Limited (ENWL) to have both these supplies disconnected as neither has the capacity to meet the building load. We have applied for a new connection of 250kVA, and for it to enter at the rear of the building as this solves a number of architectural issues, freeing up space at the public end of the basement, and moving the electrical intake and plant to the rear of the building in the back of house zone.



5.0 M&E DISTRIBUTION STRATEGY

5.1 Introduction

A major part of the Stage 3 process has been to commence design of the mechanical and electrical services strategies and how they fit within the building. At Stage 3 the intention is to address the larger coordination concerns:

- Is there enough space for central plant and is it in appropriate locations?
- How do the services traverse the building horizontally and rise up/drop down the building?
- What are the major Builderswork implications (impacts on structure that need intervention)?
- Is the overall concept feasible or do architectural changes need to be made to accommodate the M&E systems with knock on impacts on the brief.

To address these issues it becomes necessary to conduct more detailed opening up of the building and surveying of it. A risk we have is that access to the basement and ground floor pub demise is quite restricted however we have made a number of assumptions and worked with the team to develop a combined understanding of these areas.

In order to develop the concept design, we have use 3D modelling software called AutoCAD Revit to commence modelling of the major plant and distribution runs which allows us to collaborate as a design team to develop the design in a direction that is feasible and deliverable. This level of detail also permits the Stage 3 cost plan to be refined.

5.2 General distribution and plant space allocation

The general distribution strategy from Stage 2 has been adhered to.

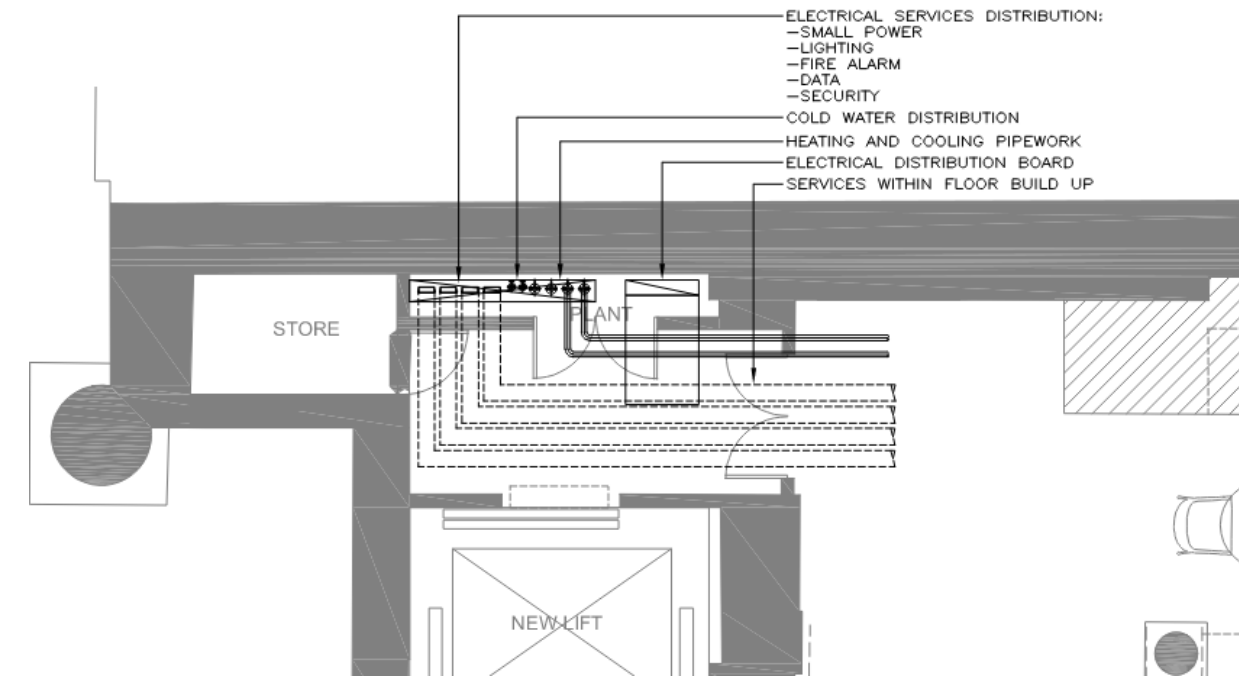
The main intervention is to form a flat roof deck at the rear of the building for the Air Source Heat Pumps. The remainder of the plant for the heat and cooling systems are to be housed in the loft above the front portico. This includes pumps and heavy buffer vessels which will be mounted on top of the lift shaft to minimise structural interventions.

The electrical intake and plant room has been moved to the rear of the building for a number of reasons:

