LANCASTER WEST ESTATE

LOT 03 - TALBOT GROVE HOUSE & MORLAND HOUSE

LANCASTER WEST NEIGHBOURHOOD TEAM

RIBA STAGE 1

INITIAL DESIGN IDEAS

FEASIBILITY REPORT

NOTTING DALE, W11 1QX, LONDON

JULY 2021 - 0196-ECD-XX-XX-RP-A-03001-P06

ECD Architects
ENERGY CONSCIOUS DESIGN

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LANCASTER WEST
NEIGHBOURHOOD TEAM
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This RIBA Stage 1 Feasibility Report has been prepared by ECD Architects on behalf of The Lancaster West Neighbourhood Team

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RIBA Stage 1 Feasibility Report

Client: Lancaster West Neighbourhood Team

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Date: 15 December 2020

Comments:

Author	Reviewer	Date	Rev.	Notes
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- **AECB** - Association for Environment Conscious Building is the leading network for sustainable building professionals such as local authorities, housing associations, architects etc. The AECB Retrofit Standard promotes the delivery of Net Zero carbon retrofits, combining a whole house 'fabric first approach' with ambitious energy efficiency measures.
- **Airtightness** - is the control of air leakage, or the elimination of unwanted zzs through the external fabric of the building envelope. This may be achieved by the correct and proper installation of a vapour check or vapour barrier. See Infiltration.
- **Annual Heat Demand** - This is the quantity of heat required by a building during the course of a year. Can refer either to space heating demand or water heating demand, or both. It is often divided by the building's square meterage to be able to compare it with buildings of different sizes.
- **ASHP** - Air Source Heat Pump is a type of heat pump that absorbs heat from a colder place and release it into a warmer place using the same process as an air conditioner. Unlike an air conditioning unit, however, it is able to both warm and cool a building and in some cases also provide domestic hot water. The system can often be connected to the existing heating pipes and radiator system.
- **BIM** - Building Information Modeling is an intelligent 3D model-based process that gives architecture, engineering, and construction professionals the insight and tools to more efficiently plan, design, construct and manage buildings.
- **BIM Level 2** - is a collaborative working process which requires an exchange in the information process which is specific to the project and coordinated between various systems and participants.
- **BRE** - Building Research Establishment is a centre of building science which aims to improve buildings and infrastructure through research and knowledge.
- **EnerPHit** - This is the Passivhaus-equivalent standard for energy efficiency when refurbishing existing buildings. It follows a fabric first approach, and requires additional insulation, triple-glazed windows and mechanical ventilation with heat recovery.
- **EPC** - Energy Performance Certificate is a document which sets out the energy efficiency of the property within a lettering system A to G (Letter 'A' being the most efficient).
- **Heat Losses** - is a measure of negative heat transfer through a building's fabric from the inside to the outside. The colder the outside temperature, the warmer the inside, and the worse the thermal insulation of the building fabric, the greater the heat loss will be. Windows, doors, walls, ground floors and roofs all quickly lose heat unless they are well insulated. See U-values.
- **HTC** - Heat Transfer Coefficient or Smart HTC, is a thermal performance rating that is used to measure the whole building thermal performance and Pulse air tightness testing. It enables whole building heat loss to be determined with just 21 days of internal temperature and energy consumption monitoring using 4-5 temporary sensors.
- **HWC** - Hot Water Cylinder, to heat and store domestic hot water.
- **Infiltration** - is the unintentional or accidental introduction of outside air into a building, typically through cracks in the building envelope and through old or poorly fitted windows and doors. Infiltration is sometimes called air leakage. See Airtightness.
- **IRS** - Integrated Reception System: provides broadcast signals from multiple sources (typically terrestrial television, FM radio, DAB digital radio and tatellite TV) to multiple outlets, via a single aerial cluster and signal booster-distributor.
- **MEV** - Mechanical Extract Ventilation is a system which extract polluted air from wet rooms; without any heat recovery.
- **MEP** - Mechanical, electrical and plumbing engineering systems of a building.
- **MVHR** - Mechanical Ventilation with Heat Recovery is a unit that brings in fresh air and pre-warms this with the heat from outgoing air. This fresh, warmed air is then distributed to living areas, while stale air is extracted from kitchen and bathrooms. Windows can still be opened, but the building will still work even if windows are kept shut.
- **PART L (Approved Document)** - It is the official guidance of the Building Regulation which containts requirements relating to the standards for the energy performance and carbon emissions of new and existing buildings.
- **PAS2035** - PAS 2035 is the new over-arching document in the retrofit standards framework introduced following the recommendations of the Each Home Counts review. PAS 2035 essentially provides a specification for the energy retrofit of domestic buildings, and details best practice guidance for domestic retrofit projects.
- **Passivhaus** - Passivhaus is a standard for energy efficiency construction in new buildings. It results in ultra-low energy buildings that require little energy for heating and cooling spaces.
- **PE**- Primary Energy is the total primary energy demand from non-renewable energy sources that is supplied to the building.
- **PER**- Renewable Primary Energy is the unit of energy generated from renewable resources.
- **PHPP** - The Passive House Planning Package. This is a modelling tool used to help design a properly functioning Passivhaus/EnerPHit project. It requires information about the building size, shape, orientation as well as the proposed insulation to the walls, floors and roof. Detailed information on windows and doors are also required. The PHPP prepares an energy balance and calculates the annual energy demand of the building.
- **SAP** - System Assessment Procedure is a method which rates and certifies buildings performances for Energy of dwellings. It provides a calculating framework that is required to demonstrate if the building complies with Approved Document Part L.
- **SHDF** - Social Housing Decarbonisation Fund Demonstrator is a government programme which supports social landlors to demonstrate innovative approaches to retrofitting social housing at scale. It will mean warmer and more energy efficient homes, a reduction in households' energy bills, and lower carbon emissions.
- **Solar Gain** - Also known as 'solar heat gain' or 'passive solar gain', solar gain is the increase in thermal energy of a space as it absorbs solar radiation (heat from the sun).
- **Thermal Bridging** - also called a cold bridge, heat bridge or thermal bypass is an area of a buildings construction that has a significantly higher heat transfer than its surrounding materials. Thermal bridging can be responsible for up to 30% of a dwelling's heat loss (BRE).
- **U-Value** - A U-Value is the measure of heat transfer through an object or structure. U-Values are generally used to define thermal performance (heat loss) and assess the performance of a building. The lower the U-value the better insulated an element is.

1.0 EXECUTIVE SUMMARY

1.0 EXECUTIVE SUMMARY

Talbot Grove House and Morland House were built in the mid-1930s and comprise 79 No dwellings across three buildings. The brief as set out in section 2.2 was to retrofit the existing units to achieve Net Zero Carbon. Due to COVID restrictions, the site investigations to date have been limited to a few void properties. We have also commissioned a measured survey of the external envelope and common areas. This survey and a thermographic study, to better understand actual heat losses across all three buildings, have been received after the completion of this report. We have also received copies of the original 1930s construction drawings and have therefore placed reliance on these for internal arrangements and structural strategy. These will need to be checked prior to the completion of detailed design.

We have been provided with stock condition information for the blocks and Energy Performance Certificates (EPC) results, which indicate that the dwellings typically achieve Band D, albeit the basis of measurement (RdSAP) is widely recognised as an unreliable measure of actual of energy consumption. Further investigation will be required to establish whether the residents are in fuel poverty however initial results from PHPP analysis suggest a typical heat loss of 240 kWh/M2/yr. As the Social Housing Decarbonisation Fund (SHDF) brief (see Section 2.2.4) requires the retrofitted buildings to consume (in use) not more than 50 kWh/m2/a this would represent an 88% improvement on existing. In order to achieve guaranteed performance to this standard we propose to target the EnerPHit standard of 25kWh/m2/a thereby providing headroom should actual performance not meet design criteria.

As outlined in this report, subject to further investigation, we believe the existing structure is capable of supporting external wall insulation. The significant improvement in the building fabric can be achieved in a variety of ways as set out in this report but all options assume this will include some form of wall insulation. In order to submit the recent SHDF application we have assumed the use of the Passivhaus Certified 'T-Cosy' system by Beattie Passive. This system comprises a sprayed airtight membrane and brackets which are fixed externally to the existing walls. Unlike all other EWI products this creates a void of sufficient depth to meet enhanced U values which, having framed around openings is then filled with non-combustible (A1) insulation. The external boarding can then receive a number of different architectural treatments to suit the location. This system comprises a very simple methodology which could enable the existing EWI sub-contractor supply chain to be trained to deliver.

With regards to services our strategy has been to simplify wherever possible and ensure that heating and hot water demand are minimised through improved fabric and reduced ventilation losses. Assuming good air-tightness can be achieved, MVHR (Mechanical Ventilation with Heat Recovery) would be required to deliver the low energy demand. This would also offer improved air quality and it is assumed that this would be done on an individual basis per flat. However, both Talbot Grove and Morland House are part of the local district heating system which is subject to a separate review. Depending upon the outcomes of this study and associated funding applications the energy performance target and associated services strategy may change from a communal system to an individual system per flat. If an individual system were required to provide heating and hot water (via a Heat Pump) this may be coupled with the MVHR system in a space-efficient compact unit. Any individual heating or ventilation system would (like a gas boiler) require an annual maintenance check.

In our experience of delivering deep retrofit at scale with residents in-situ, one of the most challenging aspects of any retrofit are the internal alterations. For this reason, we believe that any insulation works should ideally be carried out externally wherever possible. Any remaining internal works may then be limited to the installation of MVHR and associated ductwork which often requires lowered ceiling or bulkheads. Fortunately, at Talbot Grove and Morland House the existing floor to ceiling heights are relatively generous and (subject to survey) it is assumed that any ductwork could be located in the hallway area of each flat provided that this offers access to all 'wet' rooms (kitchens and bathrooms) or 'habitable' rooms (bedrooms and living room).

The communal stair and walkways are perhaps some of the most challenging details to be resolved. Any insulation measures in these areas should maintain sufficient width to provide safe access and egress from the building. Subject to survey we believe it may be possible to use high-performance non-combustible insulation in these locations but this will need to be verified in due course. Insulation options for the roof will need to address the detailing around the parapet and dormer windows and should ideally be constructed externally. Subject to further investigation the Beattie Passive T-Cosy system could also be used on the roof thereby offering thermal continuity. The existing single glazed sash windows are a significant source of heat loss. Not only through the glass and frame but also the poor seals causing excessive ventilation and draughts. In order to achieve the significant energy savings required it will be necessary to replace these, ideally with high performance 'sash-effect' triple glazed units to match the existing appearance.

With regards to procurement it is not yet clear which route will be pursued for the appointment of the main contractor. Similarly, it is not yet clear whether the scope of works will include the full range of proposals required to achieve net zero carbon as this will be dependent upon the availability of funding. After the completion of the body of this report, confirmation was received that the SHDF funding application to BEIS was successful. Finally, it is very important to note that this project is part of a wider co-design process with ongoing consultation as outlined in Section 7.0, therefore any proposals in this report will be refined in discussion with residents over the coming months.

2.0 INTRODUCTION AND BRIEF

2.1 INTRODUCTION

The Lancaster West Neighbourhood Team have appointed ECD Architects to provide multi-disciplinary design services from RIBA Stages 0-7, to refurbish Talbot Grove House and Morland House, as part of an extensive programme of works within the Lancaster West Estate.

ECD Architects appointment includes the following disciplines:

- Architecture – ECD Architects
- Structural Engineering – Wilde Engineering
- Cost Consultancy – Keegans
- Resident Engagement – PPCR

ECD Architects will also work collaboratively with other consultants as required by the client and the brief, such as:

- Fire Consultancy – IFC
- Monitoring and POE – BuildTest
- Principal Designers – Derisk
- Fire Risk Assessments – Frankhams
- Mechanical, Electrical and Plumbing (estate-wide) – TACE
- CCTV, door entry, digital TV – TGA Consultancy
- Lifts - Chapman

To produce this Feasibility Report, ECD Architects and the rest of the design team, referenced several previously appointed surveys and reports provided by LWNT.

This document provides a RIBA Stage 1 Feasibility Study of different design options that could be implemented on Talbot Grove House and Morland House.

2.2 BRIEF

2.2.1 CLIENT'S BRIEF

Talbot Grove House and Morland House, originally built in the 1930's, comprise of 79 properties across 3 similar buildings which represent a common residential property type from the inter-war period. These blocks sit within the wider Lancaster West Estate, in the Lancaster West Neighbourhood Team.

ECD Architects assisted LWNT with the submission of an application to the BEIS Social Housing Decarbonisation Fund Demonstrator to secure additional funding for this scheme. Please refer to the relevant section for further information.

LWNT has held extensive consultation over the last couple of years, with the residents of the overall Estate, in order to formulate the vision and goals of the refurbishment scheme. LWNT's vision for the Lancaster West Estate includes:

- To help the Estate to become a model 21st century social housing estate
- To be zero carbon by 2030, meaning that no carbon is produced through utilities, including heating and hot water to the homes residents live in

LWNT has already started to procure a separate Internal Refurbishment Programme (outside ECD's scope), that aims to start providing new kitchens, bathrooms and other improvements to people's homes within Morland House, starting from early 2021.

The client has also included the following Key User Requirements, in terms of aesthetics:

1. Contemporary Approach – less "institutionalised"
2. Common Theme across the Estate
3. As per ideas days – but within current budget – "which should provide opportunities to be creative with fabric improvements"

LWNT has asked ECD Architects to provide in this Feasibility Study options to implement a Net-Zero building, in terms of heating and hot water, and the most practical way to achieve this is by reducing the building's energy demand so that any remaining energy can be provided by renewable sources. In order to do this, there are different ways and standards that could be implemented, for example, the Passivhaus/EnerPHit Standard or the AECB Standard. We recommend that by using EnerPHit, which is the current gold standard for refurbishments in the industry, LWNT and the residents will have the best chance of achieving the Estate-wide zero-carbon goals.

