Cullum Welch House

Windows Appraisal Report

December 2022

Studio Partington

CITY OF LONDON

Executive Summary

The Climate Emergency

We are in a climate emergency and the City of London Corporation have declared their support of net zero. In response, they are required to step up by building and retrofitting existing building stock for climate resilience and championing sustainable growth.

Retrofitting Heritage Buildings

As a listed building and estate, Golden Lane Estate faces greater challenges than most existing buildings when it comes to retrofitting the fabric (such as the windows or adding insulation), upgrading building services or adding renewable technologies such as solar panels.

Reports and Research

Detailed research into the Estate history and archived construction drawings has been undertaken to understand the existing building and original design intent, focusing on what makes Cullum Welch House unique. Additional reports are needed to aid informed decision making on how to proceed, including sustainability/thermal modelling studies and structural analysis. A thorough condition survey is also required to confirm the extent of repairs/replacement that would be required if the frames were retained. Finally, an acoustic survey of the current noise condition is needed to inform next steps.

Recommendations

Ultimately, the chosen window proposal will be required to balance the need to create healthier, more affordable and more comfortable homes whilst preserving the important heritage of the building, which is Grade II listed. Compromises are inevitable, if the competing goals of heritage, climate, cost and disruption to residents are to be given proper consideration and suitably addressed.

There are two options presented in this document for further consideration:

- Refurbishing the existing frames and retrofitting them with vacuum glazing
- Replacing the existing windows with a new frame and high-performance glazing

Next steps

This report explores the most practical, low carbon and heritage sensitive ways to move forward with the window works, taking into account the heritage status. It observes the guidance set out in the Listed Building Management Guidelines, but also considers reduction in carbon emissions, comfort of residents, upfront and running cost implications and intrusiveness of works for those living in the flats.

In addition to the commission of the recommended reports and surveys, further engagement with residents (both tenent and leaseholder) and relevant statutory stakeholders is required prior to City of London confirming which approach to the windows upgrade they will progress with. Costing advice is also critical to allow for a cost-benefit analysis of the different approaches.

This document also outlines the importance of considering a whole building retrofit plan alongside the windows project to ensure that isolated changes don't damage the building in the long term.

Contents

1.0 Introduction

1.1 Project Team 6
1.2 Project Overview 6
1.3 Purpose of Report 6
1.4 Heritage Context 7
1.5 Climate Context 8
1.6 Relevant Examples 9

2.0 Golden Lane Estate

2.1 Summary 14
2.2 Building Types 16

3.0 Cullum Welch House

3.1 Summary 18
3.2 Special Features 18

4.0 The Windows

4.1 Description 22
4.2 Typical Existing Window 23
4.3 Example Flat 26
4.4 Condition 27
4.5 Comfort 28

5.0 Evaluation

5.1 Heritage 30
5.2 Condition and Comfort 32
5.3 Environmental 34
5.4 Structural 34

6.0 What can be done now?

6.1 Overview 36
6.2 Summary of Changes 38
6.3 The Process 39
6.4 Refurbishment 40
6.5 Replacement 41
6.6 Options Comparison 42
6.7 Fire 45

7.0 Whole House retrofit

7.1 A Whole House Approach 48
7.2 Heat Loss Through Fabric 50
7.3 Air Infiltration 51
7.4 Ventilation 51
7.5 Additional Factors 52

8.0 Conclusion

8.1 Concluding Remarks 54

9.0 Introduction

9.1 Actions 56
9.2 Additional Works 56

Glossary of Key Terms **(rear)**

1.0
Introduction

1.1 Project Team

Client	City of London Corporation
Architect	Studio Partington
Structural Engineer	Stand Consulting
Building Physics/ Sustainability Engineer	Etude
Principal Designer (CDM 2015)	Studio Partington
Project Manager	Hav Consult
Cost Consultant	Keegans
Planning Consultant	Grade Planning
Heritage Consultant	The Heritage Advisory
Communications Consultant	Thorncliffe

Critical for this project, the specialist consultants that form the project team have extensive experience working on retrofit projects, including reinforced concrete buildings and listed buildings, navigating the careful balance between heritage and sustainabiliy.

1.2 Project Overview

City of London Corporation has appointed the design team (above) to design and deliver window upgrades to the residential blocks on the Golden Lane Estate. Dependant on several factors (explored within this report), these window works could include refurbishment or replacement.

The windows to the properties on the Golden Lane Estate are bespoke and there are various window types present . Taking this, and the broader sensitivities of this project into account, a full options appraisal has been undertaken for each of the key housing blocks across the estate.

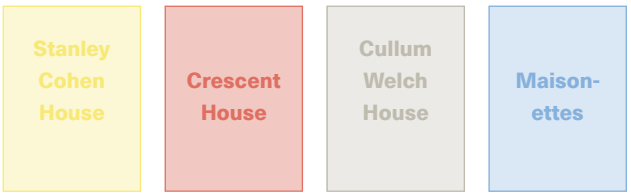
1.3 Purpose of Report

This document has been prepared by Studio Partington on behalf of the City of London Corporation. It explores several possible approaches for improvements to the condition and performance of windows in Cullum Welch House.

This study takes a typical window type from Cullum Welch House and through detailed investigation and review of it's construction, unique design features, heritage value, and current problems, demonstrates the challenges and opportunities that face the ambition to improve the windows across the estate.

The project team have identified several key stakeholders whose input will be critical in ensuring the success of this project, including residents and numerous statutory advisors/organisations. The report concludes with a series of options for addressing the challenges, to allow these stakeholders and the Corporation to make an informed decision about how best to proceed and take a balanced view on how best to ensure a comfortable, low carbon future for the Estate, whilst protecting what makes this building a valuable heritage asset.

Please note that this report sits within a suite of documents, each of which captures a key flat/window typology within the broader Golden Lane Estate; Stanley Cohen House, Crescent House and the Maisonette blocks (Basterfield, Bayer, Bowater, Cuthbert Harrowing and Hatfield House).The windows of Great Arthur House were replaced in 2018 and are subsequently not included as part of these works.



1.4 Heritage Context

Historic England are the main stakeholder organisation for all heritage buildings in the England, helping people care for, enjoy and celebrate our historic environment. They hold a register of all nationally protected historic buildings and sites in England, including Listed Buildings. The Golden Lane Estate (including buildings and landscaping) is Grade II listed, with the exception of Crescent House which is Grade II* listed. The Golden Lane Estate is entry number 1021941 on this list.

When assessing the heritage significance of an asset, Historic England set out three areas of interest for consideration, namely, archaeological, architectural and historic. The primary heritage interest of the Golden Lane Estate is architectural. The listing entries of the wider Estate and specific building types have been our principal reference point when understanding the heritage value of the Cullum Welch House.

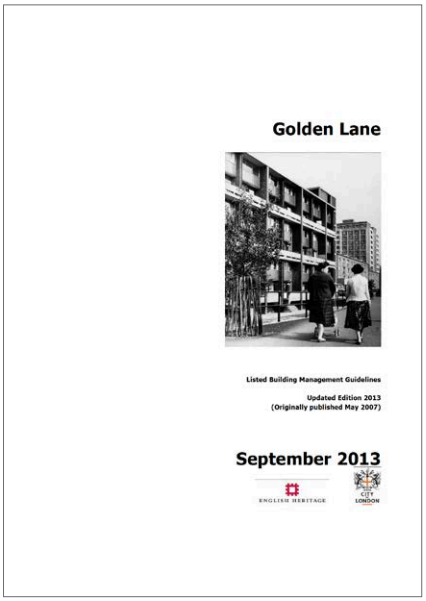
In addition to the Historic England listings, a second document has been crucial in providing expert clarity on heritage priorities and architectural nuances across both the wider estate and each unique building: the Golden Lane Listed Building Management Guidelines.

In 2007, the Corporation of the City of London adopted a set of Listed Building Management Guidelines as a Supplementary Planning Document (updated in 2013). The guidelines were written by City of London Department of Planning and Transportation and Avanti Architects, in consultation with Golden Lane residents (both tenants and leaseholders), English Heritage (now Historic England), the Twentieth Century Society, the Department of Community and Children's Services.

The document acknowledges that *'modifications to glazing, cladding and lining of structures may become necessary to resolve what appear to be widespread problems of noise and heat loss or retention across the estate',* and is intended to be *'a tool for the positive, active management of historic buildings and to guide future change'.* Energy efficiency works to listed buildings that could affect their appearance and construction will need to be carried out in a way that minimises any impact to its aesthetics or elements of special interest, however, improving ventilation and thermal performance is important to the long term survival of the building fabric.

At several points within this document, the Listed Building Management Guidelines for the Golden Lane Estate are quoted directly. These quotes can be recognised by the following formatting:

Any text which is in dark grey, thin italics is taken directly from the Listed Building Management Guidelines.



Golden Lane Listed Building Management Guidance document

1.5 Climate Context

In 2019 the UK Government amended the Climate Change Act and adopted a target for achieving net zero emissions by 2050.

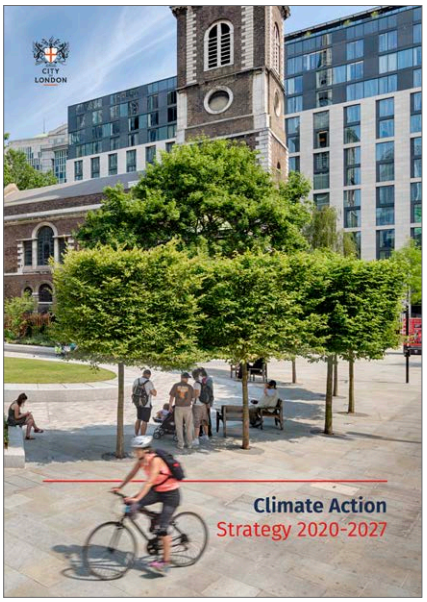
The City of London Corporation has adopted a Climate Action Strategy which sets out how the organisation will achieve net zero, build climate resilience and champion sustainable growth. By adopting the strategy, the City Corporation has committed to achieve net zero carbon emissions across their built assets (such as Golden Lane Estate) by 2027, 5 years from now. The City of London Corporation also commits to achieving climate resilience in buildings - for example, limiting overheating risk in homes.

The UK Green Building Council (UKGBC) predict that 80% of 2050's homes have already been built, so a major priority is retrofit to de-carbonise our existing housing stock. This means reducing energy use in homes by first taking a fabric-first approach. In other words, improving the performance of the building so residents don't need to use as much energy to be comfortable and healthy in their homes.

Initial heat loss studies of flats on the Golden Lane Estate have established that a substantial amount of heat in the flats is lost through the extensively glazed façades and air leaks through the building fabric. Therefore, addressing these issues will go a considerable way not only towards improving residents' comfort, but also towards heating homes more efficiently and economically.

The retrofit challenge is huge. Over one million homes every year for the next 30 years will need to be retrofitted to meet climate targets and we cannot afford to retrofit them twice. The targets set for retrofit are ambitious, but need to also be realistic, given the constraints of working with an existing building. The minimum target is to make home suitable for low carbon heating, which in general terms, means improving the energy performance to at least EPC C.

If we retrofit well, we can enjoy many social and economic benefits, as well as environmental.



The City of London Corporation Climate Action Strategy document

1.6 Relevant Examples

Within London and the wider UK, we have a large amount of 20th Century housing, the significance of which has been recognised through listed building status. In particular, there are a number of relevant case studies which can be referenced within this project. Each project spotlighted below is complex and comes with heritage sensitivities, however, they are touchstone projects for future works to Golden Lane Estate and lessons can be learnt from each window replacement, where appropriate.

The following pages list the key aspects of the window works for each of the case study projects, beginning with Great Arthur House on the Golden Lane Estate.

Great Arthur House (Golden Lane Estate)*: Photos of the existing windows/ façade (top left) and completed replacement (top right & bottom left); sketch from the architects, John Robertson Architects, showing process of replacement (bottom right). Photos by Joshua Page.*

1. Great Arthur House
Golden Lane Estate, City of London
Chamberlin, Powell & Bon (constructed 1953-7)
Grade II listed

Original: aluminium windows
New: replaced with aluminium (like for like)

In 2018, the existing windows were replaced with a new aluminium curtain wall system. The works improve the performance of the windows, with a new double glazed and thermally insulated prefabricated panel system, carefully designed to match the original design intent.

2. Alexandra Road Estate
Camden, London
Neave Brown (constructed 1972-9)
Grade II* listed

Original: hardwood timber windows
New: retained frames, replacement glass (vacuum)

In 2022, a pilot project to improve thermal efficiency and upgrade heating to homes is being undertaken. These wider retrofit proposals consider the building as a whole and include replacing the existing glass with vacuum glazing throughout the Estate. The windows are hardwood timber frames.

3. Balfron Tower
Brownfield Estate, Tower Hamlets, London
Ernő Goldfinger (constructed 1965-7)
Grade II* listed

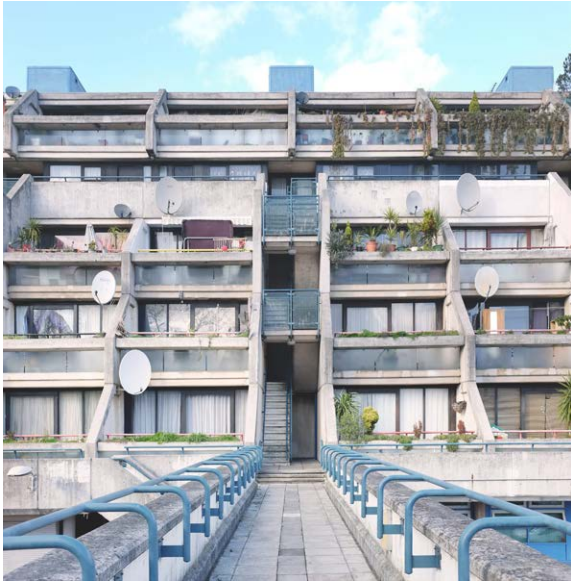
Original: painted timber windows (white)
New: replaced with aluminium (brown)

In 2014, works began to upgrade the building thermally and acoustically, including replacing all windows with doubled glazed units (many were historically replaced with modern uPVC). The new windows changed the colour from white, instead referencing local, celebrated examples of Goldfinger's work. They were also changed from timber to aluminium due to the acoustic constraints of the A12. The windows were installed alongside other building fabric upgrades such as internal wall, roof and floor insulation.