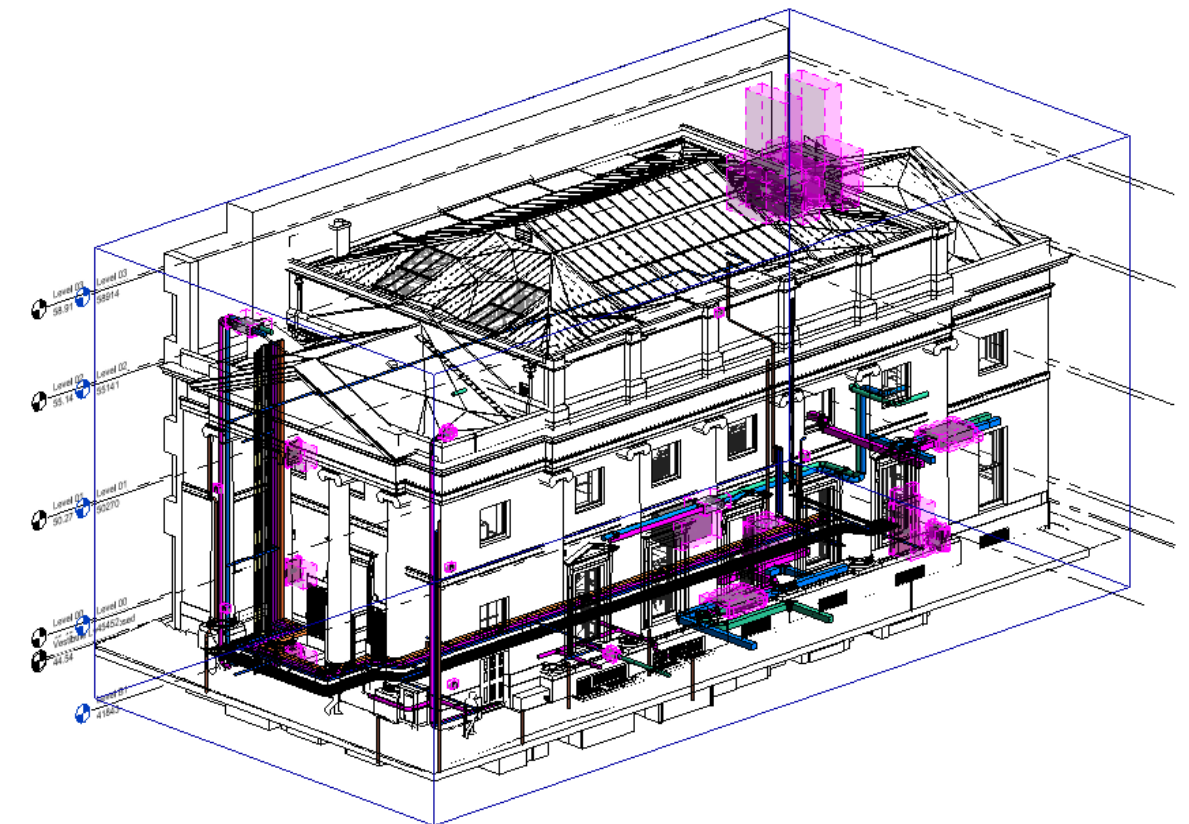
- The front space in the basement that we had initially identified for electrical plant is better served as a public facing use
- Getting the electrical intake to the rear of the building moves it away from the interventions that are taking place to the portico steps, decoupling the two tasks during construction
- Bringing the new connection into the rear has less complexity as it moves it away from the tram lines and busy Moseley Street pavement.

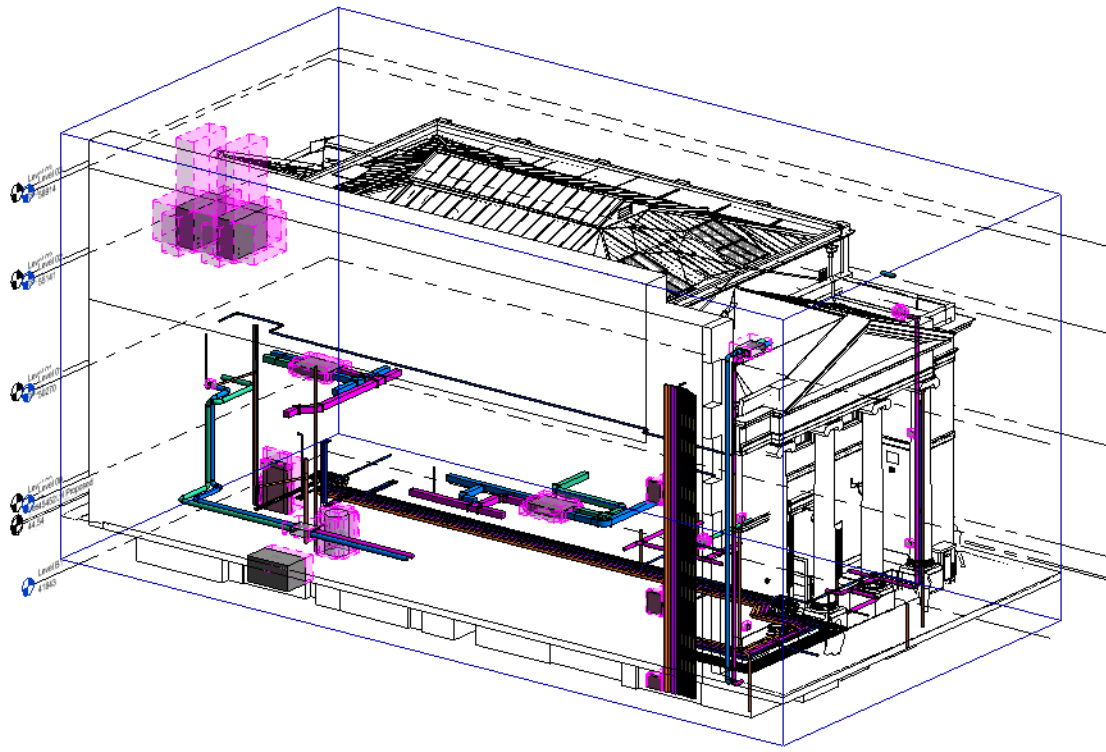
Horizontal distribution is all in the basement to connect the front and back of the building.

The main vertical riser is towards the front of the building using an existing historic boiler flue route, this minimises structural intervention as the vertical route already exists so new holes and strengthening are not required. It is also in a good location away from public access.



Due to the electrical plant room moving to the rear of the building, we need a new small riser at the rear to connect the ASHP plant deck to the electrical plant room to minimise cable lengths.





6.0 DESIGN PROPOSALS

6.1 Existing Services

All existing Mechanical and Electrical services to the building shall be removed in entirety. Access to the ground floor and basement has been limited during the design process. Once access is provided, a survey shall be conducted to determine If any luminaires can be retained, refurbished and reused. Any historic style luminaires in the building may also be recovered.

6.2 Above Ground Drainage

Design Criteria

- BS 12056
- Building Regulations Part H - Drainage and waste disposal

Requirements

All existing above ground foul drainage shall be stripped out and disposed of.

