Maisonettes

Basterfield
Bayer
Bowater
Cuthbert Harrowing
Hatfield

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 the Maisonette blocks 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 tenant 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.

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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.

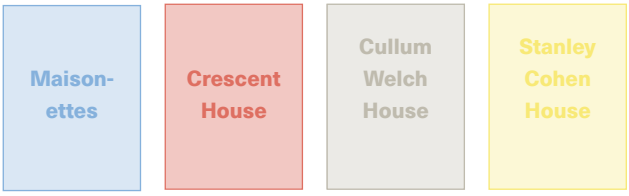
1.3 Purpose of Report

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 the Maisonette blocks. Please note that Basterfield, Bayer, Bowater, Cuthbert Harrowing and Hatfield House are grouped together and referred to as the 'Maisonettes' within this study.

This study takes a typical window type from one of the Maisonette blocks 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; Crescent House, Cullum Welch House and Stanley Cohen 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 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 Maisonette blocks.

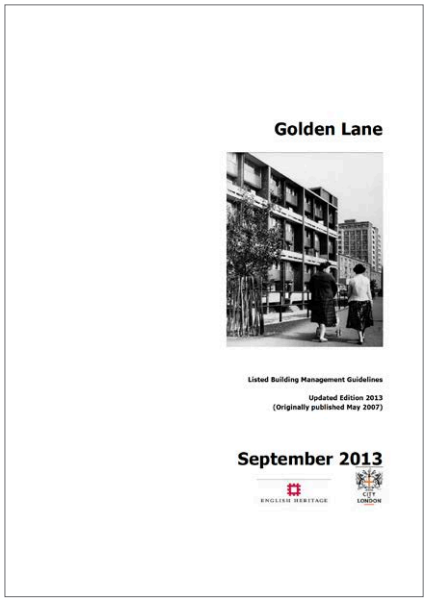
In addition to the Historic England listings, a second document has been crucial in providing expert clarity on heritage priorities and architectural nuances across both the wider estate and each unique building: the Golden Lane Listed Building Management Guidelines.

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.

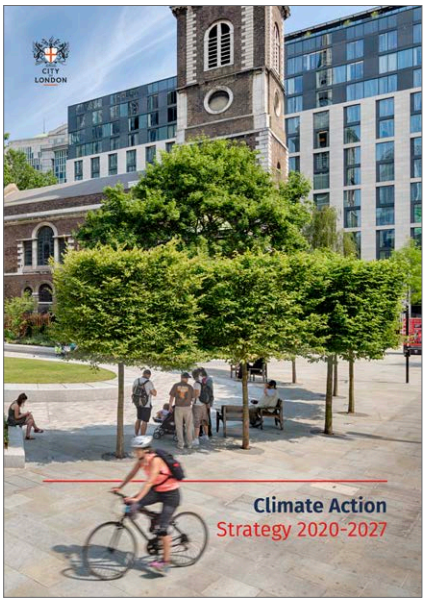
The City of London Corporation has adopted a Climate Action Strategy which sets out how the organisation will achieve net zero, build climate resilience and champion sustainable growth. By adopting the strategy, the City Corporation has committed to achieve net zero carbon emissions across their built assets (such as Golden Lane Estate) by 2040. 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 homes 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.

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.

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).*

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

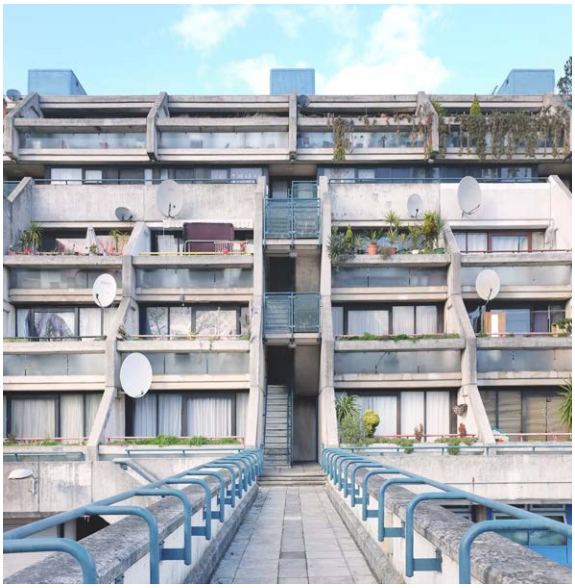
Original: painted timber windows (white)
New: replaced with aluminium (brown)

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.

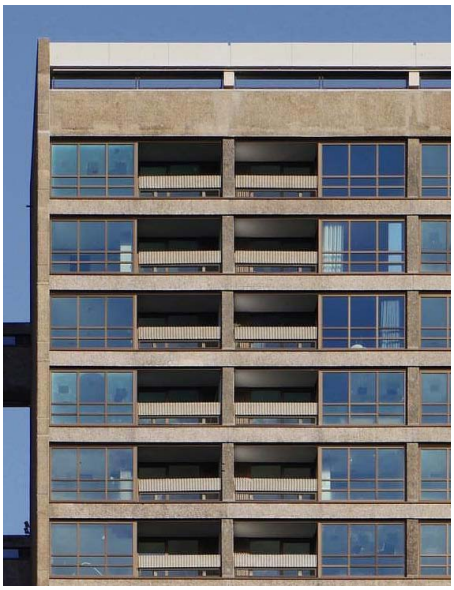
4. Trellick Tower
Cheltenham Estate, Notting Hill, London
Ernő Goldfinger (constructed 1968-72)
Grade II* listed

Original: painted timber windows
New: replaced with painted timber

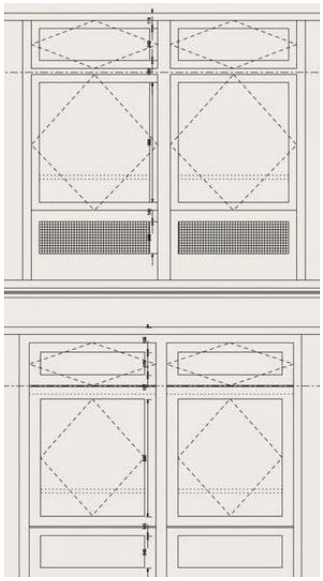
In 2005, window repair or replacement was reviewed for the building. Replacement was selected and the painted timber windows were upgraded with new, in a like for like design. The original glazing used was an experimental double glazing from Pilkington which was replaced with modern double glazing. The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

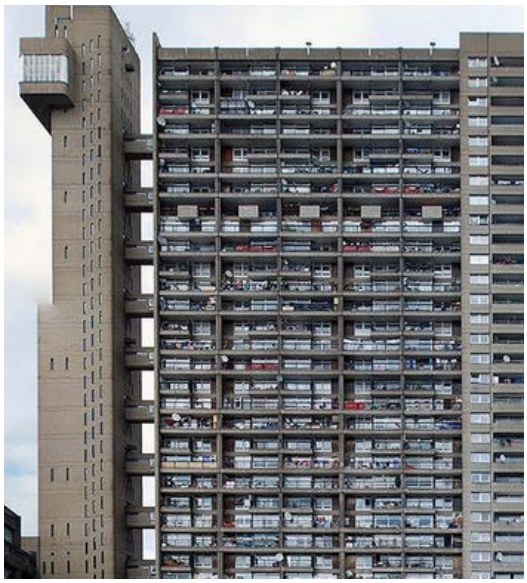


Alexandra Road Estate *(Camden): Photo of the estate ahead of glazing replacement works.*



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

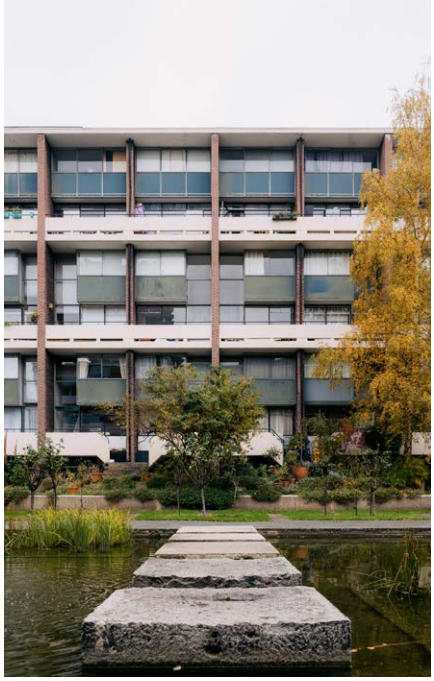


Photo of one of the maisonette blocks, Bayer House, looking across a courtyard from Basterfield House