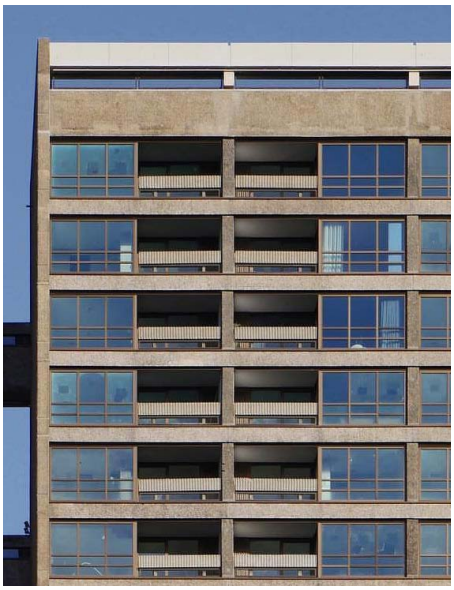
4. Trellick Tower
Cheltenham Estate, Notting Hill, London
Ernő Goldfinger (constructed 1968-72)
Grade II* listed

Original: painted timber windows
New: replaced with painted timber

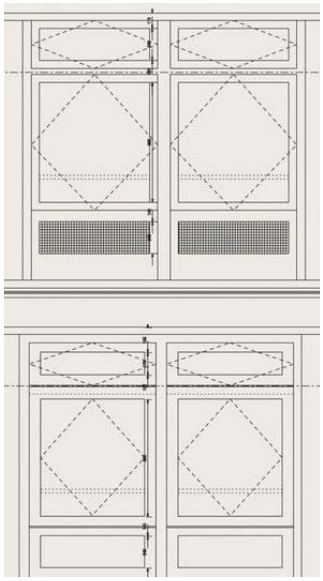
In 2005, window repair or replacement was reviewed for the building. Replacement was selected and the painted timber windows were upgraded with new, in a like for like design. The original glazing used was an experimental double glazing from Pilkington which was replaced with modern double glazing. The replacement windows were also changed from pivot to multipoint locking systems.

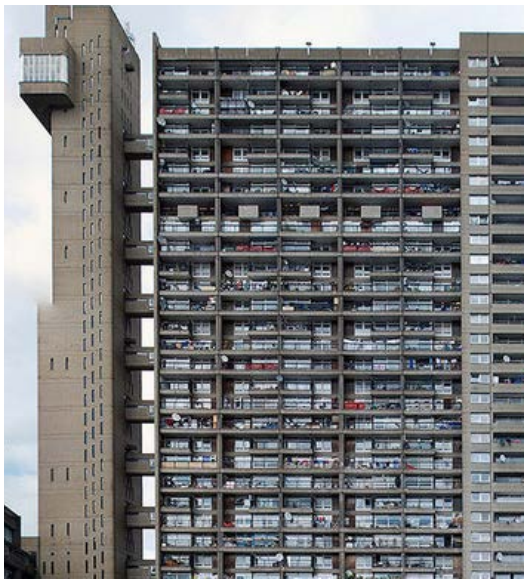


Alexandra Road Estate *(Camden): Photo of the estate ahead of glazing replacement works.*



Balfron Tower *(Tower Hamlets): Photo of existing window/façade treatment (left) and new, replacement windows/façade (right).*





Trellick Tower *(Notting Hill): Photo of the whole building (left); drawings of existing and proposed typical window, with the move from georgian wire glass to clear at low level (middle); before and after photos of window replacement (right).*

5. Park Hill - Phase 1
Park Hill, Sheffield
Ivor Smith and Jack Lynn (constructed 1957-61)
Grade II* listed

Original: timber windows (white)
New: replaced and reconfigured with aluminium (dark grey) and coloured panels

A multi-phase project to transform Park Hill began in 2009. In phase 1, the original façade (including timber windows) was replaced with brightly coloured anodised aluminium panels and large sections of new windows.

6. Park Hill - Phase 2
Park Hill, Sheffield
Ivor Smith and Jack Lynn (constructed 1957-61)
Grade II* listed

Original: timber windows (white)
New: replaced with modern black metal alternatives

In phase 2, the façade was maintained, but the windows were replaced with modern black metal alternatives. The approach followed for this phase was much more 'light touch' with a greater focus on improving the building's fabric. Coloured, insulated panels were introduced to the balconies externally, whilst internally, insulation was added to the cavity wall brick panels, windows moved back into thermal line and balcony flank walls and the soffits of living spaces were all lined in insulation.

Park Hill Phase 1 (Sheffield): Existing window/façade treatment (top) and new, replacement windows/façade as part of phase 1 refurbishment works (bottom).

Park Hill Phase 2 (Sheffield): Existing window/façade treatment (top) and new, replacement windows/façade as part of phase 2 refurbishment works (bottom).

2.0

Golden Lane Estate

2.1 Summary

The Golden Lane Estate was conceived when the City of London announced a competition for designs to regenerate the area in 1951. The site of the Golden Lane Estate had been devastated during the Second World War and was acquired by the City Corporation as a direct response to the need to provide additional housing for those who had lost their homes. In particular, the City had a duty to provide housing for those people working in the City such as nurses, doctors and police.

In 1952, Geoffrey Powell was announced as competition winner and subsequently formed a partnership with two other lecturers in architecture from the Kingston School of Art to form the partnership of Chamberlin, Powell and Bon. The estate was constructed between 1953 and 1962 across two phases.

The Golden Lane Estate is an early example of post-war, large-scale urban design which demonstrated a departure from previous ideas underpinning urban planning and set high standards for the future.

Innovative and unique, the Estate has particular value as a pioneering example of a diverse urban infill, which was wholly modern in spirit.

The Listed Building Management Guidelines states that the special architectural interest of the Golden Lane Estate starts with its considered approach to urban planning – how the buildings are arranged and the spaces between them. It then extends to the specific attributes of each of the buildings – their architectural form, language, structure, materials and components, and domestic design. The original colours – primary colours and black, white and grey – reflect the architectural ethos of the time.

The competition winning scheme for the Golden Lane Estate, from Geoffry Powell in 1952

Photo on Goswell Road, looking towards the Barbican Estate with the curve of Crescent House and the orial windows on the left

Photo from outside Crescent House, looking across the tennis courts to Cullum Welch on the right, the leisure centre on the left and Great Arther House in the background

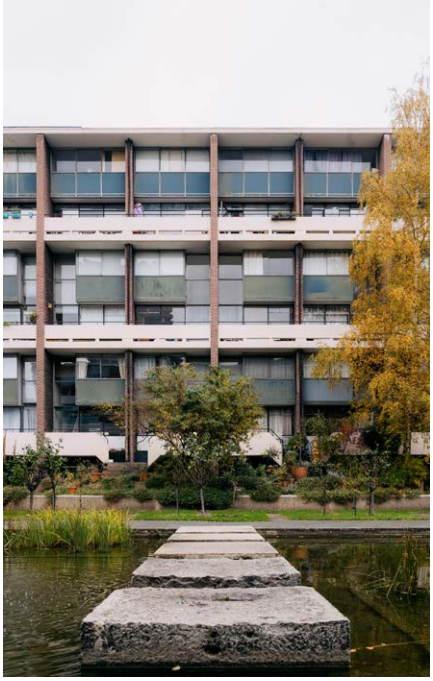


Photo of one of the maisonette blocks, Bayer House, looking across a courtyard from Basterfield House

Photo of the outward facing Cullum Welch House elevation, capturing details such as the pre-cast concrete planter holders

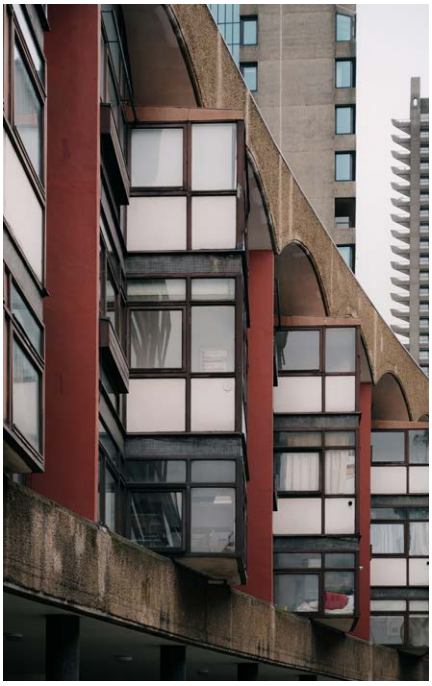


Photo of Crescent House projecting oriel windows on Goswell Road

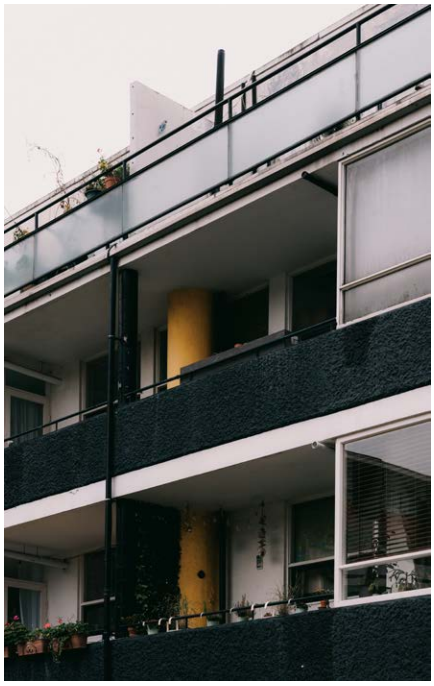


Photo of the West elevation of Stanley Cohen House, looking onto one of the shared courtyards

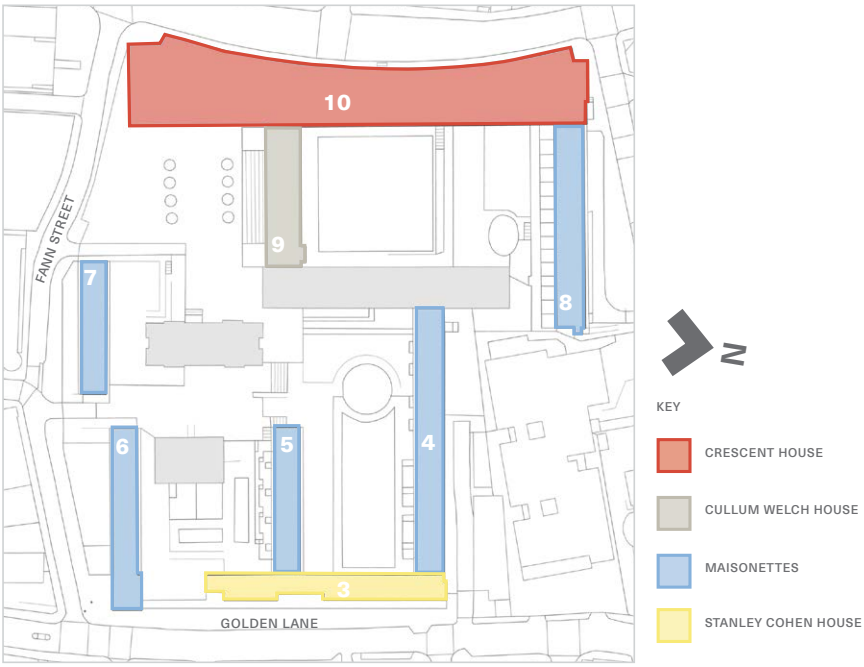
2.2 Building Types

There are 12 buildings that make up the Estate, including nine residential blocks which provide a total of 565 flats (break down per building provided in brackets on the right). The current split between leasehold properties and City of London tenanted homes is approximately 50:50.

A list of the buildings included in the Golden Lane Estate is on the right. The blocks highlighted in bold text are included as part of the wider window regeneration study, capturing 445 homes. Please note that Basterfield, Bayer, Bowater, Cuthbert Harrowing and Hatfield House are grouped together and referred to as the 'Maisonettes' within this study.

Building numbers 1, 2 and 11 have all already had window upgrade works carried out. In all instances, this included double glazing as a minimum. Building number 12 on the original plaque was labelled 'workshop' but is no longer part of the Estate.

1. Great Arthur House (120)
2. Physical Recreational Building
3. **Stanley Cohen House (32)**
4. **Basterfield House (54)**
5. **Bayer House (30)**
6. **Bowater House (30)**
7. **Cuthbert Harrowing House (18)**
8. **Hatfield House (56)**
9. **Cullum Welch House (72)**
10. **Crescent House (153)**
11. Community Centre



Site Plan of the Golden Lane Estate, highlighting types of housing block included as part of the wider window regeneration study

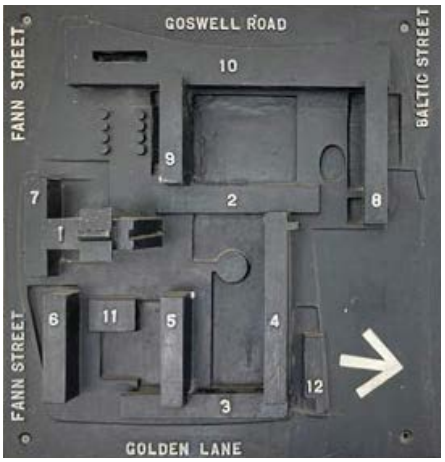


Photo of one of the original, wall-mounted, bas-relief plaques at the Golden Lane Estate, highlighting the layout of the blocks

3.0

Cullum Welch House

3.1 Summary

Cullum Welch is a seven-storey block of flats, located on the western part of the site and directly abuts Crescent House. Cullum Welch House formed part of the further development of the estate after extension of the site in 1954. Construction began the following year. The building contains 72 studio flats, spread out across six floors and sits above a double height ground floor containing storage and service cupboards for the flats on the floors above. The flats are arranged in mirrored pairs and open-air corridors along the north façade lead to flat entrances.

Each flat has an identical footprint and layout. The flat layout consists of a kitchen to the north and a living/sleeping area facing south, with the bathroom located in-between.

The building is north-south oriented. All flats are dual aspect, meaning that they have windows on opposite sides. The rooms are arranged around a small entrance lobby with a larder cupboard, incorporating a letter box, delivery hatch and gas meter (which can be read from the outside) and a linen cupboard. On the other side is a small kitchen and a separate internal bathroom, which does not have any windows and diverges from the competition brief for an external outlook for the bathrooms. All rooms have sliding doors. The south façade is animated with wide pre-cast concrete planters at floor level and shelves with holes for flower pots at cill level.

Cullum Welch is constructed from a hybrid of reinforced concrete frame and load-bearing brick party walls and piers.

3.2 Special Features

Cullum Welch House is Grade II listed. It's Historic England list entry number is 1021951. In relation to the windows, the listing description from Historic England specifically references the 'concrete access decks and red windows'. The fact that the red windows are made of softwood is not mentioned, however, the material used for the windows on the south elevation - aluminium - is included in the description.

