ARCADIS

RUTHERFORD BUILDING REFURBISHMENT

Design & Access Statement

Submitted by Arcadis

ARCADIS

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1
Introduction

Introduction

To secure a sustainable long term future for the Rutherford Building, the University of Manchester seeks to sensitively redevelop this important historical and cultural asset as contemporary workplaces, accommodating flexible office and research environments for the Geography Department. This planning application supports this objective and follows on from the earlier listed building submission (Autumn 2023) relating to the technical preparation of the building for redevelopment.

Careful consideration has been given to the approach and methodology for this proposed redevelopment, with an emphasis on the removal of post war additions where feasible to celebrate the stature and quality of the 1901 structure. Internal interventions are needed to support contemporary workplace requirements. Crafted to celebrate the volumetric and aesthetic qualities of the building, interventions are required to provide acoustic, privacy and spatial controls within large cellular spaces. Similarly discreet and measured upgrade are proposed for the windows and roof of the Rutherford Building, preserving the external appearance of the structure and energy performance of the external fabric.

This sensitive and considered development approach acknowledges ongoing dialogue with Manchester City Council and takes into consideration technical and design guidance captured within Historic England's technical publications. A coalescence of respect for the cultural and historical value of this notable building, application of technical and material advances for climate change adaptation, and demand for modern flexible workplace and research accommodation at the University of Manchester.

2
Design Approach and Considerations

Design Approach and Considerations

The University of Manchester values the historical provenance of the Rutherford Building located at the core of the Coupland Street campus. It also recognises the need to find a viable use for the three storey 1901 building.

Accommodating this diverse assortment of requirements has culminated in a measured architectural and technical response. An approach which will maintain and repair the historic building, repurpose internal spaces for modern office and research needs, improve the thermal performance of the envelope in ways that are sympathetic to the historic character and renew the engineering infrastructure using carefully selected equipment and technology, appropriate for use at the Rutherford. Improving accessibility is also at the core of the development strategy, with upgrades planned to the western stair and ramp structure, enhancements to the configuration of internal spaces where required and the introduction of wayfinding and signage to make as many parts of the building usable by all members of the University community.

The objective of conserving, repairing and reinstating the historic fabric of the building has been paramount. Redevelopment proposals explicitly strive to keep any alterations to the historic fabric to an absolute minimum. Where changes are required, careful exploration of design options has highlighted opportunities for consequential betterment in associated areas.

A nuanced and balanced approach has addressed the need to remove many of the post war alterations and additions at Rutherford to allow the 1901 architecture to take centre stage. Measures proposed include the removal of insulated plasterboard to reveal glazed internal brickwork, uncovering decorative plaster cornices concealed by electrical containment systems, and omission of modern timber skirtings. Internal plasterboard partitions, modern sanitary accommodation, suspended ceilings, and corridor/circulation fire screens will also be removed to make way for less obtrusive interventions. Original surfaces and finishes will be cleaned, repaired and refinished to sympathetically celebrate the architectural heritage of the Rutherford Building.

▲ Coupland Street External Facade

Redevelopment of the Rutherford will require spaces to be reconfigured to accommodate the functional requirements of the incoming building occupants. Design of new interventions concentrates on the use of freestanding furniture based solutions, reducing the need for hard connections and scarring of the building fabric. Where existing cellular spaces require more robust subdivision, glazed and/or freestanding partitions are proposed to preserve the spatial quality of the building and to facilitate removal at a future date.

1980s hardwood fire screens will be replaced to maintain compartmentation within the building. New slim profile screens have been selected to reduce the visual impact on significant circulation spaces. Wherever possible, new fire screens are located within decorative arched openings to circulation spaces to minimise the impression of the historic fabric, strengthening the visual coherence of the intervention.

historic fabric, affords opportunities for sensitively designed spaces within the footprint of this service block, and supports the refresh of areas at the western end of the building previously remodelled in the late 1980s.

Finally, there is an urgent need to improve the thermal performance of the external envelope and enhance the energy efficiency of the Rutherford Building. In its current guise, the building is completely uninsulated. Having consulted Historic England's guidance 'Retrofit and Energy Efficiency in Historic Buildings', proposals have identified two opportunities to improve the thermal performance, taking into account the construction of the building and its aesthetic character and quality.

By virtue of the visual and historical properties of the masonry façade and glazed brick interior, proposals for the Rutherford Building will leave this element of the external envelope uninsulated. The painted softwood windows have been modified and upgraded throughout the 120 year lifespan of the building. Many of the opening casements were replaced in the last twenty years and external timber doors to the west elevation have also been renewed. A modest number of windows are completely original. However, most windows do retain the original softwood 1901 perimeter frames. It is proposed to retain the 1901 perimeter softwood frames and replace the fixed and opening casements with replica units. The replacement casements will incorporate vacuum evacuated high performance conservation glass, concealed draught and air seals and modern long life low maintenance paint systems.

Refurbished windows will match the originals and will significantly enhance the thermal performance, air tightness and energy efficiency of the external façade at

Rutherford. Planned upgrades to the external doors and windows follow the guidance set out in HEAG 039, published by Historic England. Please refer to the section within this statement which provide more detailed technical details about the proposed upgrades to the external windows and doors.

The final tranche of thermal improvement relates to the performance of the roof coverings at Rutherford. Rosemary clay roof tiles provide the external waterproof covering on an uninsulated timber structure, underdrawn by historic lime plaster ceilings to some areas. Perennial problems with water ingress need to be resolved with more robust long term solutions. At the same time, the existing roof has limited air tightness and has a significant contribution to low levels of user comfort and poor thermal performance. A range of upgrade options have been explored, following the principles set out in Historic England's guidance documents including 'Roofing – Practical Building Conservation'. Greater detail is provided later in this document including the range of options considered. Proposals outlined within this application set out a methodology to insulate the roof structure at pitch level whilst retaining the aesthetic and profile of the overall roof of the Rutherford Building. High performance roof insulation will be added to the roof pitches together with thermal sheathing, and vapour control and breathable membranes before the original rosemary clay tiles are reused as the finished external surface. This proposal will raise the external roof level by approximately 50mm, preserving the original lime plaster ceilings, and improving insulation and air tightness significantly. Original roof appointments will be retained and refurbished where required to preserve the aesthetic of the Rutherford Building.

Proposals captured within this application outline a methodology to pare back earlier post war remodelling and alterations within the Rutherford Building, placing the historic fabric at the forefront of the redevelopment strategy. Sensitive, low impact interventions within some of the large cellular spaces will support the adoption of modern workplace practices. This redevelopment will provide a secure, flexible and adaptable home for researchers and academics from the geography department, a sustainable future for the Rutherford Building at the heart of Manchester University's campus, and a conversation based approach to maintain and repair the historical structure.