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

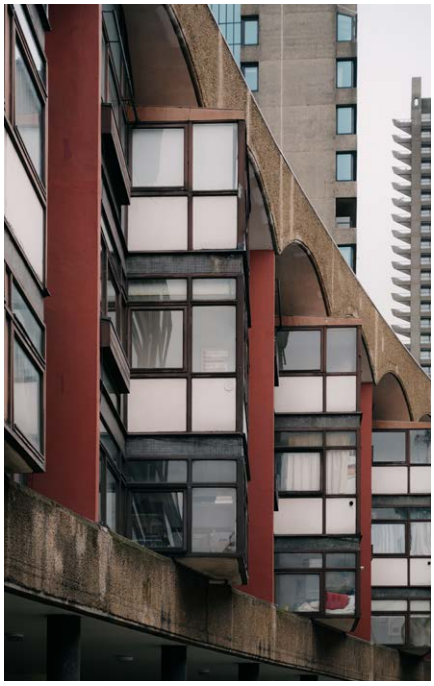


Photo of Crescent House projecting oriel windows on Goswell Road

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

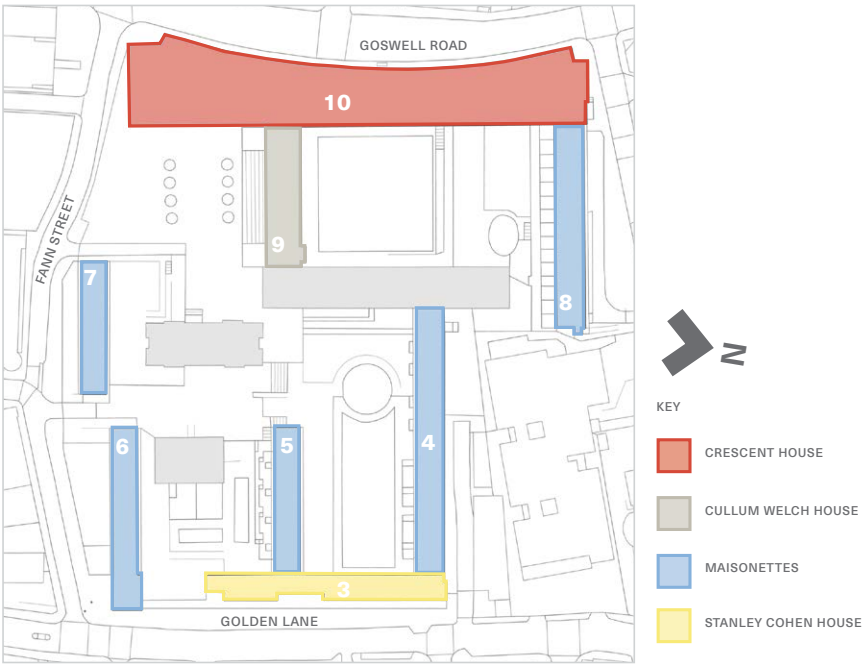
2.2 Building Types

There are 11 buildings that make up the Estate (originally 12), 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.

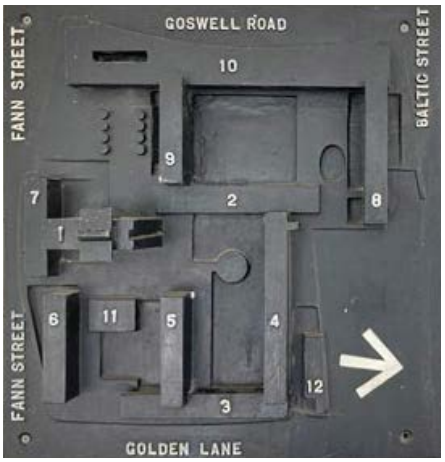


Photo of one of the original, wall-mounted, bas-relief plaques at the Golden Lane Estate, highlighting the layout of the blocks.

3.0

The Maisonettes

3.1 Summary

There are five blocks that are built in the Maisonette style on the Golden Lane Estate; Basterfield House, Bayer House, Bowater House, Cuthbert Harrowing House and Hatfield House. All of the Maisonette blocks are six storeys, with the exception of Cuthbert Harrowing House which is four-storeys and Hatfield House which has a seven-storeys due to the addition of a lower ground floor.

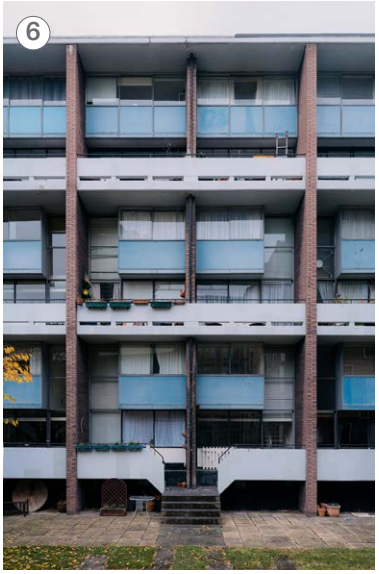
Three Maisonette blocks form two of the Estate boundaries - Hatfield sits on the North (Baltic Street West) and Bowater and Cuthbert Harrowing on the South (Fann Street). Bayer and Basterfield are staggered between the two boundaries, helping to create courtyards within the Estate. The Maisonette blocks vary in length and number of flats, ranging from the 18 homes in Cuthbert Harrowing House to 56 in Hatfield House. In total, the Maisonette blocks provide 188 homes.

The majority of the Maisonette flats are 2-bed, with a small number of 3-beds and, to the lower ground floor of Hatfield House, 14 studio flats. All Maisonette blocks were constructed between 1953 and 1956, with the exception of Hatfield House which followed later in 1958-61. Basterfield and Bayer House directly abut Stanley Cohen House and Hatfield abuts Crescent House.

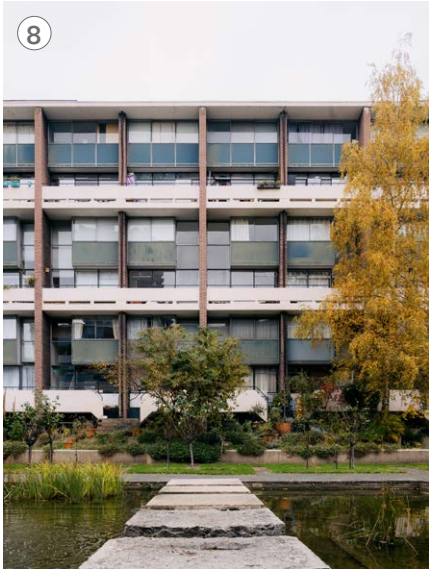
In general, flats have a kitchen and double height living/dining space on the entrance storey, with a bathroom and two bedrooms above. All flats are dual aspect, meaning that they have windows on opposite sides, and have a small balcony to provide private amenity space. Each block is north-south oriented, with the entrance, kitchen, bathroom and one bedroom on the north elevation, and the living space, balcony and second bedroom facing the south. All rooms have at least one window.

The Maisonette blocks are constructed from a hybrid of load-bearing brick walls with in situ concrete slab floors.

The images on the following page are numbered as per the site plan in Section 2.2.



Bowater House (south elevation)



Bayer House (south elevation)

Cuthbert Harrowing House (south elevation)

Basterfield House (south elevation)

Hatfield House (south elevation)

3.2 Special Features

All five of the Maisonette blocks are Grade II listed. Their Historic England list entry numbers are: 1021943 (Basterfield), 1021944 (Bayer), 1021947 (Bowater), 1021948 (Cuthbert Harrowing) and 1021942 (Hatfield).

For all five Maisonette blocks, the listing description from Historic England references the 'aluminium windows with timber facing to living room' and that 'the repeated aluminium system continues as the framework for the cladding panels set in bands under the windows' on the South elevation (blue to Bowater, Cuthbert Harrowing, Hatfield and Bayer House, red to Basterfield). Note that the kitchen and bathroom windows are painted softwood and not mentioned in Historic England's listing.

Also referenced are the 'upper floor bedroom windows, the set-back staircase windows to each unit on lower levels and the continuous bands of glazing and panels to top floor of uppermost maisonettes' on the North elevation (blue to Bowater, Cuthbert Harrowing and Hatfield House, red to Basterfield and Bayer).

In addition to the listing description, special features of the Maisonette blocks which contribute to their distinctive character have been highlighted in the Listed Building Management Guidelines. A summary is listed below:

1. *strong, rhythmic pattern to the elevation (due to paired maisonettes), with a continuous band of glazing and coloured glass on the upper floor of the topmost maisonettes*

2. *'externally, at night particularly, a feeling is given of the living room going up to the double height and the bedroom floating as a box and piercing the glass screen' (Architectural Association Journal, April 1957)*

3. *the bright colour of the cladding (red or blue) and the lighter quality of the aluminium frames contrasts with the comparatively darker materials used elsewhere*

4. *aluminium-framed windows, with top-hung night ventilators, slide horizontally and are designed to over-slide for easy cleaning*

5. *spaciousness and light - resulted principally from the large windows between the south-facing living rooms and generous balconies*

6. *the glazed aluminium doors to the balconies slide vertically, counterbalanced by the top section which can be lowered to four feet above floor level for easy cleaning*

7. *windows in the living room originally had curtain tracks fitted at transom level, adding to the geometry of the elevation. Few of these curtain tracks survive*

8. *the figure-of-eight heating coil placed at the centre of the double-height window to prevent cold down-draughts and condensation Most have since been removed (south elevation)*

9. *open grilles to fire escape balconies improves daylight to the kitchens below (north elevation)*

10. *access to the courtyards from the living room by private stairs – an extension of living space as intended by the architects*

The sketch of the south elevation on the following page highlights majority of these special features.

1. strong, rhythmic pattern to elevation, with a continuous band of glazing and coloured glass
2. bedroom reads as 'a floating box piercing glass screen'
3. bright colour of the cladding and the lighter quality of the aluminium frames contrasts with the comparatively darker materials used elsewhere
4. aluminium-framed windows slide horizontally
5. spaciousness and light from large windows and generious balconies
6. glazed aluminium doors slide vertically
7. curtain tracks at transom level
8. figure of eight heating coil
9. escape balconies (north elevation, not shown)
10. courtyard access from living rooms

Photo of Basterfield House south elevation, highlighting pairing of maisonette flats

Photo of Basterfield House north elevation, highlighting decked access and escape balconies

Photo of Bayer House south elevation, highlighting a single maisonette unit

Photo of Basterfield House south elevation, highlighting one type of the concrete steps to courtyards

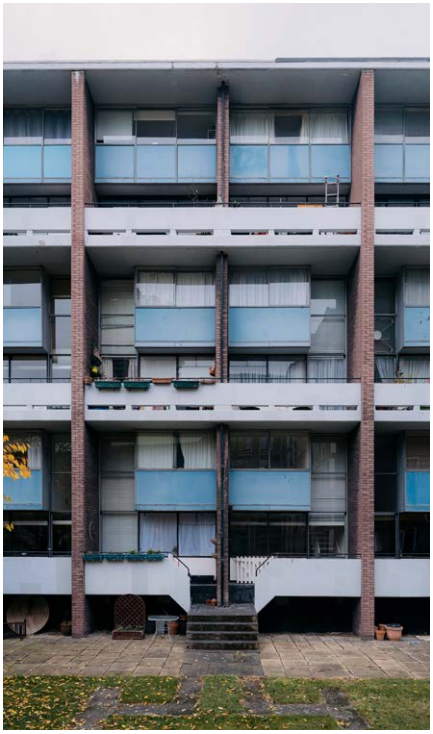


Photo of Bowater House south elevation, highlighting one type of the concrete steps to courtyards

Photo of Hatfield House south elevation, highlighting brick cross walls projecting at either end of the balconies and small gardens

Photo of Hatfield House north elevation, highlighting heavy brick piers defining the recess in the access gallery (entrance doors behind)

Photo of Basterfield House south elevation, highlighting rhythm of elevation

4.0

The Windows

4.1 Description

Materials

The windows generally follow the same style and materiality throughout the building - aluminium framed. The exceptions are the kitchen and bathroom windows to the north elevations which are painted (red external, white internal) softwood. The aluminium windows to the dining/living room also have a hardwood timber surround, with a painted (black) framing externally. There is a mix of fixed lights and opening lights throughout.