Provide a full new above ground foul drainage system to remove soil and wastewater from sanitary appliances, CW cisterns, heating systems, water systems, condensate, overflows and safety valve discharges with the minimum risk of blockage. The system shall be a full new working system in HDPE pipework throughout the building to all new sanitaryware and catering installations, with ventilation to above the roof or using Air Admittance Valves.

Where practical the above ground drainage shall connect to existing below ground drainage connections in order to minimise costly work in providing new below ground drainage below the basement slab.

6.3 Rainwater Drainage

Design Criteria

- BS 12056
- Building Regulations Part H - Drainage and waste disposal

Requirements

A full new rainwater system shall be provided to convey rainwater from the rainwater outlets on the roof (designed by the architect) to the below ground connections at basement level (designed by the civil engineer). All internal pipework shall be made of cast iron and will be a gravity system.

6.4 Piped Services

Design Criteria

- The Gas Safety (installations and use) Regulations (1998)
- Building Regulations Part J – Combustion Appliances and Fuel Storage Systems
- The Water Supply (Water Fittings) Regulations 1999
- Building Regulations Part G - (Sanitation, Hot Water Safety and Water Efficiency)
- Building Regulations Part L2b - Conservation of fuel and power in existing buildings other than dwellings
- Non-Domestic Building Services Compliance Guide
- United Utilities Requirements

Requirements

All existing gas pipework shall be removed in entirety and disposed of, including all utility meters and utility connections as no gas connection will be required in the future.

All existing water services shall be stripped back to the incoming water mater and disposed of. Care will need to be taken to ensure the system is fully drained down before remove to prevent damage to the building fabric.

Provide a full new water distribution system in insulated copper pipework to all water outlets and sanitary fitting and catering fittings.

From the mains incomer, provide a mains distribution system to all wholesome water outlets, and to the water tank in the basement.

Provide a packaged water tank/booster set in the basement. This shall provide a boosted water system to all cold water outlets and to hot water generators.

Hot water will generally be generated local to the outlet using point of use electric heaters under the sink, or instantaneous electric water heaters. Water should not exceed 41C at all outlets except cleaner sinks and catering sinks where 55C will be acceptable.

In the kitchen a hot water cylinder will be provided, this shall be heated by a dedicated air source heat pump with electric immersion back up. The hot water cylinder shall be located in the kitchen space and will require a recirculation system to maintain system temperature to reduce dead legs and the risk of Legionella.

6.5 Heating and Cooling

Design Criteria

- Building Regulations Part L2b - Conservation of fuel and power in existing buildings other than dwellings
- Non-Domestic Building Services Compliance Guide
- External design conditions: Winter -4°C / Summer 28°C

Space	Winter Conditions	Summer Conditions
Basement Accommodation	21°C	No cooling
Basement Archive space	18°C +/-2°C 55%RH +/-5%	22°C +/-2°C 55%RH +/-5%
Entrance Vestibule	16°C	No cooling
Ground floor event space	21°C	25°C
Ground floor small event space	21°C	25°C
General circulation	18°C	No cooling
First floor main library	50%RH conservation heating with a minimum temperature of 18°C	50%RH conservation heating with a minimum temperature of 18°C (no cooling)
First floor members room	50%RH conservation heating with a minimum temperature of 18°C	50%RH conservation heating with a minimum temperature of 18°C (no cooling)
WCs	18°C	No cooling

Requirements

Strip out

Strip out the existing heating systems that serve the pub and the library above, including boilers, ancillary equipment, pipework and heat emitters. Care will need to be taken to ensure the system is fully drained down before remove to prevent damage to the building fabric.

The specialist refrigeration systems that serve the kitchen fridge/freezer and cellar cooling shall be retained and reused following inspection and confirmation that they are fit for purpose (if left by the current pub tenant).

New Heat Source

Provide a whole new heating and cooling system based on 2no 65kW air source heat pumps located on the roof at the rear of the building on the newly formed plant deck. One of the ASHPs shall be reversible to provide cooling in summer.

Provide suitably sized buffer vessels for the heating and cooling system in the roof void above the front portico to ensure safe and efficient operation of the heat pumps.

Provide distributing pipework in screwed and threaded steel throughout the building to heat emitters which shall be zoned with individual digital zone control. Heating circulation will be at 50°C flow / 40°C return maximum. Cooling circulation will be at 6°C flow / 12°C return.

Space Heating

The follow heating and cooling emitters are proposed for each space type, these are subject to change following opening up.

Space/Zone	Heating Cooling Emitters
Basement	
Office/Occupied Spaces	Ceiling mounted fan coil units shall provide heating to the spaces as there is little wall space available.
WCs	Ceiling mounted radiant ceiling panels.
Corridors/Circulation	Fan coil units or ceiling mounted radiant ceiling panels.
Kitchen	Warm air heating using the recirculation system. Cooling to also be provided to the recirculation system.
Archive	Dedicated ducted packaged humidification/dehumidification system with close temperature control unit, located outside of the archive space.
Archive Study Room	Fan coil unit with heating and cooling.
Ground Floor	
Main Entrance Vestibule	Underfloor heating.
Main Event Space	Floor standing fan coil units concealed in the column bases to provide heating and cooling.
Small Event Space	Wall mounted fan coiling concealed in joinery to provide heating and cooling.
First Floor	
Lobby	Underfloor heating.
Main Library Space	Underfloor heating between existing floor joists, with concealed wall mounted fan coil units below window sills for trimming of temperature.
Members Reading Room	Underfloor heating between existing floor joists, with concealed wall mounted fan coil units below window sills for trimming of temperature.



6.6 Ventilation

Design Criteria

- Building Regulations Approved Document B - Fire Safety
- Building Regulations Part F - Ventilation
- Building Regulations Part L2b - Conservation of fuel and power in existing buildings other than dwellings
- Non-Domestic Building Services Compliance Guide

Space	Vent rate
Office/occupied spaces	12l/s.person
WC	6l/s per WC
Shower	15l/s per shower

Requirements

Strip out and dispose of any existing mechanical ventilation equipment.