▲ Insulated Plasterboard Lining to be Removed if safe to do so to Reveal Historic Brickwork

▲ New Slim Profile Metal Screens to Celebrate Historic Fabric

▲ Academic's Office

3
Celebrating the Historical Fabric

Paring Back the Fabric To Reveal the 1901 Building and Celebrate the Historical, Cultural and Educational Context

The Rutherford Building was constructed between 1898 and 1900 as the Physical Laboratories. Designed by architect James William Beaumont, the building opened as a university laboratory and research facility in 1901, and is located in a cluster of significant university buildings at the centre of the historic campus.

Of equal importance is the building's historic, cultural and scientific significance. Conceived by the Langworthy Professor of Physics, Arthur Schuster in collaboration with Beaumont, the Rutherford Building sought to bring Germanic practices of collaborative teaching and learning to Manchester and create an environment to support research into the growing field of physics at the end of the 19th century. Following recent scientific discoveries such as radium, the building was used for internationally significant research including atomic science by noteworthy figures such as Hans Geiger and Ernest Rutherford.

The legibility of the original architectural design including the layout of the building interior and the survival of the decoration and material treatments from 1901, provide a tangible link to the scientific and research legacy. A wide range of additions and modifications to the historic fabric have weakened coherence of the original design and operational intent.

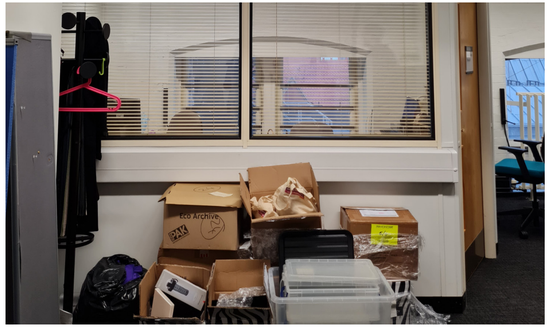
As part of the redevelopment, many of these more recent additions will be removed to restore visual legibility to internal spaces and facilitate a better appreciation of the building fabric and its research pedigree.

Items scheduled for removal during the redevelopment

▲ Glazed Tropical Hardwood Fire Screens to Circulation Areas

▲ Surface mounted dado trunking, containment and services within cellular spaces

▲ Late addition - balustrade to mezzanine floor



▲ Internal Plasterboard Position

Items scheduled for removal during the redevelopment include:

- Insulated plasterboard overcladding to decorative internal brickwork.
- Glazed tropical hardwood fire screens to circulation areas.
- Sanitary accommodation including associated partitions, ceilings and finishes.
- Surface mounted dado trunking, containment and services infrastructure from circulation and cellular spaces at all floor levels.
- Electrical, security and left safety systems infrastructure and fittings
- Modern timber skirtings
- Glazed screens to meeting rooms
- Internal plasterboard partitions
- Modern fire doors between the Rutherford and adjacent museum accommodation.

Removal of these additions will allow more sensitively designed and selected interventions and equipment to be introduced within Rutherfordm placing the historic fabric and character at the forefront, whilst providing contemporary functionality to meet the needs of today's academics and researchers.

▲ Cladding Added to Mezzanine Floor Fascia in 1990s to be removed

4
Designing for reuse

Designing for reuse – sensitive interventions

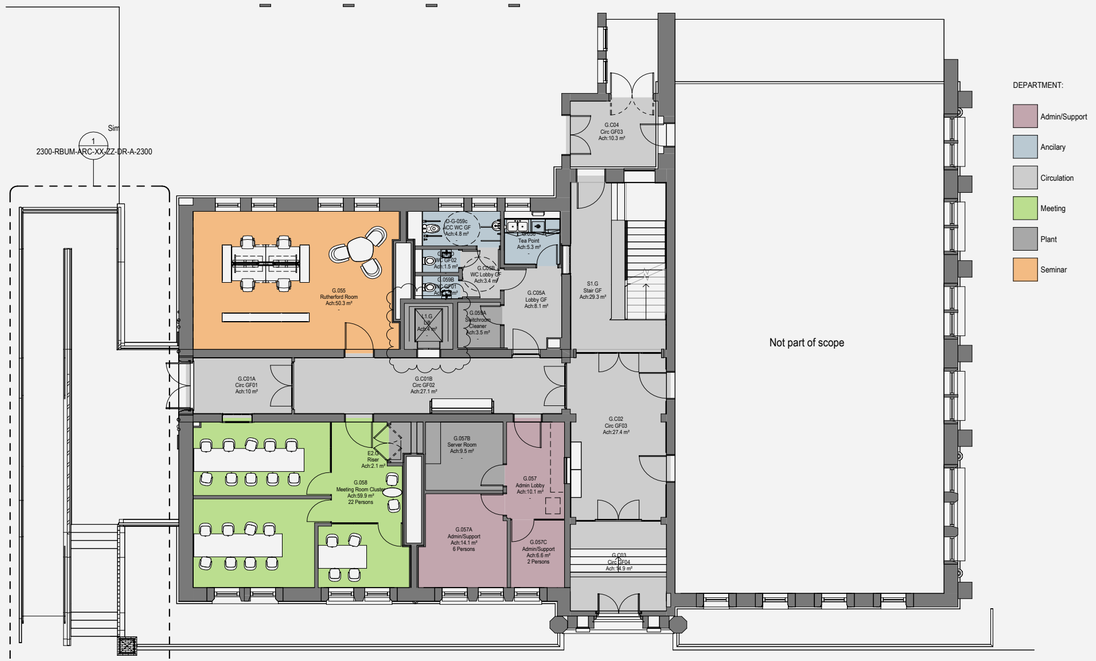
The existing cellular spaces within the Rutherford Building are generously proportioned, providing a malleable canvas for redevelopment. As would be anticipated, some adaptation of these area will be required to accommodate the functional and technical needs of academics, researchers and post graduate researchers.

A light touch approach is proposed for these spaces, making use of freestanding furniture based systems where practical with additional enhancement if required to satisfy specific workplace demands. Control and management of acoustic environments will be paramount to the successful development of the working spaces. Acknowledging the requirement for acoustic privacy, a holistic design strategy has been developed, once again placing emphasis on preserving the historic fabric, minimising visual impact and accommodation flexibility without the need for intrusive works.

Some of the cellular spaces will be repurposed as work and study areas for academic members of staff. The requirement for visual and acoustic privacy has resulted in the subdivision of academic workstations into clusters of three or four desks. Freestanding meeting pods, 2.7m high glazed/acoustic screens and furniture systems create the framework for subdivision. Suspended acoustic baffles moderate the vertical scale of the spaces to human proportion and preserve the three dimensional quality of the original volumes.