Glazing

All windows are single glazed, including the opaque Muroglass panels. The fixed lights to several bathrooms have horizontally reeded glass for privacy. Some windows in other rooms have had obscuring film applied retrospectively.

Opening lights

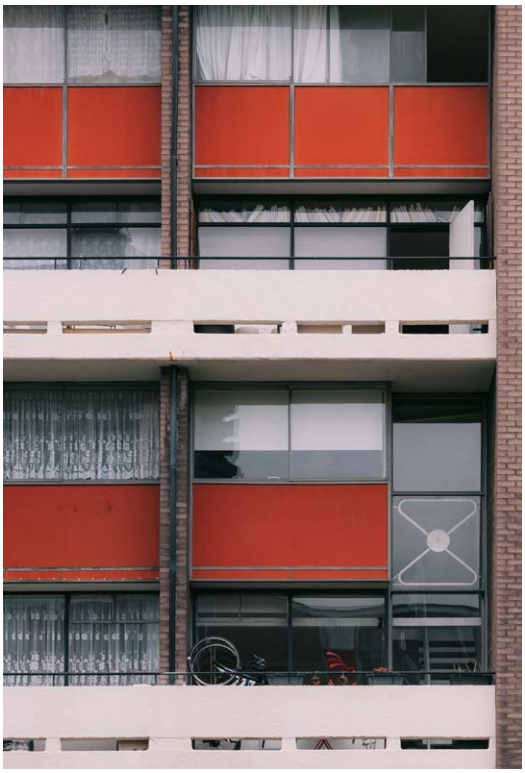
Windows in bedrooms have a horizontal sliding opening light. The opening lights to the dining/living space include a small, horizontal sliding fan light and a door which slides vertically, counterbalanced by the top section of window. Opening lights in bathrooms and kitchens are top hung fan lights. None of the windows have built-in trickle ventilators (typically installed to ensure adequate background ventilation) and over time, ad-hoc ventilators have been added mid-pane to several windows.

Ironmongery

The ironmongery is metal throughout, but the style varies dependant on the opening mechanism. Original latches can be found on sliding windows alongside aluminium 'D' handles. The top-hung, softwood windows have metal Preston stays (screw-jack mechanism) installed.

Additional comments

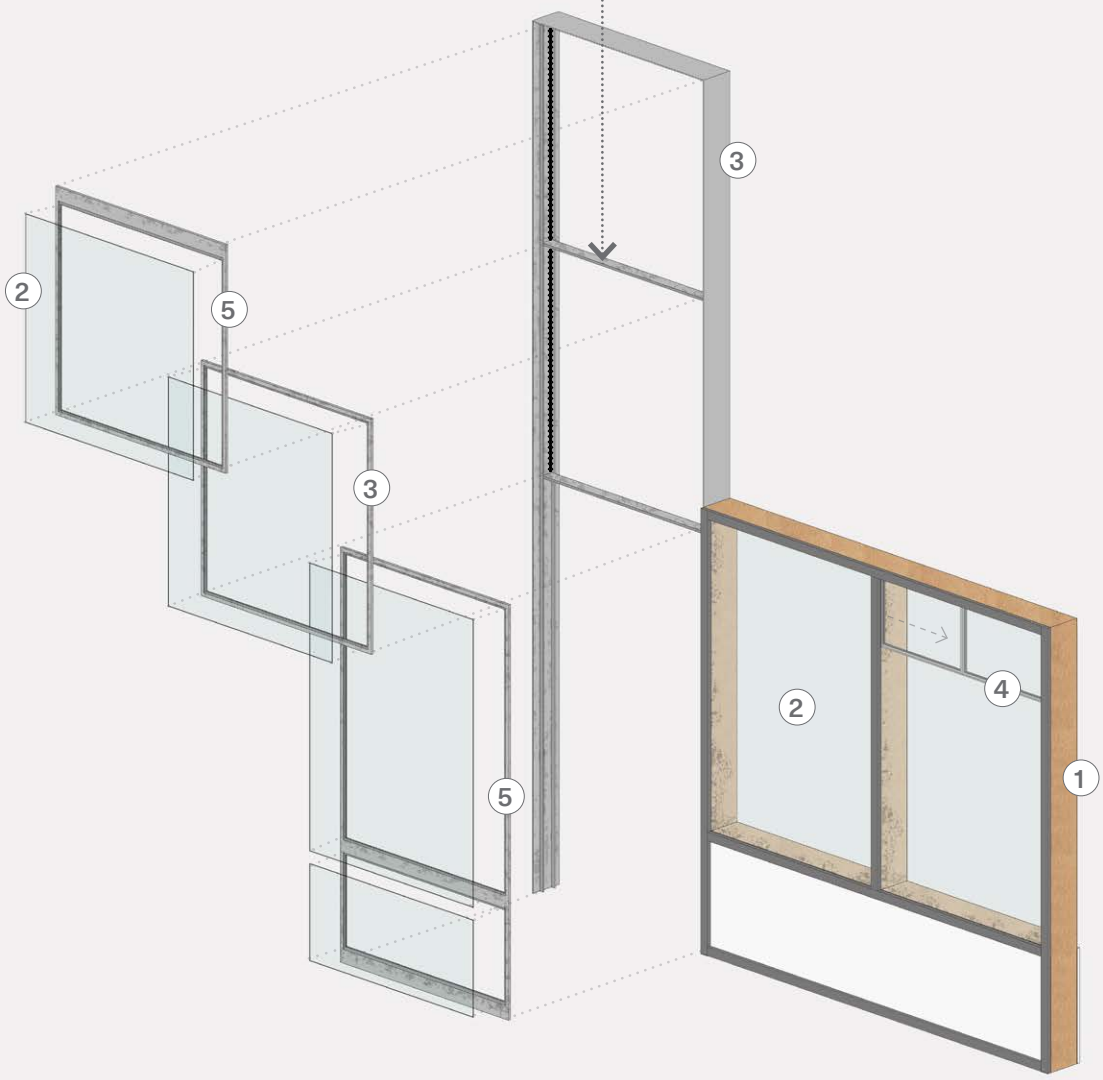
A small number of the figure-of-eight heating coils, (centre of the double-height window) remain, although these are no longer operational. These are installed through the existing metal frame/track associated with the guillotine window/door system. Where these have been removed, the cut pipework is sometimes visible. Several windows (namely bathrooms) have retrospectively had plastic vents installed mid-pane. Blue and red Muroglass spandrels are found beneath bedroom windows and in a continuous run at the uppermost storey, where the elevation detail changes. Plywood panels sit below the dining/living windows.



Photograph of the South elevation of Basterfield House, facing one of the courtyards (top two maisonette flats)

4.2 Typical Existing Window

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



Key

1. hardwood timber sub-frame (living/dining space only)
2. single glazing
3. aluminium outer-frame
4. aluminium opening window frame - horizontal slider
5. alumninium opening window/door frame - vertical slider with chain mechanism (living/dining space only)

This drawing highlights the different elements of a typical, **existing** *window found in one of the Maisonette blocks. 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. The images on the following page highlight the typical window design of the Maisonette blocks, including the window frame, types of glazing (fixed/opening), methods of operation and any additional, unique details.*

WINDOW FRAME

Softwood timber window frame

Window frames to the kitchen & bathroom on the north elevations are softwood. Frame supports fixed glazing at lower level and an openable light above. Painted white internally and red externally. Note that none of the windows have built-in trickle ventilators

Aluminium window frame

Aluminium frames to all windows (including oriel windows and the vertical door to balcony), apart from in kitchens/ bathrooms. Mix of fixed panes and horizontal sliding panes. Single-glazed. Note that none of the windows have built-in trickle ventilators.

Hardwood frame

Hardwood framed windows beneath the oriel window. Hardwood functions as both sill in the exterior and window board in the interior. Painted black externally, clear finish internally. Plywood infill's below the glazing within timber frame.

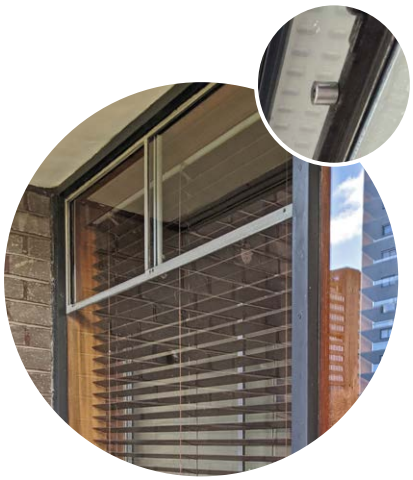
TYPES OF OPENING

Vertical door/window combination

Three glazing panels make up this double height, aluminium framed system: the top light, which serves as a counterweight to the door (providing access to balcony) and a fixed central light. The door is pushed upwards in front of the fixed pane, with the counter window simultaneously dropping behind the fixed pane in the same movement. Single glazed

Top-hung opening light

Softwood top-hung opening windows in fan-light style. Painted red finish externally and white internally. Found in bathrooms and kitchens on the north elevation. Single-glazed. Note screwjack opening/fixing mechanism. Fixed glazing below.