In addition to the listing description, special features of Cullum Welch House which contribute to it's distinctive character have been highlighted in the Listed Building Management Guidelines. A summary is listed below:

1. *its position as the transition point between the lighter treatment of the maisonettes and the more robust appearance of Crescent House.*
2. *the floor-to-ceiling windows to the living/sleeping area*
3. *the exposed aggregate of the concrete shelf and planter, both of which have a polished finish internally. The exterior faces were painted grey at a later date*
4. *the wide pre-cast concrete planters at floor level*
5. *the shelves with holes for flower pots at cill level*
6. *the open concrete balustrades on the access galleries*
7. *the kitchen windows painted tomato red*

The sketches on the following page highlights these special features.

1. transition point between the Maisonette blocks and Crescent House
2. floor-to-ceiling windows
3. the exposed aggregate of the concrete shelf and planter (internal)
4. the wide pre-cast concrete planters at floor level
5. shelves at cill level, with holes for flower pots
6. the open concrete balustrades on the access galleries
7. tomato red painted kitchen windows

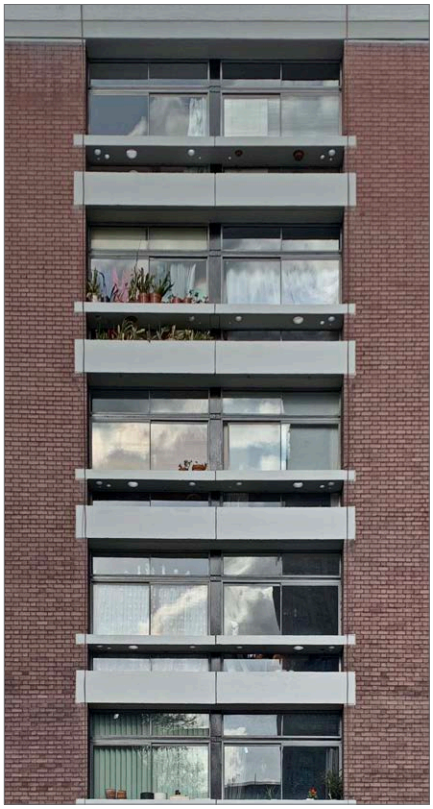


Photo of Cullum Welch House south façade, highlighting pairing of studio flats.

Photo of Cullum Welch House northern façade, highlighting the tomato red painted timber windows and the open access concrete balconies.

Photo of stairs leading from a public courtyard to the double height ground floor space with storage and service cupboards.

Photo of Cullum Welch House (north elevation) and Crescent house meeting point.

Photo of Cullum Welch House pre-cast concrete planters at floor and cill level, highlighting the holes for flower pots.

4.0

The Windows

4.1 Description

Materials

The same five window styles are used consistently throughout the building. In the bedroom/living space, three window types make up the majority of the south façade. All windows on the north elevation are tomato-red painted softwood frames. Windows on the south elevation are aluminium. On each elevation, the window surrounds contain a mix of fixed glazing and opening lights. On the softwood frames, external timber beads have been used to fix the glazing in the frame.

Glazing

All windows are made of un-obscured single glazing, with only the fixed lower light in the kitchen being glazed with reeded glass to provide privacy.

Opening lights

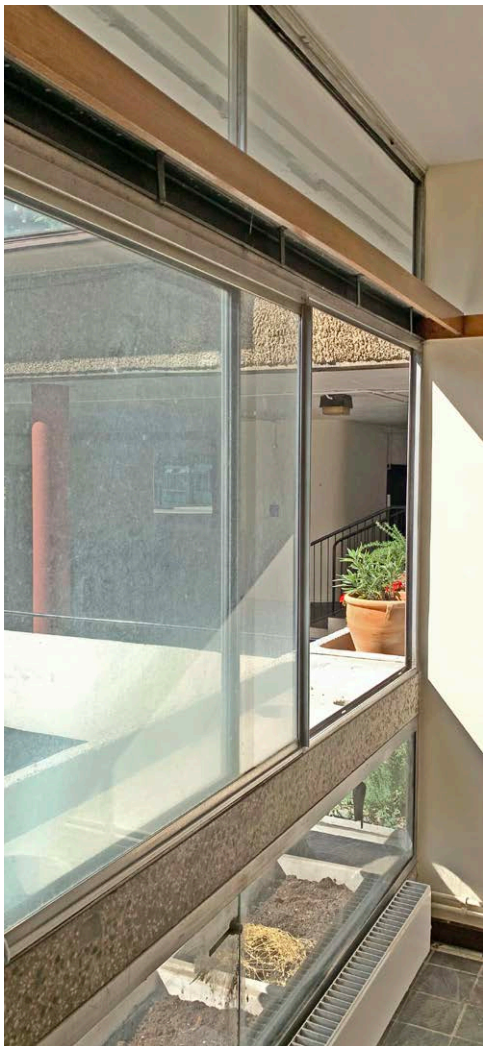
Opening lights in bedroom/living space are consistently horizontally sliding. Two unframed glass panels slide on runners and sit within an aluminium-framed window at the top and bottom. In the middle, an aluminium-framed window, with framed panels slide along a track. The kitchen window is made up of a top hung opening fanlight which sits over a fixed lower light. The fanlight above the front door is fixed. None of the windows have built-in trickle ventilators so there is no means of ensuring the flats have adequate background ventilation.

Ironmongery

The ironmongery to opening lights is metal throughout, but the style varies. D-style aluminium handles and latches to largest sliding windows, aluminium sliding bars to smallest sliding windows and a Preston stay (screw-jack mechanism) to the opening softwood windows.

Additional comments

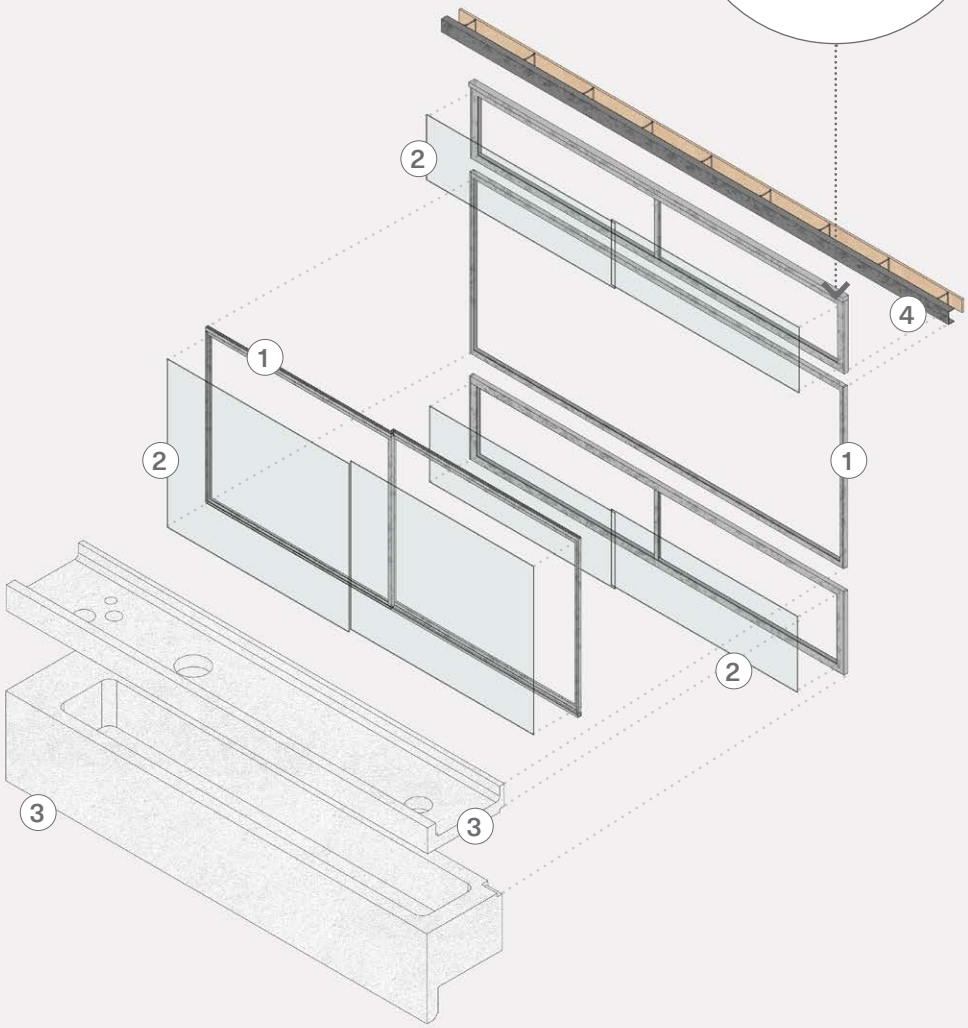
Plastic vents were retrofitted into some kitchen and top bedroom/living fanlights, possibly to provide extra ventilation when heating was switched from a centralised district heating system to individual boilers per flat. The southern façade includes wide pre-cast concrete planters at floor level and shelves with circular holes for flowerpots at cill level. The shelves were specifically designed to present an interesting pattern when empty.



Photograph of the south elevation windows from inside the living/bedroom space

4.2 Typical Existing Window

Existing windows showing signs of deterioration, especially the aluminium running tracks. See photos overleaf. More information in Section 4.4 and 5.2.



Key

1. aluminium frame
2. single glazing
3. pre cast concrete planter
4. steel C-section, with timber rail (internal)

This drawing highlights the different elements of a typical, existing window found in Cullum Welch House. The principles can be applied to all windows in the block; all frames are aluminium and all windows areconsistently horizontally sliding on the south façade. The images on the following page highlight the typical window design at Cullum Welch House, including the window frame, types of glazing (fixed/opening), methods of operation and additional, unique details.

WINDOW FRAME

Framless windows

The fanlight and lower lighto the living/ bedroom area have frameless panes of glass sliding on runners, which contributes towards poor airtightness. The photo shows an anomaly flat, where a rachet lock has been fitted to the slider retrospectively.

Aluminium window frame

Aluminium frames to all windows, apart from in kitchens. Mix of fixed panes and horizontal sliding panes, majority of latter include frameless glass. The design echos the aluminium windows of the maisonette blocks, provided by the same supplier, Quicktho. Single-glazed. Note that none of the windows have built-in trickle ventilators.

Softwood timber frame

Softwood frames to kitchen windows. Frame supports fixed glazing at lower level (with external timber beading) and an openable light above. Painted white internally and red externally. Design echos the maisonettes kitchen windows, sharing similar profiles and incorporating shadow gaps/recesses to articulate the bulk of the frame. Note that none of the windows have built-in trickle ventilators

TYPES OF OPENING

Horizontally siding opening light

All three windows on the southern façade are single glazed and open by sliding horizontally.

Fixed light

Fixed, horizontally reeded (also known as fluted or ribbed), single glazing within a red timber frame sits underneath the opening light in the kitchen. A fixed light within a painted softwood frame above the front door allows light into the corridor.

Top hung opening light

Softwood top-hung opening windows in fanlight style. Painted red finish externally and white internally. Found in kitchens on the north elevation. Single-glazed. Note original Preston stay (screw-jack opening/fixing mechanism) is retained. On the exterior side, the render stops approximately 10mm short of the window frame to echo the articulation of the timber profiles.

OPERATION & IRONMONGERY

Latch

An aluminium latch ensures the middle alumiminum framed sliding window on the southern façade, can be locked when closed.

'D' style handle

An aluminium 'D' handle sits at the bottom of the internal alumiminum framed sliding window on the southern façade.

Sliding bars

Aluminium sliding bars on the top and bottom unframed windows. A visual inspection shows that some windows no longer have these.

ADDITIONAL DETAILS

Pre-cast concrete planters

Wide pre-cast concrete planters at floor level and shelves with circular holes for flowerpots at cill level. The shelves were specifically designed to also present an interesting pattern when empty.

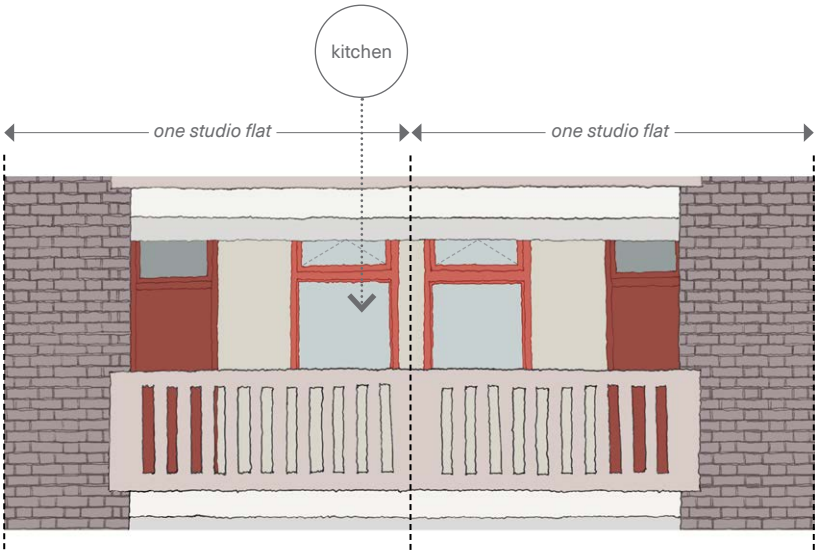
Timber curtain rail and steel C-section

A steel C-section beam supports the top horizontally sliding fanlight and sits on the brick piers. A timber curtain rail is attached back to the beam and continues along one of the studio walls.

Exposed aggregate concrete

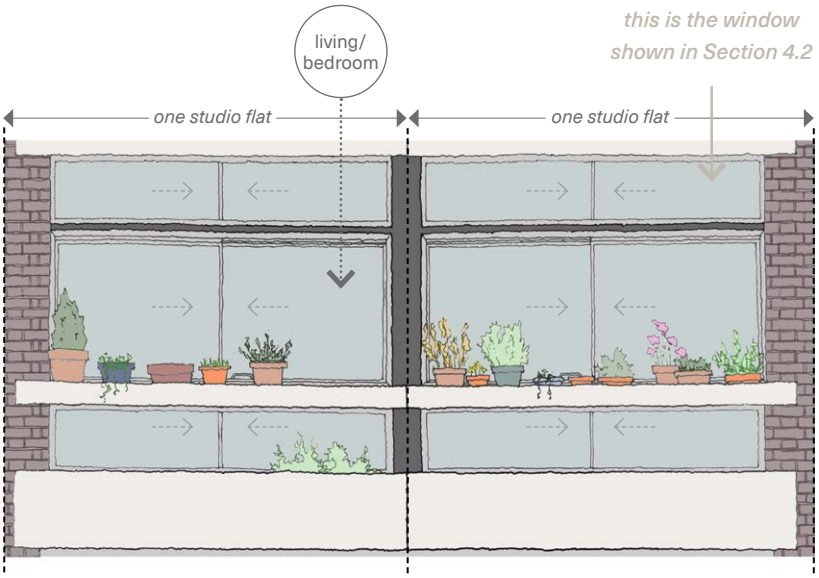
The inner faces of both concrete elements (planter and shelf) areare distinguished by having exposed aggregate with a polished finish. Initially intended to be unpainted both internally and externally, they were subsequently painted in grey on the exterior.