Areas designated for researchers incorporate furniture based arrangements, made up of generously dimensioned workstations to support agile working patterns, freestanding meeting pods and loose furniture components. This approach for researcher work areas avoids the need to make physical connections to the building fabric. Suspended acoustic baffles reduce the vertical scale of the spaces to a more comfortable height for office and research use, and also allow an appreciation of the three dimensional quality of the original building volumes.

At second floor level to the eastern aspect of the staircase, a dedicated study area is planned for postgraduate researchers to work from. Once again a furniture based solution is proposed, avoiding the need to make physical connections to the building fabric. Acoustic reservoirs are



▲ Proposed GA Plan - Level GF

incorporated within the suspended light fittings to provide acoustic controls. Generously proportioned workstations, freestanding meeting pods and additional loose furniture components complete the postgraduate researcher area.

Within this area at second floor level, proposals for the refurbishment of the 1990s mezzanine structure include:-

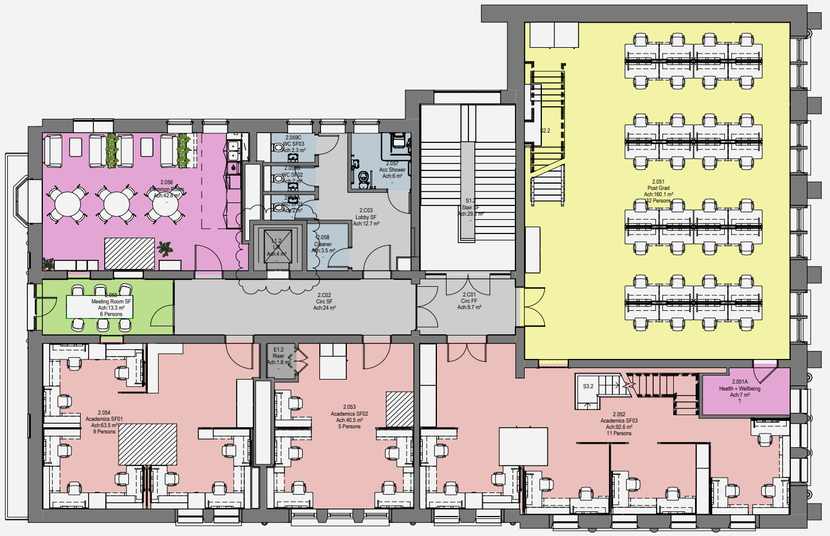
- Replacement of glass and ash balustrade within a bespoke painted steel and oak handrail inspired by the main staircase design
- Concealment of ash stair treads with a carpet wrap.
- Rationalisation of mezzanine ceiling surfaces to present a cleaner aesthetic and enhanced acoustic controls.

At first and second floor levels, it is proposed to introduce glazed meeting spaces the western end of the central corridor zones. Slim profile glass acoustic screens will separate the meeting areas from the existing circulation zones. The glass screens will preserve the spatial quality of the overall volume and facilitate an appreciation of the 1901 building. Existing door openings from cellular spaces into the new meeting rooms will be maintained and refinished. Doors will be locked to prevent usage with discreet acoustic screens added to the room side of each aperture. This will allow the door openings to be acoustically sealed without preventing loss of the historic fabric in these areas. suspended acoustic baffles will also be provided above the freestanding furniture to provide local controls.

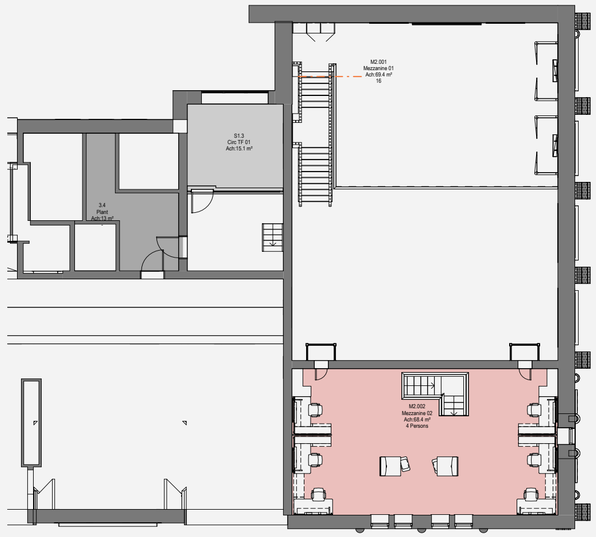
The geography department also require a group of larger meeting rooms. Proposals illustrate the creation of a meeting room suite at the south west corner of the ground floor plan. The suggested arrangement provides three meeting room and an associated break out space. By virtue of the acoustic and audio visual requirements, the meeting room are hard installations, with glazed acoustic partitions fixed to the building fabric. Great care has been given to the selection of meeting room partitions to minimise the visual impact of the intervention, facilitate a direct appreciation of the scale of the original building volume and limit the requirements for mechanical fixings to the decorative internal brickwork. Suspended acoustic baffles and lighting reduce the scale of the meeting room spaces to a more comfortable height, and allow and appreciation of the proportions of the historic volume. Freestanding furniture components complete the design of the meeting rooms with audio visual equipment mounted on new lightweight partitions.

To the east of the new meeting room cluster, the adjacent cellular space will also be subdivided to create two bookable meeting rooms/office spaces and a large breakout area. Within this area, it is proposed to reduce the size of the 1990s vertical service riser as well as insulated plasterboard overcladding of the decorative brickwork. These omissions will reinstate the original quality of the volume and allow the installation of full height glazed acoustic partitions to the meeting spaces. Suspended acoustic baffles and lighting will be required within the meeting spaces. The full height glazed frontages to the meeting spaces will allow an appreciation of the scale of the original volume as well as the design and detailing of the internal window configuration.

▲ Proposed GA Plan - Level 01



▲ Proposed GA Plan - Level 02



▲ Proposed GA Plan - Level 03

▲ Existing Stair

▲ Common Room - Social Space

No changes are planned for the Rutherford Room at ground floor. The room will be carefully redecorated and include freestanding furniture components for quiet study and research. There are no proposals to fix equipment or fixtures to the fabric of this space.

As highlighted earlier in this statement, proposals include the construction of a new welfare and toilet core to the north east of the lift at ground, first and second floor levels. Design of these areas aims to minimise loss of historic fabric, preserve detailing and facilitate future deconstruction. Toilet cubicles are designed as freestanding modules within the larger historic volumes, allowing an appreciation of the scale of the 1901 space and controlling views of the new accommodation when observed from outside. Existing openings which are not required for access will be preserved with discreet acoustic screens added internally. Door opening detailing and joinery appointments will all be retained and refinished as part of the building wide maintenance and restoration undertaking.