Horizontally sliding opening light

Aluminium-framed, horizontally sliding windows found throughout. Dining/living space opening sits back-to-back with fixed pane (above). Sill to lintel sliders to bedrooms, with north facing bedroom windows sliding externally over fire escape balcony.

OPERATION & IRONMONGERY

'D' style handles

Original aluminium window handles to the large sliding windows to all bedrooms. Note that smaller fan slide slider does not have a specific handle.

Latch

Original metal latches to all sliding windows. Note original manufacturer, QUICKTHO.

Various handles/latches

Transom in the balcony door incorporates several handles/ latches for security and ease of use.

ADDITIONAL DETAILS

Coloured glass cladding

Coloured, Muroglass spandrel panels found beneath the oriel windows on both the north and south elevations (colours vary). Note the retained figure-of-eight heating coil and evidence of pipework where coil has been removed.

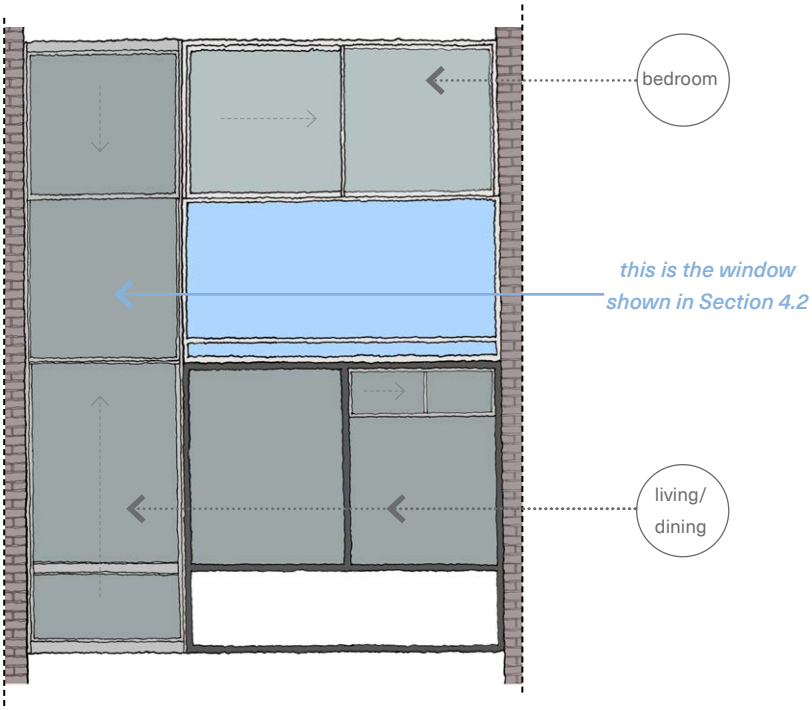
Escape balconies

Bedroom window sliding mechanism continues along escape balcony to north elevation. Window slides across external balcony.

Reeded glass

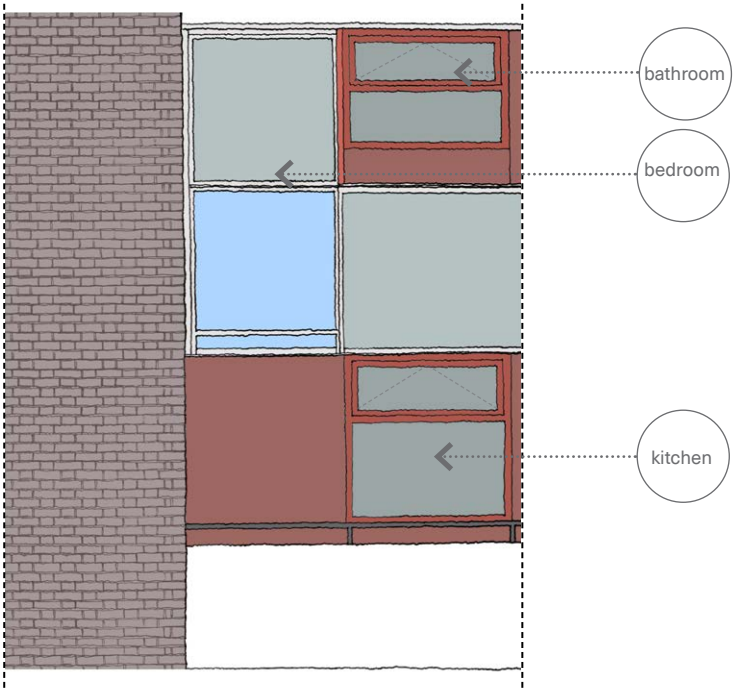
Also known as fluted glass or ribbed glass Horizontally reeded glass to fixed light in bathrooms (north elevations)

4.3 Example Flat



South Elevation: *Sketch of a typical flat elevation on the south side of the building. This flat is a 2-bed maisonette and has one bedroom and the main living/dining area on this elevation. Windows are a mix of fixed lights and veritcal and horizonal sliding opening. All frameless or with an aluminium frame.*

Photo of a section of the south facing side of a typical maisonette block. Dependant on the building, these face the road or a shared courtyard and the Muroglass cladding is red or blue.



North Elevation: *Sketch of a typical flat elevation on the north side of the building. This flat is a 2-bed maisonette and has one bedroom (aluminium framed, sliding), the kitchen and bathroom (both painted softwood with a top hung opening above a fixed light) on this elevation.*

Photo of a section of the north facing side of a typical maisonette block. Dependant on the building, these face the road or a shared courtyard and the Muroglass cladding is red or blue.

4.4 Condition

Studio Partington has undertaken a visual survey of a selection of windows across the five Maisonette blocks. After over sixty years of use, the condition of the windows across the estate has deteriorated. Both the aluminium and timber are visibly deteriorated, leaving the frames exposed and vulnerable.

The Muroglass panels are most significantly deteriorated or damaged on the south elevations. There is also evidence that faded panels have been painted ad-hoc. It is worth noting that deterioration of the hardwood frames has occurred on the interior side of the windows, suggesting that the damage has been caused by condensation, rather than exposure to the elements externally.

Although it is clear that most windows are in need of repair, the extent of repair or replacement works that are required is unknown and a thorough condition survey is required to confirm this. It is highly likely that windows on the exposed parts of the building, where they are not protected by projecting balconies, have deteriorated to a greater extent.

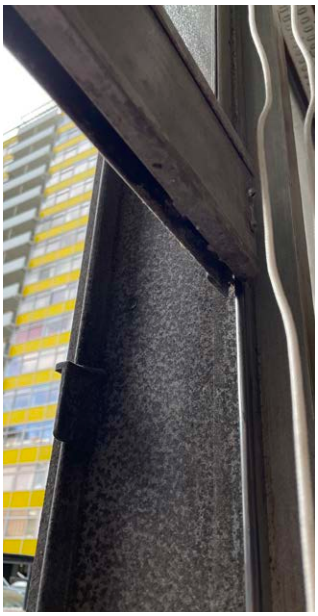
The life expectancy of windows varies significantly with usage, weather/exposure, installation, maintenance, and quality of materials. As a general rule, the typical life expectancy for aluminium frames is 30-45 years, therefore, the frames in the Maisonette blocks have exceeded their expected lifespan.

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

Right: a number of timber windows look to have been replaced with uPVC windows, confirming issued with condition or thermal comfort, or both.

Protective coating on timber frame and sill (internal) bubbling/peeling

Oxidisation of the aluminium frames internally and externally (sliding). Peeling paintwork to timber reveal internally



Oxidisation of the aluminium frames internally and externally (door system)

Damage/deterioration of the Muroglass spandrel panels. Many are faded or have been replaced with a poor colour match

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 41 residents of Maisonette blocks, accounting for 22% of all residents across Hatfield, Basterfield. Bayer, Bowater and Cuthbert Harrowing House . All blocks are represented, with no more than 30% of the total respondents attributed to a single 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 if 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.

32% consider the comfort of their home to be between 0-5 (0 is extremely uncomfortable and 10 is extremely comfortable)

71% feel draughts and have uncomfortable places to sit in their home, especially close to the windows

59% suffer from condensation or mould growth

46% feel their flat is hot and uncomfortable in the summer months

42% feel their windows don't open sufficiently to get good ventilation

note the windows being difficult to use is the primary reason cited for keeping them closed. Noise, safety & security and poor condition are also cited.

59% keep their windows closed due to external noise and pollution

note that this increases to 75% for Bowater and 79% for Hatfield, both of which front a street

27% feel the air in their flat feels fresh when the heating is on

59% feel their home heats up quickly, but **49%** feel their home loses heat quickly when the heating is turned off

49% live in colder conditions than they would like to save money on heating bills

5.0

Evaluation

5.1 Heritage

For the Maisonette blocks, the materials used for the windows and use of the bright red and blue opaque glass cladding are both referenced within 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 are the glazing and glass cladding. 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 sashes, in the Maisonette blocks exemplifies its architectural interest as a pioneering piece of Modern architecture.

Further to references about the window design, of note is the quality of accommodation that the Maisonettes provided which was exceptional for the time: heating and hot water provided centrally; sound insulation in all maisonettes; natural light and ventilation to kitchens and bathrooms; spacious, private balconies; living rooms and bedrooms on average 4.5% above the dimensions recommended by the Ministry of Housing and local government at the time, and ample storage space even within tightly planned interiors. Chamberlin, Powell and Bon were using the technology and information available at the time to provide high quality, healthy, comfortable home for London's key workers. The architects embraced an innovative approach to design.