4.3 Example Flat



North Elevation: *Sketch of a typical flat elevation on the south side of the building. Note that the flats are paired and this section of the elevation shows two neighbouring flats. All the flats are a 1 bedroom studio flat and this elevation has red painted timber window frames.*

Photo of a section of the north facing side of the building, which faces the communal tennis courts.



South Elevation: *Sketch of a typical flat elevation on the north side of the building. Note that the flats are paired and this section of the elevation shows two neighbouring flats. All flats are a 1 bedroom studio flat and this elevation has 3 sliding windows, stacked from floor to ceiling, of which only the middle one is aluminium framed.*

Photo of a section of the south facing side of the building which faces onto a courtyard, fronting Fann street.

4.4 Condition

Studio Partington has undertaken a visual survey of a selection of windows at Cullum Welch House. After over sixty years of use, the condition of the windows across the estate has deteriorated. The aluminium is showing signs of deterioration, leaving the frames exposed and vulnerable.

All the windows and their integrated ironmongery appear to be original, with the aluminium frames exhibiting signs of weathering and stiffness. Although it is clear that many of the aluminium windows are damaged or decaying in parts, the extent of repair or replacement works that are required is unknown and a thorough condition survey is required to confirm this.

A visual inspection indicates that the kitchen windows are in reasonable condition. The sheltered position of the window, facing the covered access gallery, limits exposure to the elements. The painted finish on the frames also provides a supplementary measure of protection.

The life expectancy of windows varies significantly with usage, weather/exposure, installation, maintenance, and quality of materials. As a general rule, the life expectancy of a painted softwood frame, such as those on the north elevation, is typically 20-40 years on average. The typical life expectancy for aluminium frames is 30-45 years, therefore, the frames have exceeded their expected lifespan.

Please note that these windows would fail to meet many modern regulations, including thermal performance standards and current safety standards for new homes.

The original sliding aluminium bar appears to be missing on some of the unframed sliding windows, leaving a gap for warm to escape out of.

Ventilation panels have been retrofitted into some windows and some have subsequently been covered to stop any draughts.

The original aluminium frames and runners are weathered and stiff, showing signs of oxidisation.

4.5 Comfort

The building fabric, including the windows, is a significant factor in how comfortable a building feels. Focusing on the windows in particular, this includes technical, thermal performance, but it also includes factors such as ease of use.

To help the team understand what it's like to live on the Golden Lane Estate, a Residents' Comfort Survey was undertaken across the whole Estate in 2020. Responses included twelve residents of Cullum Welch House, accounting for 17% of residents in this block. Although a small sample, there are clear, shared experiences within the building. The responses are highlighted on the right.

This anecdotal information from residents, combined with the condition of the existing windows, confirms that it is likely that a number of households are living in unhealthy, cold homes and that air quality is compromised and condensation problems are widespread, leading to a higher likelihood of health issues, both physical and mental.

Please note that the survey was undertaken in early 2020, therefore, the responses don't take into account the increase in energy prices which have been steadily rising, with a recent, significant jump in late 2022.

33% consider the comfort of their home to be between 0-5 (0 is extremely uncomfortable and 10 is extremely comfortable)

67% feel draughts and have uncomfortable places to sit in their home, especially close to the windows

50% suffer from condensation or mould growth

50% feel their flat is hot and uncomfortable in the summer months

75% feel their windows don't open sufficiently to get good ventilation

note that whose windows don't open sufficiently cite the windows poor condition as the primary reason for keeping them closed. Difficult operation is also cited.

50% keep their windows closed due to external noise and pollution

8% feel the air in their flat feels fresh when the heating is on

83% feel that their home heats up quickly, but

67% feel their home loses heat quickly when the heating is turned off

42% live in colder conditions than they would like to save money on heating bills

5.0
Evaluation

5.1 Heritage

For Cullum Welch House, the materials used for the windows are referenced in the listing description. In addition, the window size, contributing to the qualities of light and space, is referenced within the Listed Building Management Guidelines, therefore, these details are deemed to be the most significant in heritage terms.

The Listed Building Management Guidelines state that the materials and components used are an important element of the estate's character and special interest. Among the most striking elements is the glazing. Repairs or replacements must be closely matched to maintain visual consistency, and there should be no generic changes to the materials used in the buildings' fabric, components or finishes, including aluminium or timber glazed screens, windows, doors and panels.

In addition, they also state that the characteristics of transparency, light and space are dominant throughout the estate. The architects' vision for all buildings, whether residential or communal, was that light and openness be experienced both internally and externally.

The specification of metal-framed windows in a residential building was innovative at the time of design and construction. It also facilitated the creation of light and airy interiors, as well as employing industrial methods of mass production, both central tenets of the Modernist movement. Therefore the use of aluminium opening lights, rather than traditional timber frames, at Cullum Welch House exemplifies its architectural interest as a pioneering piece of Modern architecture.

Further to references about the window design, of note is the economical use of space Cullum Welch House uses. With floor to ceiling glazing on the south facing façade and careful planning and detailing, the Cullum Welch House flats are the smallest of the estate.

Section 1.2.2.2 of the Listed Building Management Guidelines specifically references works to the 'Thermal and Acoustic Performance of Glazing and External Envelope'. It also states the following:

1. *Modifications to glazing, cladding and lining of structures may become necessary to resolve what appear to be widespread problems of noise and heat loss/retention across the estate*

2. *Any works to resolve these problems should be applied consistently across the block/blocks and the estate as a whole. Piecemeal interventions in individual flats which would have a seriously detrimental impact on the external appearance of the building should not be permitted.*

For this reason, piecemeal interventions on a 'flat by flat' basis has been ruled out. The Listed Building Management Guidelines also reference the window replacement works that have already taken place at Great Arthur House. The principles of this project can be applied across the Estate:

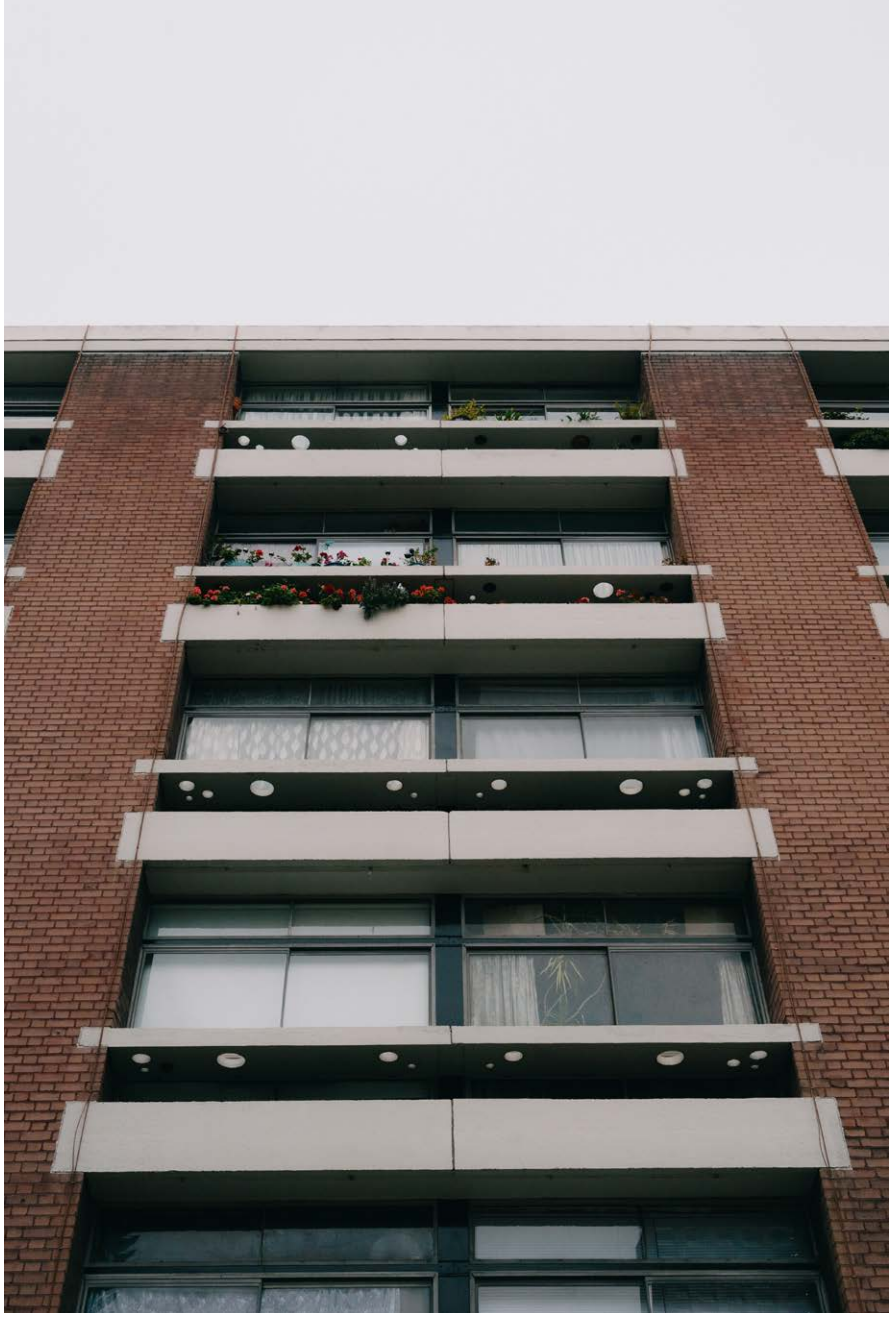
- *While the aluminium-framed glass cladding of Great Arthur House was state-of-the-art when completed in the 1950s, its performance and appearance have deteriorated over the years*

- *Where original details or material specifications have failed, it is likely to be necessary to develop a new and improved design*

- *The solutions proposed should respect the key visual intentions and character of the original design, whilst optimising environmental performance standards*

Quicktho

The aluminium windows found in Cullum Welch House and more widely across the estate were made by Wandsworth-based company, Quicktho, which also made them for Routemaster buses. A 1928 original advertisement for Quicktho promised “perfect ventilation and perfect, simple and easy control". In addition, "no rushing and tugging, rattling in windy weather and no more draughts".



Photograph of Cullum Welch House, showing the fully glazed south elevation and pre-cast concrete planters at floor and cill level, highlighting the holes for flower pots.

5.2 Condition and Comfort

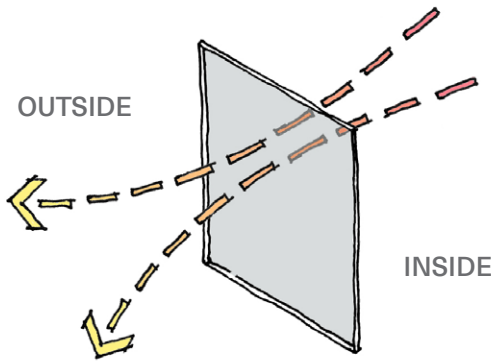
Despite being innovative at the time of design and construction, aspects of the mid-twentieth century detailing, including the thermal performance of the window frames/single glazing, combined with additional uninsulated elements of the building envelope, such as the external walls, means that heat is not retained once the source is turned off. Residents have described experiencing difficulties during cold winter conditions including high fuel bills, difficulty maintaining comfortable internal temperatures and condensation/ mould growth issues. The building's age and condition of windows is likely to be worsening this.

Without the benefit of double or triple glazing, heat from inside the flat escapes easily. This is exacerbated in the living/bed rooms of the Cullum Welch House flats, where most of the external wall is glass. Central heating, cooking, washing, bathing and breathing all add heat and moisture to the internal air. Condensation forms when warm moisture laden air hits a cold surface - whenever the external temperature is lower than the internal temperature there is potential for condensation to form on the inner surface of single glazing. This risk is significantly reduced/eliminated with double or triple glazing, where a cavity separates the inner pane from the lower, external temperature. Condensation tends to pool at the bottom of the timber frames, resulting in their deterioration. A lack of efficient ventilation within the homes then leads to mould growth in areas of lingering condensation.

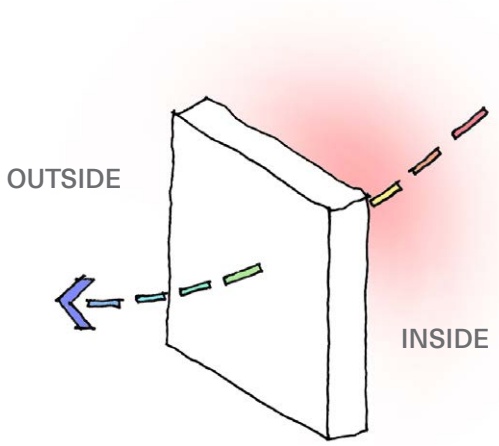
Older windows can often be draughty as over time they distort and gaps open up as joints become weakened. The seals, brushes, rollers etc. also wear out. The small gaps found around the window frames/openings mean that there is poor airtightness - the building is 'leaky' and draughty. Although adequate ventilation is important to limit condensation and mould, excessive, uncontrolled air leakage through windows is uncomfortable for occupants and wastes heat.

Overheating during the summer months also needs to be considered as part as climate resilient design proposals. Single glazing has a high g-value, which means it lets in a high percentage of the sun's rays which subsequently can't escape and cause flats to overheat in summer. Regardless of the efficiency of the glazing poor window condition and difficulty of operation will lead to further overheating if residents don't feel confident to open window and increase ventilation to 'purge' their homes on particularly warm days.