A whole-house retrofit approach that is compliant with PAS 2035, will provide the residents with a warm and comfortable home as well as reduced energy bills, thanks to an improved thermal performance of the fabric, triple glazed windows, whole house ventilation and energy efficient appliances.

LWNT's Package of Option, across the Estate includes 3 tiers of measures, as shown in the table below. These options, namely 1, 2 and 3, are being used throughout this Feasibility Report to illustrate the different options presented by our multi-disciplinary team.

BIM Level 2 is currently being considered by LWNT to be implemented across the Estate, which if required will also form part of our brief. A BIM based methodology will ensure a golden thread of information via building passports based on structured robust datasets on all components, systems and materials used in the built asset leading to cost effective management through life cycle costing.

As part of our briefing, we received LWNT's borough wide Sustainability Strategy, produced by Etude, which sets out the following requirements to achieve Net-Zero (please note this is for new-build, therefore lesser targets are achievable on retrofits).

	Passivhaus (PH) standard	EnerPHit standard	PH low-energy standard	AECB standard	UK Part L1A 2013 (newbuild) approximately
Space heating/cooling demand	15 kWh/m^2/a	20-25 kWh/m^2/a	30 kWh/m^2/a	50 kWh/m^2/a	54 kWh/m^2/a
PE/PER demand	120 kWh/m^2/a	120 kWh/m^2/a	120 kWh/m^2/a	N/A	190 kWh/m^2/a
Airtightness (n50)	0.6 n50 1/h	1.0 n50 1/h	1.0 n50 1/h	2 n50 1/h	5.0 n50 1/h
Thermal bridges	0.01 W/MK	as PH standard	as PH standard	as PH standard	0.05 or 0.15 W/MK
Overheating frequency (>25C) %	10%	10%	10%	10%	not measured

Figure 1 - ENERGY STANDARDS - J. Traynor: EnerPHit: A Step by Step Guide to Low Energy Retrofit (2019)

LWNT has also asked ECD Architects to work closely with residents to co-design the solutions for Talbot Grove House and Morland House in a participatory way, following their extensive resident engagement sessions as detailed later in this report. All these consultations reports also form part of our general brief, but must be validated and approved by LWNT in terms of their suitability, technical implementation, maintenance and budget allowance. Some of these residents' suggestions and wishes, have been included in this Feasibility Report as options, which can be included should the considerations above are met (ie. lifts, balconies, etc).

Apart from the envelope works (insulation, roofs, floors and windows) there are other issues raised by residents that ought to be addressed alongside these works. Some form part of this feasibility study and are presented in more detail here.

Others are outside our scope but need to be integrated into the same programme, and we will work closely with the relevant external consultants.

Within our scope:

- Acoustic improvements
- Blocks' communal areas redecoration
- Refuse and recycling improvements

By others, but integrated:z

- Heating
- Door entry systems
- Lighting
- CCTV
- Landscaping Works
- Plumbing
- Below ground drainage

	Walls	Thermal Bridging	Air-tightness	Glazing	Roof	Ventilation	Heating	Solar
0 Current situation	Solid Walls, uninsulated	Very High	Very poor, mostly due to windows	Very Poor, single glazed. Cold winter, overheats with direct sunlight	Uninsulated? Causes overheating for top floor flats in summer, cold in winter	Poor	Gas Heat Network. Poor controls on flats, produces overheating. High carbon emissions	-
1 Essential	-	-	Improved glazing	High performance double/ triple + new external doors	Super insulated	Additional MEV	Heat pump based heat network	-
2 High Performance envelope	High performance Internal or External insulation	New Internal or External Envelope	Best practice	High performance double/ triple + new external doors	Super insulated	Additional MEV/MVHR	Heat pump based heat network	-
3 High performance + solar PV & storage	High performance Internal or External insulation	New Internal or External Envelope	Best practice	High performance double/ triple + new external doors	Super insulated	Additional MEV/MVHR	Heat pump based heat network	Solar PV + communal storage

Figure 2 - Table with refurbishment Options

	Requirements for Net Zero carbon	Permissible alternative until 2025 *Or backstop after 2025 in exceptional cases with justification*	**Example specification.** The recommended approach is good building fabric for Ultra low energy consumption, heat pump heating and PV for generation (ULE-HP)
Reduce operational energy consumption and fuel cost	Achieve an Energy Use Intensity [a] of less than 35 kWh/m²/yr	Achieve an Energy Use Intensity [a] of less than 50 kWh/m²/yr	• Efficient surface area to floor area ratio (form factor) of less than 1.5 for buildings over four storeys and less than 2 for smaller. • Proportion of windows 10-25% depending on orientation. • Thermal bridge free junctions • Triple-glazed windows • High efficiency MVHR positioned within 2m of external wall • External shading to south and west facing windows to mitigate overheating
	Achieve a space heating demand [b] between 10 and 15 kWh/m²/yr	Achieve a space heating demand [b] between 10 and 30 kWh/m²/yr	
	Achieve an air permeability of less than 0.6 m³/h/m² at 50 Pa	Achieve an air permeability of less than 1.5 m³/h/m² at 50 Pa	
	Air tightness testing required for every flat. Target a total hot water demand [b] of less than 18 kWh/m²/yr Report % reduction in carbon emissions over Part L 2013		
Reduce embodied carbon	Report embodied carbon for building life cycle stages A1-A5 [c] Compare to the benchmark value of 500 $kgCO_2/m^2/yr$ for new multi-residential buildings Report improvements achieved during design		• Can be achieved with a wide range of construction types. See detailed guidance.
Low carbon energy supply	No gas connection or fossil fuel consumption on site. (target no heat from waste) Report estimated annual cost of energy per dwelling for each building		• No gas boilers • Heat pump with low temperature circulation • Carefully sized hot water storage and reduced pipe length
	Direct electric heating only permissible if full Net Zero requirements are met.		
	Achieve an electricity generation intensity of more than $100kWh/m^2_{building\ footprint}/yr$	Include roof space to achieve an electricity generation intensity of more than $50kWh/m^2_{building\ footprint}/yr$ Report PV generation in $kWh/m^2_{building\ footprint}/yr$	
Measurement and verification	Predicted energy performance calculation and report at planning, tender and end of construction (5-year energy monitoring post-construction		• Sub-metering for key energy uses and renewables. Automated data reporting from whole building.
Zero operational carbon balance	Report predicted annual carbon balance for the whole development showing predicted carbon emissions from consumption, carbon saved from generation and net predicted emissions. Report planning carbon calculations and total predicted carbon calculations separately.		
Overheating risk	Clearly describe summer comfort strategy. CIBSE TM59 Overheating risk assessment. Mark opening windows and report hours an example window is open to meet requirements, include hottest and median day values.		
Sustainable outcomes	Follow AECB Water standards and achieve 'good practice' requirements Provide adequate space for waste and recycling storage Bike parking must allow 1.4m² per cycle (or 0.7m² for two tier stacking).		• Water flow restrictors or fittings to control flow. • External bin and bike stores adjacent to the main building.

Figure 3 - Etude'sLWNT Sustainability Strategy for New Builds

2.2.2 PREVIOUS RESIDENTS CONSULTATION

Both Morland House and Talbot Grove House were originally built in the 1930's. The last major refurbishment carried out was in 1975 to both blocks.

There have been numerous engagements, workshops and Co-design with the residents, the diagram below illustrates the timeline.

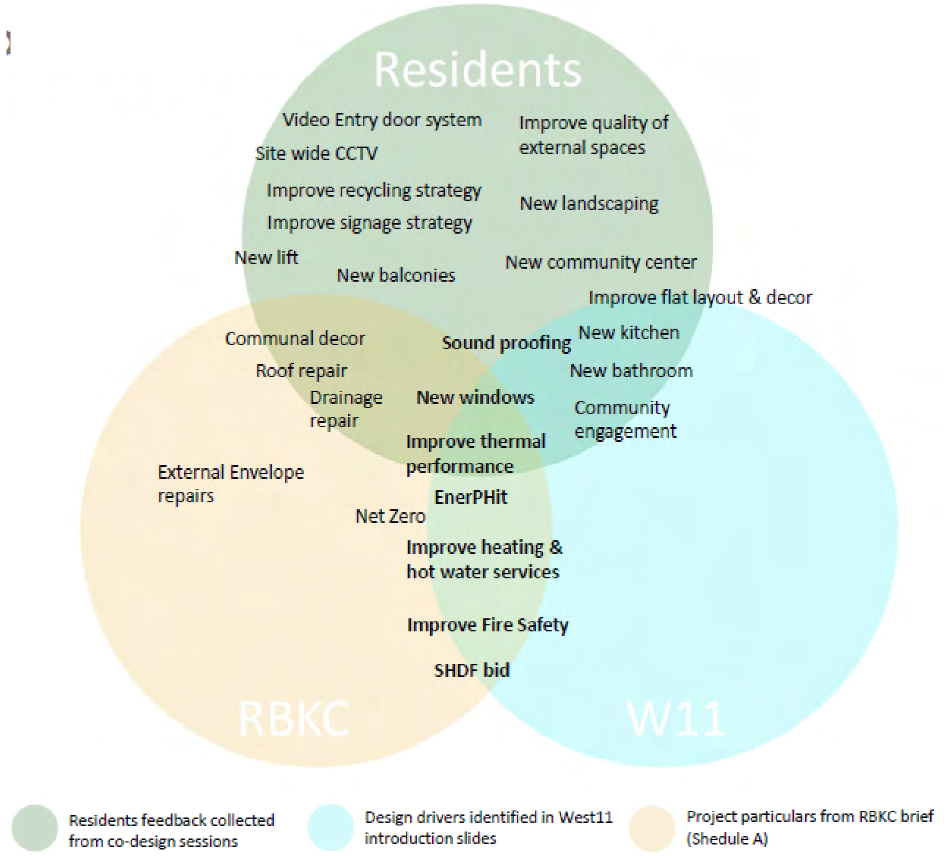


Figure 4 - Design drivers, brief and resident's feedback matrix

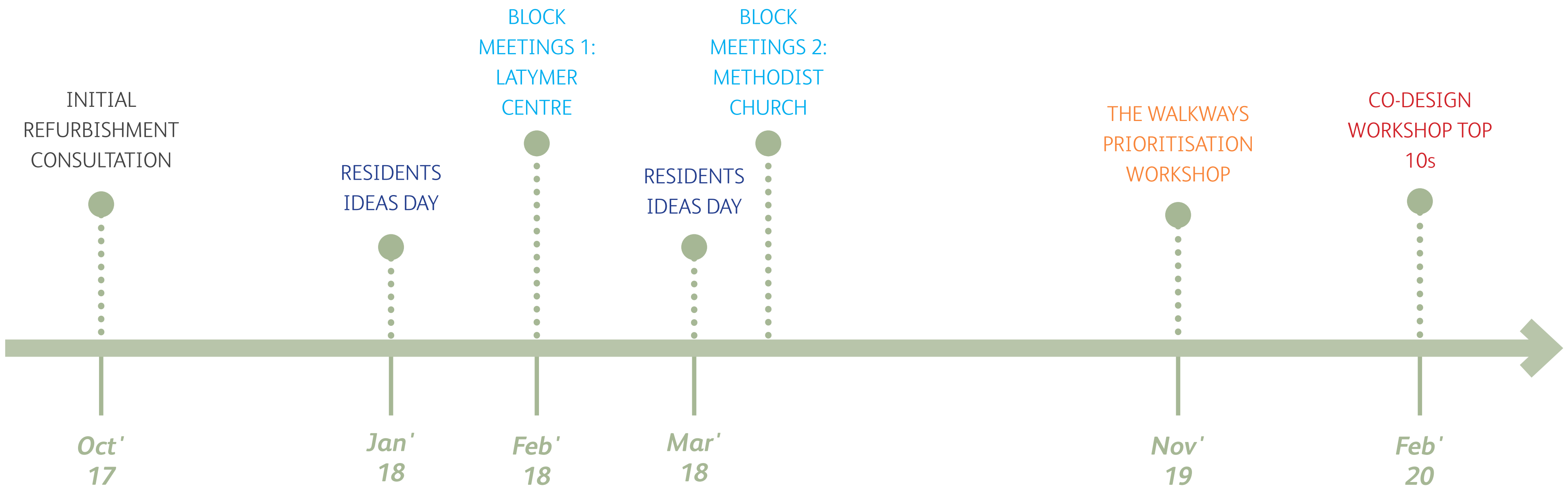


Figure 5 - Timeline of previous consultations

LWE & WELCOME (IDEAS DAY)

At the LWE & welcome (ideas day) workshop residents from both Morland House and Talbot Grove House had the opportunity to discuss their concerns and early design options for their homes and their buildings. Resident's expressed wanting upgrades to their kitchens and bathrooms, feeling insecure within their homes particularly at ground floor level, the need for overlooking into the communal garden from their homes and having external private areas.

For their building and external space residents discussed having insufficient space for bicycle storage and recycling bins, making the communal garden more usable, having a clear defined entrance area, lifts and some sort of communal facilities near the building.