A new staff common room and social space are planned for the former transit and workroom at second floor level to the north west corner of the building. Given the peak occupancy at second and mezzanine floor levels, it is essential that the new common room is located alongside the largest contingent of building users. A range of spaces were considered including first floor accommodation before selecting the former transit room and preparation space. The former ‘optics laboratory to the south of the corridor was discounted due to its architectural and scientific heritage. The rooflights and refraction openings within the west elevation specifically configured to support optical experimentation and research were considered of such importance that this space would be better used for academics, where the historic artifacts can be placed centre stage. The former transit room and preparation space have been selected for the new common room as the overall volume provides a suitable area for the anticipated use and the intended function will allow elements such as the bay window to be integrated within the interior design solution. The creation of the new social space will require removal of the 2010 partition wall which currently separates the two spaces. This partition replaced an earlier 1901 lightweight wall, constructed during the refurbishment of the two rooms in 2010. Removal of this wall is required to create a room of adequate size to host large departmental meetings, workshops and social functions. A downstand plasterboard clad fin suspended below the historic ceilings will highlight the location of the partition wall and is integrated within the acoustic raft arrangement. A new counter and tea point are proposed at the eastern end of the room. This fitted furniture will be fixed to plaster wall surfaces only, with no connections to decorative internal brickwork. All other fittings will be freestanding furniture components. Suspended acoustic baffles and linear lighting are planned, to reduce the scale of the social space and provide an appropriate environment for small and large social and departmental gatherings. The permeability of the baffles will allow an appreciation of the shape of the original space. Throughout the redeveloped building, steps have been taken to reduce loss of historic fabric, preserve original decorative and architectural detailing, and minimise permanent connections to the structure. This approach supports the restoration of the 1901 structure and allows future reconfiguration with minimum disruption to the building. Sensitive and carefully crafted interventions to support meaningful reuse.

5
Minimising Loss of Historic Fabric

Minimising Loss of Historic Fabric and Appointments

As design proposals have been developed for the Rutherford Building, particular attention has been given to minimise loss of historic fabric, decorative detailing and surface treatments. Notable considerations and actions are as follows:

Glazed brickwork to building interior

As a key attribute of Arthur Schuster's ambition of creating a cutting edge research building, the exposed decorative and glazed brickwork forms an important part of the original design concept. Every step has been taken to celebrate the materiality of the brickwork including the removal of insulated plasterboard overcladding where technically feasible, timber skirtings applied at late dates and surface mounted dado trunking and electrical containment. Discreet local repairs will be carried out using approved traditional craft processes (to be agreed with MCC following preparation of a representative sample). Execution of repairs will be subject to assessment of all relevant health and safety considerations. Cleaning of brickwork surfaces will be kept to a minimum and will require appropriate risk analysis as a result of presence of lead within the brickwork glaze.

Decorative tiling

Decorative tiling will be preserved in all areas of the building. When tiles require making good following changes to internal openings, replica tiles will be commissioned from a reputable ceramics manufacturer. Samples will be provided for approval prior to carrying out any making good to the building.

Architectural joinery

Original 1901 architectural joinery including doors, linings, architraves and wall panelling will be cleaned using appropriate methods as a precursor to repair and refinishing. A sample will be prepared to demonstrate refinishing techniques prior to carrying out works.

Wherever practical original doors will be upgraded to meet contemporary requirements for fire compartmentation. Specific samples will be provided to demonstrate techniques and materials prior to carrying out repairs.

Original ironmongery will be retained. A controlled cleaning process will be proposed to preserve the patina.

Existing door openings which are not required as part of the redevelopment will be retained. Doors will be locked shut with architectural ironmongery retained. An independent acoustic and fire partition will be introduced to the non public side of the door. This partition will be installed in an appropriate manner to allow removal at a future date without damaging the historic fabric. A sample will be constructed to demonstrate the intended techniques prior to executing finished works.

Decorative moulded and reeded vertical timber panelling within the second floor former lecture room will be stripped down to remove contemporary paint finishes. Proposals include refinishing the historic panelling with appropriate fire retardant wood finishes to match internal doors and joinery. Prior to commencing work, a sample will be prepared to demonstrate paint removal and the final finished result. Similar processes will be used to treat the timber panelling to the bay window within the second floor transit room to the north west corner of the building.

Timber appointments within the Rutherford room will be cleaned using sensitive conservation techniques with local repairs if required.

Terrazzo floors

Generally the terrazzo floors within the Rutherford Building are in excellent condition. However, a significant repair is required adjacent to the former main entrance within the reception space. Advice will be sought from an accredited repair contractor and a small sample repair will be carried out prior to the executing the finished works. Specific care will be taken to select the appropriate size and colour of aggregate to complete a suitable repair.

Architectural metalwork – internal

Architectural metalwork to the main staircase and second floor lecture room roof tiles are in good condition. These elements will be redecorated.

Lime plaster ceilings and cornices

The ambitions for the redevelopment project are to retain, repair and preserve all lime plaster ceilings and cornices. All efforts will be made to achieve this objective.

Where there is a need to repair, patch of stabilise lime plaster ceilings and/or decorative plaster cornices, traditional wet craft techniques will be used exclusively/ sample repairs will be carried out for approval before executing any restoration of ceilings and cornices. Lime plaster will be used for any repairs.

▲ Existing Cornices to be Retained wherever Possible and Reinstated like-for-like, where Removal due to Remediation is Required

6
Thermal Performance Upgrades

Thermal performance upgrades to the external fabric

Manchester University is committed to creating a true low carbon campus. This ambition aligns with Historic England's guidance 'Climate Change and Historic Building Adaptation'.

'The world faces huge challenges as a result of the climate emergency and the need to mitigate and adapt to unprecedented levels of environmental change. As an intrinsic part of the wider environment the historic environment is also under threat, but is can also be part of the solution. In the same way that nature-based solutions can address climate change, heritage-based solutions can also play a positive role.'

At the Rutherford Building a range of mitigation measures have been thoughtfully and carefully analysed to preserve the architectural and historical character of the structure, and to significantly improve the thermal and technical performance of the external envelope.

Making use of contemporary high performance materials and construction techniques, the proposed enhancements will reduce heat loss, improve air tightness and vapour control and enhance energy efficiency. The proposed upgrade options reflect Historic England's latest technical guidance. Careful consideration about the potential visual and aesthetic impact of the enhancements has shaped the design response. Upgrades to the timber windows and roof structure will maintain the look and feel of the Rutherford Building as an icon of progressive scientific and educational learning and experimentation whilst lifting the building's thermal and energy performance to contemporary standards for this type of heritage solution.