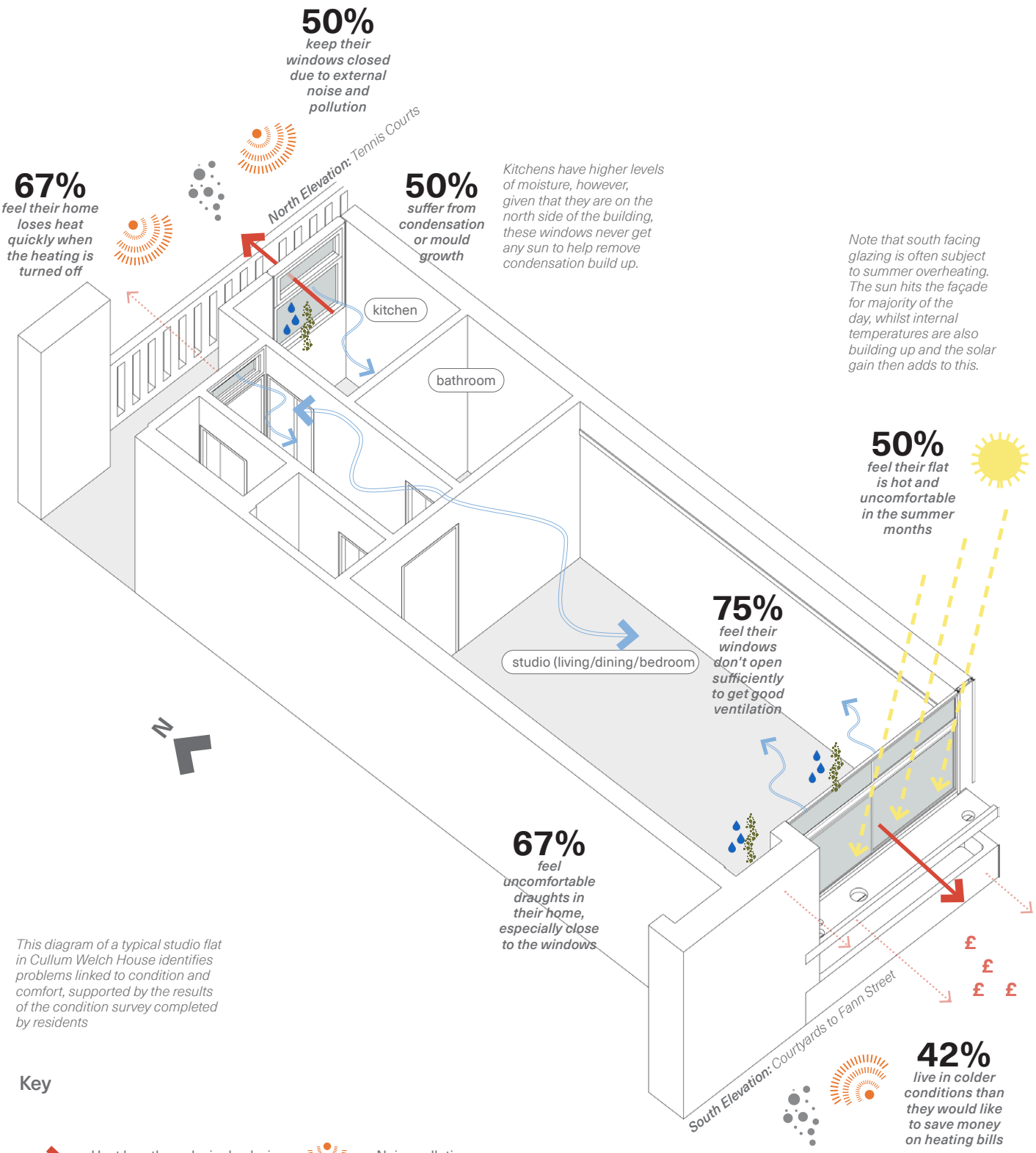
Noise is an issue for flats in Cullum Welch House, with tennis courts to the north and a large, hard-surfaced courtyard leading directly to Fann street to the south. A noise monitoring survey undertaken by AECOM at Crescent House confirmed that in addition to the road, noise levels from the internal courtyards (tennis courts) were also significantly higher than recommended guidance.



Heat loss through single glazing is significant as the glass has a high thermal transmittance - it is a very good transferer of heat (not good for heat retention in homes!). Glass is better at retaining heat when it is high performance (vacuum/ double/triple) and in an insulated (thermally broken) frame



Heat loss through external walls is less significant as a typical wall build up doesn not have a thermal transmittance rate as high as glass - it is better at retaining heat. External walls are even better at retaining heat when they are insulated



This diagram of a typical studio flat in Cullum Welch House identifies problems linked to condition and comfort, supported by the results of the condition survey completed by residents

Key

- Heat loss through single glazing
- Heat loss through external walls & thermal bridges (incl. window frame)
- Uncontrolled incoming air (draughts)
- Excess solar gains (summer)
- Noise pollution
- Air pollution
- Mould growth
- Condensation build-up

5.3 Environmental

To suppliment the information included in this report, it is recommended that Sustainability/Building Physics Engineers (Etude) are commisioned to produce a report which looks at the energy and sustainability improvement strategy for Cullum Welch House.

This should include modelling a sample dwelling against different refurbishment options using SAP (Standard Assessment Procedure) and PHPP (Passive House Planning Package) calculations, in addition to detailed thermal bridge modelling for key junctions. The scope of the study should also include a review of the ventilation strategy.

In addition to Etude's work which will focus on operational carbon and possible cost savings for residents, it is also recommended that emobided carbon calculations are undertaken to understand the whole life carbon associated with each of the approaches being considered by City of London.

5.4 Structural

It is also recommended that Structural Engineers (Stand) are commissioned to produce a report which reviews the building structure of Cullum Welch House. This should include a summary of the existing structure, context for the original structural design and a structural assessment of differet refurishment options.

Note that when John Robertson Architects were undertaking window upgrades to Great Arthur House, investigation into the existing façade structure revealed several cost-saving construction short cuts e.g. the Quicktho extrusions had been applied using wood screws in horizontal teak boards that were fixed to the concrete slabs. It is critical that these investigations take place to help to mitigate risks associated with working with an existing building.

6.0

What Can Be Done Now?

6.1 Overview

Studio Partington have undertaken a detailed analysis of the windows in Cullum Welch House, encompassing design, condition, residents' comfort and heritage significance. Further analysis of structure and thermal performance by expert consultants within the wider design team is recommended as part of the options review process.

On the basis of the analysis completed to date, several options for window improvements have emerged. Each bring with them their own set of advantages and disadvantages, which will need to be weighed against each other in order to make a considered decision regarding any proposed work to the windows.

There are two core options for how the window improvements can be approached: refurbishment or replacement. A summary is provided overleaf, supplemented with an options comparison provided in diagram and table format over the following pages.

A hybrid scenario was also considered as part of this process - the installation of secondary glazing to the inside of the flats. Secondary glazing has been installed in other flats on the Estate, however, this has not been successful. While secondary glazing can have an impact on heat loss and draughts, it has exacerbated condensation problems and due to the bespoke nature of the windows on the Estate, is visible from the exterior, changing the elevation of the building. Loss of internal space is highly likely, which would reduce usable space in already compact homes, such as the studio flats in Cullum Welch House.

REFURBISHMENT

When considering heritage and thermal performance, refurbishment is the **lowest impact** option. This could be summarised as resulting in a positive/neutral heritage impact, but a poor thermal performance impact:

Heritage:

Thermal:

Refurbishment is the option which would result in the least amount of change from a heritage perspective, but it also means that there is the least amount of improvement from a thermal performance/resident comfort/ease of use perspective.

It's worth noting that low impact does not mean minimal disruption for residents during the construction phase. Refurbishment requires expert craftsmanship which can be time consuming and may not negate the need to remove and/or replace the existing windows.

REPLACEMENT

When considering heritage and thermal performance, refurbishment is the **highest impact** option. This could be summarised as resulting in a negative heritage impact and significant and positive thermal performance impact:

Heritage:

Thermal:

Replacement is the option which would result in the most change, from a heritage perspective and also a thermal performance/resident comfort/ ease of use perspective.

It's worth noting that although this option is high impact, it does not mean it will be the highest level of disruption to residents. When planned effectively, replacement can be a time efficient solution.

6.2 Summary of Changes

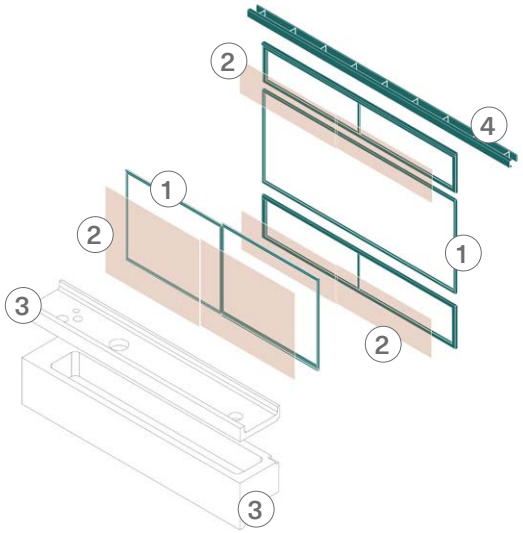
The diagrams on this page highlight the different elements which make up a typical window at Cullum Welch House and specifies how each of those elements will likely change within each approach.

In all approaches, improved, high-performance glazing is proposed. Single glazing is typically 3-6mm thick, vacuum glazing is 8-9mm, high-performing double glazing is nominally 32mm and triple is notionally 44mm thick. In the refurbishment approach, in order to utilise the existing frames, the only high-performance glazing that would be thin enough is vacuum glazing. A small adjustment to the rebates for the glass would be required for this. If the replacement option is undertaken, new frames can be designed to take vacuum, double or triple glazing thicknesses.

It's important to note the following:

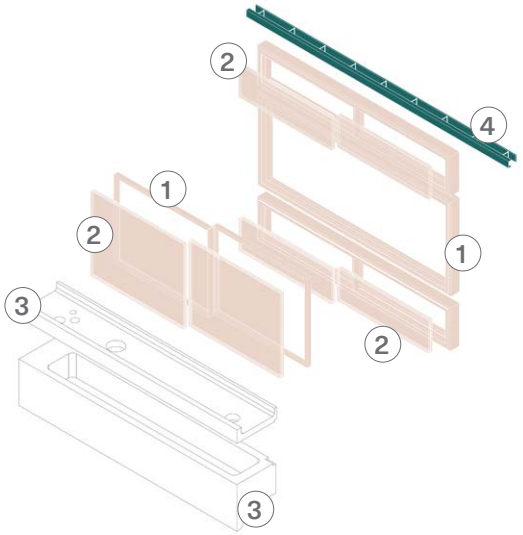
- A percentage of the window frames in the 'refurbishment' option could require replacement, where frames cannot be repaired effectively. These replacements will match the existing like for like.
- Within the full replacement approach, the configuration and style of the openings and proporations of the windows will be the same as existing. Replacement frames will be matched to the existing design intent as closely as possible, however, certain changes will be unavoidable, such as frame thickness.

REFURBISHMENT



- REFURBISHED (repairs/partial replacement where needed)
- NEW
- ① **refurbished** aluminium frame
- ② **new** vacuum glazing
- ③ **existing** pre cast concrete planter
- ④ **refurbished** steel C-section, with existing timber rail (internal)

REPLACEMENT



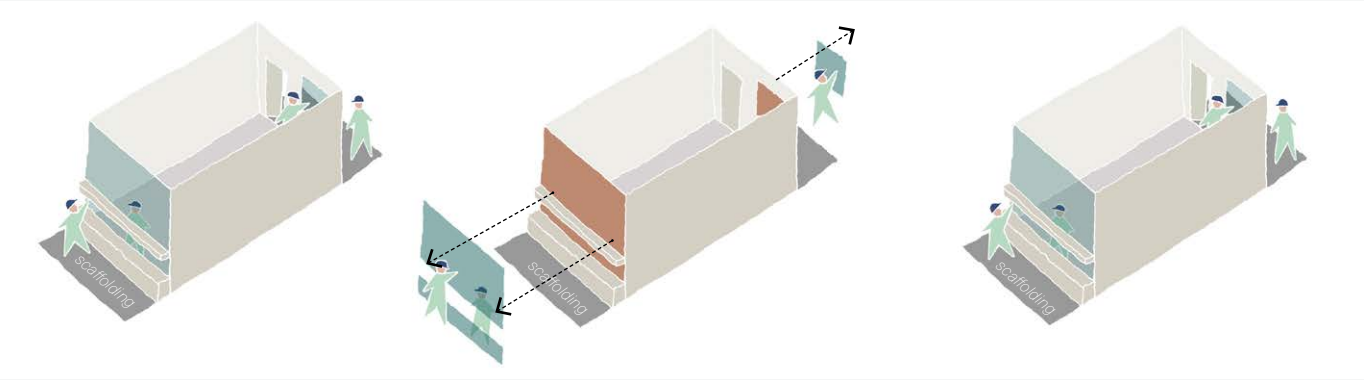
- REFURBISHED (repairs/partial replacement where needed)
- NEW
- ① **new** aluminium frame
- ② **new** high performance glazing
- ③ **existing** pre cast concrete planter
- ④ **refurbished** steel C-section, with existing timber rail

6.3 The Process

The diagrams below describe the anticipated process of works for the refurbishment and replacement approach for each flat. This includes works on site vs off site and inside the flat vs outside (accessed via scaffolding).

Given the varied extent of deterioration across the building, the time-frame attached to the refurbishment process is unknown and will likely differ flat to flat, potentially taking a significant period of time to complete. When considering the replacement approach, given that the windows will be manufactured off site and every flat will be treated the same, the time-frame attached to this process can be predicted and only the number of windows in a flat will cause variations.