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*

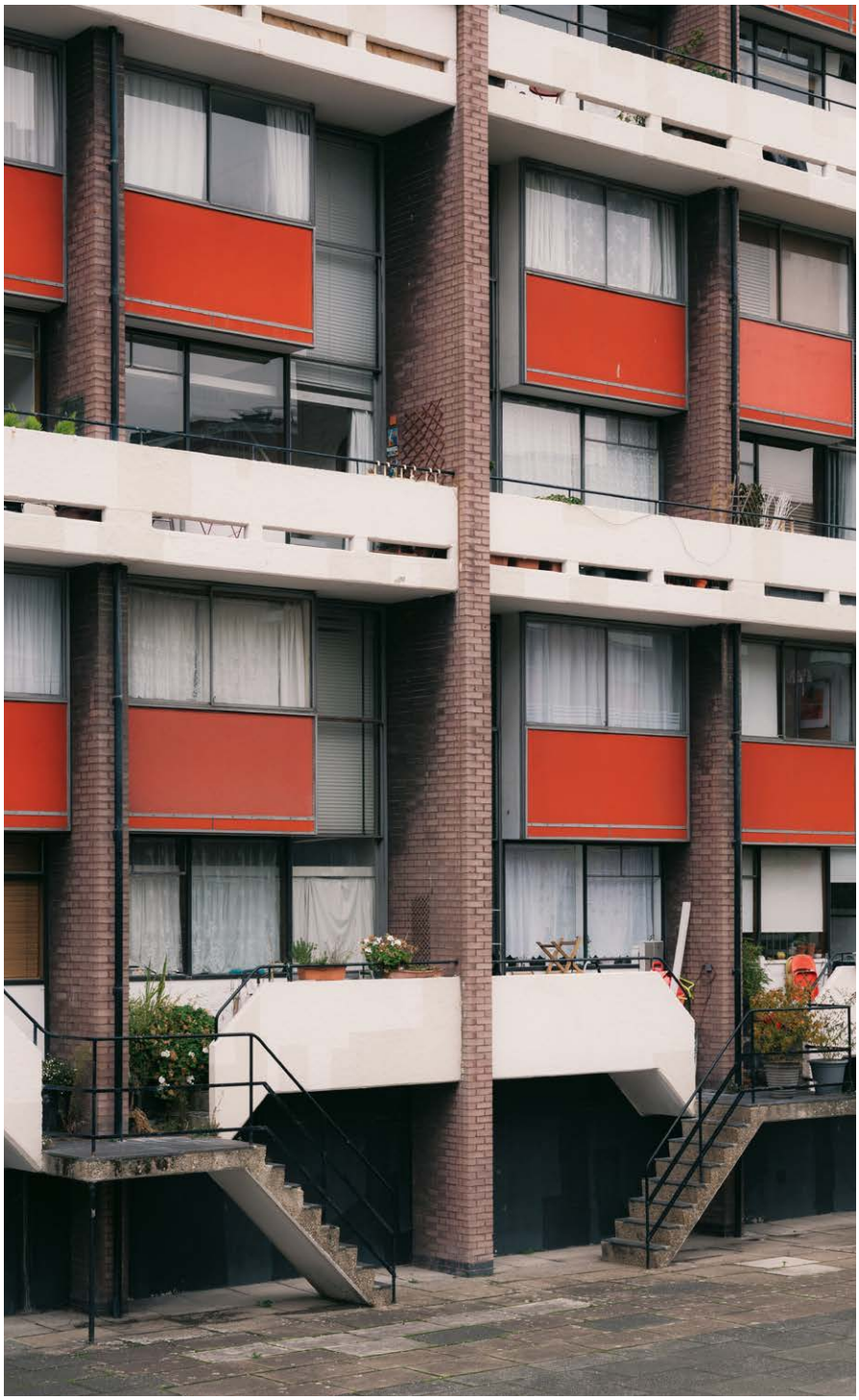
- *Where original details or material specifications have failed, it is likely to be necessary to develop a new and improved design*

- *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 the Maisonettes 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".

A major achievement was the successful arrangement of two-storey maisonettes with gallery access. Although now common, in the early 1950s this was new. The Golden Lane Estate helped to establish a form of housing later widely adopted and, in this respect, the maisonette blocks are of particular architectural interest.



Photograph of Basterfield House, highlighting balconies and private stairs, red Muroglass spandrel panels and glazing

5.2 Condition and Comfort

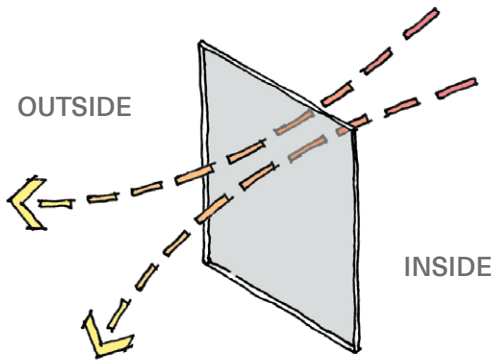
Despite being innovative at the time of design and construction, aspects of the mid-twentieth century detailing, including the thermal performance of the window frames/single glazing, combined with additional uninsulated elements of the building envelope, such as the external walls, means that heat is 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 south facing rooms of the Maisonette blocks, 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 aluminium and timber frames, resulting in their deterioration. A lack of efficient ventilation within the homes then leads to mould growth in areas of lingering condensation.

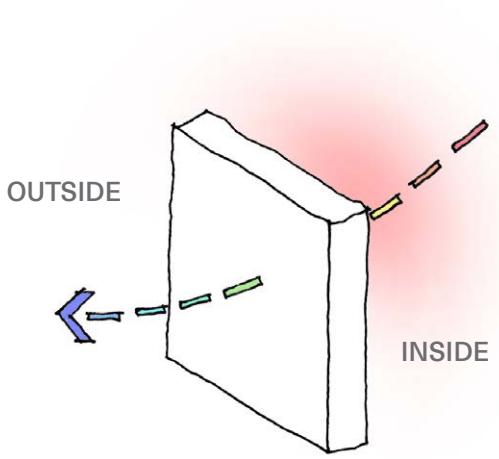
Older windows can often be draughty as over time they distort and gaps open up as joints become weakened. The seals, brushes, rollers etc. also wear out. The small gaps found around the window frames/openings mean that there is poor airtightness - the building is 'leaky' and draughty. Although adequate 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 of the 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. Efficiency of the glazing aside, 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.

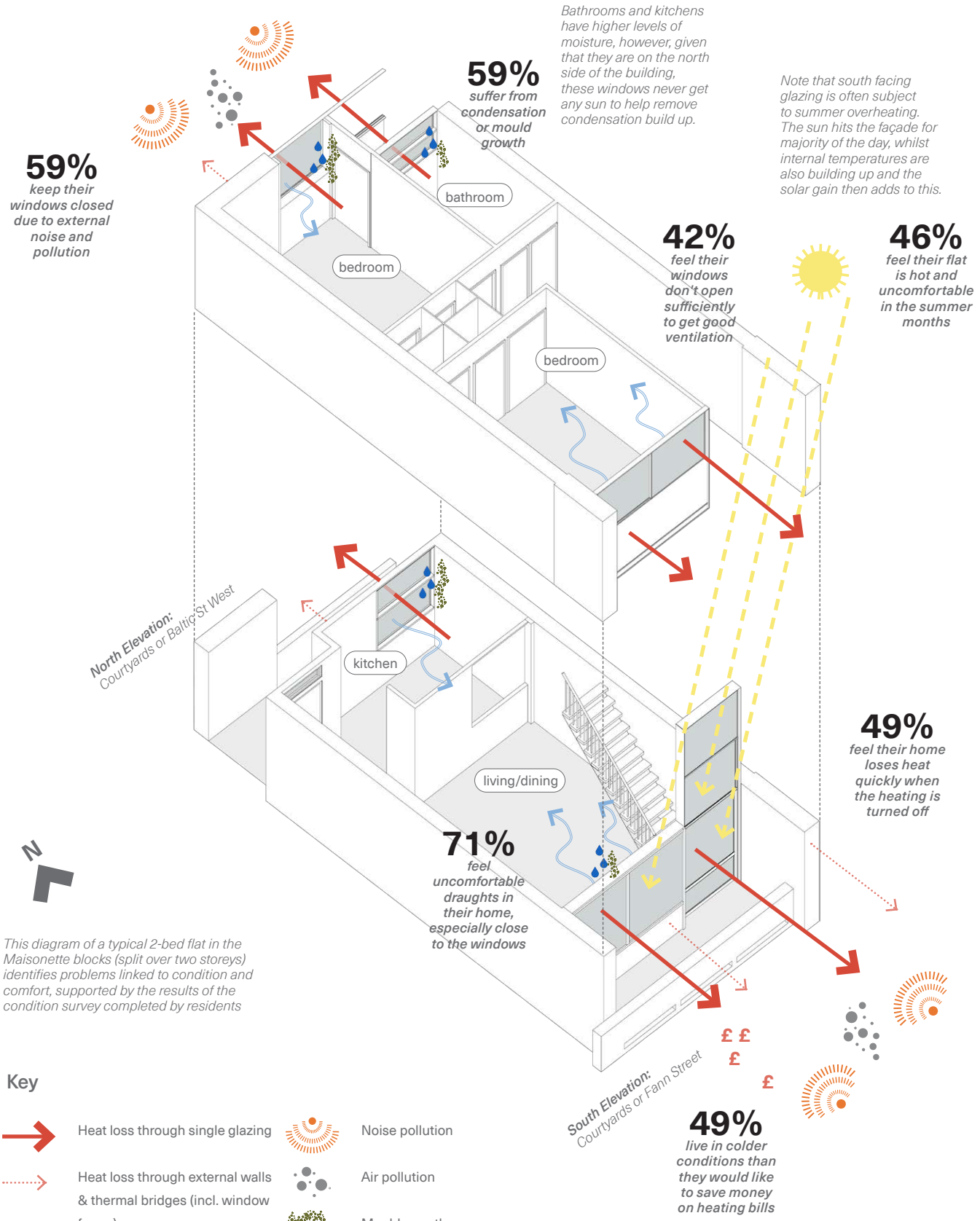
Noise is an issue for flats in the Maisonette blocks, likely due to the proximity of the courtyards and surrounding streets. A noise monitoring survey undertaken by AECOM at Crescent House confirmed that in addition to the road, noise levels from the internal courtyards (tennis courts) were also significantly 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 does 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 2-bed flat in the Maisonette blocks (split over two storeys) 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 all the Maisonette blocks.