CO-DESIGN WORKSHOPS

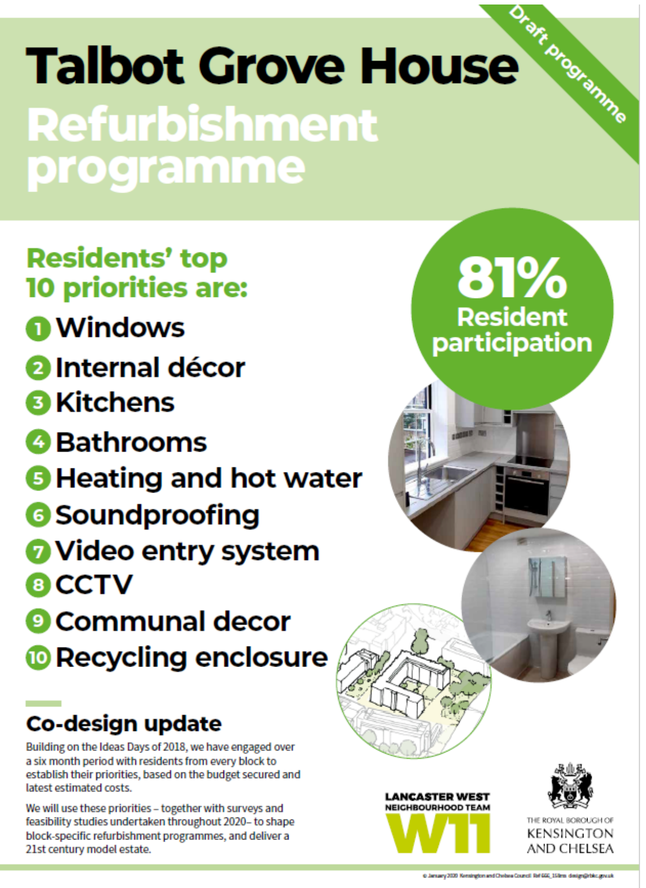
The Co-Design Workshops for both Morland House and Talbot Grove House were held on 20th February 2020 and led by the Resident Engagement Team. This COVID-19 friendly workshop established the resident's priorities for the refurbishment programme from the items available.

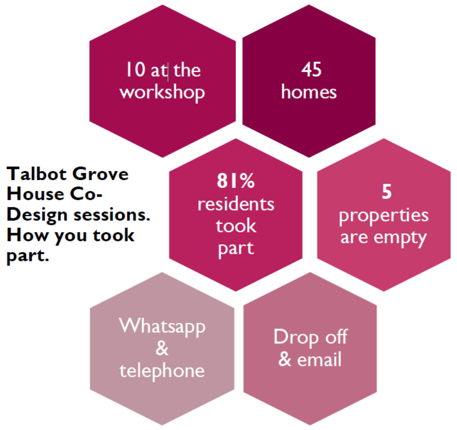
ECD proposed response to the key areas to both Morland House and Talbot Grove House.

- Improve the facade performance by installing a new double/ triple glazed windows to thermally improve the building.
- Improve the façade fabric by introducing a new internal wall (IWI) or external wall (EWI) system.
- Improvements to the communal areas/ stair core: decorations, new flooring, LED lighting, etc. Include painting of all metalwork

RESIDENTS TOP 10 PRIORITIES

TALBOT GROVE HOUSE

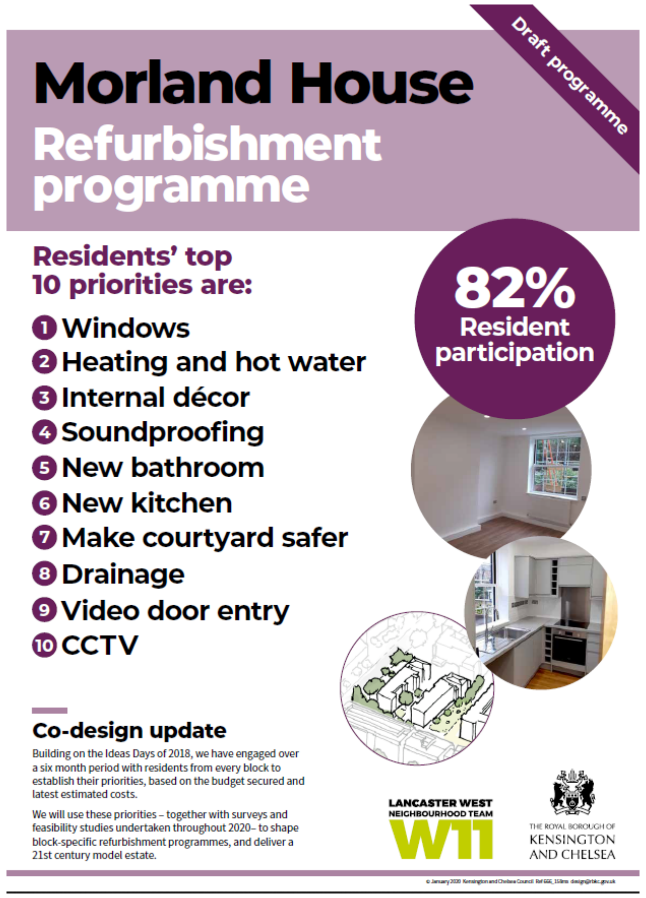




Residents Priorities

1. New Windows
2. Internal decor
3. New Kitchens
4. New Bathrooms
5. Heating Renewal
6. Sound Proofing
7. Video door entry system
8. CCTV
9. Communal Decor
10. Recycling enclosure

MORLAND HOUSE



Residents Priorities

1. New Windows
2. Heating Renewal
3. Internal Decor
4. Sound Proofing
5. New Bathrooms
6. New Kitchens
7. Courtyard gates & lighting
8. Drainage
9. Video door entry system
10. CCTV

NOTE: Items in darker green are those within ECD Scope of Works - items in light grey are by others, but to be coordinated

2.2.2 RETROFIT ACCELERATOR REPORT OPTIONS

Prior to the appointment of ECD and other MDC teams, LWNT obtained input from Retrofit Accelerator on an estate-wide basis. This high-level study (see report dated 21st May 2020) identifies a series of retrofit packages that could be applied to each of the building typologies as part of the route to net zero Carbon. These interventions are identified as Option 1 (Essentials); Option 2 (High performance envelope) and Option 3 (High performance envelope plus renewables and storage). These options were subsequently categorized by LWNT as Bronze (option 1), Silver (option 2) and Gold (option 3).

Each intervention considered the impact across all building elements including:

- Walls
- Thermal bridging
- Air-tightness
- Glazing
- Roof
- Ventilation
- Heating
- Solar

For Talbot Grove and Morland House the proposed interventions are set out in the table below:

Package	Walls	Thermal bridging	Air-tightness	Glazing	Roof	Ventilation	Heating	Solar
0 Current situation	Solid wall, uninsulated	Potentially through balconies	Poor due to windows	Single glazed, sash	Room in roof, uncertain age, potentially no or little insulation	Unknown	Gas based heat network	None
1 Essentials			Basic draught proofing	High performance double / triple + new external doors	Max insulation possible with existing structure	Additional MEV	Heat pump-based heat network	
2 High performance envelope			Best practice	High performance double / triple + new external doors	Potentially new super-insulated roof	Additional MEV/MVHR	Heat pump-based heat network	
3 High performance + solar PV & storage			Best practice	High performance double / triple + new external doors	Potentially new super-insulated roof	Additional MEV/MVHR	Heat pump-based heat network	Solar PV + Communal storage

Figure 6 - Retrofit Accellerator Report extract

Based upon the limited information available at that time this high-level report made several important assumptions about the build-up and condition of each block and therefore the authors advise that the results should be treated with caution. Nevertheless, this study offered indicative energy performance results which are set out below (Figure 7).

Package	Annual CO_2 emissions (tonnes)	Heat demand (kWh/m²) Ground – Mid – Top Floor			Annual tenant cost (heating and electricity)
0 Current situation	3.6*	148	106	193	£1,100*
1 Essentials	1.9	123	72	109	£790
2 High performance envelope	1.7	93	71	82	£720
3 High performance + solar PV & storage	1.2	93	71	82	£460

Figure 7 - Retrofit Accellerator Report extract

Indicative costs per property were also provided with a risk profile for each option. The report also identified some of the further work to be undertaken by the MDC teams to verify assumptions and confirm the suitability of proposals. For Talbot Grove and Morland House these included:

1. What is the potential for roof insulation or new roof?
2. Thermal bridging, ventilation and overheating strategies
3. How does each option fit with heat network feasibility?

One of the important assumptions made in the Retrofit Accelerator report was that wall insulation may not be possible for these blocks for the following reasons:

- The loss of heritage and aesthetic features
- Technical challenges, particularly around the walkway
- Costs could not be estimated with any degree of confidence

Whilst these issues need to be carefully considered we would challenge these assumptions for the reasons set out below.

Alongside the work undertaken by Retrofit Accelerator LWNT appointed Eco Design Consultants to provide a more in-depth study for Morland House. Their Passivhaus (1) Options Report V1.2 dated May 2020 is referred to below. Modelling the building in PHPP Eco Design identified an average space heating demand in the existing building (Base Case) of approximately 240kWh/m2/a. This compares to the Retrofit Accelerator report which suggests a range from 106kWh/m2/a (mid-floor) to 193kWh/m2/a (top-floor). Given the greater degree of accuracy provided by PHPP modelling (compared to EPC data derived from RdSAP and used by Retrofit Accelerator) we believe the ECO Design report represents a much more reliable model of existing performance.

As shown in the Passivhaus Options Report (refer to Section 3.3) the estimated heat losses from the existing walls and associated thermal bridging represent approximately 75kWh/m2/a of the total losses, i.e.: over 30%. Therefore, we do not believe external walls can be excluded from any analysis of zero Carbon retrofit. Therefore, all options put forward in this report assume that the existing walls will need to be insulated, either externally or internally.

2.2.3 SOCIAL HOUSING DECARBONISATION FUND

To realise the ambitions for a Zero Carbon Estate the Design Team have supported LWNT seek additional funding for the works. The SHDF fund launched by BEIS in late September 2020 was identified as a key opportunity and ECD worked very closely with LWNT to meet the funding criteria and demonstrate the potential for significant energy savings on these buildings.

The SHDF key criteria to be achieved can be summarised as follows:

1. Reduce space heating demand to not more than 50kWh/m2/a by offering a Whole House retrofit solution in accordance with PAS 2035.
2. Demonstrate innovation and potential for financial savings when delivered at scale
3. Provide a robust methodology for the assessment of both existing dwellings and installed measures with ongoing monitoring in-use.
4. Provide a clear procurement route and programme to demonstrate how the project could be completed by the end of 2021.
5. Demonstrate how the improved building fabric will support the Health and Comfort of the Residents

Given the very tight deadlines for the funding application a series of assumptions were made in discussion with LWNT and should the application be successful these will need to be discussed with both residents and planning officers before the proposals can be verified. Nevertheless the proposed option for EWI using the Beattie Passive 'T-Cosy' system was modelled in PHPP and the outcomes demonstrate a significant reduction in space heating demand as set out in one of the proposed options in this report. For further information related to this, please refer to page 66 (Beattie T-Cosy System) and page 36 (Space heating demand reduction).

The application was submitted in mid-November and a decision is expected by the end of the year. Should this application be successful the design team would review the current proposals and work with LWNT and other stakeholders to accelerate the current programme to achieve the funding deadlines.

Evaluating Retrofit

Disruption	Band	Examples
Minimal	⚒	Low energy lamps, energy efficient appliances
Low	⚒⚒	Heating controls, cavity wall insulation, draught-stripping, loft insulation
Moderate	⚒⚒⚒	Replacement boiler, solar water heating
High	⚒⚒⚒⚒	Replacement windows, whole house ventilation, external wall insulation
Significant	⚒⚒⚒⚒⚒	Ground floor insulation, internal wall insulation, new heating system

Net cost (£) (capital minus fuel saving) divided by Whole-life carbon dioxide emissions reduction (tonne)

Capital cost band	Symbol
Up to £100	£
£100-£1000	££
£1000-£5000	£££
£5000-£10,000	££££
Over £10,000	£££££

Carbon cost effectiveness (£/tCO_2)	Symbol
Pays for itself	☺☺☺☺☺
0-10 £/tonne CO_2	☺☺☺☺
10-100 £/tonne CO_2	☺☺☺
100-500 £/tonne CO_2	☺☺
>500 £/tonne CO_2	☺

Measure	Capital cost	Carbon cost effectiveness	Disruption
Floors			
Floor insulation	££	☺☺☺☺☺	⚒⚒⚒⚒⚒
Walls			
Internal wall insulation	££££	☺☺☺☺☺	⚒⚒⚒⚒⚒
Cavity wall insulation	££	☺☺☺☺☺	⚒⚒
External wall insulation	££££/£	☺☺☺☺☺	⚒⚒⚒
Roofs			
Loft insulation	££	☺☺☺☺☺	⚒⚒
Rafter insulation (only when reroofing)	£££	☺☺	⚒⚒⚒
Windows and doors			
Replacement windows and doors (U value 1.8)	£££	☺☺	⚒⚒⚒
Replacement windows and doors (U value 0.8)	£££££	☺☺	⚒⚒⚒
Air tightness and ventilation			
Draught-stripping	£	☺☺☺☺☺	⚒⚒⚒
Major air-tightness measures	££	☺☺☺☺☺	⚒⚒⚒
Air-tightness measures with MVHR	£££	☺☺	⚒⚒⚒⚒
Lighting and appliances			
Low energy lights	£	☺☺☺☺☺	⚒
Low energy appliances (marginal cost of replacement)	£££	☺☺	⚒
Heating			
Replacement gas boiler	£££	☺☺	⚒⚒⚒
Upgrading heating controls	££	☺☺☺	⚒⚒
Micro CMP	££££	☺	⚒⚒⚒
Ground source heat pump	£££££	☺	⚒⚒⚒⚒⚒
Air source heat pump	££££	☺	⚒⚒⚒⚒
Wood pellet boiler	££££	☺☺	⚒⚒⚒⚒
Renewable energy systems			
Solar hot water heating	£££	☺	⚒⚒
1kW photovoltaic panels	££££	☺	⚒⚒
Micro wind turbine	£££	☺	⚒⚒

Figure 8 - PAS2035 table for evaluating retrofits

MAXIMISING FIRE SAFETY

In the light of the Grenfell tragedy and the ongoing inquiry plus the findings of the Building Safer Future report and draft Building Safety Bill; any proposals for changes to the existing buildings will, quite rightly, be required to demonstrate the most rigorous approach to maximise the Fire Safety of residents and the wider community. ECD company policy is to recommend A1 materials on external walls wherever possible and not less than A2 in accordance with Building Regulations Part B. A bespoke non-combustibility tracker will be prepared as the design develops to record all external wall materials and their combustibility. The detailed design information will be reviewed by our independent Fire Consultant and submitted to Building Control for approval prior to the commencement of the works. During construction the contractor will be required to demonstrate to the Clerk of Works (with photographic evidence) the installation of all materials.