REFURBISHMENT



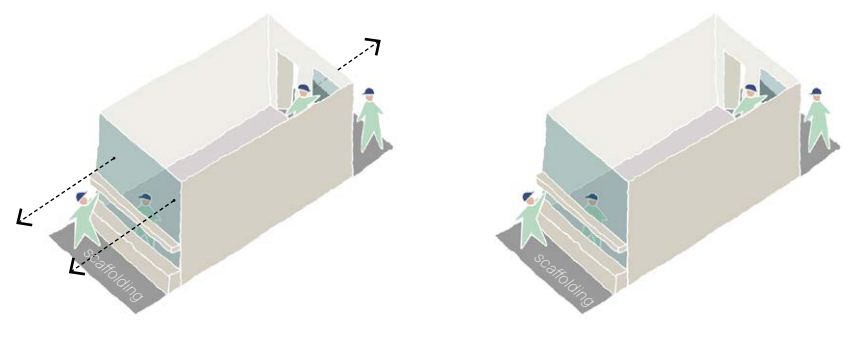
Step One: *Repairs/refurbishment works take place internally and externally, with windows remaining in situ.*

Step Two: *Significant repairs to some flats may require windows to be fully removed and taken to a factory to be refurbished off site. Temporary windows/boarding required in this instance.*

Step Three: *Any windows which were taken off site are returned and re-installed. Where windows couldn't be refurbished, new, replacement windows are installed in their place. Any making good which is required internally takes place.*

timeframe will vary on a flat by flat basis, dependant on extent of damage

REPLACEMENT

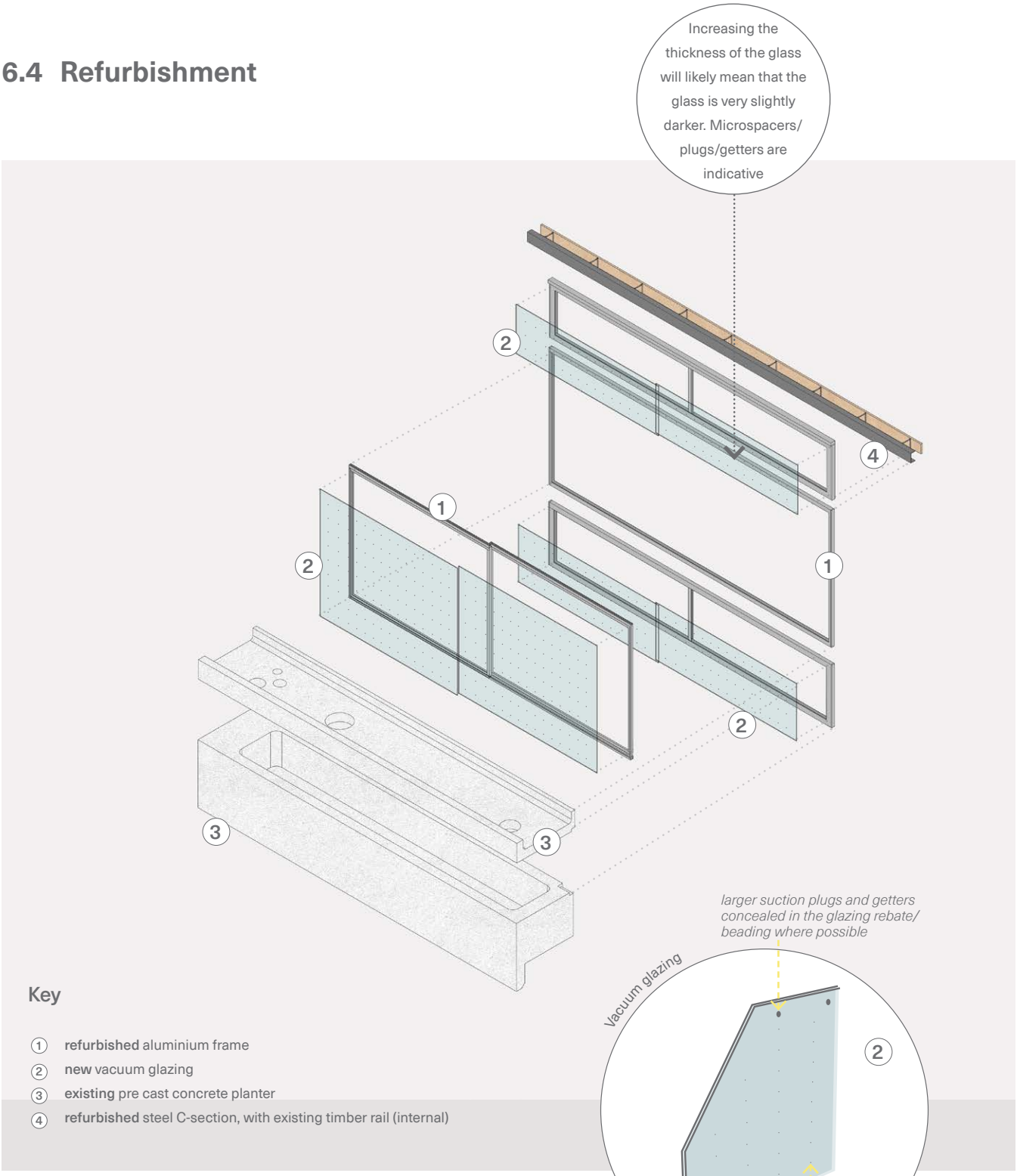


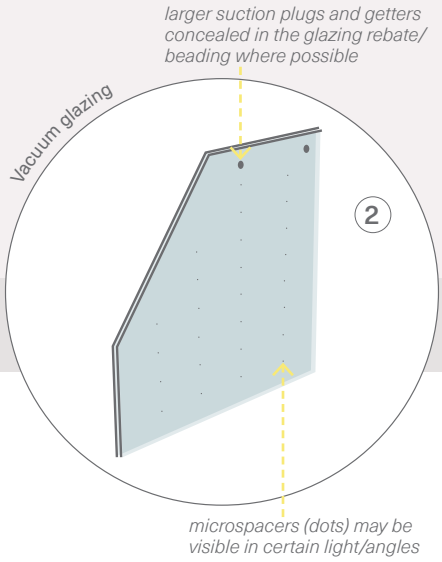
Step One: *New windows arrive on site ready for installation. Existing windows are removed for recycling.*

Step Two: *New windows are immediately installed, alongside any making good which is required taking place internally.*

timeframe can be predicted and is reduced by off-site manufacture

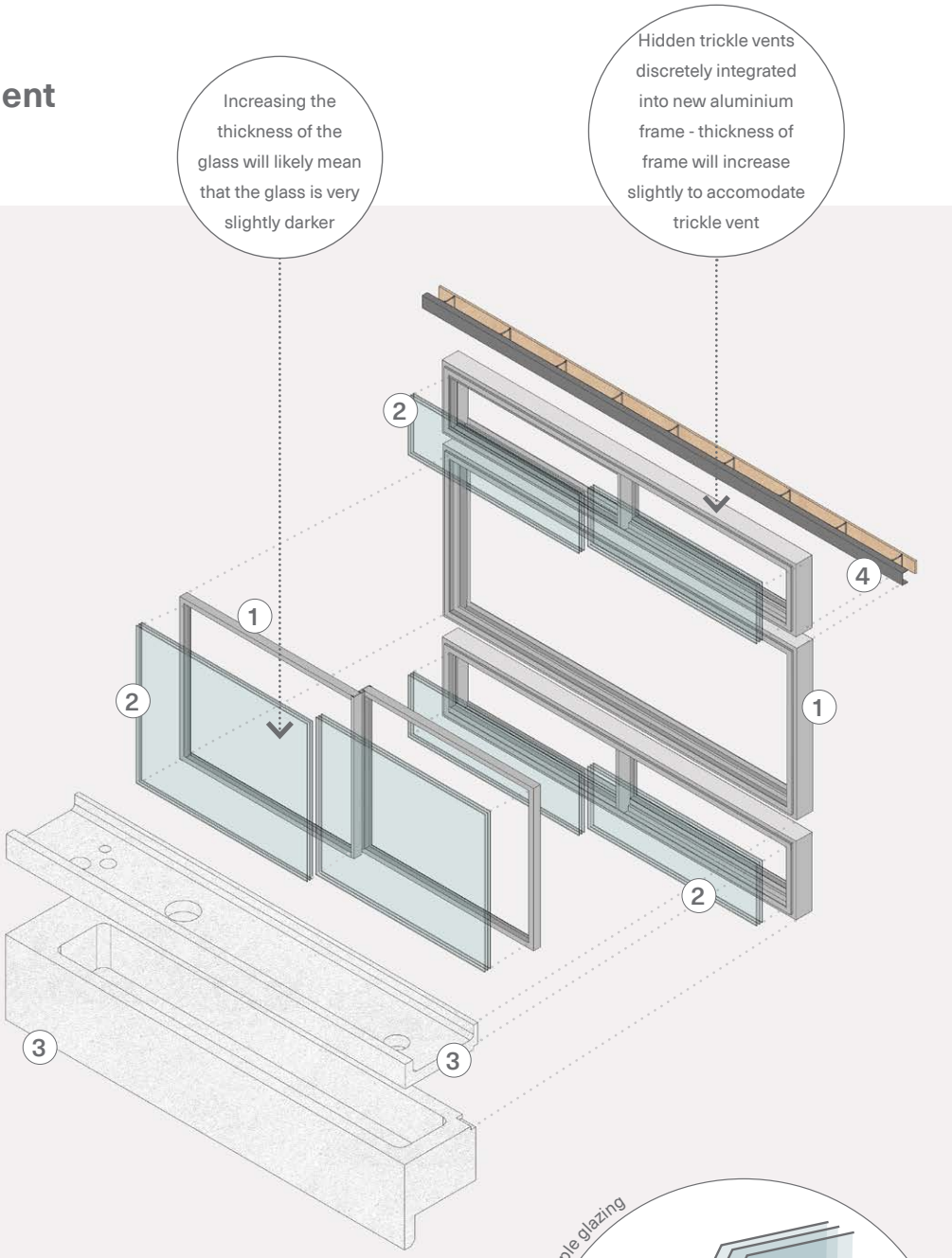
6.4 Refurbishment





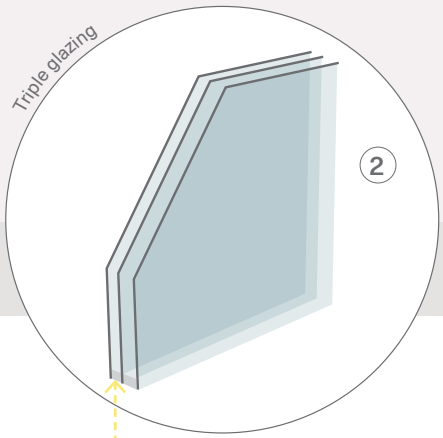
This drawing highlights the different elements of a typical, **refurbished** *window at Cullum Welch House. The principles can be applied to all windows in the block, apart from the north facing softwood window (these are not described as significant in heritage terms). Principally. the vast majority of the frames are aluminium and open by moving horizonally or vertically.*

6.5 Replacement



Key

1. **new** aluminium frame
2. **new** high performance glazing
3. **existing** pre cast concrete planter
4. **new** steel C-section, with existing timber rail (internal)



spacer bar and seals are likely to be visible

This drawing highlights the different elements of a typical, **replacement** *window at Cullum Welch House. The principles can be applied to all windows in the block, apart from the north facing softwood window (these are not described as significant in heritage terms). Principally, the vast majority of the frames are aluminium and open by moving horizonally or vertically. High performance glazing could be vacuum, double or triple, however, triple glazing is shown as this would have the maximum impact.*

6.6 Options Comparison

Cullum Welch House: Options Comparison Table (1 of 3)		
	Refurbish frames and retrofit with vacuum glazing	**Replacement frames with high-performance glazing**
Disruption to Residents / Logistics	• *Windows remain in situ, though extensive refurbishment is likely required from inside the flat. Scaffolding likely required for external refurbishment.* • *Duration of work is unpredictable/will vary between flats, dependent on extent of refurbishment required.* • *Significantly damaged windows would need to be taken off site for repairs and re-installed.* • *Reduced deliveries/storage on estate - new glazing only .*	• *Windows removed and new unit (frame and glazing) installed. Bulk of the work will happen externally from scaffolding. Minimal work to take place inside the flat.* • *Greater certainty regarding the time required to execute the work.* • *Delivery of windows would need to be carefully coordinated. Possible increased storage required on estate for new window units.*
Acoustics	• *The existing frames and poor sealing is a path for noise - this can't be improved through refurbishment.* • *Improved acoustic performance of glazing when closed. Lack of air cavity between panes of glass further reduces ability of noise to travel between outside and inside. Note that upgrading the glazing will not change the impact of noise when the windows are open.*	• *Improved acoustic performance of glazing when window is closed. Note that triple glazing is demonstrably better than the vacuum or double. Note that upgrading the glazing will not change the impact of noise when the windows are open.*
Ease of Operation	• *Operation of windows (including ironmongery) remains as existing. Improved condition may improve ease of use to some extent.*	• *New window and associated ironmongery, significantly improving ease of use. Opportunity to make ironmongery more accessible.* • *Note that triple glazed openings may increase slightly in weight.*
Ease of Maintenance	• *There are limited suppliers of this bespoke product, therefore, any breakages/replacement glazing will likely have a 16 week lead time.* • *Continued maintenance required for refurbished frames until end of life. Note that Vacuum glazing is not yet thoroughly tested.*	• *Triple glazing is a more standardised glazing system and easier to replace, meaning it is quicker and cheaper to replace.* • *New frames will need less maintenance in the medium term and will carry a warranty. Continued maintenance then required until end of life.*

Cullum Welch House: Options Comparison Table (2 of 3)		
	Refurbish frames and retrofit with vacuum glazing	**Replacement frames with high-performance glazing**
Capital Cost	• *Given that the extent of repairs/replacement is unknown, it is difficult to predict capital costs for the works. Multiple/extensive repairs require skilled workers on site and a longer process, which could impact costs.* • *Note that the capital cost of vacuum glazing is higher than triple glazing.* • *Cost estimates to be provided by a cost consultant based on condition survey, for resident review and cost/benefit analysis alongside proposals.*	• *Full replacement provides the benefit of economies of scale and a more efficient construction period, utilising off-site manufacture.* • *Cost estimates to be provided by a cost consultant, for resident review and cost/benefit analysis alongside proposals.*
Operational Cost and CO_2 Savings	• *Estimated operational energy and cost savings to be provided by Etude. As a general rule, the higher impact the thermal performance improvements in the building fabric, the higher the savings, therefore, refurbished windows will see a smaller reduction in operational cost and CO_2*	• *Estimated operational energy and cost savings to be provided by Etude. As a general rule, the higher impact the thermal performance improvements in the building fabric, the higher the savings, therefore, replacement windows will provide the best performance and therefore biggest cut in operational cost and CO_2*
Thermal (Heat Loss)	• *A u-value can be provided for the centre pane (glazing only) and for the overall window. Expected centre pane u-value of up to 0.7 for vacuum glazing, however, this will increase (become worse) when the whole window, including frame, is taken into account.* • *It is recommended that specific u-value calculations are undertaken for the different types/sizes of windows, factoring in the existing frame to provide overall window u-values.* • *Refurbished frames will remain a significant cold bridge, therefore, condensation consideration is critical and the risk will never be fully mitigated, particularly in the winter months.*	• *Expected centre pane u-value of up to 0.55 for 44mm triple glazing.* • *It is recommended that specific u-value calculations are undertaken for the different types/sizes of windows, factoring in the existing frame to provide overall window u-values.*
Weathertightness	• *Little change compared to the existing. Repairs to the frame and replacement beading could help where the timber is particularly degraded. Sectional repairs to frame could create 'weak points'.*	• *Improvement through installation of full replacement window units.*

Cullum Welch House: Options Comparison Table (3 of 3)		
	Refurbish frames and retrofit with vacuum glazing	**Replacement frames with high-performance glazing**
Embodied CO_2 (CO_2e)	• *Note that the embodied carbon in glass is particularly high in comparison to other materials due to being process intensive. Embodied carbon calculations have been undertaken for Crescent House as part of the options analysis. The same process is recommended for Cullum Welch House.* • *For Crescent House, the whole life carbon analysis for vacuum glazing with refurbished frames is higher than the triple glazed, full replacement. The limited suppliers of vacuum glazing means that the travel distances to the UK can be significant.* • *The embodied carbon associated with retained frames (aluminium and timber) would be saved.*	• *Note that the embodied carbon in glass is particularly high in comparison to other materials due to being process intensive. Embodied carbon calculations have been undertaken for Crescent House as part of the options analysis. The same process is recommended for Cullum Welch House.* • *For Crescent House, the whole life carbon analysis for full replacement with triple glazing is lower than the vacuum glazing approach.* • *There is additional embodied carbon associated with new timber and aluminium frames and removal of the existing. It is important that the responsible disposal of the existing frames is considered e.g. recycled. Any timber removed should not be left to rot.*
Heritage/Visual Impact	• *Original design intent would be maintained.* • *Retains as much of the original timber & steel frames as possible. None of the glazing retained.* • *Some adaptation of existing frames may be required to accommodate the increased thickness of vacuum glazing.* • *Existing window ironmongery retained.* • *Minor change to the appearance of the window, owing to the darker tint of vacuum glazing and use of microspacers which read as dots.*	• *Original design intent would be maintained as new frames will match as closely as possible and replicate the existing materials.* • *None of the original frames or glazing retained.* • *New frames will be thicker than existing due to thermal break (insulation) to frame and to accommodate the increased thickness of the glazing.* • *No space will be lost internally, however, externally on the south elevation, the concrete planters will appear slightly shorter due to thicker windows.* • *None of the existing window ironmongery retained. Design details of replacement ironmongery to be developed.* • *Some change to the appearance of the window, owing to the darker tint of high performance glazing.* • *New windows provide the opportunity to include trickle vents, to improve background ventilation and help mitigate condensation.*

6.7 Technical Compliance

Any works undertaken at Golden Lane must comply with a set of industry standards, described in England's Building Regulations (2010). It is acknowledged that no matter the approach chosen, the proposed upgrade to the windows at Cullum Welch House will need to comply with current, relevant regulations. Building Regulations are there to protect the health and safety of people in and around buildings and guidance for compliance is included in a suite of Approved Documents.