Appraisal of options to upgrade thermal performance of the roof structure

There is genuine need to enhance the thermal performance of the fabric at the Rutherford Building. This ambition must strike a balance between energy conservation, occupant comfort, maintenance liabilities and listed building considerations. Analysis of suitable techniques to improve the thermal performance of the roof structure has weighted the review process towards reductions in energy consumption and optimisation of user comfort.

Seven options have been examined considering thermal benefits, buildability and construction implications, cost benefits and conservation matters/ from 'a do nothing' option through to substantial reconfiguration of the roof structure to facilitate very high insulation values, some of the variations may require extensive and complex changes to the external roof profile, finishes and detailing. These changes are on important consideration in the decision making process, recognising the guidance outlined by Historic England and the informed viewpoint of Manchester City Council about alternations to the fabric of listed buildings. In accordance with Historic England's published guidance, it is believed that MCC would support proportionate upgrades to the roof of the Rutherford Building to improve thermal performance, reduce energy consumption and secure the long term viability of this important historical and cultural structure. Legislation for listed buildings recognises the sensitivity of upgrading historic structures, meaning there is no requirement to meet the regulatory standards for new build developments. However, there is an expectation that appropriate measures will be taken to balance conservation and sustainability with the goal of improving energy performance.

A brief overview of the seven options follows. Please make reference to the table below for more comprehensive details.

The first option suggests no changes to the roof build up. Without the addition of insulation, the existing construction has a U value of 2.5 w/m2k and no effective air tightness barrier.

At Stage 02, proposals made allowance for the insertion of blown mineral fibre insulation into the roof cavities from inside the building. This option would provide a typical U value of 0.3 w/m2k with a marginal improvement to air tightness. This is a low risk proposal from a conservation and listed building perspective.

Option 3 assumes existing external roof finishes are removed to allow vapour barrier, insulation, breather membrane and insulated sheathing board to be installed, prior to reinstatement of the original clay roof tiles. A typical U value of 0.34 w/m2k can be achieved with the addition of an airtight roof

▲ View of Roof

membrane and a marginal increase in roof height of 17mm. This is a low risk option from a conservation and listed building perspective.

Option 4 makes provision for additional insulation by extending the depth of the existing rafters by 50mm and including a more substantial insulated sheathing board. A typical U value of 0.21 w/m2k can be achieved with the addition of an airtight roof membrane and a significant windcatchers. It is considered a higher risk option from a conservation and listed building perspective and would also add cost with the requirement to revise windcatcher, dormer and roof edge detailing.

Option 5 is a variation of option 4, substituting a 22mm insulted sheathing board in place of the 60mm Steico Universal Dry product. This provides a typical U value of 0.26 w/m2k with the addition of an airtight membrane. Overall roof profile would be raised by 54mm which is a more manageable output. Whilst this option would require abutments, interfaces and roof edges to be redesigned. It is considered this option is a low risk proposal from a conservation and listed building perspective.

Option 6 provides a U value of 0.15 w/m2k, satisfying current requirements for newly constructed buildings. Existing rafters would need to be extended by 125mm to accommodate 200mm of roof insulation. With an increase in overall roof depth of 129mm, this option is considered high risk from a listed building perspective and would require comprehensive changes to roof appointments and details, gutter design and verge interfaces.

Option 7 adopts a different approach, providing additional insulation within the existing building envelope by replacing lime plaster ceilings with modern surfaces and reducing room height by approximately 75mm. with a typical U Value of 0.20 w/m2k, this option would provide high levels of thermal performance, excellent vapour control with limited air tightness. MCC consider the original lime plaster ceilings with expanded metal substrates to be of historical importance, meaning this proposal carries some risk from a listed building perspective. Whilst the change of height would be inconsequential in most areas, some spaces such as the mezzanines would be effected significantly.

Option	U- Value (W/m²k)	Roof Construction	Overall Roof construction Thickness (not including expanded metal lath + lime plaster ceiling)	Works to be carried out (Externally / Internally)
Option 1 Existing roof Build up	2.5	• Rosemary roof tiles • Counter-battens (50mm not confirmed) • 18mm Timber Sarking Board • 100mm existing rafters • Expanded metal lath and lime plaster	193mm	
Option 2 Stage 2 Design Option	0.30	• Rosemary roof tiles • Counter-battens (50mm not confirmed) • 18mm Timber Sarking Board • 100mm existing rafters • Blow-in-Insulation Woodfibre into cavity - Gutex Thermofibre • Expanded metal lath and lime plaster ceiling	193mm	Internally
Option 3	0.34	• Rosemary roof tiles • Tile-battens (25mm) • Counter-battens (25mm) • Breather membrane – Tyvek Airguard • 35mm Steico Universal T&G sheathing boards • 75mm RW4A Rockwool Insulation (Between rafters) • 100mm existing rafters • VCL - Visqueen vapour barrier (wrapped over rafters) • Expanded metal lath and lime plaster ceiling	210mm	Externally
Option 4	0.30	• Rosemary roof tiles • Tile battens (25mm) • Counter-battens (25mm) • Breather membrane – Tyvek Airguard • 60mm Steico Universal Dry T&G sheathing boards • 50mm new timber battens over rafters • 125mm RW4A Rockwool Insulation (between rafters) • 100mm existing rafters • VCL - Visqueen vapour barrier (wrapped over rafters) • Expanded metal lath and lime plaster ceiling	285mm	Externally

Option	U- Value (W/m²k)	Roof Construction	Overall Roof construction Thickness (not including expanded metal lath + lime plaster ceiling)	Works to be carried out (Externally / Internally)
Option 5	0.26	• Rosemary roof tiles • Tile battens (25mm) • Counter-battens s(25mm) • Breather membrane – Tyvek Airguard • 22mm Steico Universal T&G sheathing boards • 50mm new timber battens over rafters • 125mm RW4A Rockwool Insulation (between rafters) • 100mm existing rafters • VCL - Visqueen vapour barrier (wrapped over rafters) • Expanded metal lath and lime plaster ceiling	247mm	Externally
Option 6	0.15	• Rosemary roof tiles • Tile battens (25mm) • Counter-battens s(25mm) • Breather membrane – Tyvek Airguard • 22mm Steico Universal T&G sheathing boards • 125mm new timber battens over rafters (structural issues) • 200mm RW4A Rockwool Insulation (between rafters) • 100mm existing rafters • VCL - Visqueen vapour barrier (wrapped over rafters) • Expanded metal lath and lime plaster ceiling	322mm	Externally
Option 7	0.20	• Rosemary roof tiles • Counter-battens (50mm not confirmed) • 18mm Timber Sarking Board • 100mm existing rafters • 100mm RW4A Rockwool insulation between rafters • 75mm insulation between battens fixed under existing rafters • Reflective vapour barrier • New Plasterboard / expanded metal lath + lime plaster (25mm approx.)	Roof remains as existing to base of rafter Ceiling would be 75mm lower	Internally

▲ View of Roof from Drone

Taking account of the requirement to provide good levels of insulation, excellent vapour control and robust airtightness, Arcadis recommend Option 5 as a sensible and progressive approach. With a modelled U value of 0.26 w/m2k, this proposal would require modest changes to the external profile and detailing of the roof and is likely to be considered as a reasonable and proportionate upgrade to the Rutherford Building. Changes to the roof detailing would not detract from the profile of the building within its context and would allow verge, eaves and roof penetration details to be preserved, an important consideration.