General mechanical ventilation requirements

The majority of the building will remain naturally ventilated with minor alterations. Some areas are to be provided with mechanical ventilation.

The basement occupied spaces shall be provided with MVHR units to provide fresh air and extract stale air. This will be automatically driven by air quality and humidity.

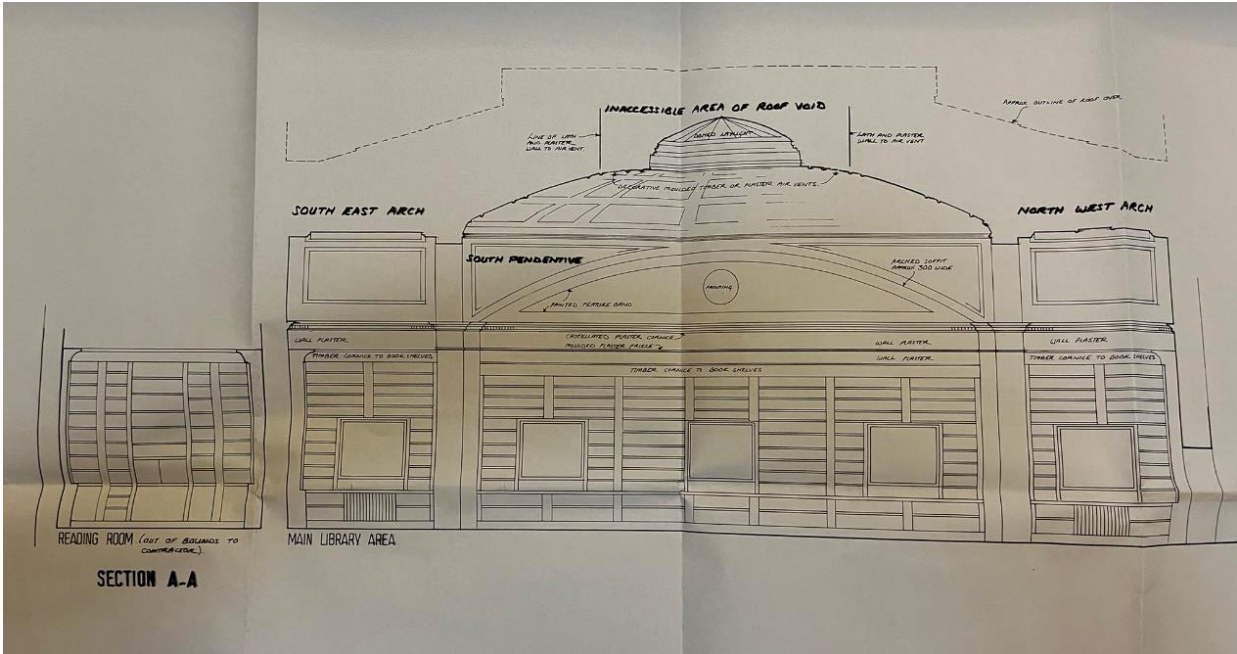
WCs are provided with mechanical extract on timeclock control.

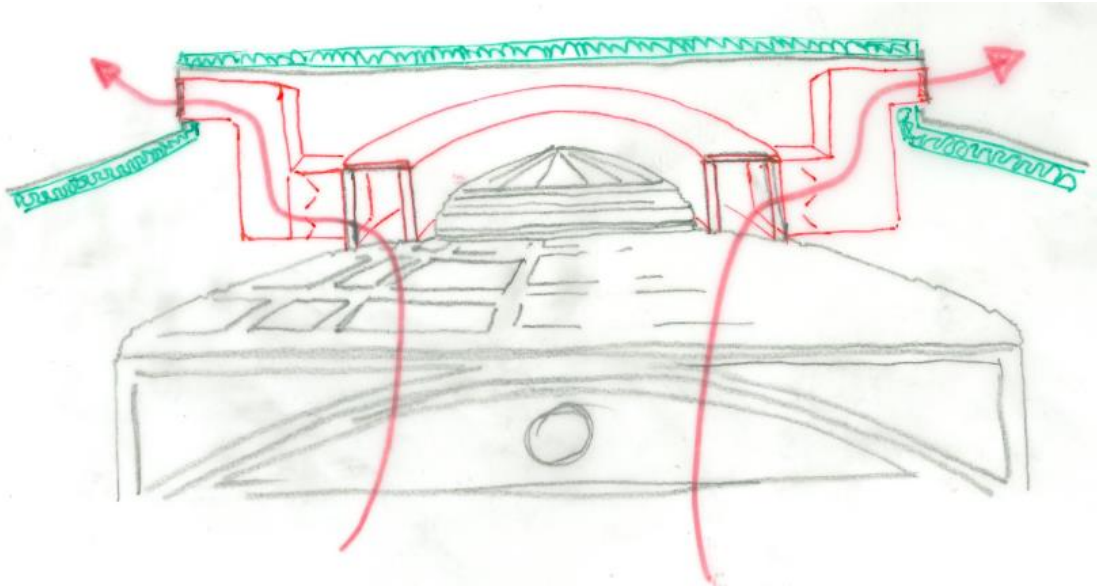
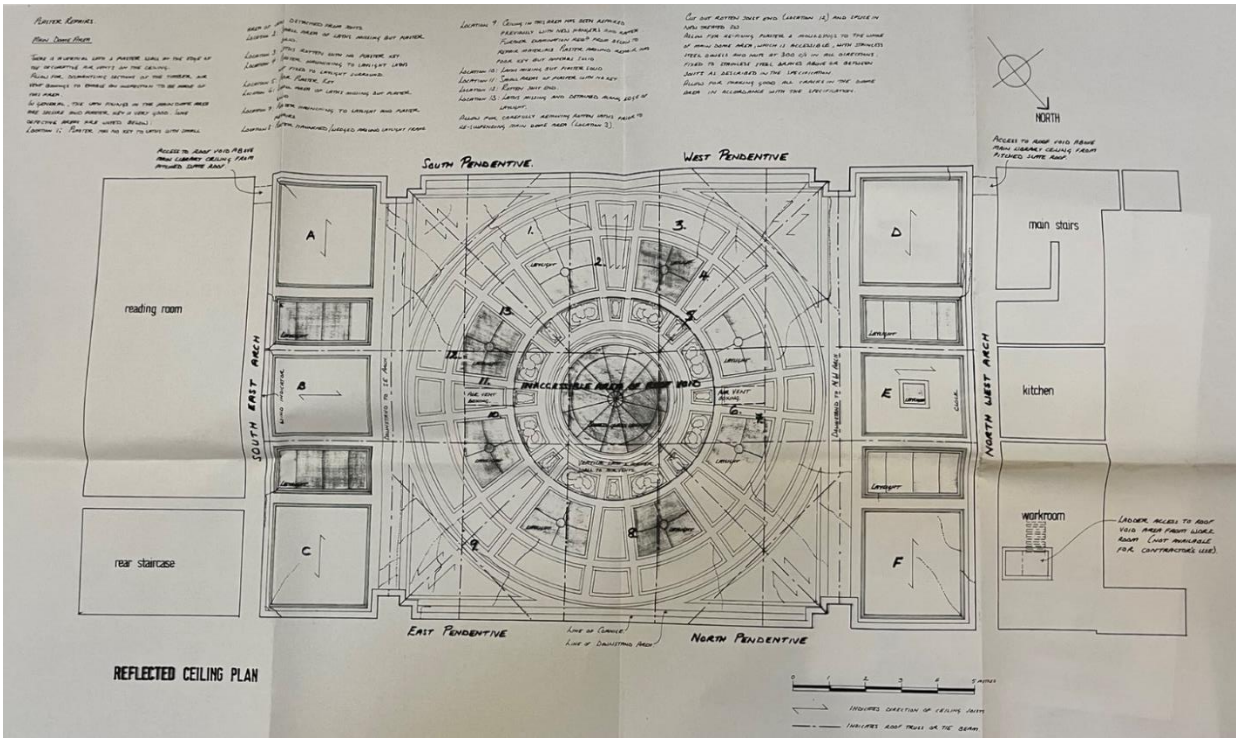
The Small Event Space at ground floor level shall be provided with MVHR controlled by air quality and humidity.