The following Approved Documents are relevant to the windows works and the guidance will be consulted throughout the project to ensure compliance: Certain Approved Documents have exemptions for listed buildings - in this instance, the Approved Document will still be used as best practice and full compliance will be sought wherever possible.

Approved Document A: Structure
Regardless of which approach is chosen, the weight of the windows is going to increase and the loadings will be confirmed to ensure that the existing building has the structural loading capacity to accommodate these changes.

Approved Document B: Fire Safety
The guidance in Approved Document B focuses specifically on fire safety regulations. From the 1st of December 2022, the latest versions of the Fire Safety Act and Approved Document B - Volume 1 (dwellings) will come into effect. These documents set out the regulations around fire safety in dwellings (including blocks of flats) and outline the following three key conditions to consider:

1. The height of the top floor
2. The distance from any relevant boundary
3. The control of combustible materials, in association with the above

Building Height
The top floor of Cullum Welch House, measured from the general external level of Fann Street to the South, is 19.8m.

For any building over 18m, the document states that "any insulation product, filler material (such as the [...] window spandrel panels [...] used in the construction of an external wall should be class A2-s3, d2 or better." This means the material needs to be non-combustible, however, the regulation clarifies that this does not apply to “window frames and glass”.

Relevant Boundaries
The relevant boundaries to the North, East and South of Cullum Welch House are all greater than 1m. The block abuts Crescent House on the West façade, therefore, this boundary is less than 1m.

The regulations specify that “the external wall of a building should not provide a medium for fire spread” and that designs should reduce the “risk of ignition from flames coming from adjacent buildings”. If the top floor of a building is above 18m and has a relevant boundary which is less than 1m to another building, then the external surface of the walls must be non-combustible (of class A2 or better). However, window frames and glass are excluded from this regulation.

Sketch section through the shorter end of Cullum Welch House, highlighting the height of the uppermost floor level.

Approved Document F: Ventilation
This document states that when building work is carried out that will affect the ventilation of the existing dwelling, for example, replacing a window, the ventilation of the dwelling should either meet the standards in the relevant approved document or not be less satisfactory than before the work was carried out. The checklist for existing dwellings states 'Make a visual check for mould or condensation. If either are present, install additional ventilation provisions or seek specialist advice'. Compliant ventilation proposals will be made.

Approved Document J: Combustion appliances and fuel storage systems
The required safe distance between a gas flue extraction point and opening windows/vents is outlined in this document. Flue locations will be reviewed alongside window openings and any new vents e.g. trickle vents.

Approved Document K: Protection from falling, collision and impact
Certain windows at low level within each home will need to comply with protection from falling, collision and impact requirements, which can include glass specification and opening mechanisms.

Approved Document L: Conservation of fuel and power
This document provides minimum requirements for renovation of existing elements and/or new building elements in existing dwellings, such as windows. It covers areas such as U-values and air tightness.

Approved Document M: Access to and use of buildings
Guidance is provided on how to create accessible dwellings for residents and/or visitors. Undertaking any building works to an existing dwelling provides an opportunity to review and/or improve it's accessibility.

Approved Document O: Overheating
This document has a strong intersect with Part F and window design. Overheating mitigation must factor in noise, pollution and security, among other considerations. This document only applied to new homes, therefore, is not a requirement for Cullum Welch House, however, the potential to reduce summer overheating will be considered.

Throughout the project development, the design team will continue to have regular discussions with Building Control, to ensure any proposals made comply with all relevant Building Regulations.

CDM 2015

The Construction (Design and Management) Regulations 2015 cover the management of health, safety and welfare when carrying out construction projects. There are a number of roles defined within CDM 2015: namely designers, contractors, a Principal designer and Principal contractor.

CDM 2015 focuses specifically on either pre-construction and construction information. Studio Partington are undertaking the Principal Designer role and subsequently will coordinate the pre-construction health and safety information required by the regulations. This will include understanding and mitigating risks associated with working on existing buildings, such as asbestos.

7.0

Whole House Retrofit

7.1 A Whole House Approach

This project focuses on window upgrades to the residential blocks on the Golden Lane Estate and the final design which gets delivered on site should create healthier, more affordable and more comfortable homes. That said, to create truly healthier and comfortable homes, the windows cannot be considered in isolation. For the project to be a success, best practice is that a whole house approach is taken.

Piecemeal retrofit of a building, whereby individual fabric elements are upgraded in isolation of each other, can lead to unintended consequences. Heat will escape through the weakest part of a building fabric and until all of the external envelope is performing better, heat will continue to find a route out of the home. There are various aspects of each home that should be considered holistically alongside any works to the windows (see diagram overleaf).

Without considering these measures together, the impact that the window works have will be less significant and could, in some instances, make the condition within the flats worse in certain areas. If we don't address other thermal bridges in the building fabric, which allow heat to escape, the thermal efficiency of the flats cannot be fully optimised.

It is acknowledged that many of these measures and the associated possible solutions will be subjective to residents and other stakeholders and not all of them will be appropriate for this building type, however, the design team feel it is important to highlight these thermal comfort measures alongside the window considerations. These improvements also allow the building to be brought as close as possible to the current thermal performance standards in the Building Regulations.

PAS 2035

Following several poor examples of single measure retrofit projects, a best practice guide was developed for retrofit works, called PAS 2035. This document details how to carry out quality energy retrofits of existing domestic buildings, alongside best practice guidance for implementing energy efficiency measures.

What makes PAS 2035 unique is that it outlines a whole house/building approach to the retrofit process, considering the home, environment, occupancy and the improvement objectives of the client. Regardless of whether all of the measures listed in this section happen now or in the future, they must be considered alongside the window works. In line with the principles of PAS 2035, it is essential that a retrofit plan is developed for how/when the changes will take place.

The framework ensures that quality retrofit is achieved, eliminating the issue of retrofit work being considered in isolation (which can unintentionally damage the overall building performance).

The key aspects for consideration and coordination:

1. ***Thermal bridges & heat loss through fabric***
   Due to the concrete elements of construction and lack of insulation within the building envelope. heat is transferred and lost through the fabric and key junctions.

2. ***Air infiltration***
   Excess air infiltration is experienced as cold draughts, particularly near windows.

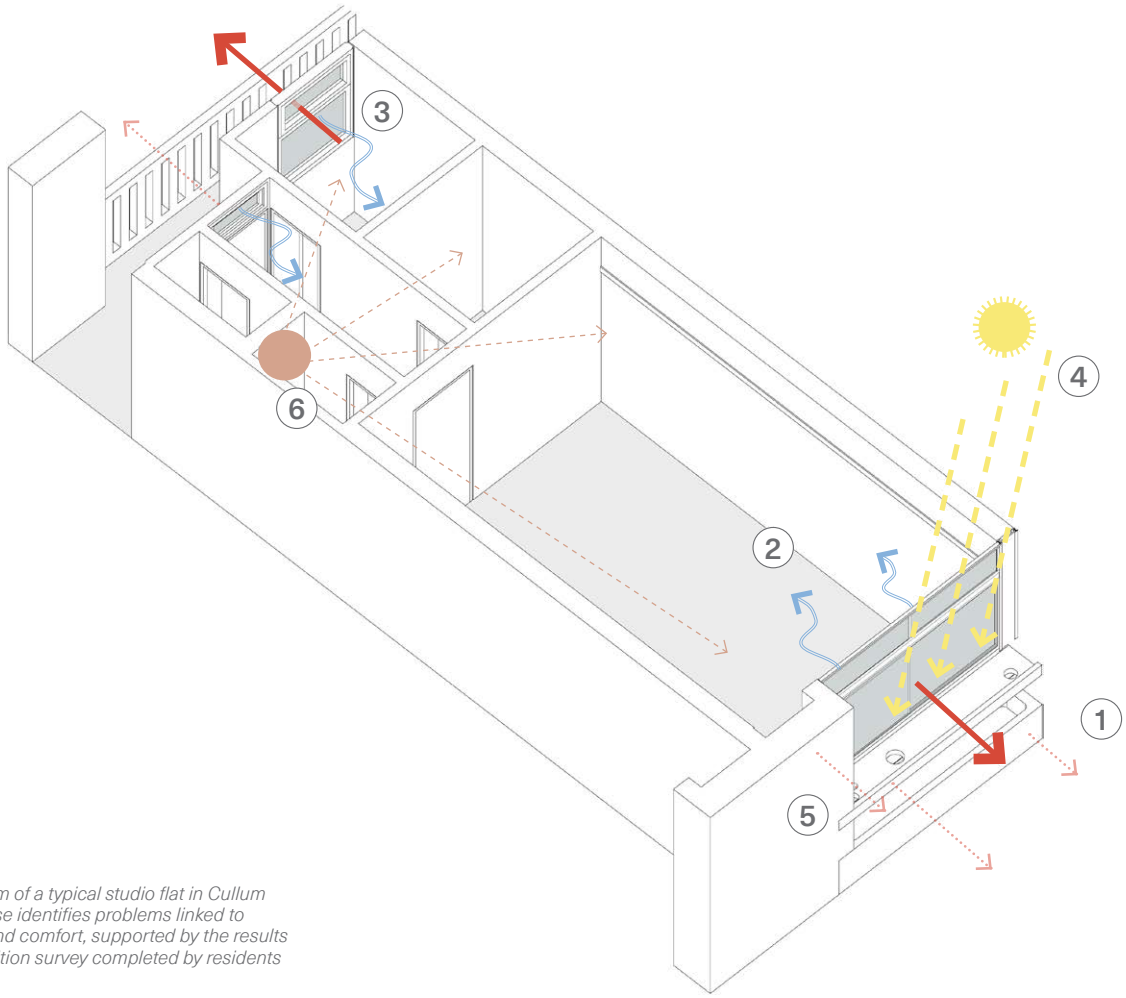
3. ***Ventilation***
   Moisture is not being effectively removed from all homes. None of the existing windows have trickle vents for background ventilation and there is no mechanical background ventilation.

Additional factors to be considered:

4. ***Solar heat gains***
   Solar gains from the south provide free heat on sunny days in the winter but means that this side of the home can suffer from overheating in summer.

5. ***Thermal mass***
   Concrete and brick is thermal mass - it absorbs, stores and releases heat slowly. In summer this helps to keep homes cool, but in winter it can mean that they take longer to heat up

6. ***Heating System***
   Ineffecient heating systems increase energy consumption and energy bills. Also, increased maintenance costs



This diagram of a typical studio flat in Cullum Welch House identifies problems linked to condition and comfort, supported by the results of the condition survey completed by residents

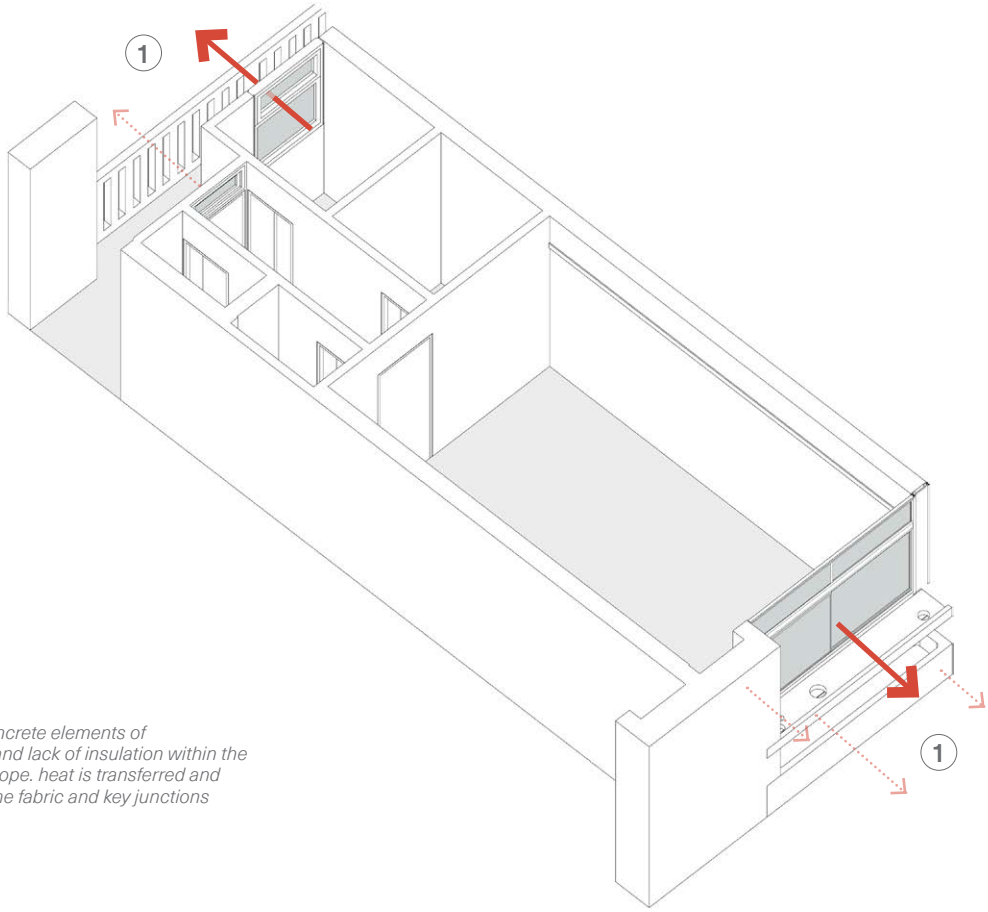
7.2 Heat Loss Through Fabric

The fabric of the buildings at Golden Lane Estate is generally in good condition for the age of the buildings, however, it is poorly insulated and sealed. Similarly to most of the other blocks on the estate, the walls of Cullum Welch House do not have cavities and are not insulated.