This evidence will be tagged to the BIM model and will be handed over to LWNT on completion of the works thereby ensuring a 'Golden Thread' of information is maintained from design to completion.

LWNT are currently undertaking Type 4 Fire Safety Risk Assessments, to maximise safety, which include intrusive investigations to both common parts and individual flats. The design team have recently been provided with the outcomes from each archetype and will incorporate the recommendations into the design proposals wherever necessary. LWNT have provided information on the existing fire escape routes and these will be reviewed in advance of any retrofit proposals and fire strategies prepared in due course to reflect the proposed scheme. IFC (International Fire Consultants) are to be appointed from RIBA Stage 2 onwards to support the development of this work.

ENERPHIT

The Passivhaus concept, and its retrofit equivalent EnerPHit, is focused on achieving very high standards of energy efficiency, requiring designers to consider thermal performance in great detail to eliminate the need for a conventional-sized heating system and deliver high standards of internal air quality and thermal comfort. Therefore, it is a perfect standard to achieve Net Zero Carbon, together with discarding gas and taking into consideration the embodied carbon of the chosen materials.

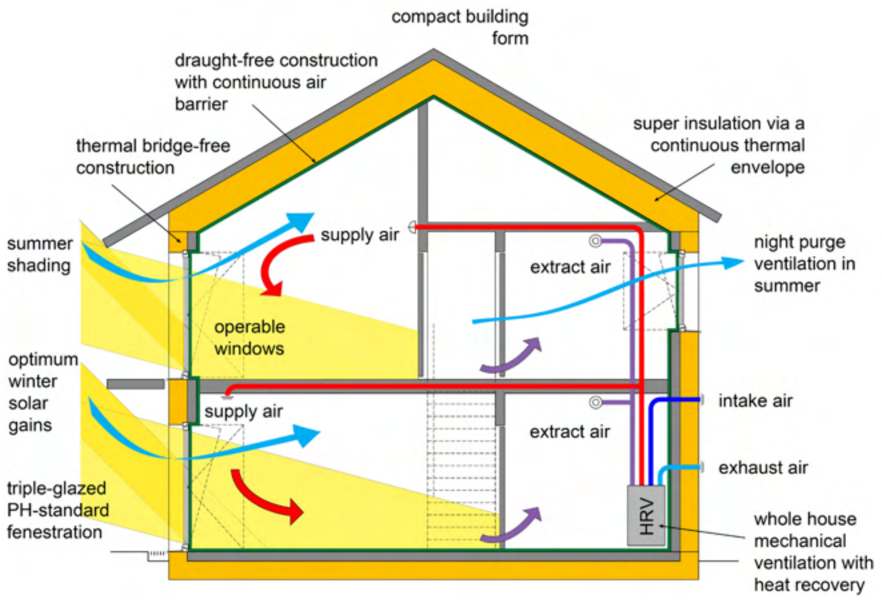


Figure 9 - Passivhaus Diagram

EnerPHit is the retrofit strategy utilising Passivhaus principles to meet the key criteria in order to provide an energy balance between internal heat gains and external heat loss to minimise energy bills. Careful specification and detailing is required to achieve a highly insulated thermal envelope, high levels of airtightness, minimal thermal bridges and the provision of Mechanical Ventilation with Heat Recovery[1].

EnerPHit Criteria	
Specific Heat Demand	≤ 20 kWh/m².yr for London (Heat Demand method) Alternative method - by Component
Primary Energy Demand	≤ 120 kWh/m².yr
Air Tightness	≤ 1.0

1.Mechanical Ventilation with Heat Recovery (MVHR) unit brings in fresh air and pre-warms this with the heat from outgoing air. This fresh, warmed air is then distributed to living areas, while stale air is extracted from kitchen and bathrooms. Windows can still be opened, but the building will still work even if windows are kept shut. The Passive House Planning Package (PHPP) is a design tool which enables architects and designers to professionally plan and optimise their Passive House design.

The EnerPHit standard is less stringent than Passivhaus due to the number of design factors which are fixed and the difficulty in eliminating existing thermal bridges. In this particular instance, Talbot Grove House and Morland House have a relative good form factor which may assist in achieving the EnerPHit target, however, further confirmation of this will come in later stages, during the detailed design phases.

The residual space heating and hot water demand is typically so small that conventional heating solutions are not necessarily required – for small flats this might only equate to the power of a hairdryer at the coldest time of the year. Heating could then be delivered through the ventilation system, for example, or by a combination of communal air source heat pumps and solar thermal collectors. For this project, this means that careful consideration must be had to size either the District Heating system input, of an alternative individual space heating solution.

To ensure the above conditions are met, all Passivhaus-certified design proposals are checked using the bespoke Passivhaus (PHPP) design software, which has been developed and refined over many years of monitored experience. Thermal modeling using PHPP will also assess the risk of summer overheating and appropriate design strategies, such as shading, can be developed to mitigate this, which is an important adaptation to future climatic conditions.

In addition to the heating energy saving strategies outlined, the standard promotes the provision of efficient hot water distribution and storage systems, along with low energy lighting and appliances to minimise electricity consumption.

BENEFITS

Together with the meticulous attention to air tightness, triple-glazing with insulated window frames which eliminates all internal draughts, Passivhaus-standard fenestration would also deliver the highest level of acoustic protection, whilst the supply of pre-warmed and filtered fresh air also ensures the highest levels of indoor air quality without having to rely only on opening windows – a particular concern for security at lower levels, noise disruption and under-ventilation within the winter months.

For tenants, there are significant improvements on the quality of life within Passivhaus standard dwellings. Taking precedent in completed Passivhaus and EnerPHit projects, residents have expressed that they are exceptionally comfortable thermally, due to the warm surface temperatures and even internal air temperatures - as a result, they are always mould free even in the worst winter conditions.

But perhaps one of most important benefit is the impact on potential fuel poverty. With a limit on space heating demand of 20-25 kWh per square meter per year on EnerPHit projects (depending on the location), Passivhaus measures reduce annual heating cost for residents. A further design limit on total primary energy of 120 kWh per square meter per year also ensures that the entire energy bill is also kept to a minimum.

Passivhaus/EnerPHit designs can deliver often life-changing performance in terms of health and economic benefits. Achieving this standard of refurbishment would put the Lancaster West Estate at the forefront of low carbon buildings, not only within the Council, but also on a national and even international platform.

Further to the previous consideration of the financial benefits of Passivhaus/EnerPHit, there are many non-financial benefits of the retrofit for residents:

- The thermal comfort benefits of increased levels of fabric insulation linked with triple glazed windows and heat recovery ventilation have been thoroughly described in several studies, which show that there are also significant health benefits associated with warmer housing. Cold housing affects respiratory health, emotional well-being, health resilience, manual dexterity (leading to more accidents); fuel poverty also negatively affects dietary opportunities and choices
- The warmer wall surfaces and continuous extract ventilation will also mean the elimination of surface mould arising from excessive condensation. This can improve residents' health, particularly so for any residents with asthmatic or respiratory conditions. For the landlord, the cost of treating mould growth is eliminated
- The quality assurance during the design and construction process, thanks to third party certifiers
- The elimination of the performance gap between predicted and actual energy usage
- Excellent indoor air quality, thanks to the fresh filtered incoming air, which is inner city areas, such as in LWNT, helps filtering air pollutants and improve people's health

FUTURE CLIMATE SCENARIOS

With the current climate crisis, the climate is becoming more extreme and unpredictable. Summers are getting hotter and the risk of overheating is increasing in all properties. That is particularly important for vulnerable residents like elderly, children or people with certain medical conditions.

Passivhaus methodology allows to assess and take into account future climate scenarios and design for them, ensuring internal thermal comfort today and in the future.

3.0 EXISTING BUILDING AND CONTEXT

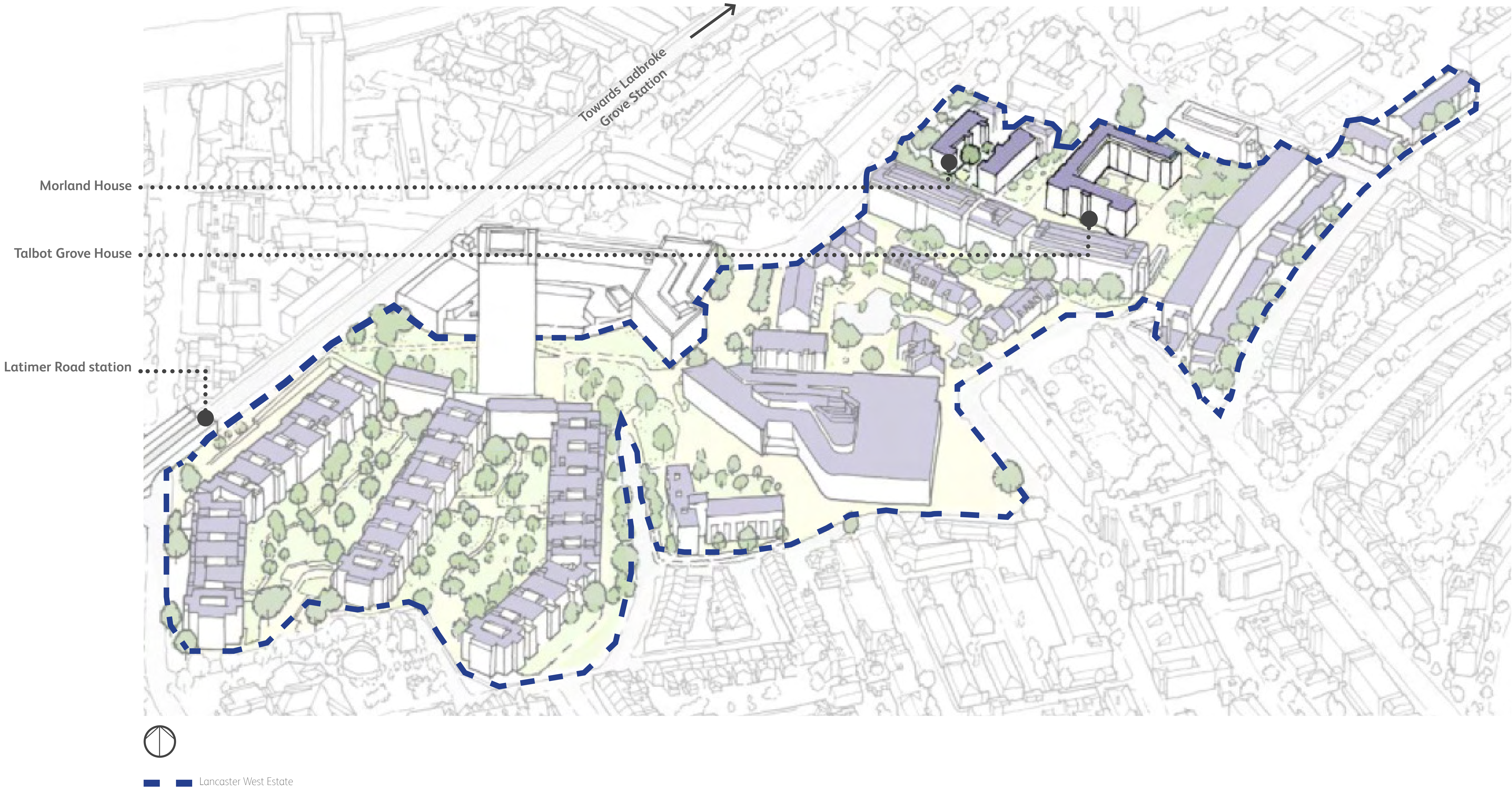


Figure 10 - Aerial view of Lancaster West Estate

SITE LOCATION

Morland House and Talbot Grove House sit under the Lancaster West Neighbourhood Team. These two buildings are in close proximity within each other and minutes walking distance to Latimer Road Tube Station and Grenfell Tower.