Ductwork shall generally be standard galvanized steel ductwork with self acting fire dampers at compartment penetrations in walls and floor slabs. Where ductwork crosses escape route corridors, smoke and fire dampers shall be provided in line with Building Regulations Approved Document B (Fire Safety).

Main Library Space

The main library room on the first floor is currently naturally ventilated via air vents in the ceiling, as shown in the original sketches below. However, the airflow through these is uncontrolled and the current rooflight structure built around the dome is poorly sealed, leading to unstable conditions and large thermal losses.





Replacing the opening windows with centre pivot windows will help allow more air to flow in summer.

6.7 Kitchen Ventilation

Design Criteria

- DW172
- Planning Requirements
- Building Regulations Part F - Ventilation
- Building Regulations Part L2b - Conservation of fuel and power in existing buildings other than dwellings
- Non-Domestic Building Services Compliance Guide
-

Requirements

The allowance for the basement kitchen is for a recirculation system. This is for several reasons:

- Energy efficiency – over 25% of the building energy consumption is due to warming the fresh incoming air for a full supply/extract system.
- Energy connection – the load on the heat pumps for warming this air is likely to push the overall electrical load to the point that a substation is required.
- Coordination with listed building – there is no feasible route for the exhaust ductwork to the roof that would comply with DW172 and not cause harm to the listed building fabric. The current route out of a rear window at ground level is not acceptable aesthetically.

A new air recirculation and filtration system shall be provided within the kitchen space.

6.8 LV Power

Design Criteria

- IET Wiring Regulations 18th Editions (and all updates)
- Building Regulations Approved Document B - Fire Safety
- Building Regulations Part L2b - Conservation of fuel and power in existing buildings other than dwellings
- Non-Domestic Building Services Compliance Guide



By improving the sealing, we are proposing to form a plenum with actuated dampers between the laylights and rooflights to control the amount of ventilation, as shown on the sketch below. This will limit variations in temperature and humidity creating much more stable conditions for the collection and people that the library contains.

Requirements

Strip out all existing wiring and containment throughout the building and dispose of, this includes all incoming LV power infrastructure such as fuse heads and meters.

A whole new LV wiring system shall be provided throughout the building from a single incoming source in a new location to the rear of the building.

Provide a new LV main switchboard in the basement plant room at the rear of the building. From there, new submains shall be provided to all zone distribution boards and large mechanical plant power supply requirements (ASHPs, large ventilation units, BMS control panels etc). Submains shall be XLPE muticore cables with steel armour.

Small power is to be distributed in singles throughout the building. Where possible it shall be in robust galvanised steel containment. Where this is not possible due to heritage impact or space provision in existing floors where notching is required, provide final circuits in armoured multicore cable.

The systems shall be designed to have full selectivity.

Outlets shall be selected to suit the aesthetic of the space.