The uninsulated concrete planter and brick construction of Cullum Welch House means that a number of significant thermal bridges exist. This means heat is transferred and lost through the building envelope and key junctions, including external walls, floors, roofs, windows and doors. In addition, the existing window frames are not thermally broken, which means that they are not insulated. This creates a significant thermal bridge where heat can escape from inside the flat.

Possible, high level solutions are included below:

- **Windows/doors (confirmed):** Improvement of the windows thermal performance. New frames would be thermally broken, further reducing thermal bridging and heat loss.
- **External walls:** In addition to this, install insulation to the cavity to the external walls. Where there is no cavity, install insulation internally or externally, to ensure that the existing poor thermal performance isn't exacerbated by the improved windows.
- **Roof:** In addition to this, install insulation to the roof, internally or externally.
- **Floor slab:** In addition to this, install external insulation to any exposed floor slab



1 *Due to the concrete elements of construction and lack of insulation within the building envelope. heat is transferred and lost through the fabric and key junctions*

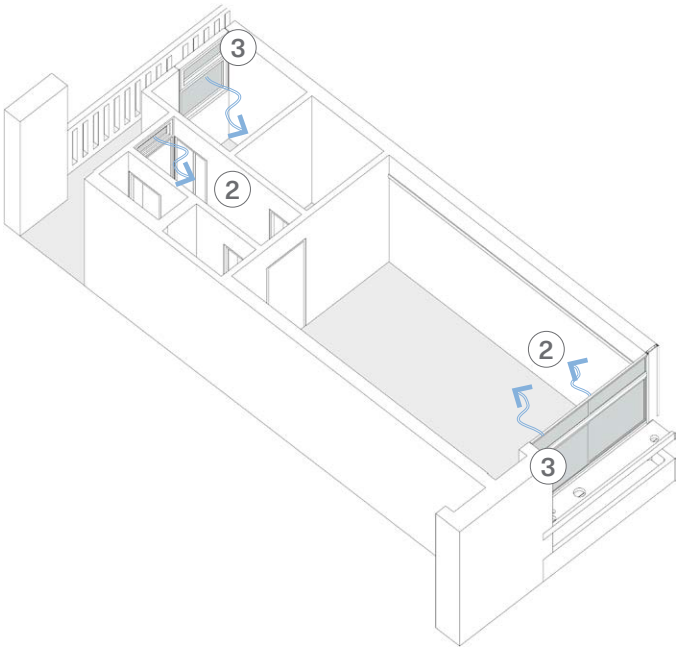
7.3 Air Infiltration

Poor airtightness can be attributed to gaps (big and small) in the building fabric. Excess air infiltration is experienced in homes as draughts. Majority of these draughts are felt due to poorly sealed windows and doors, which reduce the airtightness of the dwellings and subsequently increase heat loss.

Possible, high level solutions are included below:

- **Windows/doors:** Improved seals to windows and doors and airtightness around structural openings to help keep the heat inside the homes. New windows/doors installed with improved airtightness.
- **External walls/junctions:** Improved airtightness throughout the flat through installation of airtightness material e.g. airtightness tape.

2 *Excess air infiltration is experienced as cold draughts, particularly near windows*



7.4 Ventilation

Ventilation in homes keeps air fresh and - in addition to controlled ventilation in homes keeps air fresh and - in addition to sufficient levels of heat - ensures moisture is effectively removed from the internal environment, preventing condensation and mould growth.

There is currently uncontrolled ventilation due to gaps in the windows/frames, leading to high levels of heat loss, without removing condensation build up. As homes become better insulated and more airtight, the addition of controlled ventilation is even more important.

Possible, high level solutions are included below:

- **Trickle vents:** New windows can incorporate trickle vents within the frame to provide background ventilation .
- **Centralised Mechanical Extract Ventilation (MEV):** One unit that can extract air from multiple spaces within the homes. Window vents or natural leaky fabric required for replacement air.
- **Mechanical Ventilation with Heat Recovery (MVHR):** As homes are constructed or retrofitted with higher levels of insulation and airtightness, MVHR is increasingly being used to provide fresh air without losing heat through uncontrolled gaps in the building envelope e.g. leaky fabric or users opening windows. Combining this with heat recovery means that incoming fresh air is heated using the old, heated air which is being extracted, further reducing heat loss.

3 *Moisture is not being effectively removed from all homes. None of the existing windows have trickle vents for background ventilation and there is no mechanical background ventilation*

7.5 Additional Factors

Thermal Mass

Concrete and brick are thermal mass. Thermal mass absorbs, stores and releases heat slower than lightweight materials such as timber. In summer, this helps to keep homes cool as excess heat is slowly absorbed during the day. If the home is suitably ventilated at night the concrete can cool down again and recharge ready to absorb heat the next day.

However, this also means in winter the concrete will also absorb heat from the heating system, so homes can take a little longer to warm up at the beginning of the heating season.

Solar gains

Solar gains from the south elevation provides homes with free heat. It can also mean that this side of the home is warmer than the north side.

The kitchen is a room which generate a lot of moisture, however, it is consistantly located on the north side of the building where it will not benefit from solar gains, likely exacerbating condendation problems here during the winter. In the summer, the main living/bedroom space on the south side of the building can suffer with overheating, which needs to be considered within the proposals.

Heating

Heating and hot water in the flats is currently provided via gas boiler. Individual boilers were installed when the district heating system was decommissioned. Generally, the boilers have been installed within the kitchens and the boiler flues are fixed through the external wall on the north elevation. Building regulations have guidance on the minimum distance a horizontal extract flue can be from an opening window when the flue serves a gas boiler. The regulations state that the flue should be 300mm from the opening window or vent. Any works to the windows will trigger the need to comply with these regulations.

Looking to the future, with the eventual phasing out of gas boilers and the Corporation aiming to achieve Net Zero in operations by 2027, and across its full value chain by 2040, the current window works also provide an opportunity to begin the transition to a low-carbon heating system ahead of the de-carbonisation of the national grid.

8.0

Conclusion

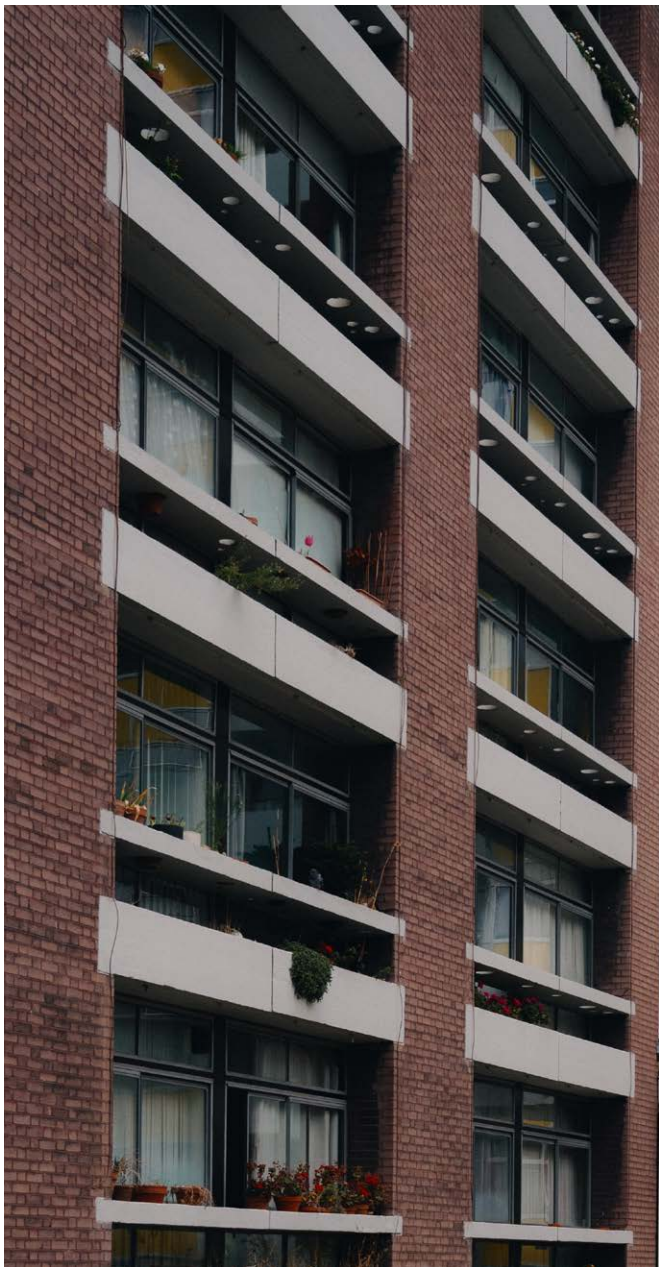
8.1 Concluding Remarks

The Golden Lane Estate is an extremely valuable example of post-war architecture and urban planning in London. Cullum Welch House forms an important part of this history - recognised by it's Grade II listed status. The proposed window works will adhere to the Listed Building Management Guidelines, whilst balancing an increasingly urgent need to retrofit our existing building stock in response to the climate emergency.

Ultimately, there is no single optimal solution to the numerous challenges posed by the condition of the flat windows across the estate. Compromises are inevitable, if the competing goals of heritage, climate, cost and disruption are to be given proper consideration and suitably addressed. The research and design work undertaken to date - and summarised in this document - has narrowed the window upgrade approaches at Cullum Welch House down to two. The first involves refurbishing the existing frames and retrofitting them with vacuum glazing; and the second, replacing the existing windows with a new frame and a high performance glazing, such as triple-glazing.

The refurbishment approach prioritises the preservation of the historic fabric over optimisation of the thermal performance and resident comfort, while the replacement approach appears to do the opposite, putting improved thermal performance and resident comfort first, resulting in the removal of historic fabric.

While the scope of this project only tackles the windows, the document also makes it clear that the upgrades need to be seen as part of a comprehensive upgrade to the whole building, encompassing insulation, ventilation, and ultimately, heating. Interventions to any one of the elements listed above will have an inevitable impact on the others, so consideration must be given to maintaining a healthy balance between each element, to ensure that each upgrade doesn't cause more harm than good.



Photograph of Cullum Welch House, showing the fully glazed south elevation, pre-cast concrete planters at floor and cill level and brick piers.

9.0

Next Steps

LITTER

9.1 Actions

This document provides an overview of the windows project process to date. Ahead of the City of London Corporation making a decision about which option to proceed with for the windows at Cullum Welch House, there are a number of additional processes to be undertaken:

- Commissioning and reviewing reports prepared by expert consultants who can provide detailed comentary on the existing and predicated sustainability/thermal performance and existing structural analysis of the building. This should also include an accoustic survey of the existing noise conditions.
- In addition, a thorough condition survey is required, following which, advice on captital costs is to be provided by a cost consultant.
- Engagement with residents (both tenant and leaseholder) to get a deeper understanding of occupant experience, concerns and aspirations for their home in Cullum Welch House.
- Engagement with relevant statutory stakeholders to bottom out any concerns and ensure that the proposals are acceptable in heritage terms.

Once a decision has been made about which approach to the windows upgrade City of London would like to progress with, a summary of the subsequent process is listed below:

- Planning application for chosen approach developed and submitted for approval
- A competitive tender process to find a contractor who can deliver the works on site, taking cost, quality and desired time-frames into account.
- A design team would recommend that a pilot project is undertaken in one flat, ahead of the full works commencing. This will help the team understand out any unexpected details on site and confirm the level of disruption (and for how long) each home can expect for the works to their flat.

Throughout this process, the design and construction team will be in conversation with building control to ensure that the works being proposed/undertaken are compliant. Health and Safety requirements as per the Construction Design and Management Regulations (2015) will be followed, overseen by the Principal Designer (Studio Partington) and the Principal Contractor (TBC).

9.2 Additional Works

As per the recommendations in this document, to meaningfully improve and future proof Cullum Welch House, a 'whole house' review of retrofit measures should form part of a long-term retrofit plan.

In addition to these retrofit works, there is an opportunity to undertake general maintenance and repairs to the building. If scaffolding is required for the works and is already in place for the windows project, it would be ideal to undertake a programme of decoration to the external, common parts of Cullum Welch House.

Glossary of Key Terms

Net zero

Refers to the balance between the amount of greenhouse gas produced and the amount removed from the atmosphere. It means cutting greenhouse gas emissions to as close to zero as possible.

Retrofit

Adding new components to a building to make it perform better.

Thermal Performance

A factor that is concerned with how well your home retains heat.

Thermal Comfort

Describes a person's state of mind in terms of whether they feel too hot or too cold.

Secondary glazing

A fully independent, secondary window system installed to the room side of existing windows. The original windows remain in position in their original unaltered form.

High performance glazing

Combines optimum thermal and acoustic performance, to create a comfortable internal environment. This glazing will have a low U-value, low G-value and high VLT (Visual Light Transmittance) value.

U-value

Thermal transmittance. The rate of transfer of heat through a structure, divided by the difference in temperature across that structure. Low is good, high is bad. With windows, a centre pane u-value is for the glass only, compared to a whole window u-value which is for the whole unit, including the frame.

G-value

A measure of how much solar heat (infrared radiation) is allowed in through the window. A low g-value indicates that a window lets through a low percentage of the solar heat.

VLT value

The amount of visible light that passes through a glazing system. The higher the rating, the more natural light passes through.

Vacuum glazing

Two pieces of glass, except that it doesn't have a gas in the cavity like double glazing, it has a vacuum which is an extremely thin gap.

Thermal Bridge

Also known as a cold bridge. A part of the building envelope where the material or detail used has a significantly higher heat transfer than what surrounds it (e.g. concrete or glass in an external wall), so significant heat is lost here.

Thank you for taking the time to read this document.

If you have any queries, please contact:

www.communityuk.site