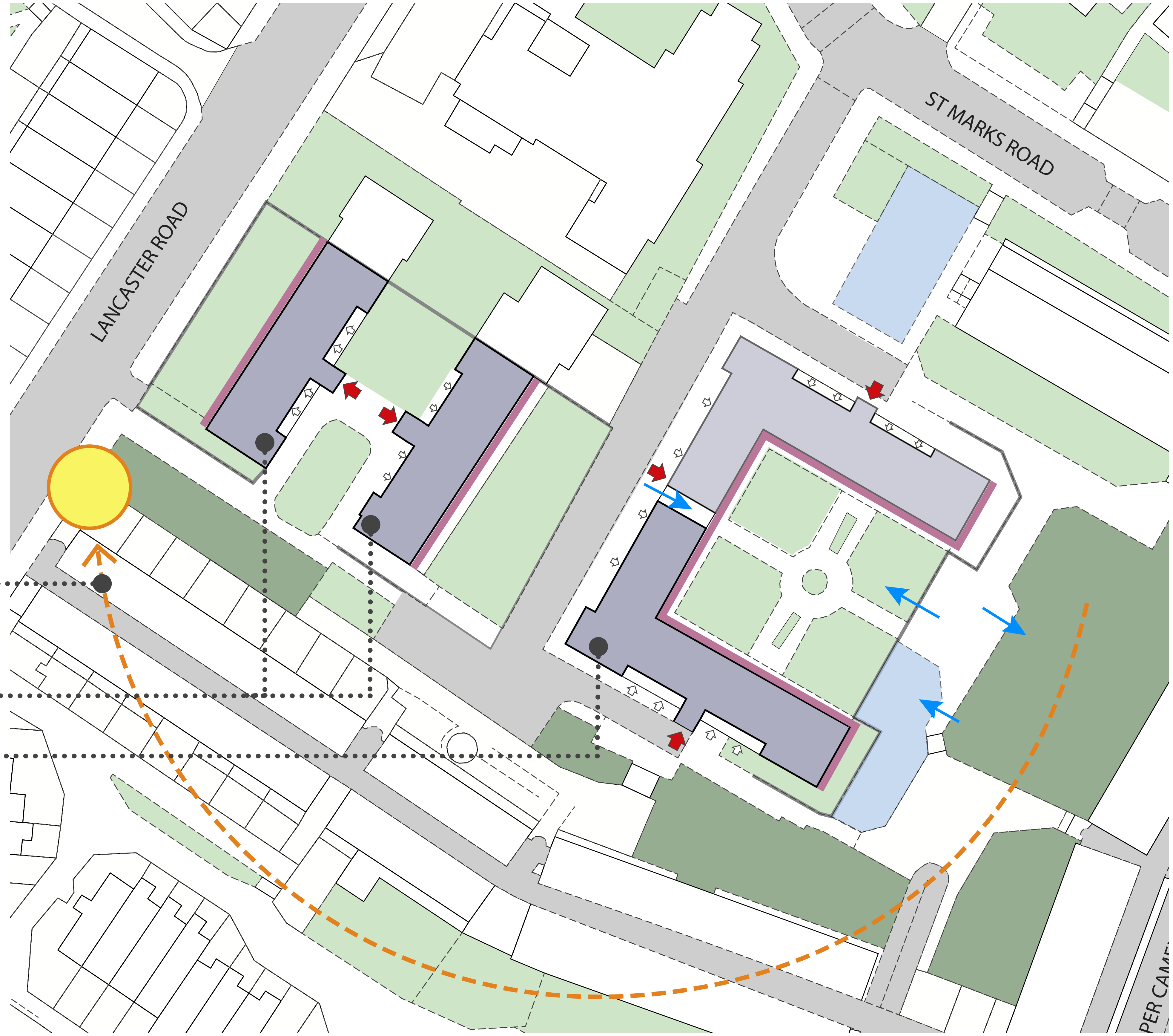


Figure 11 - Location plan showing sun path

Figure 12 - Aerial View

HISTORY

During 1930, the Housing Act encouraged councils to demolish and rebuild poor quality housing, some of which were Morland House and (1931) and Talbot Grove House (1932).

Figure 14 - Talbot Grove House

Figure 13 - Morland House

By doing so, local councils made sure there would be no overcrowding in the area and rent collectors made sure the properties were kept in good conditions and warm. Nevertheless, by having a compact type of property, such as in Morland and Talbot Grove House, meant that they were designed for an economic use of materials and do not have a particularly good relationship with the exterior:

- Little overlooking of the gardens from balconies
- Shared bins and access routes, smells and waste building up
- Poor acoustic performance
- Unwanted access through communal areas

In the "Book of Ideas" these buildings are described as:

"Morland House and Talbot Grove House date from the 1930s, and feature stairs leading to open access decks, with ungated communal spaces between the buildings. Both blocks suffer from poor maintenance, single glazed windows and lack of lifts. Security is also a major concern, both in terms of block access, and the spaces between the buildings. There is a lack of external open space, both communal and private, which is poorly designed and not easily accessible."

Figure 15 - Morland House Collage

Figure 16 - Site Plan Location

MORLAND HOUSE

Morland House is situated on Lancaster Road and consists of two blocks facing each other with a shared communal garden in between. The block has four storeys in total (including the mansard roof), the top two floors contain some maisonettes. The communal garden facades consist of buff brick and the external ones of red brick; both blocks share a decor of vertical brick lintels above all windows.

As mentioned before in this report, there have been numerous engagements from the council, which lead to workshops and Co-design with the residents; during this engagement process, the residents raised multiple concerns, such as:

- Poor Internal decor, especially for kitchens and bathrooms
- Poor Insulation (affected by single glazed windows, heat loss and poor acoustics)
- Poor security with lack of security gates, video door entry and CCTV system

Figure 18 - Internal Courtyard and open walkways

Figure 17 - Bricks intersection and colours

Figure 19 - External facades and fenestration

MATERIAL AND COLOUR SURVEY

Morland House Architecture is enhanced by a rich variety of materials, textures and colours.

The black and white base colour schemes is brought to life by different shades of bricks and clays, punctuated by burst of bright green, with occasional touches of blue.

A visual study of the site and its surroundings enabled us to identify a clear existing colour palette that will inform future design aspirations.

Green has been singled out as a strong element that should be integrated to our proposals.

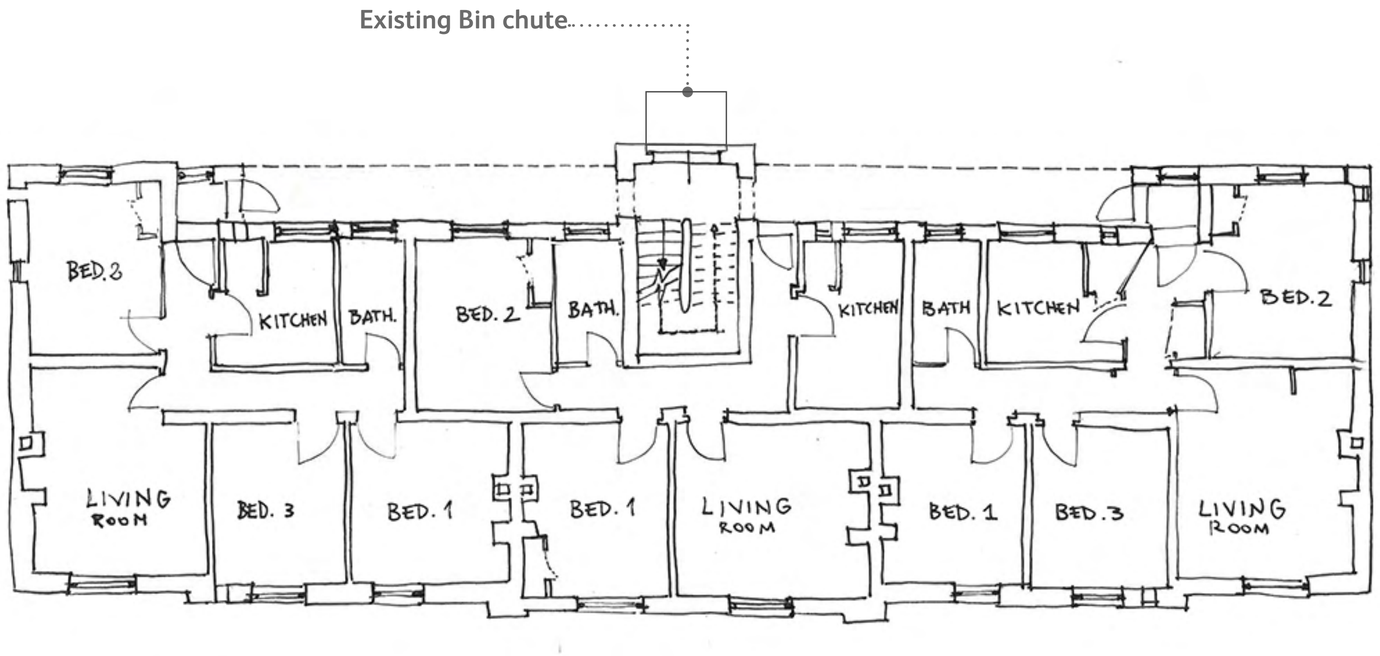


Figure 20 - Existing Typical Ground Floor Plan

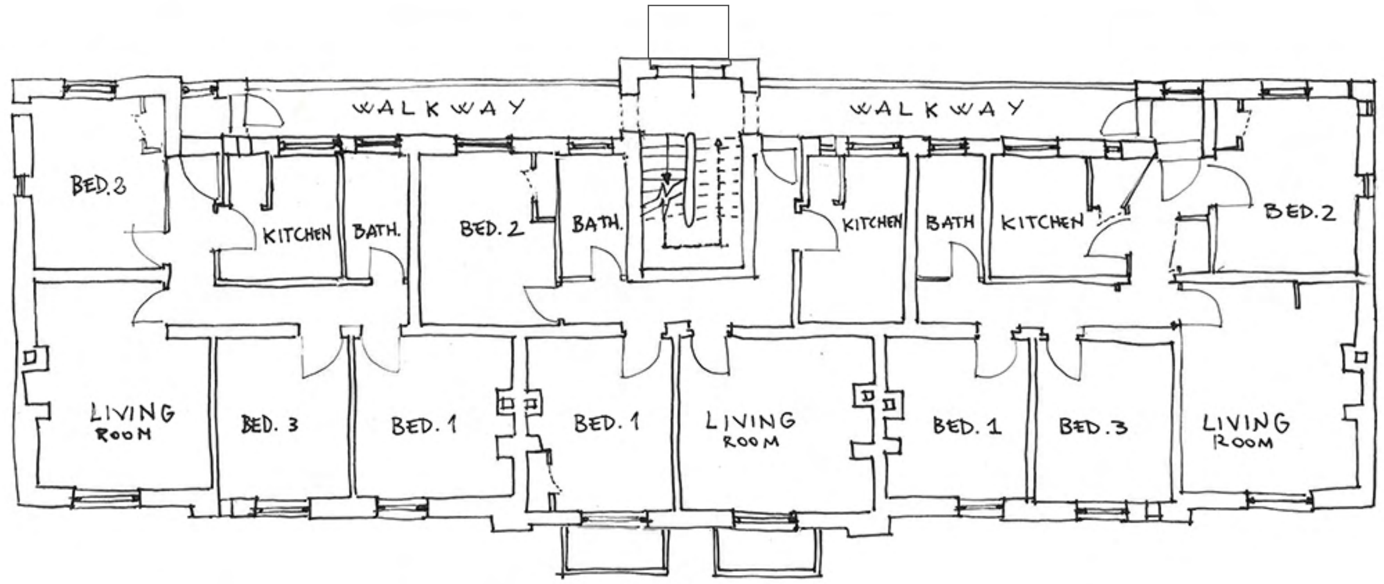


Figure 21 - Existing Typical First Floor Plan

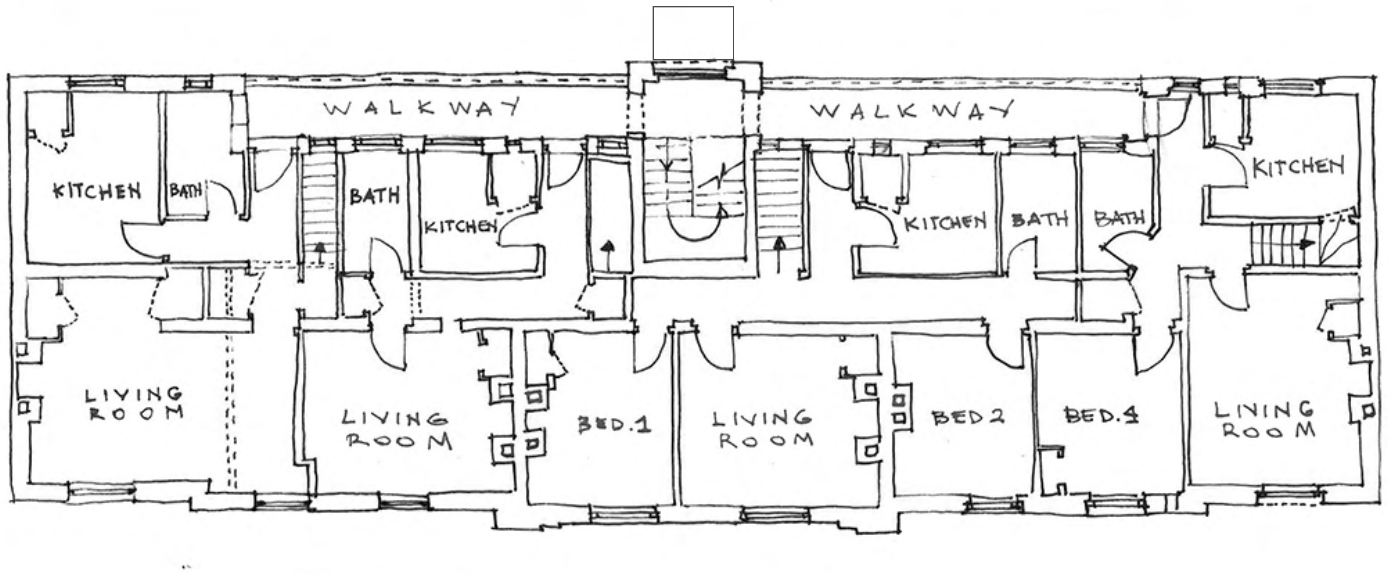


Figure 22 - Existing Typical Second Floor Plan

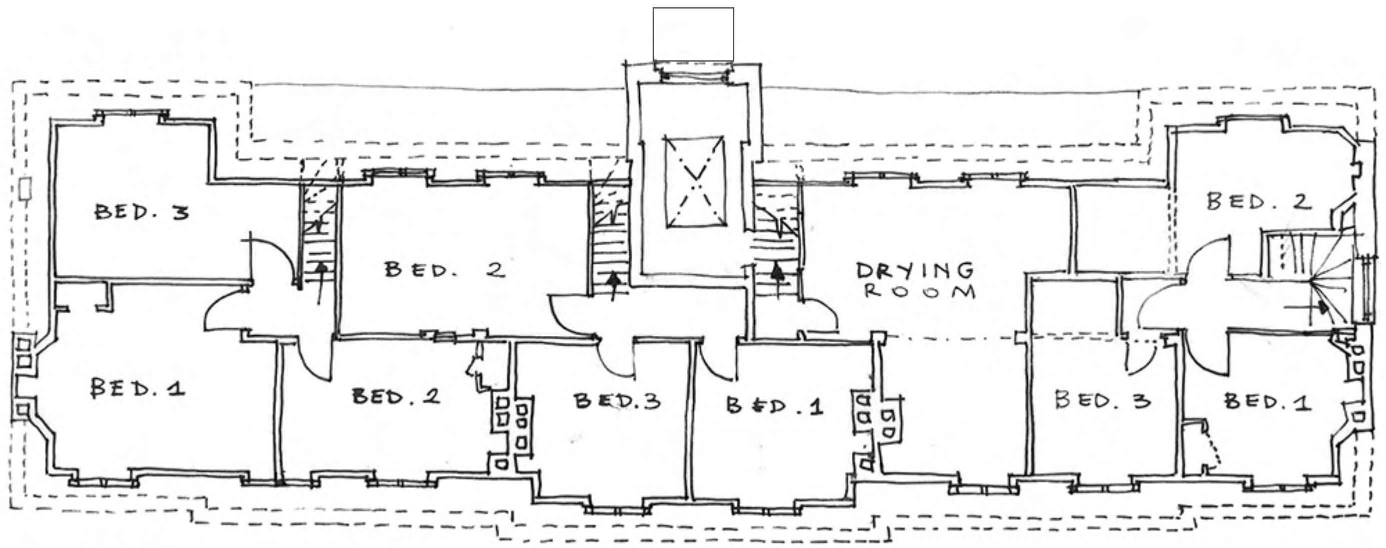


Figure 23 - Existing Typical Roof Plan

NOTE: ECD Architects and LWNT, commissioned a measured survey of these blocks, to include external facades and communal areas.