Plant areas and areas with robust requirements shall be surface mounted Metalclad type outlets:



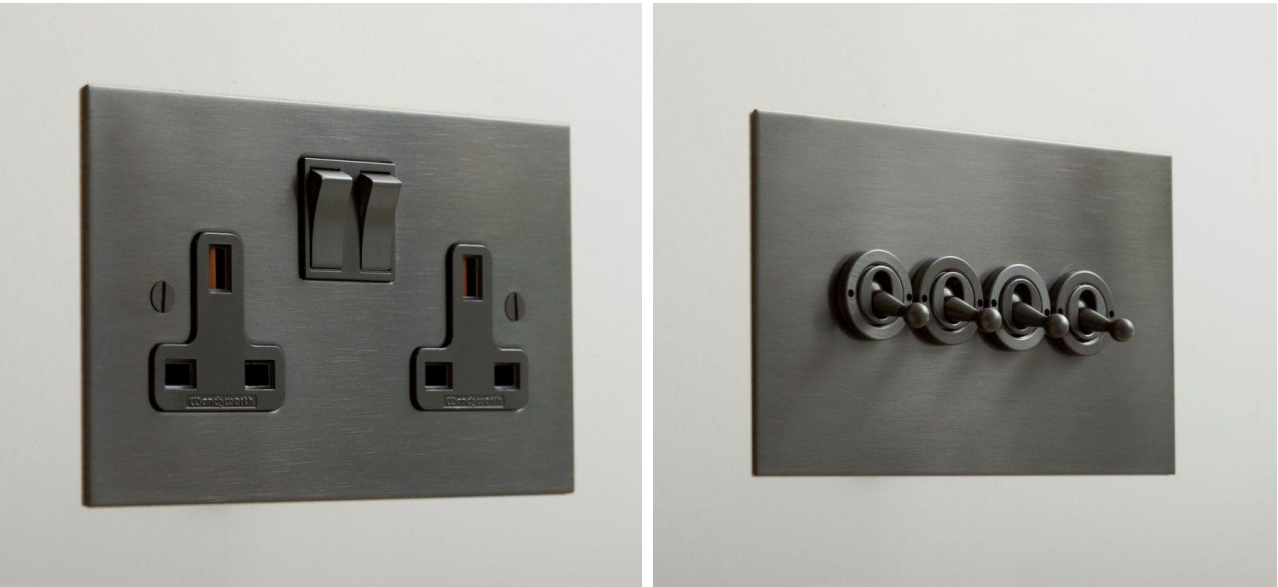
Back of house office spaces shall be standard MK Edge white plastic:



Front of house spaces shall be a metal finish to suit the space, for example the ground floor may be brushed stainless steel, with or without USB ports for patrons to charge devices:



The heritage spaces on the upper floor require a more considered approach such as a Forbes & Lomax antique bronze:



Floor boxes are identified to the large spaces, however confirmation on existing floor construction is required to confirm if this is feasible. Provide CableDuct floorboxes where identified on the drawings, these shall be bespoke and designed to accommodate floor finishes for the different rooms. Each floor box shall contain power and data. In some locations they shall also accommodate AV terminals.

6.9 Lightning Protection and Earthing and Bonding

Design Criteria

- IET Wiring Regulations 18th Editions (and all updates)
- Building Regulations Approved Document B - Fire Safety

Requirements

It is assumed that a whole new lightning protection system is required. This will require a new air termination tape network on the roof, and new circular section copper down connectors to new earth terminals.

6.10 Data/Structured Cabling System

Design Criteria

- IET Wiring Regulations 18th Editions (and all updates)

Requirements

Provide a full new Cat 6A data network to the building to allow staff use and public access via a wireless network. The contractor shall provide all passive equipment including rack, patch panels, power injectors, data wiring and terminated outlets, the client shall provide active equipment such as switches, WAPs, servers etc.

Systems such as access control, BMS and CCTV will not use the data network. Instead the specialists shall provide their own full working network independent of the general data network, but there shall be provision to interface with the network.

6.11 General Lighting

Design Criteria

- IET Wiring Regulations 18th Editions (and all updates)
- Building Regulations Approved Document B - Fire Safety
- Building Regulations Approved Document M – Access to and use of buildings
- Building Regulations Part L2b - Conservation of fuel and power in existing buildings other than dwellings
- Non-Domestic Building Services Compliance Guide
- BS EN 60598-1 - Luminaires. General requirements and tests
- BS 8300 - Inclusive Design
- BS EN 12464 – Lighting of Workplaces
- BS 5266 – Emergency Lighting
- BS 1838 Emergency Lighting
- PAS 6463 – Design for the mind
- CIBSE Guide F: Energy Efficiency in Buildings
- CIBSE Guide K: Electricity in Buildings
- CIBSE Commissioning Code L: Lighting
- SLL Lighting Guides
- SLL Code for Lighting 2022
- TM39 Building Energy Metering 2009

Space	Light level (Lx)	Specific Requirements
Basement		
Office/Occupied Spaces	300-500lux.	Presence detection In office spaces - 0.6 Uo, UGR <16 4000K, CRI 90+
WCs	200lux at WHB level	Presence detection
Corridors/Circulation	100lux	Presence detection
Stairs	100-150Lux on floor	2700-3000K Centrally switchable
Kitchen	500lux on work surface	Switchable 0.6 Uo 4000K CRI 90+
Archive	500lux	Zero UV, 90+CRI, 4000K manually dimmable
Archive Study Room	500lux	Zero UV, 90+CRI, 4000K CRI 90+, UGR <19 (manually dimmable)
Plant room	200lux on floor	Switchable. Impact resistant and IP rated. Absence detection (set with an 8 hour off delay)

Space	Light level (Lx)	Specific Requirements
Ground Floor		
Main Entrance Vestibule	100-150lux	2700-3000K Centrally switchable
Main Event Space	200lux	2700-3000K Centrally controllable and zonable
Small Event Space	200lux	2700-3000K Centrally controllable and zonable
Stairs	100-150Lux on floor	2700-3000K Centrally switchable
First Floor		
Lobby	100-150lux	2700-3000K Centrally switchable
Main Library Space	150lux	Zero UV, 90+CRI, 2700-3000K Centrally controllable
Bookshelves	200lux on vertical surface	Zero UV, 90+CRI, 2700-3000K Centrally controllable
Reading Areas	500lux	Zero UV, 90+CRI, 2700-3000K manual dimming of task lighting, 0.6 Uo on desks
Members Reading Room	300lux	Zero UV, 90+CRI, 2700-3000K Centrally controllable, manual dimming of task lighting

Requirements

Remove all existing lighting including wiring, switches and luminaires.

Provide a whole new lighting installation throughout the building using LED lighting. Front of house spaces shall be provided with a digital addressable system so that zoning and dimming control can be provided to suit event requirements and space use. A ‘kill switch’ in an agreed location shall provide a means of switching of all lights by the last person out.