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 structures for all the Maisonette blocks. This should include a summary of the existing structure, context for the original structural design and a structural assessment of different 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 the Maisonette blocks, 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 homes. Secondary glazing has been installed in other flats on the Estate, however, this has not been entirely successful. While secondary glazing can have an impact on heat loss and draughts, it can exacerbate 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.

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

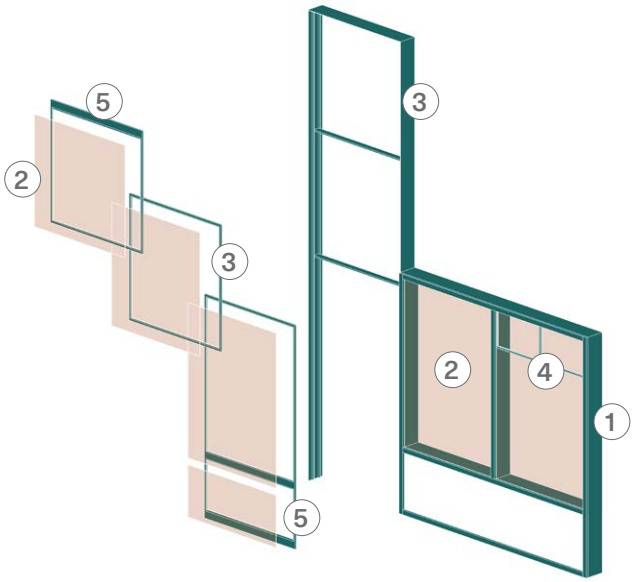
The diagrams on this page highlight the different elements which make up a typical window in a Maisonette block and specifies how each of those elements will likely change within each approach.

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:

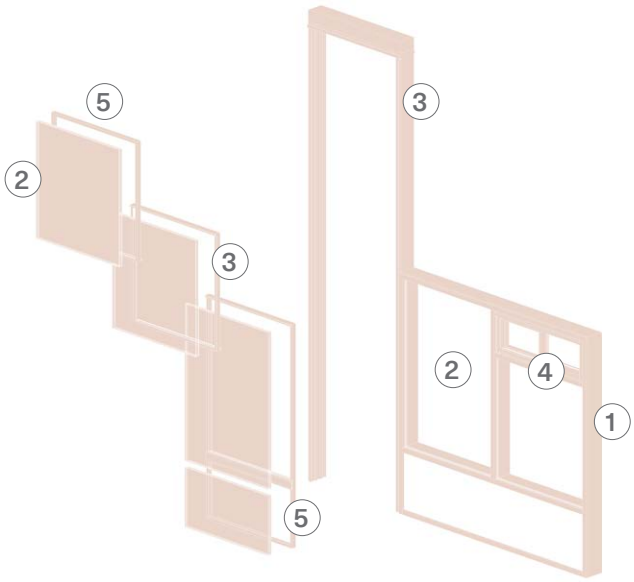
- A percentage of the window frames in the 'refurbishment' option could require replacement, where frames cannot be repaired effectively. These replacements will match the existing like for like.
- Within the full replacement approach, the configuration and style of the openings and proporations of the 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** hardwood timber frame
2. **new** vacuum glazing
3. **refurbished** aluminium outer-frame
4. **refurbished** aluminium opening window frame - horizontal slider
5. **refurbished** aluminium opening window/door frame - vertical slider

REPLACEMENT



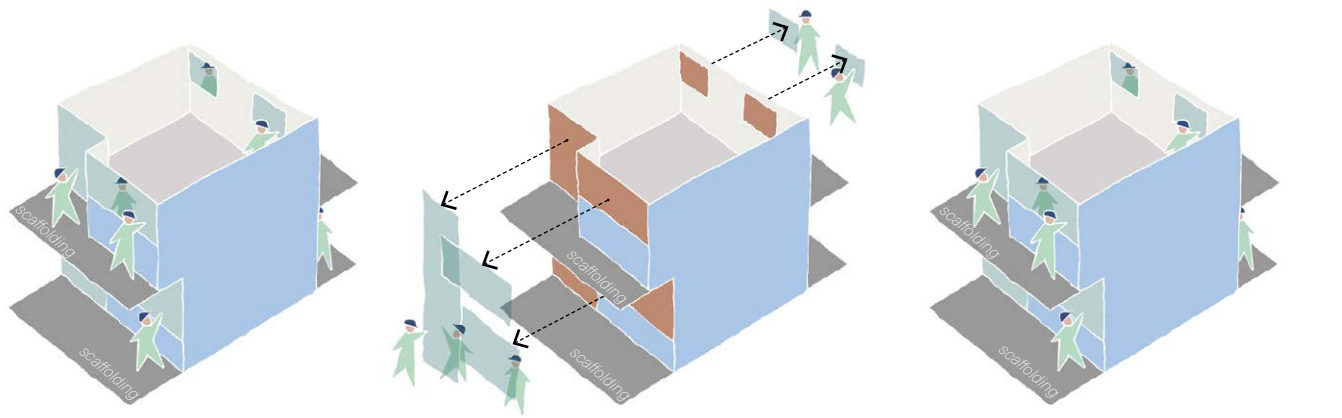
- NEW
1. **new** hardwood timber frame (note that this could be retained)
2. **new** high performance glazing
3. **new** aluminium outer-frame
4. **new** aluminium opening window frame - horizontal slider
5. **new** aluminium opening window/door frame - vertical slider

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



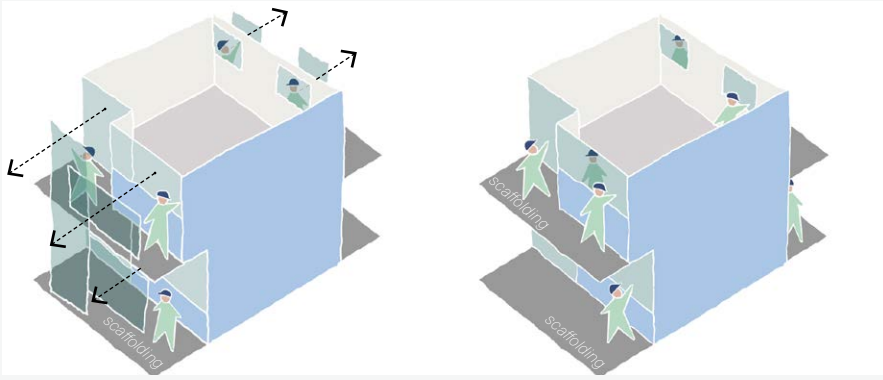
Step One: *Repairs/refurbishment works take place internally and externally, with windows remaining in situ.*