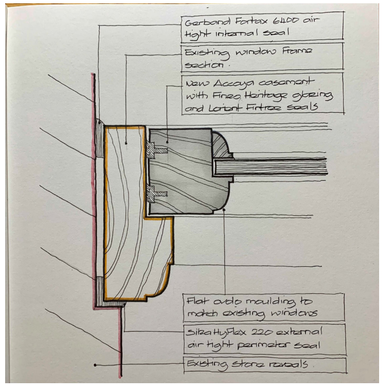
Appraisal of options to upgrade thermal performance of the windows

The existing timber windows at the Rutherford Building are single glazed and comprise original first growth pine frames with modern softwood casements. Whilst the windows are generally in good order with minimal evidence of rot, the fit of the casements and perimeter air tightness seals do not meet current standards for listed buildings. Casements do not include seals meaning draughts and high levels of air permeability affect most of the windows at Rutherford. The original timber window frames are built into rebates within the decorative stone façade. Perimeter sealing around the historic window frames is inconsistent and allows considerable air leakage into the building.

Discussions with Manchester City Council recognise the need to improve the performance of the windows, whilst applying a sensitive approach to any upgrade process. There is no doubt that the conservation officer will expect the original timber perimeter frames to be preserved. However, recommendations to upgrade the perimeter airtightness will be supported, subject to agreeing appropriate materials, application techniques and providing a representative sample of the proposed sealing methods.

As the fixed and opening casements are replacements, it is expected that MCC will support their replacement with matching timber fabrications. Timber section sizes and edge moulds will provide accurate copies of the original 1901 patterns, formed from FSC Accoya to provide a minimum material guarantee of 25 years. As part of the replacement process, perimeter brush seals will be incorporated within machined grooves to casement concealed edges to provide consistent draught protection, whilst maintaining the external appearance of the windows.

It is recommended that the original single glazing should be replaced either with a high performance vacuum evacuated heritage glass system or slim profile conservation double glazed units. Discussions with the conservation officer have highlighted concerns about the



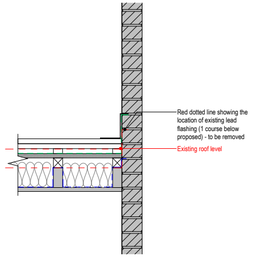
▲ Proposed Window Jamb Detail

Window Option	U- Value (W/m²k)	Roof Construction	Positives	Negatives
Option 1 Existing	5.2	• Existing painted timber frame + casements - single glazed		
Option 2	4/5 (inc. infiltration - 10ACH)	• Existing timber windows - single glazed • Existing timber frame + casements repaired where required • Three-part air tightness seal to all perimeter junctions • Frames + casements painted with 10yr maintenance warrantied system (internally + externally) – Paint to be stripped off frames and casements (potential lead paint – suitable contractor to safely remove)	Likely to be most favourable option from conservation perspective	Offers poor thermal improvements
Option 3	Glazing upgrade = 0.8 (inc. infiltration - 5ACH)	• Existing Timber Frame retained (frames to be weather sealed, timber repairs carried out, any gaps etc. sealed, three part air tightness seal to all perimeter junctions • New Timber casements • Reglazed using Fineo Heritage vacuum insulating glass • Frames + casements painted with 10yr maintenance warrantied system (internally + externally) – Paint to be stripped off frames and casements (potential lead paint – suitable contractor to safely remove)	Glazing is 8mm thick and will fit within existing casement profile Greater thermal performance of glazing (equivalent of triple glazing)	Not fully approved by conservation officer Potentially a more expensive option
Option 4	Glazing upgrade = 1.2 (inc. infiltration - 5ACH)	• Existing Timber Frame retained (frames to be weather sealed, timber repairs carried out, any gaps etc. sealed, three part air tightness seal to all perimeter junctions • New Timber casements • Reglazed using conservation double glazed units Frames + casements painted with 10yr maintenance warrantied system (internally + externally) – Paint to be stripped off frames and casements (potential lead paint – suitable contractor to safely remove)	Cheaper more standardised casement profile	Potentially may be problematic from a conservation perspective Different casement profile required to accommodate wider double-glazed units

introduction of double glazing. Therefore, Arcadis recommend Option 3 [refer to attached table for more detailed technical information] -introduction of Fineo Heritage vacuum evacuated glass panels. This system provides very high levels of thermal performance and is used within the listed building and conservation arena to give contemporary standards of insulation whilst minimising the visual impact of the upgrade process. It is important to highlight that MCC have not formally accepted the Fineo vacuum evacuated glass and samples will need to be submitted for approval when the formal listed building application is lodged with the council.

▲ Chimney Stack

▲ Existing Lead Gutter over Corridor



1 Chimney Detail Copy 2
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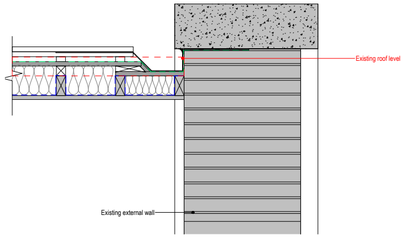
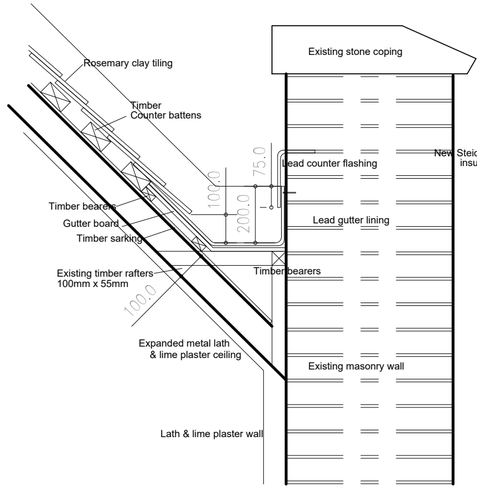