Emergency lighting will generally be self-contained non-maintained fittings and escape lighting throughout the building where possible. The heritage spaces that are provided with heritage style fittings will require a bespoke battery solution.

External lighting will also be provided to the façade to add architectural interest to the façade and portico, and for safe egress from the building in the event of a power cut or other emergency.

6.12 Specialist Lighting (ground floor)

Lighting will be provided by a range of light fittings aimed to focus light where required. Decorative pendants will be suspended from the coffered ceilings to provide ambient light levels. Linear LED fittings will be integrated into display and shelving units to illuminate books and retail items. Linear LED lighting should be integrated into architectural details within the furniture including the café counter.



Lucis Polaris pendant



Integrated shelf lighting



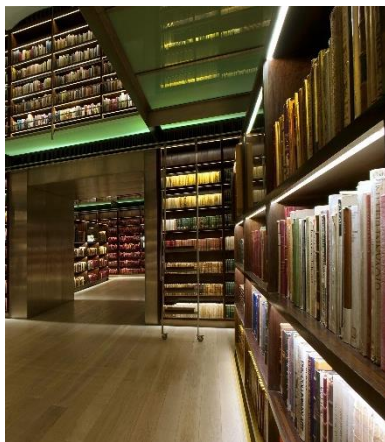
Formula Luce Aiko

6.13 Specialist Lighting (first floor)

Lighting will be provided by a range of light fittings aimed to focus light where needed with higher light levels being provided at desks which will be provided by individually controllable task lighting and at bookshelves by shelf lighting. There is the possibility of suspending a decorative fitting in the location of the original gas lantern.

The surrounding areas will be lit to a lower level for orientation and circulation.

Uplighting will be provided around the edge of the space to illuminate the inside faces of the ceiling and dome to provide reflected light into the space and highlight the architectural details. Lighting will also be provided internally above the dome to backlight the glazed dome roof lights to provide ambient lighting into the main library space. This lighting could be tunable white to mimic the changing colour temperature of natural daylight.



Integrated lighting to bookshelves



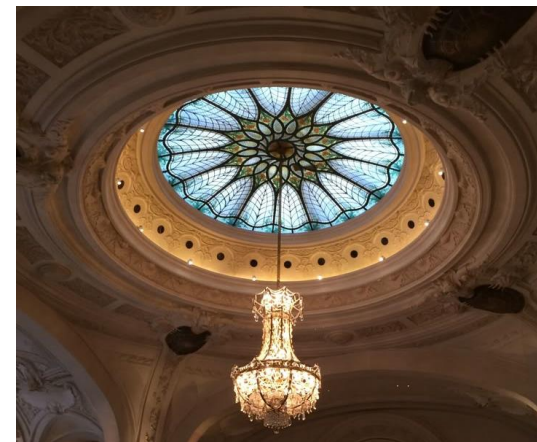
Aktiva B-Line



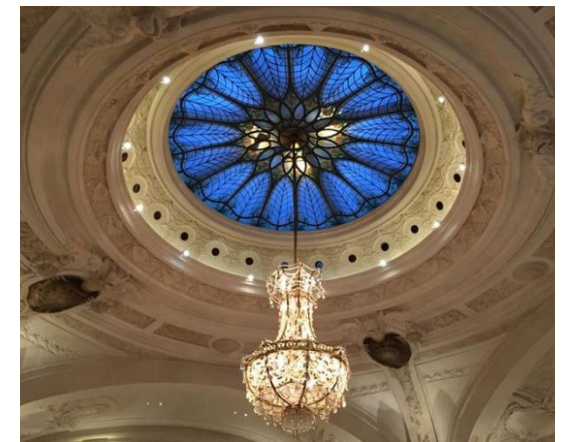
Task lighting to be individually controlled



Aktiva A-Line



Dome uplit with the possibility of suspending a decorative pendant from the original location of the gas burner. Glass dome back-lit



6.14 Security Systems

Design Criteria

- IET Wiring Regulations 18th Editions (and all updates)
- Communications Act 2003
- BS8300 - Design of an accessible and inclusive built environment. Buildings. Code of practice
- BS 50131 – Alarm systems, intrusion and hold up systems
- BS50133 – Alarm systems access control
- National Security Inspectorate
- Home Office guidance on ‘Places of Public Gathering’

Requirements

Remove all existing systems and dispose of. Provide the following open protocol specialist designed systems:

CCTV

Provide a full new IP based CCTV system with fixed cameras throughout, covering sensitive areas such as main entrance, rear entrance, points of sale and staff locations and unmonitored publicly accessible circulation spaces. A digital recording system is to be provided in the basement office.

Security Detection and Alarm

Provide a full new security and detection alarm system that allows each floor to be isolated independently as well as acting as one.

Electronic Access Control

Electronic access control shall be coordinated with the general security and management strategy for the building to ensure that the front of house/back of house barrier is robust, and that specific rooms can also be managed securely. Access controlled doors shall also be able to be easily isolated when free access is required. Access will be by card or fob, and readers shall be silent with LED to confirm that the lock is disengaged.

The architect shall provide details of maglocks and latch plates and other ironmongry. Where possible the route from secure to unsecure will be by normal door handle not requiring pushbuttons and breakglasses. This means that access control will generally by electronic latch plates rather than frame mounted maglocks.

6.15 Facilities for Accessibility

Design Criteria

- IET Wiring Regulations 18th Editions (and all updates)
- BS8300 - Design of an accessible and inclusive built environment. Buildings. Code of practice
- BS5839 – Fire detection and alarm systems in buildings
- Building Regulations Approved Document B - Fire Safety
- Building Regulations Approved Document M - Access to and Use of Buildings

Requirements

Provide the following open protocol specialist designed systems:

Disabled Refuge Call Point system

Provide disabled refuge call points at all locations identified on the architects’ drawings, this includes the rear stairs and the lift lobby at basement and first floor level. The call points shall dial back to a central position receiver at the main fire fighting position, understood to be the rear entrance on Back George Street.