At the time of writing of this report, these surveys have not been yet received; therefore, the illustrations shown in this report have been redrawn from historic archive information and may not be accurate in certain aspects, for example in relation to the subdivision of flats and rooms, as we know that the blocks undertook important remodelling works during the 1970s.

Figure 24 - Morland House Historic Elevations

Refer to tables below for tenure and accommodation schedule of Morland House

Morland House Existing Accommodation			Flat	Maisonette
	1 BED	1p	18	-
		2p	10	-
	2 BED	3p	4	-
		4p	-	2
	3BED	4p	-	-
		5p	-	-
	4BED	6p	-	-
		7p	-	-

	Talbot House	Morland Grove House
Properties	45	34
Tenants	35	27
Leaseholders	10	7

Figure 26 - Tenure

Block	Addresses	Flats
Morland Grove House	1-17	17
Morland GroveHouse	18-34	17
Talbot House	1-45	45

Figure 25 - Number of Properties per block

Figure 27 - Talbot Grove House Collage

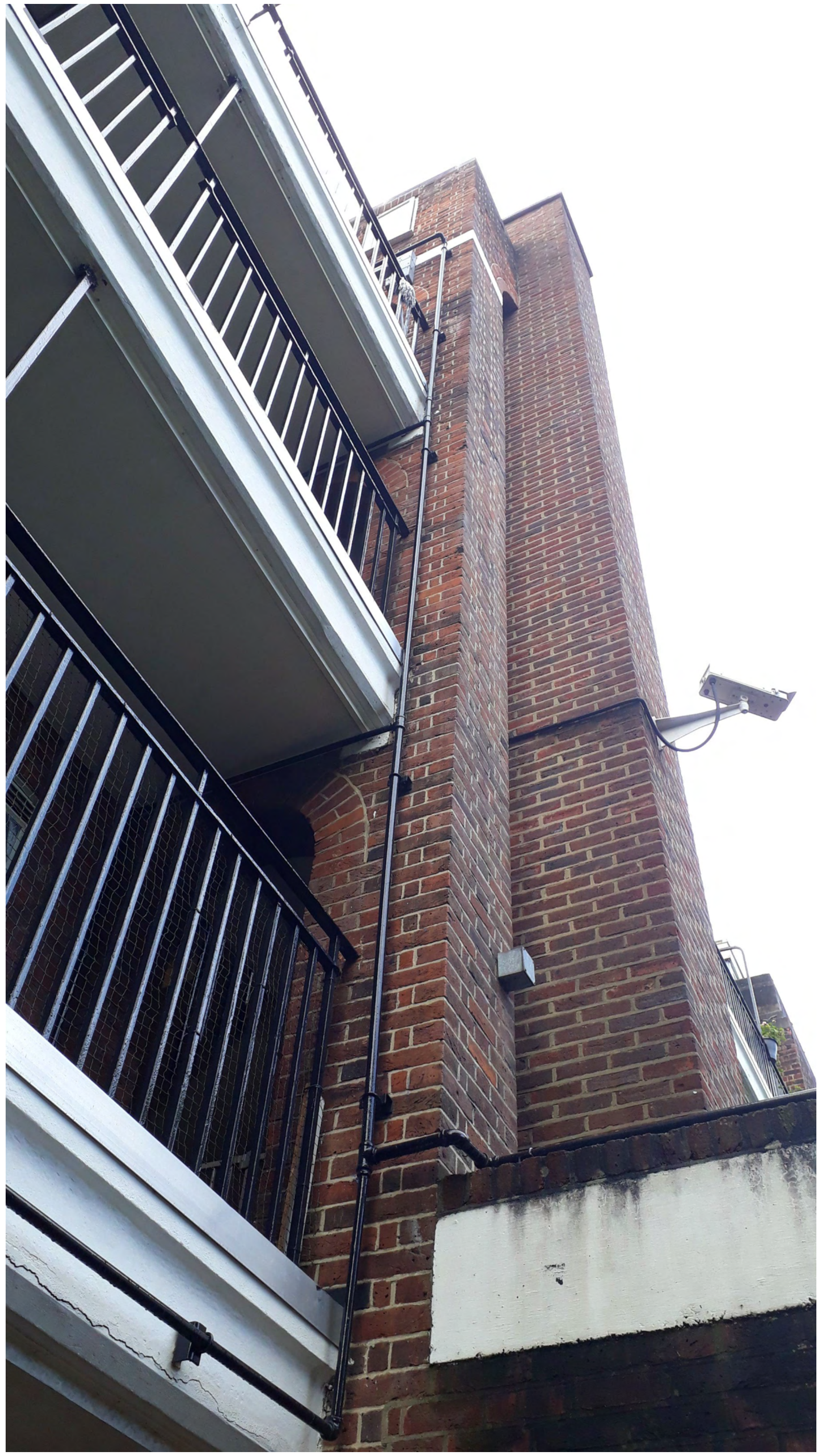


Figure 28 - Photographs of Existing Building, gardens and walkways

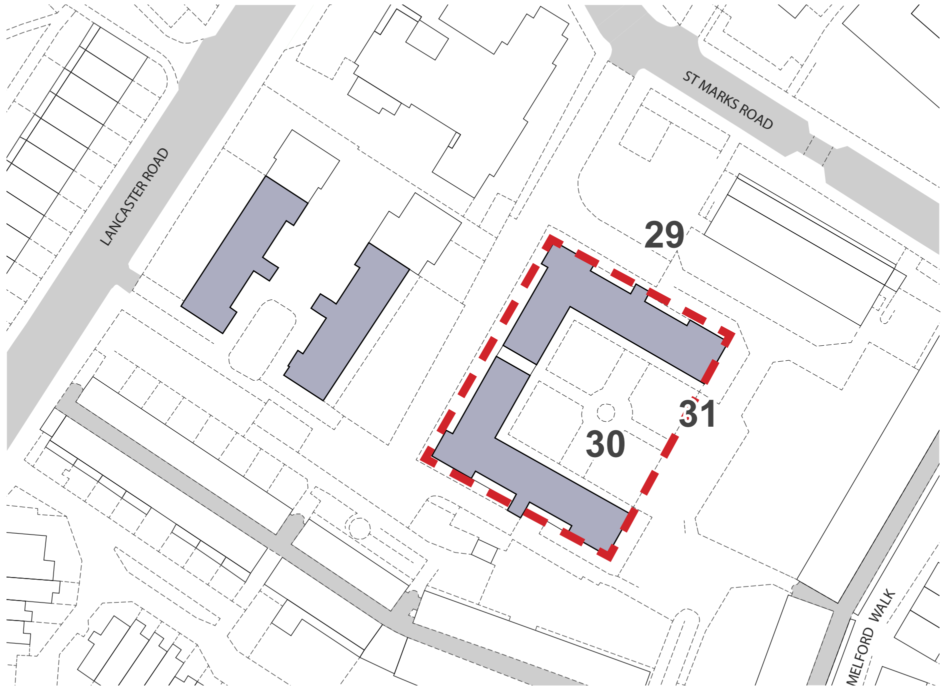


Figure 32 - Site Location Plan

TALBOT GROVE HOUSE

Talbot Grove House is situated adjacent to Morland House and consists of one horse shoe shaped building with a shared communal garden in the courtyard. The block has five storeys in total (including the mansard roof), the top two floors contain some maisonettes. The courtyard and the external facades consist of red brick; the blocks share a decor of vertical brick lintels above all windows.

The three sections of the building have in total 3 open staircores, one per section.

Figure 29 - Existing Bin Chute

Figure 30 - Internal Courtyard

Figure 31 - External facade and amenities

MATERIAL AND COLOUR SURVEY

MATERIAL AND COLOUR SURVEY

Talbot Grove Architecture is enhanced by a rich variety of materials, textures and colours.

The black and white base colour schemes is brought to life by different shades of bricks and clays, punctuated by burst of bright green, with occasional touches of blue.

A visual study of the site and its surroundings enabled us to identify a clear existing colour palette that will inform future design aspirations.

Green has been singled out as a strong element that should be integrated to our proposals.