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

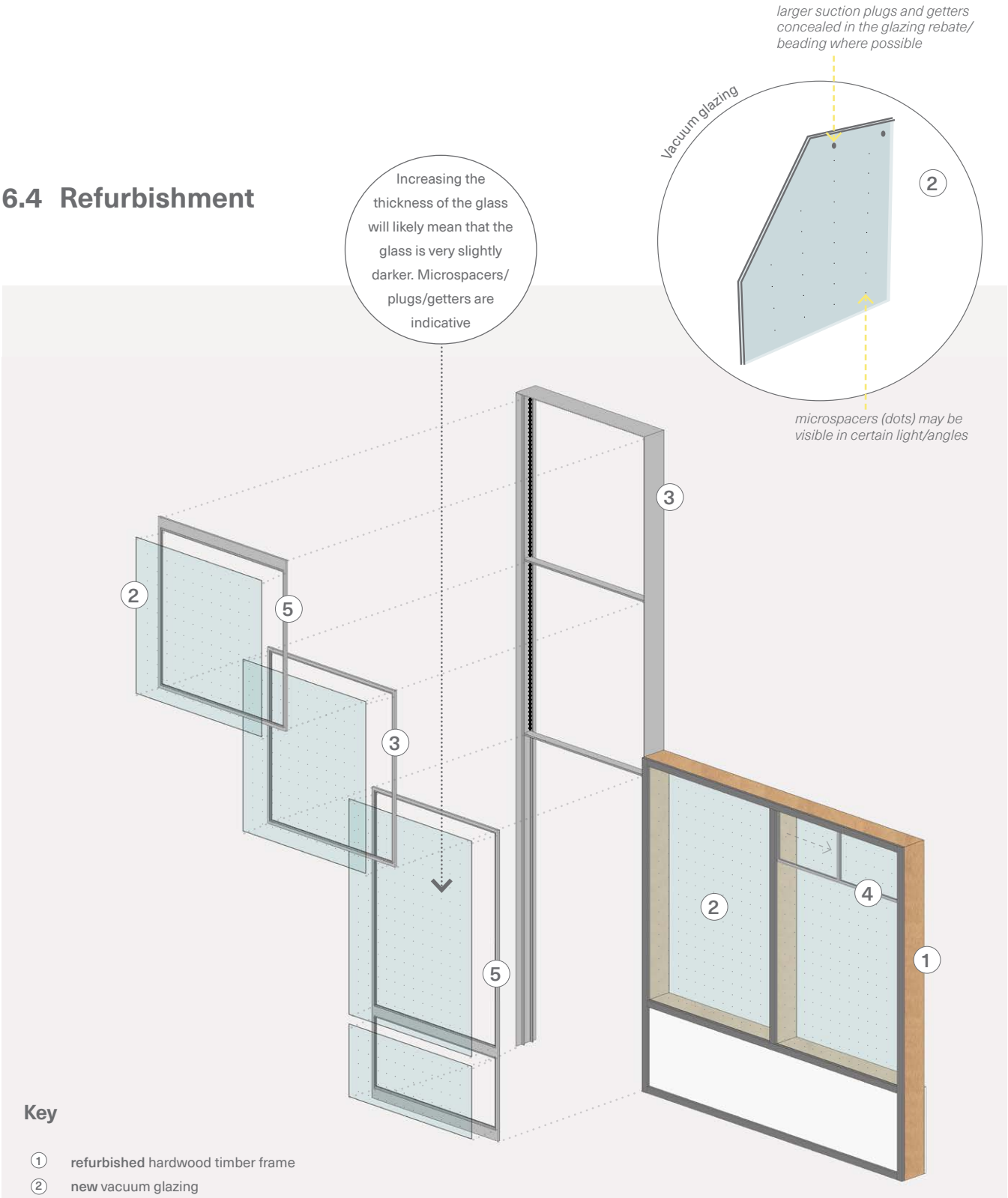


Step One: *New windows arrive on site ready for installation. Existing windows are removed for recycling.*

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

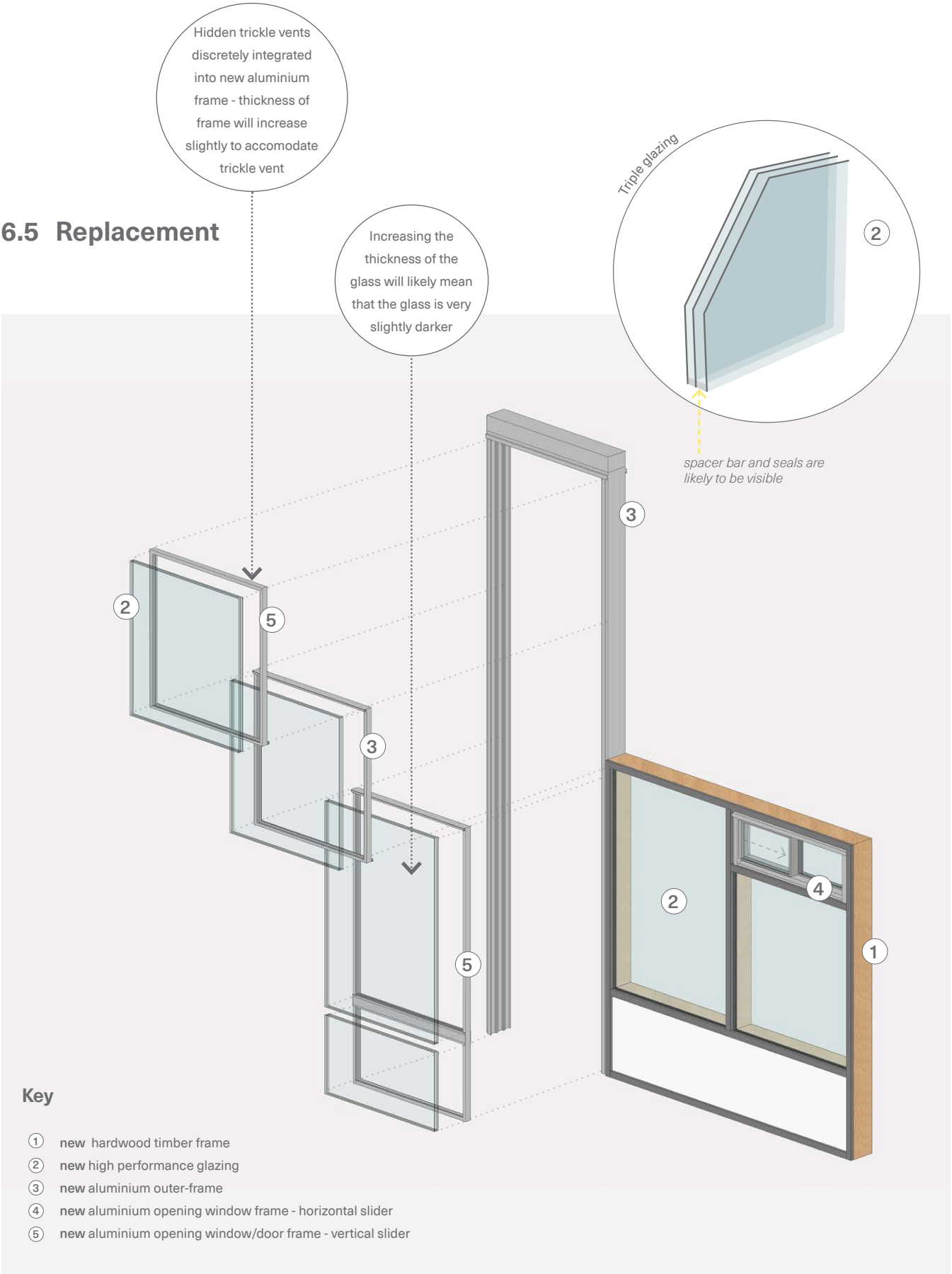


Key

1. **refurbished** hardwood timber frame
2. **new** vacuum glazing
3. **refurbished** aluminium outer-frame
4. **refurbished** aluminium opening window frame - horizontal slider
5. **refurbished** aluminium opening window/door frame - vertical slider with chain mechanism

This drawing highlights the different elements of a typical, **refurbished** *window found in one of the Maisonette blocks. 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



This drawing highlights the different elements of a typical, **replacement** *window found in one of the Maisonette blocks. 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

The Maisonette Blocks: 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.*

The Maisonette Blocks: 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.*	• *Improvement through installation of full replacement window units.*

The Maisonette Blocks: 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 the Maisonettes.* • *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 the Maisonettes.* • *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 aluminium 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.* • *External line of window (how much the glass is set in from the edge of the wall) will not change .* • *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 in the Maisonettes 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:

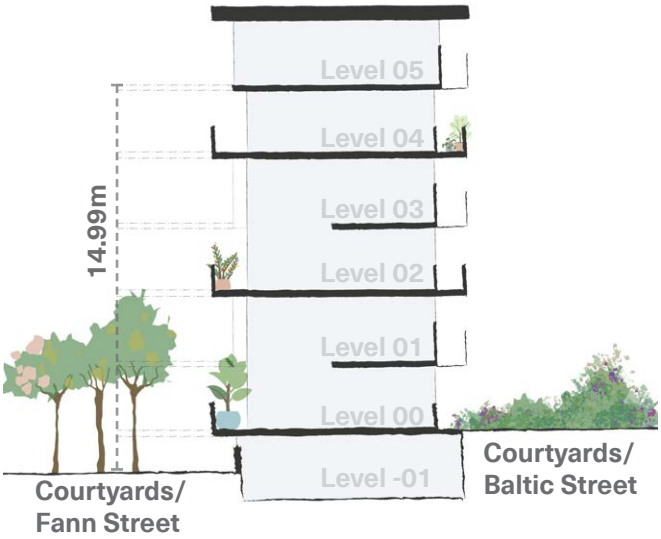
1. The height of the top floor
2. The distance from any relevant boundary
3. The control of combustible materials, in association with the above

Building Height
The top floors of Hatfield House, Basterfield House, Bayer House and Bowater House, measured from the lowest external level as a 'worst case scenario', are all between 11m and 18m.

For buildings over 11m but less than 18m, clause 10.7 establishes that "any insulation product, filler material (such as the [...] window spandrel panels [...] used in the construction of an external wall should be A2-s1, d0 or better" . However, the regulation clarifies that this does not apply to “window frames and glass”. As Cuthbert Harrowing House is below 11m in height, this clauses does not apply.

Relevant Boundaries
All relevant boundaries to the five Maisonette blocks are greater than 1m, with the following exceptions; Hatfield House abuts Crescent House on the West façade and Basterfield House and Bayer House both abut Stanley Cohen on the East façade, making these boundaries 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 11m 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-s1, d0(2) or better). Note that window frames and glass are excluded from this regulation, however, spandrel panels are included.



Sketch section through the shorter end of Basterfield House, highlighting the height of the uppermost floor level on 3 of the 5 maisonette blocks.

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 the Maisonette blocks, 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 ***Heat loss through fabric***
Due to the concrete and masonry 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 masonry are both thermal mass materials - they absorb, store and release 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.