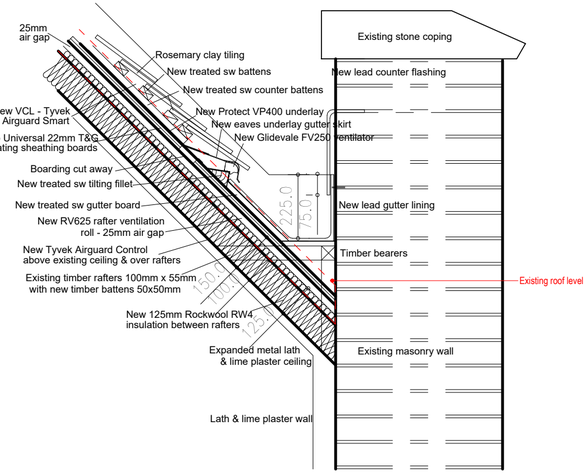
▲ Option 5 - Proposed Verge + Chimney Detail

RUTHERFORD BUILDING
Existing roof parapet eaves

Note :
Existing construction to be confirmed
All existing dimensions to be confirmed



RUTHERFORD BUILDING
Proposed roof parapet eaves
OPTION 5
Note :
Roof ventilation to BS 5250:2021
Roof insulation U value = 0.26 W/m2K
All dimensions to be confirmed



▲ Option 5 - Proposed Roof Eaves Detail

▲ View of Gable Roof, Chimney Breast and Flat Roof

▲ View of Roof from Drone

7

External façade – Repairs and Restoration Works

External façade – Repairs and Restoration works

As part of the proposed redevelopment of the Rutherford Building, Manchester University would like to carry out extensive restoration and repair works to the external façade.

In addition to the refurbishment of external doors and windows, and the roof outlined above, repairs are also planned for the following elements of the façade:

- Repair and stabilisation of external balconies and balustrades
- Repair and redecoration of cast iron gutters, rainwater and sanitation pipework.
- Brickwork and stone repairs to upper sections of east elevation to address historic water ingress.
- Stonework and lead roof repairs to former main entrance.
- Comprehensive external redecoration
- Remodelling and upgrade of 1990s access ramp and stairs to the west elevation.
- Replacement of entrance doors to west elevation
- Insertion of additional cast iron ventilation grilles within the façade to serve internal heating and cooling requirements.

Repair and stabilisation of external balconies and balustrades

Urgent repairs are required to the projecting stone balconies to the west elevation of the Rutherford Building. At present, there is evidence of water ingress along the west elevation, potentially linked to the construction of the cantilevered balconies. Works to these areas will include repointing of horizontal and vertical bed joints with lime mortar, repairs to cover flashings where required, cleaning of horizontal stone surfaces and comprehensive repainting of the decorative wrought iron balustrades.

Repair and redecoration of cast iron gutters, rainwater and sanitation pipework

The Rutherford Building retains the majority of the 1901 cast iron rainwater and sanitation goods to the external façade. In accordance with acknowledged conservation practices, all cast iron items will be inspected, locally repaired using appropriate stable materials and techniques, and repainted. Samples of the complete paint system will be provided for approval before redecoration works are carried out.

Brickwork and stone repairs to upper sections of east elevation

There is a perennial problem of water ingress to the second floor accommodation, principally along the east elevation. A number of construction and maintenance issues contribute to the water ingress. Extensive repairs are planned to address these problems including repointing of horizontal and vertical bed joints with lime mortar, rebedding coping stones, repair/replacement of lead flashings and back gutters and local replacement of spalled brickwork. Samples of proposed repointing methods and brickwork replacement will be submitted for approval before comprehensive repair works are carried out.

Stonework and lead roof repairs to former main entrance

Water ingress above the former main entrance originates from the narrow lead roof and has caused significant damage to the decorative ashlar masonry below. Robust repairs to the lead roof are planned using traditional materials and craft techniques. Repairs to the stonework will be quantified and categorised in collaboration with accredited stone masonry specialists. A detailed method statement will be provided highlighting proposed repair methods, materials and techniques. This schedule will be agreed with Manchester City Council before repair samples are prepared for approval. All repairs will use traditional craft techniques to provide sensitive restoration of the main entrance façade.

▲ External Balcony

Comprehensive external redecoration

All painted components of the Rutherford Building are to be redecorated including wrought iron balustrades, cast iron rainwater and sanitation goods, timber windows and external doors. Modern long life, low maintenance paint systems are proposed. Samples of the completed paint systems will be provided for approval before redecoration works are carried out.

Remodelling and upgrade of 1990s access ramp and stairs to the west elevation

Constructed in the late 1990s, the steel access ramp and stairs enabled a new building entrance to be introduced in the centre of the west elevation. The ramp structures consists of welded tubular steel box sections supporting a mild steel and cable balustrade, with brickwork infill panels below the framework.

It is proposed to redevelop the ramp to provide a more sensitive aesthetic and to develop a complimentary language following the construction of the new access ramp to the neighbouring University Museum. The metal balustrade to the ramp will be replaced with a welded and painted steel fabrication, referencing the patterns of the historic wrought iron balustrades along Coupland Street. Exposed structural steel sections will be repainted, changing the colour from black to a natural earth tone to compliment the stonework detailing of the Rutherford Building. Brickwork infill panels will be replaced with traditional ashlar masonry, reinforcing the architectural language. samples of stone and jointing techniques will be submitted for approval prior to construction.

Replacement of entrance doors to west elevation

The existing entrance doors to the west elevation are of painted timber construction. Installed in the late 1990s, the doors are of modern manufacture and do not have the stature of main entrance doors to an important university building.

It is proposed to replace the current doors with bespoke European oak doors, designed to match the main entrance arrangement on Coupland Street. The new doors will include an oak frame with glazed fanlight, traditional raised and fielded panels, and mortise and tenon construction. Doors will be clear finished. Samples of timber, construction and finishes will be submitted for approval prior to construction.