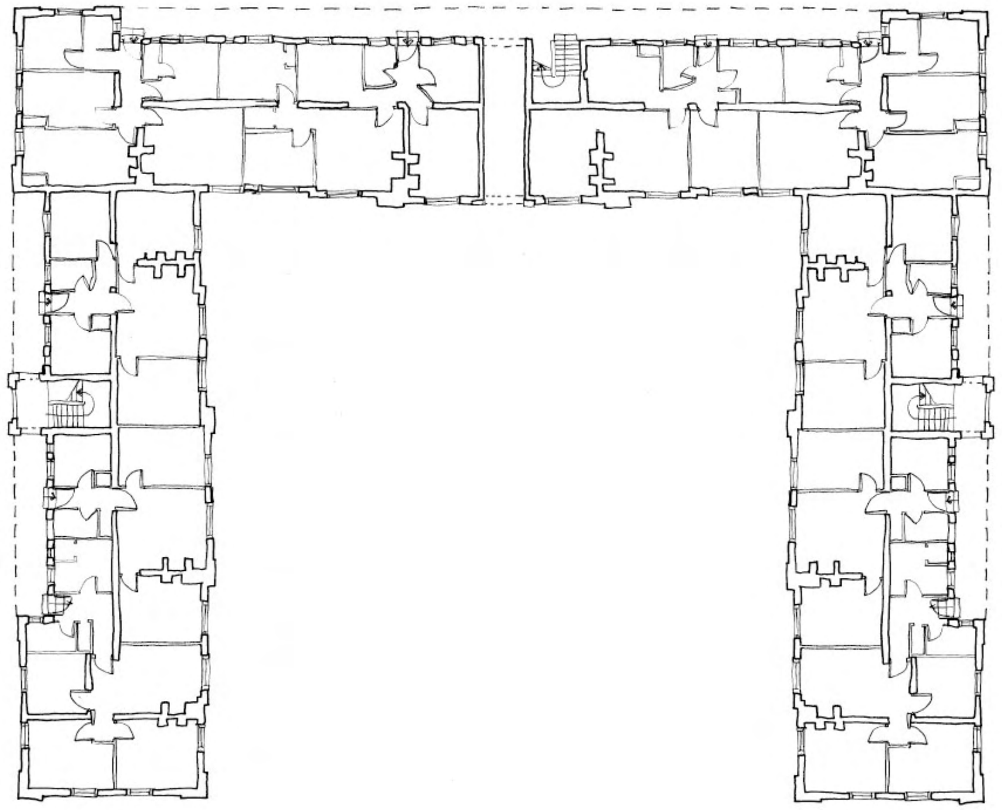


Figure 33 - Existing Ground Floor Plan

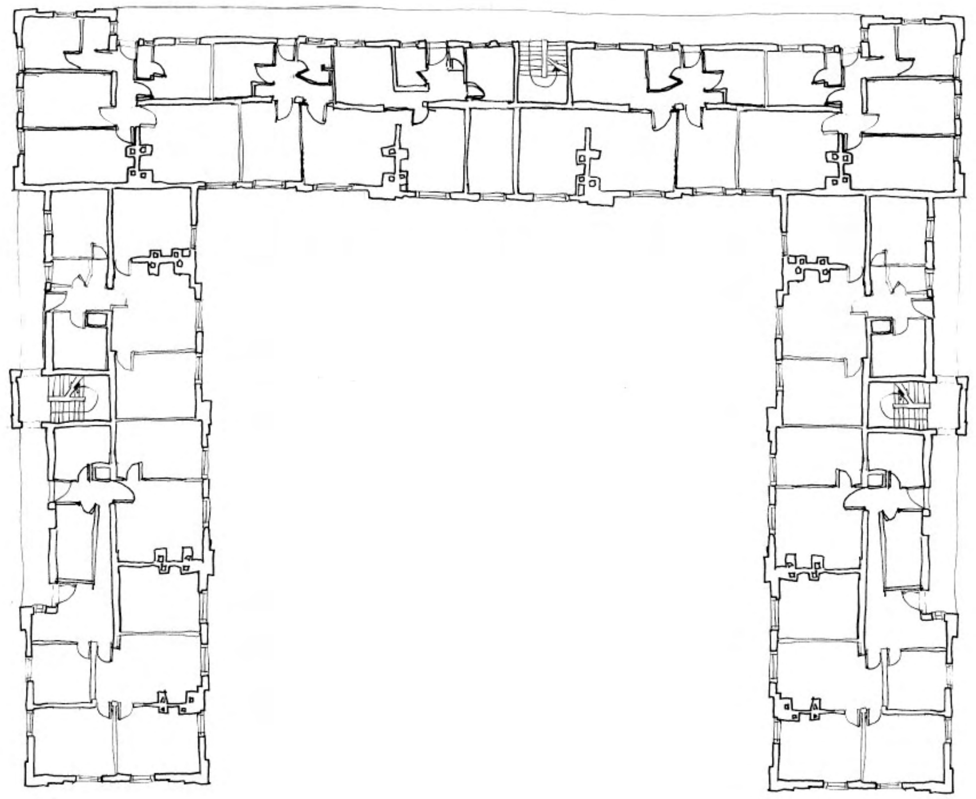


Figure 34 - Existing Typical Floor Plan

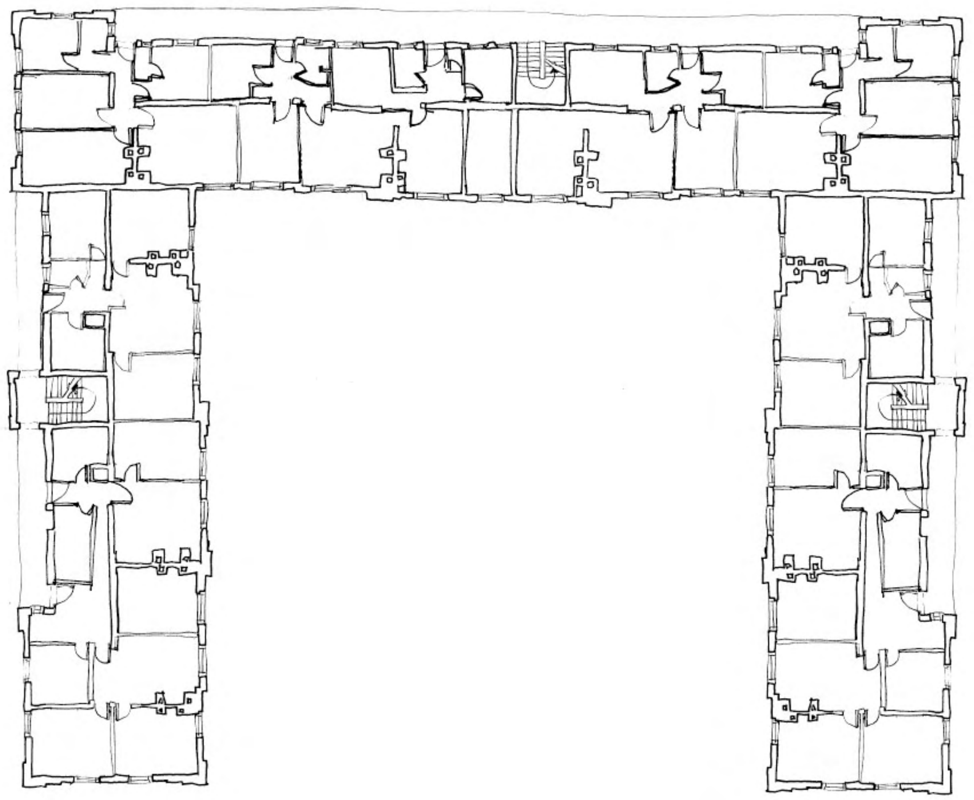


Figure 35 - Existing 3rd Floor Plan

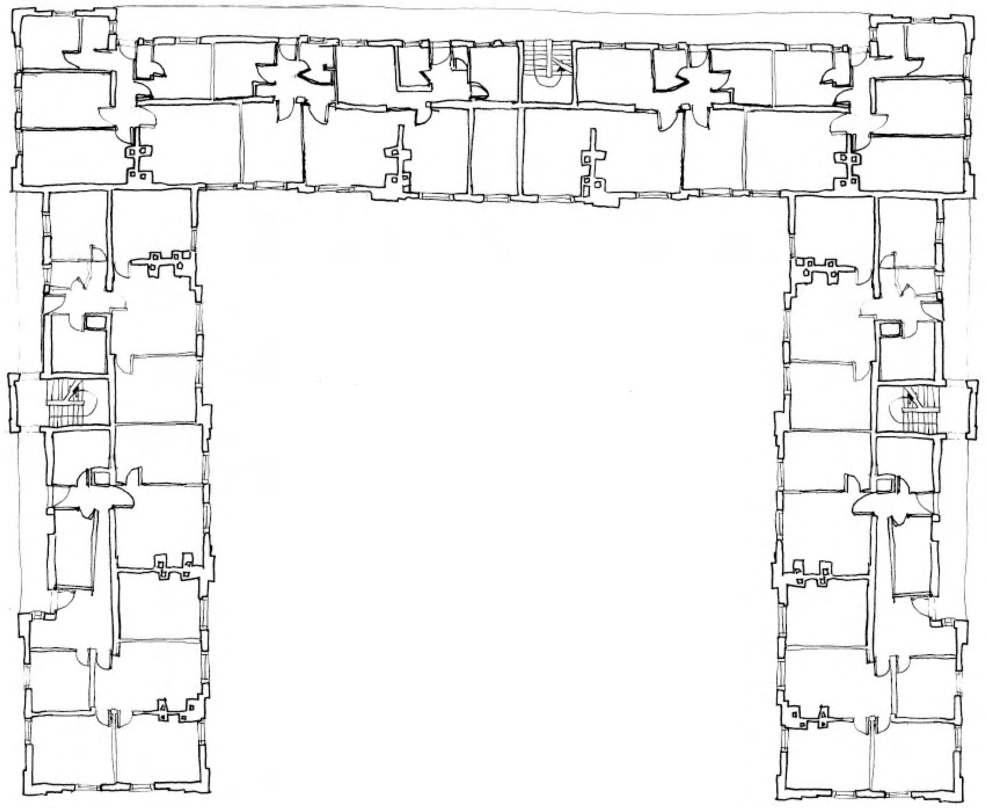


Figure 36 - Existing 4th Floor Plan

NOTE: ECD Architects and LWNT, commissioned a measured survey of these blocks, to include external facades and communal areas.

At the time of writing of this report, these surveys have not been yet received; therefore, the illustrations shown in this report have been redrawn from historic archive information and may not be accurate in certain aspects, for example in relation to the subdivision of flats and rooms, as we know that the blocks undertook important remodelling works during the 1970s.

Refer to tables below for tenure and accommodation schedule of Talbot Grove House

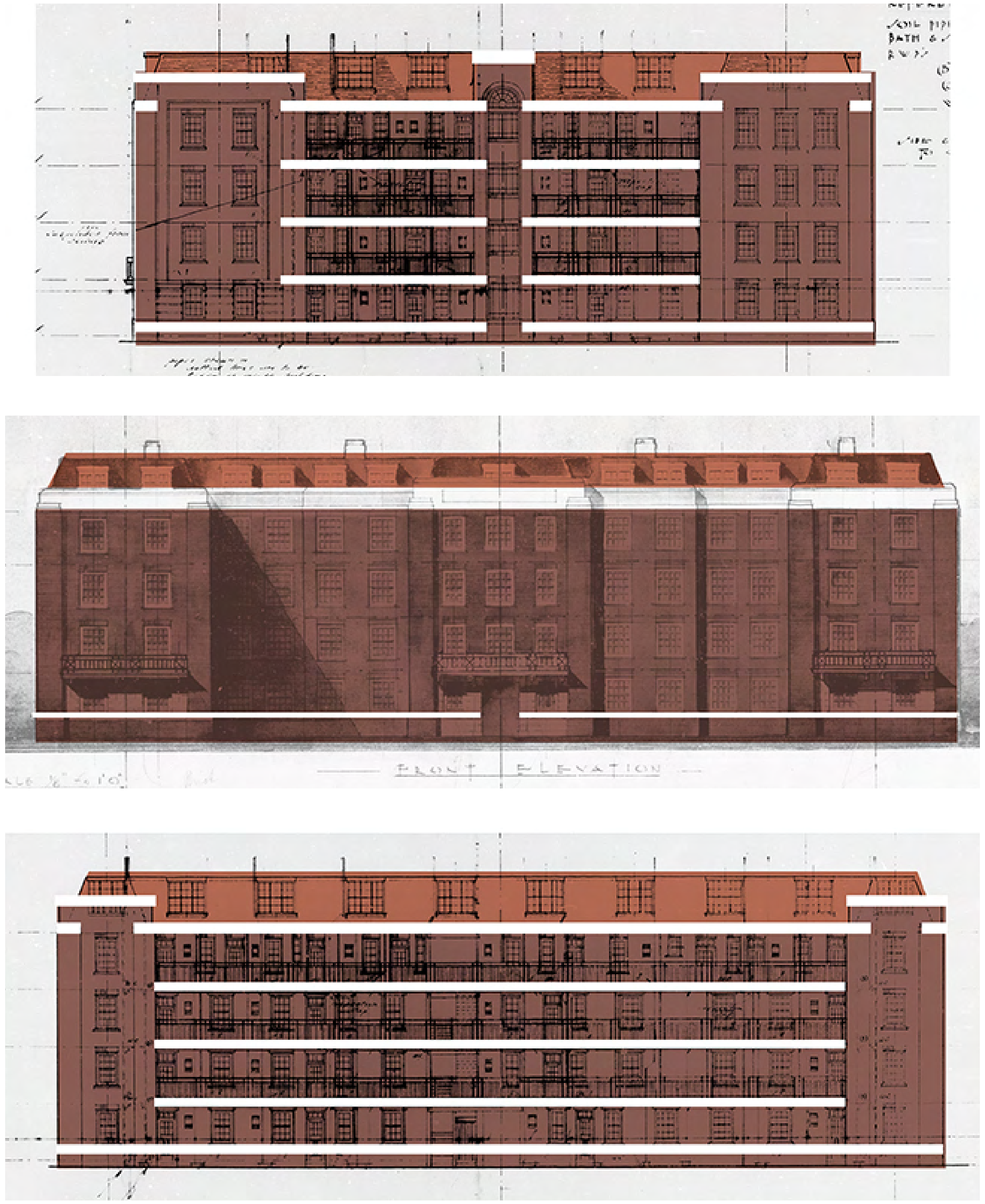


Figure 37 - Talbot Grove House Historic Elevations

Talbot Grove House Existing Accommodation			Flat	Maisonette
	1 BED	1p	-	-
		2p	-	-
	2 BED	3p	4	2
		4p	18	4
	3BED	4p	-	-
		5p	11	5
	4BED	6p	-	-
		7p	1	-

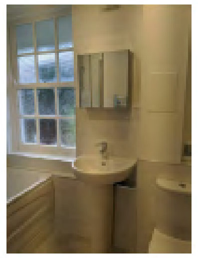
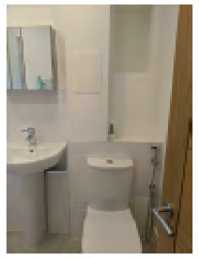
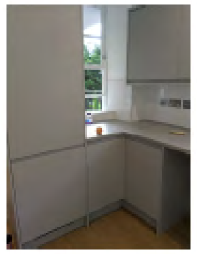
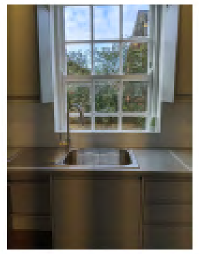
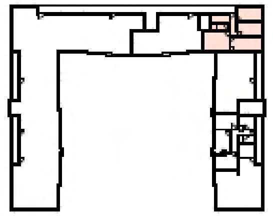
	Talbot House	Morland Grove House
Properties	45	34
Tenants	35	27
Leaseholders	10	7

Figure 39 - Tenure

Block	Addresses	Flats
Morland Grove House	1-17	17
Morland GroveHouse	18-34	17
Talbot House	1-45	45