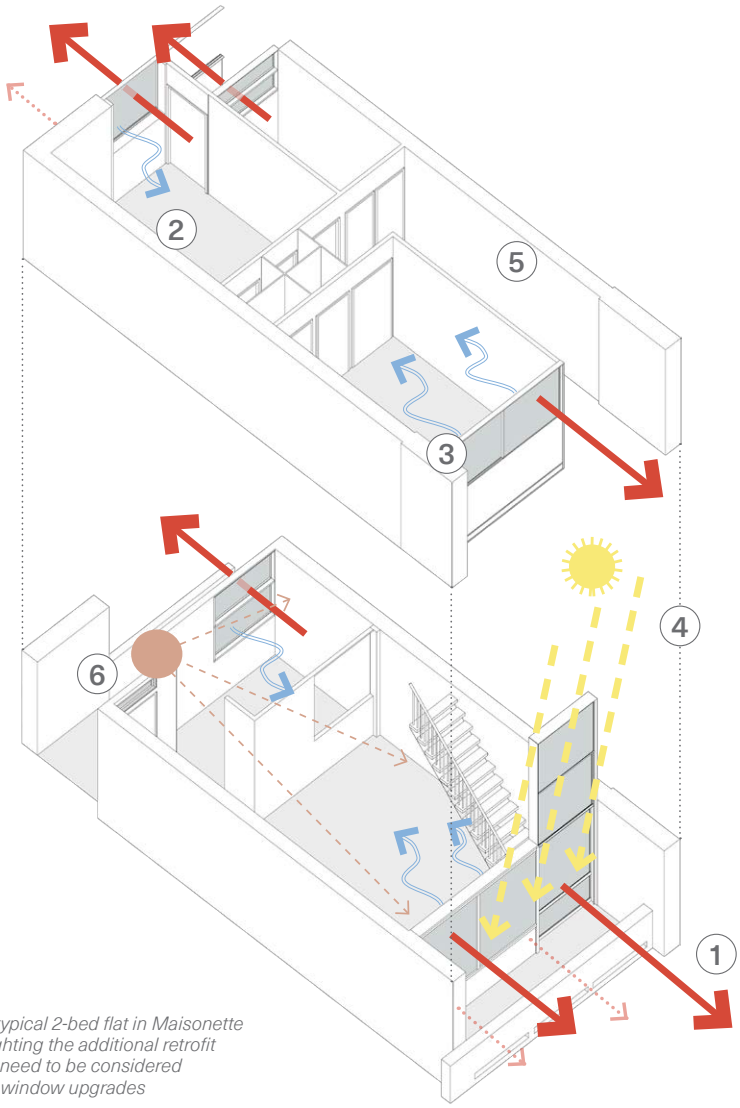


Diagram of a typical 2-bed flat in Maisonette blocks, highlighting the additional retrofit factors which need to be considered alongside the window upgrades

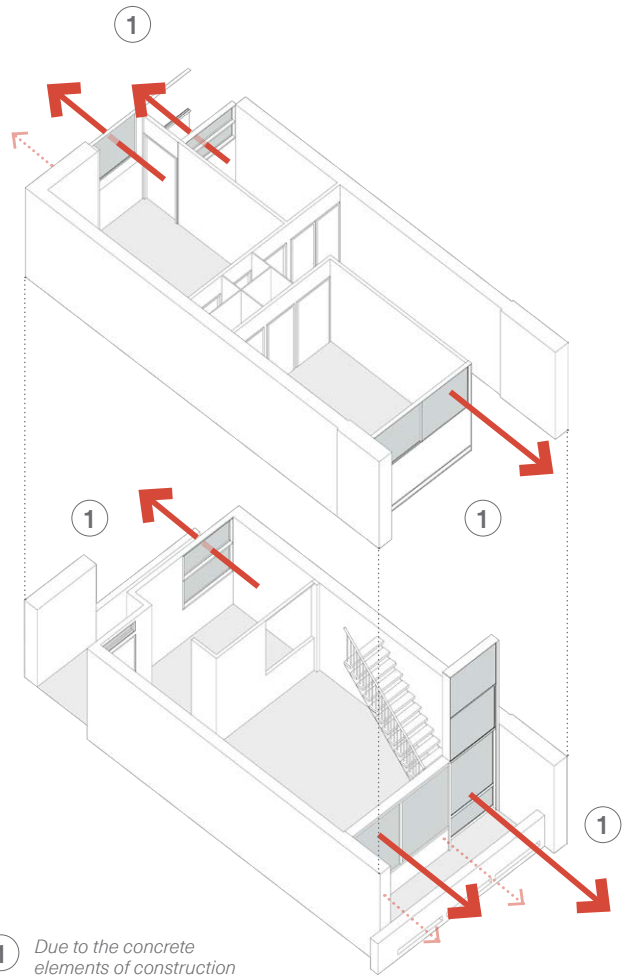
7.2 Heat Loss Through Fabric

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.

The uninsulated concrete and brick construction of the Maisonette blocks 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. Insulation can be included within the glass cladding spandrel panels.
- **External walls:** In addition to this, 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.



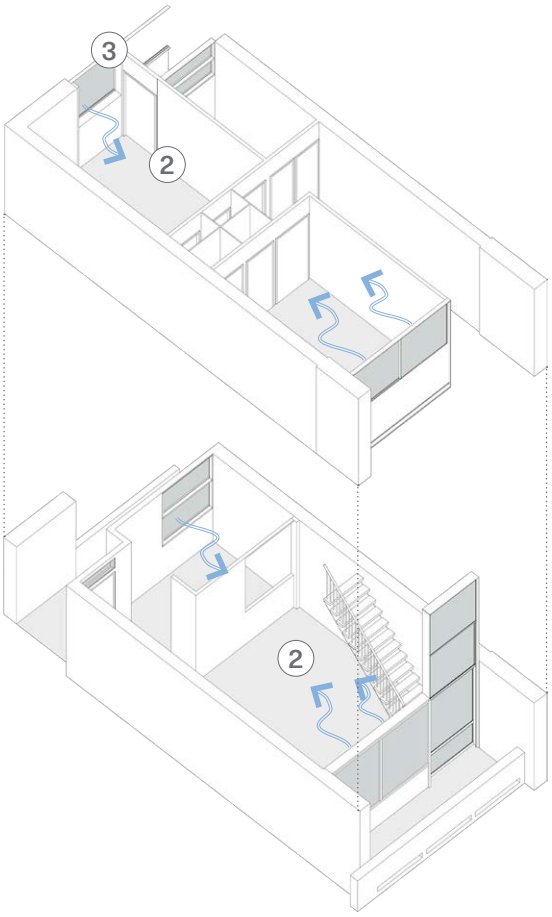
1 *Due to the concrete elements of construction and lack of insulation within the building envelope. heat is transferred and lost through the fabric and key junctions*

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*

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*

7.4 Ventilation

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 as background vents are needed to provide 'make-up air' for mechanical extract, otherwise the pressure increases in the dwelling and the fan wont work.

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. MVHR requires a airtight fabric, therefore, trickle vents and other background ventilation e.g. an existing leaky fabric need to be avoided.

7.5 Additional Factors

Thermal Mass

Concrete and masonry are materials with a high thermal mass. They absorb, store and release 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 and bathroom are rooms which generate a lot of moisture, however, they are located on the north side of the building where they do not benefit from solar gains, likely exacerbating condendation problems in these rooms during the winter. In the summer, rooms 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

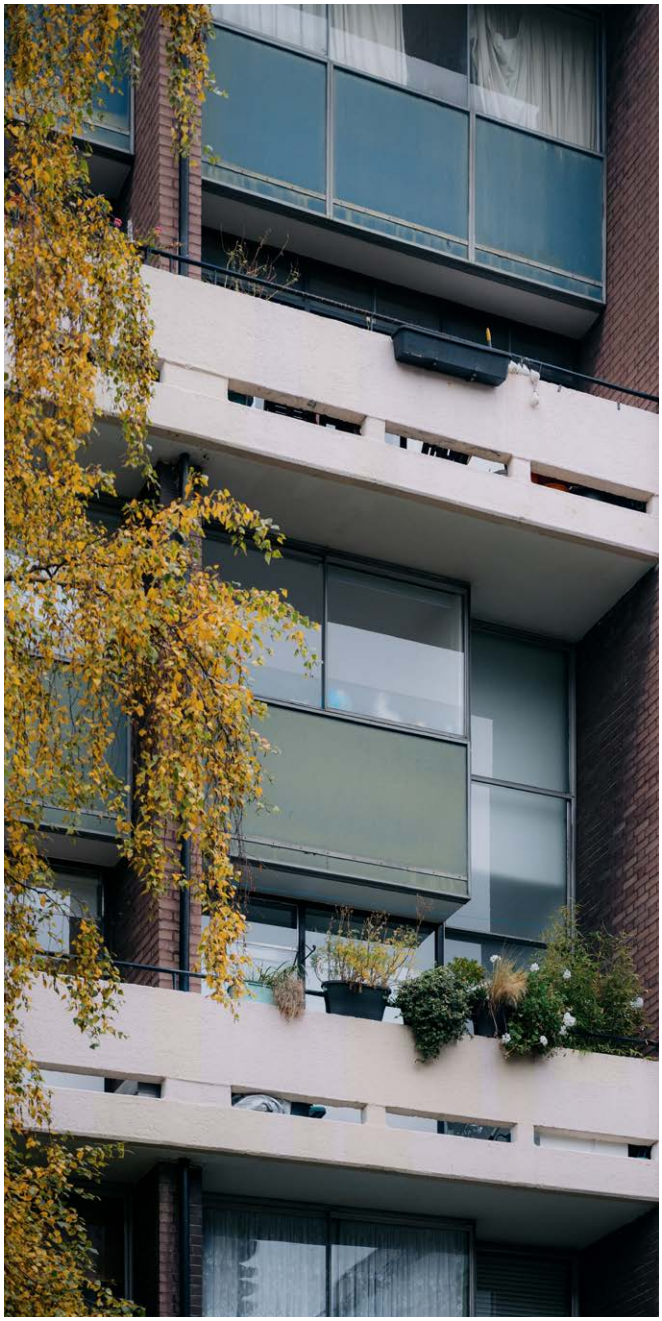
8.1 Concluding Remarks

The Golden Lane Estate is an extremely valuable example of post-war architecture and urban planning in London. The maisonettes form 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 on the maisonettes 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 Hatfield House south elevation, showing the projecting bedrooms with horizontal sliding windows, guillotine door/window system, balconies and brick piers.

9.0

Next Steps

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 in the Maisonette blocks, there are a number of actions to be undertaken to inform next steps, outlined below:

- 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 the Maisonette blocks
- 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 the Maisonette blocks, 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 the Maisonette blocks.

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.

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