▲ Stonework + Leadwork Repairs to Main Entrance on Coupland Street

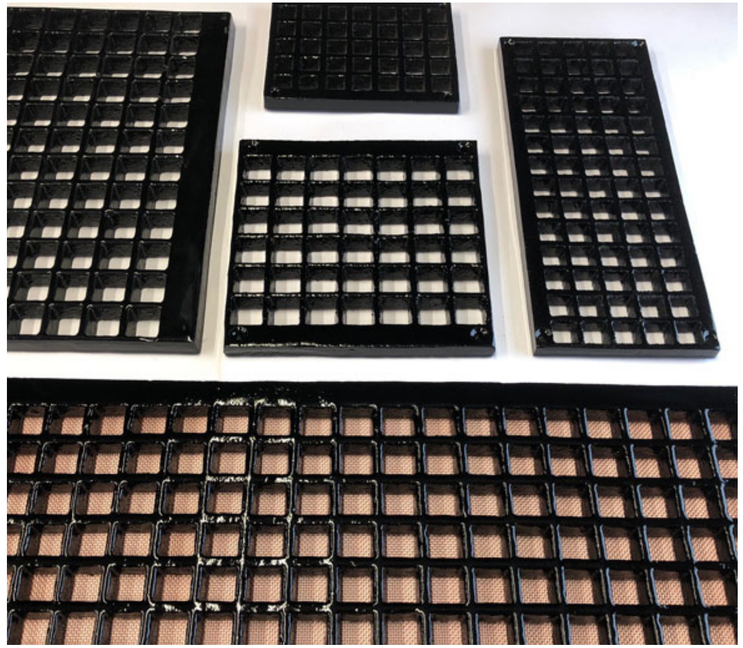
▲ Replacement of Entrance Doors to West Elevation

Insertion of additional cast iron ventilation grilles within the external masonry façade

The 1901 Rutherford Building incorporates a series of cast iron grilles within the masonry façade. The grilles form part of Schuster's and Beaumont's innovative heating and ventilation strategy.

As the building spaces are subdivided to meet the needs of the geography department, there is a requirement to introduce additional ventilation systems at ground floor level and to the new sanitation and welfare core at the rest of the building.

Replica cast iron grilles are proposed to develop the existing vernacular language of the Rutherford Building and provide additional apertures through the façade for ventilation purposes. Grilles have been carefully positioned to maintain the crafted positioned to maintain the crafted composition of the external elevations. Please refer to the detailed drawings or further information about the proposed arrangement. A sample of the grille will be submitted for approval prior to construction.



▲ Example of Grills

▲ Remodelling and Upgrade of 1990's Access Ramp and Stairs to the West Elevation

8

Renewal of Engineering Systems and Infrastructure

Renewal of Engineering Systems and Infrastructure

At the time of construction at the end of the 19th century, the Rutherford Building was positioned at the forefront of engineering design. The building incorporated innovative natural ventilation strategies, a centralised heating system and a lift. Services were distributed around the building with a pseudo industrial aesthetic of exposed brickwork, vertical surface mounted conduits and visible ventilation grilles.

As the building has developed over the 120 year period since its construction, the raw elegance of the original strategy has been hidden with the introduction of plastic dado trunking to most rooms, the use of large electrical steel containment within circulation zones an the addition of intrusive vertical risers, changing the shape and form of important spaces.

The redevelopment of the Rutherford as a work and research facility proposes the wholesale renewal of engineering systems, facilitating the introduction of modern low energy infrastructure confused to provide a cleaner and less cluttered aesthetic. An engineering strategy which references the original design philosophy of Schuster and Beaumont.

Primary services distribution of most systems will make use of new accessible floor trunking. This approach will allow conduit drops to be reintroduced, providing power, data and building management to individual work, research and collaboration spaces. There will be minimal requirements for horizontal dado trunking. In addition, to this benefit, the introduction of floor trunking will remove the requirement for surface mounted electrical containment within circulation zones. This will allow building occupants to appreciate the historic ceilings and decorative cornices

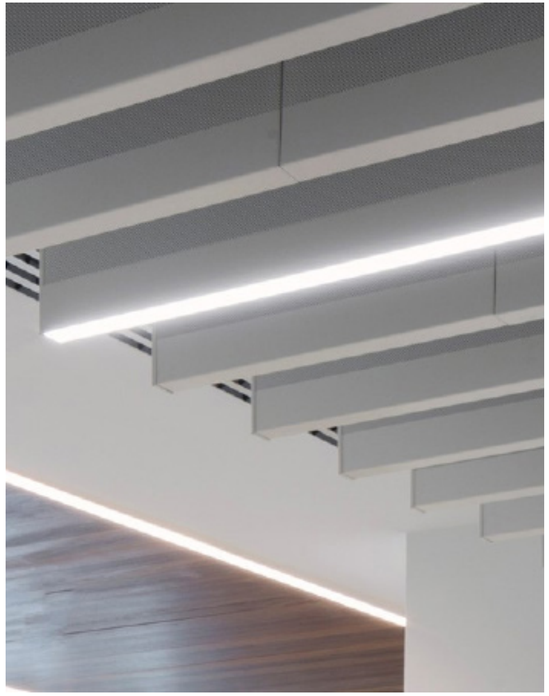
Central heating pipework distribution will follow original routes, with radiator feeds passing through floor structures using existing penetrations wherever feasible. It must be noted that existing holes through floors may need to be enlarged to accommodate fire stopping collars.

Addendum:

Condenser Unit – External – Roof D:
The new comms room is located on the ٢rd floor. The original intention was for the room to only be mechanically extracted using MVHR units. However in order for the room to remain at a constant temperature and be compliant with the University standards, we now require mechanical cooling in the form of air conditioning.
The condenser unit would be located on the flat roof, Roof D wall mounted on the masonry stair enclosure. The ductwork would be routed through the stair enclosure, into the comms lobby and through a vent panel into the comms room as shown on the drawings. Roof D has a parapet wall around its perimeter and is screened by the tall gabled surrounding roofs of the building meaning it would not be visible from street level or neighbouring buildings.

Monodraught to Mezzanine:
The building is generally naturally ventilated through openable windows. On the mezzanine there are no openable windows but there is an existing monodraught system within the gable wall. There is currently an existing vent grille and monodraught unit within the cavity of the masonry wall, however the external opening behind the monodraught unit has been bricked up. We would like to unbrick this area, make the monodraught unit slightly taller so that it has sufficient ventilation for projected increased temperatures. This would avoid the requirement for potential mechanical cooling.

Additional Structural Support for external gantry stairs:
The original intention for supporting the gantry stairs was to use gallows brackets fixed to the masonry stair enclosure. This was based on the understanding that the masonry wall was two leaves of masonry with no cavity. Upon further site investigation it was discovered that there was a cavity which meant that the cavity wall alone would not be sufficient to support the gantry. Our intention is to use structural plates which are fixed to the internal face of the stair enclosure to roof D providing additional support to the gallows brackets.



▲ Integrated Lighting with Linear Acoustic Baffles

▲ High Level Trunking in Corridor to be Removed to Reveal Historic Ceiling

▲ Building Approach

▲ Touchdown Social Space

▲ Researches Office

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