Accessible WC Alarm

Provide a centralised pull cord alarm system for each accessible WC and the Changing Places space. Over each door provide an alarm light and sounder. All spaces are to feed back to a central alarm position at the office.

Assistive Listening System

Provide induction loops for the hard of hearing at the specific areas where this is required including:

- Bar
- Welcome desk
- First floor desk
- Event space

6.16 Fire Detection and Alarm

Design Criteria

- IET Wiring Regulations 18th Editions (and all updates)
- BS8300 - Design of an accessible and inclusive built environment. Buildings. Code of practice
- BS5839 – Fire detection and alarm systems in buildings
- BS9999 - Code of practice for fire safety in the design, management and use of buildings
- Building Regulations Approved Document B - Fire Safety
- Building Regulations Approved Document M - Access to and Use of Buildings

Requirements

Provide a specialist designed open protocol fire detection and alarm system to L1 standard. The system must be designed to be integrated into a historic building with colour coded heads throughout the front of house spaces.

The main library and members reading room shall be provided with a discrete aspirating system.

The main fire panel shall be situated at the main fire fighting position, understood to be the rear entrance on Back George Street.

6.17 Central Control, Building Management and Energy Metering

Design Criteria

- IET Wiring Regulations 18th Editions (and all updates)
- Building Regulations Part L2b - Conservation of fuel and power in existing buildings other than dwellings
- Non-Domestic Building Services Compliance Guide
- BS 13321 - Open data communication in building automation, controls and building management

Requirements

Provide a specialist designed open protocol control system that shall control and monitor the operation of the heating and cooling system, and ventilation systems automatically in an efficient manner that is easy to modify. The BMS shall generally control temperatures in each zone independently, and relative humidity in the library and members reading room.

Provide local digital thermostat interface devices in the following spaces:

- Archive Reading Room
- Basement Office
- Event Space
- Small Event Space
- Main Library

- Members Reading Room

These should be able to do the following:

- Allow adjustment of temperature
- Report:
 - Temperature
 - Relative Humidity
 - Air Quality

The BMS shall have a simple graphics package that allows easy adjustment of set point and reporting of faults.

The Control system shall also provide an energy consumption monitoring system, this will record the following:

Meter	Logging	Period
Building wide electrical consumption	kWh / carbon / £	Hourly consumption logged for a year Daily consumption logged for a year Annual consumption
Each individual distribution board	Power and Lighting kWh / carbon / £	ourly consumption logged for a year Daily consumption logged for a year Annual consumption Kitchen and bars to be MID standard
ASHP01 electrical supply	kWh / carbon / £	Hourly consumption logged for a year Daily consumption logged for a year Annual consumption
ASHP02 electrical supply	kWh / carbon / £	Hourly consumption logged for a year Daily consumption logged for a year Annual consumption
ASHP01 heat metering	kWh / carbon / £	Hourly consumption logged for a year Daily consumption logged for a year Annual consumption
ASHP02 heat metering	kWh / carbon / £	Hourly consumption logged for a year Daily consumption logged for a year Annual consumption
ASHP01	COP	Continuous comparison and logging of ASHP COP on an hourly basis logged for a year
ASHP02	COP	Continuous comparison and logging of ASHP COP on an hourly basis logged for a year
ASHP01	Flow and return temperatures	Continuous hourly logging for a year
ASHP02	Flow and return temperatures	Continuous hourly logging for a year
Building wide water consumption	m ³	Hourly consumption logged for a year Daily consumption logged for a year Annual consumption
Hot, Cold and mains water consumption to basement kitchen water supply	m ³	Hourly consumption logged for a year Daily consumption logged for a year Annual consumption MID standard metering
Water consumption to ground floor bar water supply	m ³	Hourly consumption logged for a year Daily consumption logged for a year Annual consumption MID standard metering

Meter	Logging	Period
Weather data	External temperature, RH	Hourly recording, logged for a year
All thermostats	Internal temperature	Hourly interval recorded and logged and recorded for a year
All humidistats	Internal %RH	Hourly interval recorded and logged and recorded for a year

6.18 Lifts

Design Criteria

- BS EN 81 - Safety rules for the construction and installation of lifts. Special lifts for the transport of persons and goods
- IET Wiring Regulations 18th Editions (and all updates)
- BS8300 - Design of an accessible and inclusive built environment. Buildings. Code of practice
- BS5839 – Fire detection and alarm systems in buildings
- BS9999 - Code of practice for fire safety in the design, management and use of buildings
- Building Regulations Approved Document B - Fire Safety
- Building Regulations Approved Document M - Access to and Use of Buildings

Requirements

Main passenger evacuation lift

Provide a new passenger lift to the front of the building. This lift shall also be used as an evacuation lift and be provided with batteries as a secondary power supply for resilience in the event of mains power failure.

The lift shall be a standard machineroom-less traction lift with bespoke finishes to the architects specification with a car size not exceeding 2000x1400 with a lifting capacity of 1000kg.

The main lift shall be a smart lift that incorporates access control to allow limitation of public access to the basement.

Dumbwaiter

Provide a new dumb waiter connecting the basement kitchen to the ground floor prep area.

Rear beer keg lift

The existing beer keg lift at the rear building (if left by tenant) requires specialist inspection and certification.

6.19 Outstanding Information Required

The following information is required in order to complete the design during Stage 4 to remove risk from the Tender process and during the construction process

- Access to the ground floor and basement for more extensive surveying
- An understanding of what the tenant is taking and what is being left
- Below ground drainage pop up locations so that the above ground drainage can be finalised and below ground drainage works confirmed in detail
- Bar design requirements
- Kitchen design requirements
- AV and performance equipment requirements
- Confirmation of level of protection required during construction including thermal environment, fire detection and alarm etc, to protect building fabric and collection

7.0 APPENDIX 1

7.1 Stage 3 Drawings and Schedules