Figure 38 - Number of Properties per block

GF - Flat 19
1 : 50

Flat 19 @First floor

Approx. ceiling height = 2470 mm

All dims are indicative - further site survey required

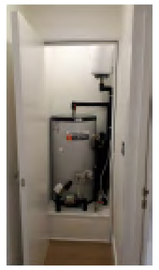
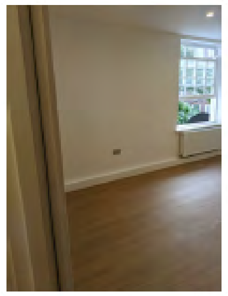
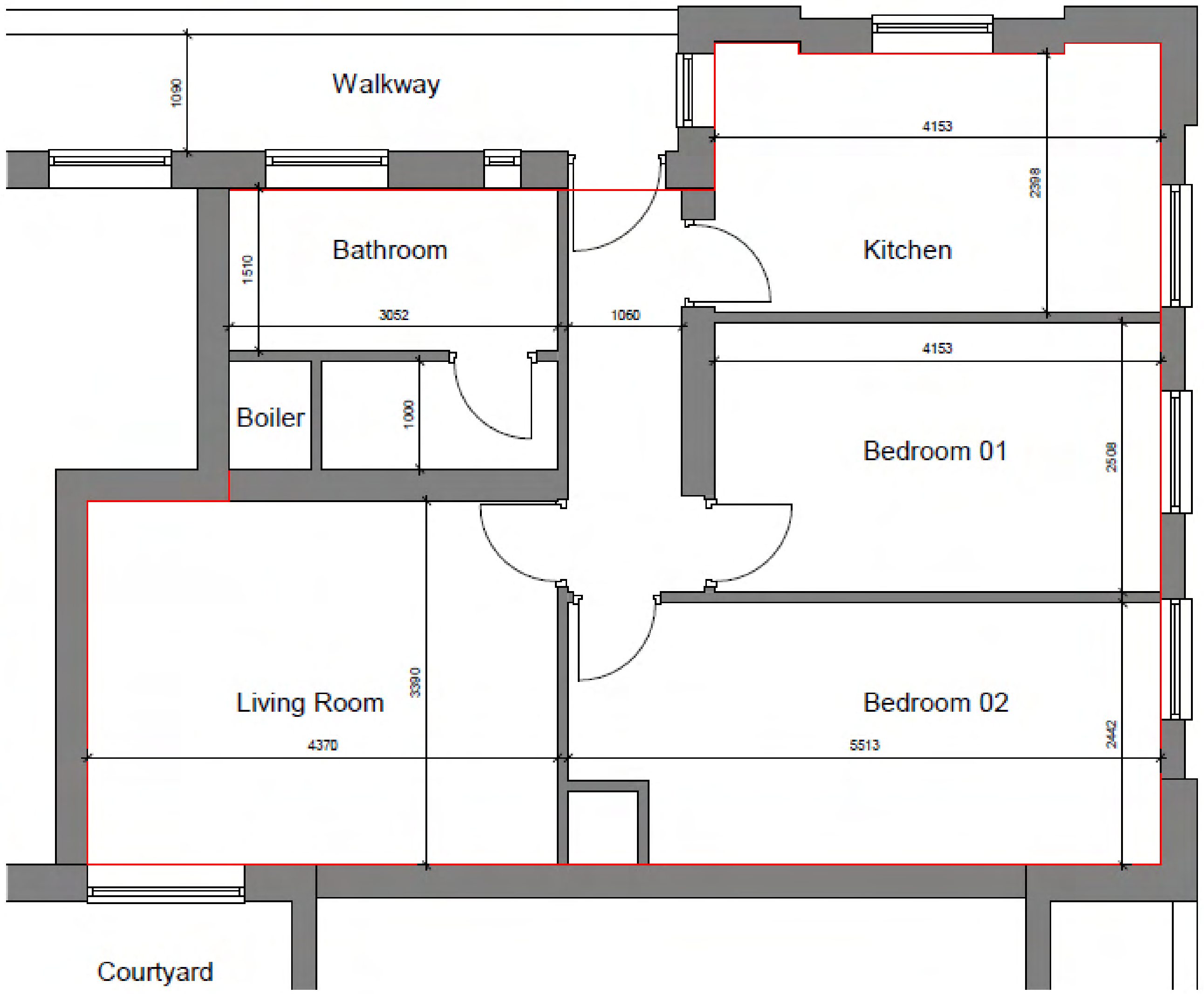
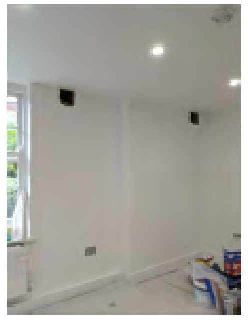




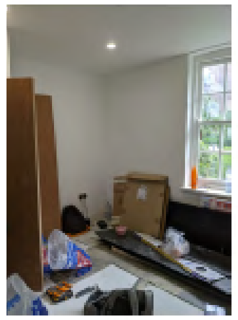
Figure 40 - Indicative Flat Layout - not to scale, and based on indicative measures taken from site.

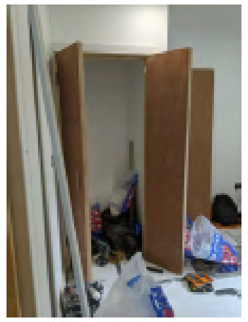
Flat 02 - 1:50

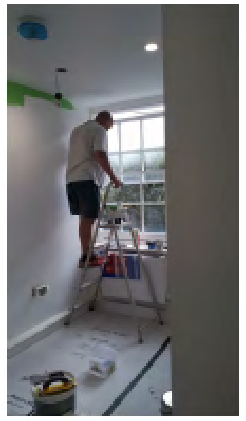
1 : 50

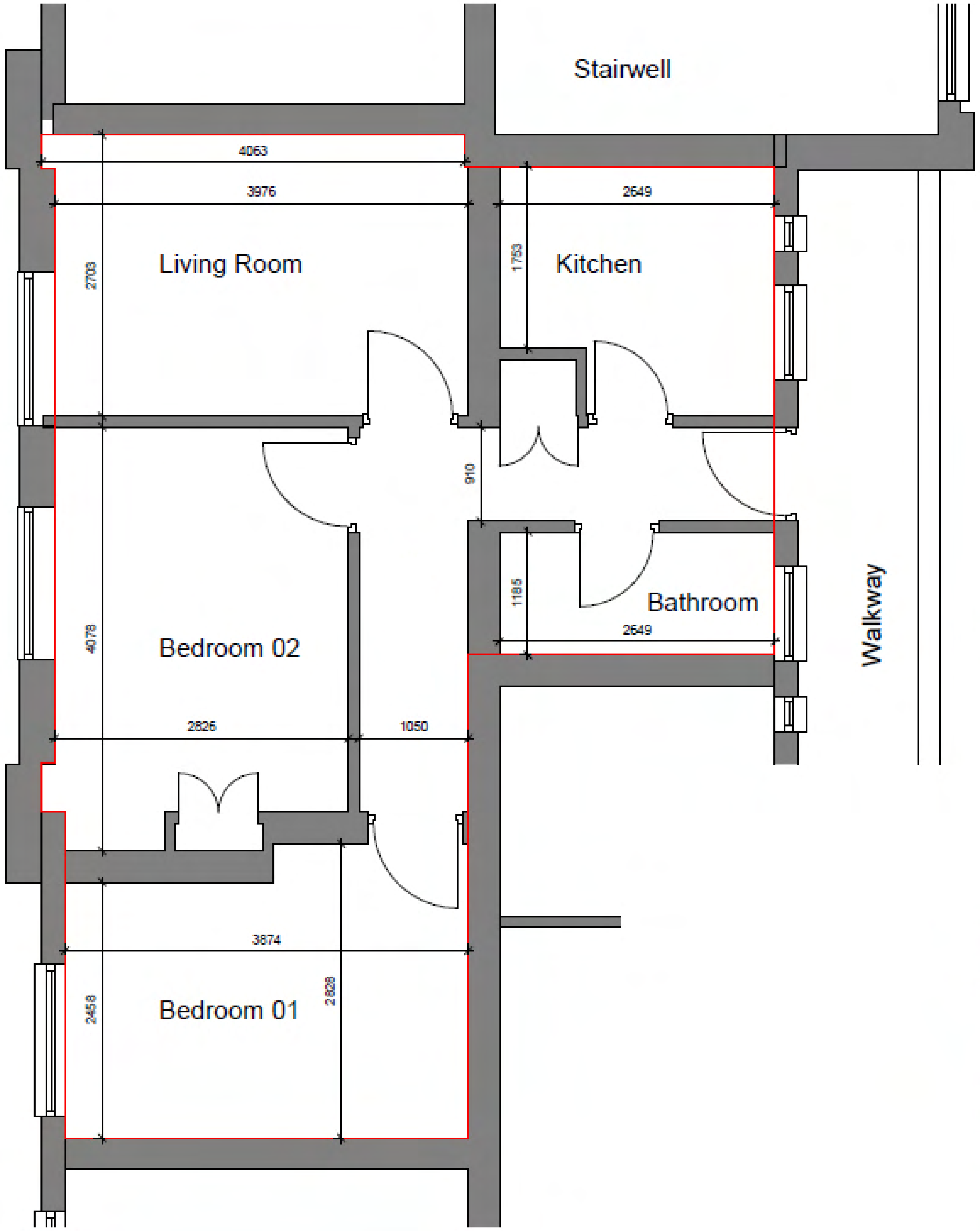
Courtyard

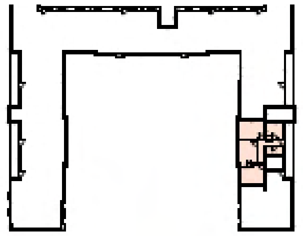








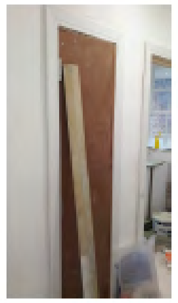


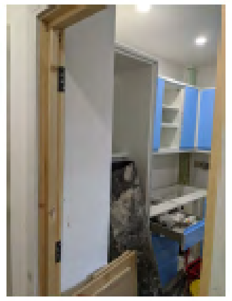


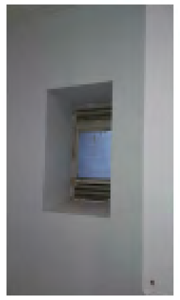
Flat 02 @Ground Floor

Approx. ceiling height = 2470 mm

All dims are indicative - further site survey required







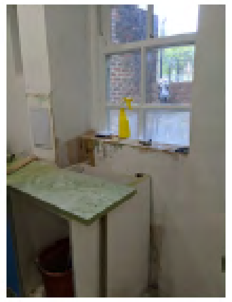
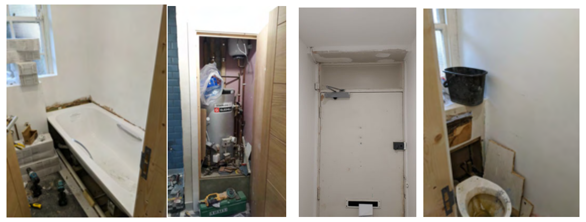
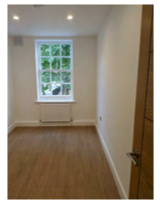


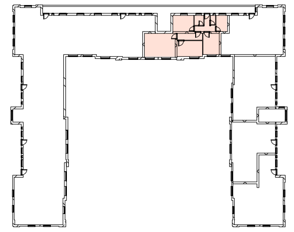
Figure 41 - Indicative Flat Layout - not to scale, and based on indicative measures taken from site.

Flat 20 - 1:50

1 : 50



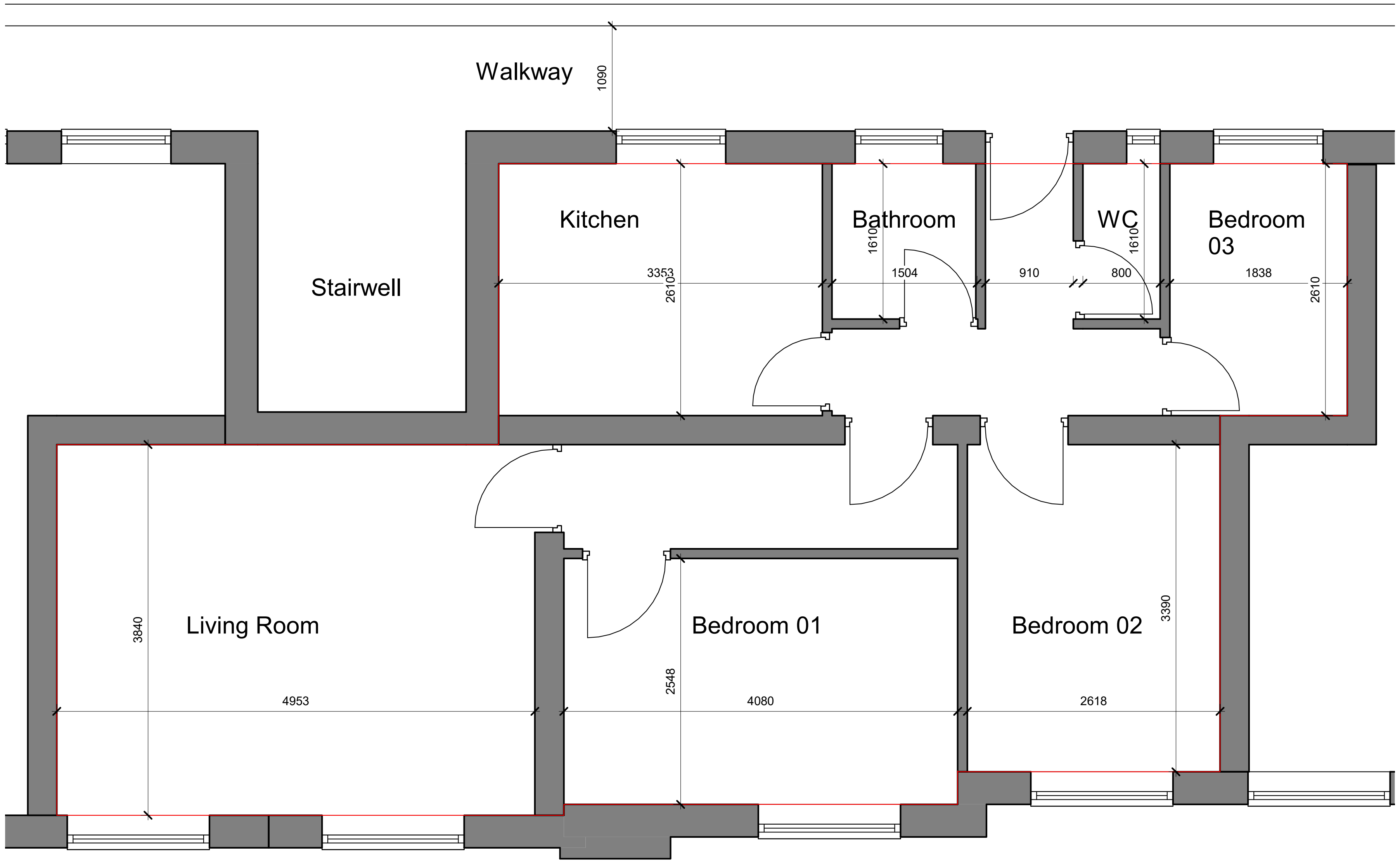


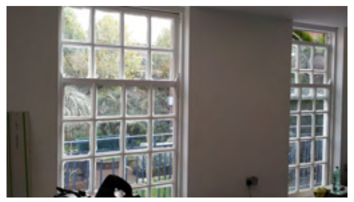


Flat 20 @First floor

Approx. ceiling height = 2470 mm

All dims are indicative - further site survey required





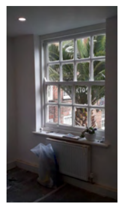


Figure 42 - Indicative Flat Layout - not to scale, and based on indicative measures taken from site.

Figure 43 - Photographs of LWNT's internal refurbishment program in progress

MORLAND HOUSE

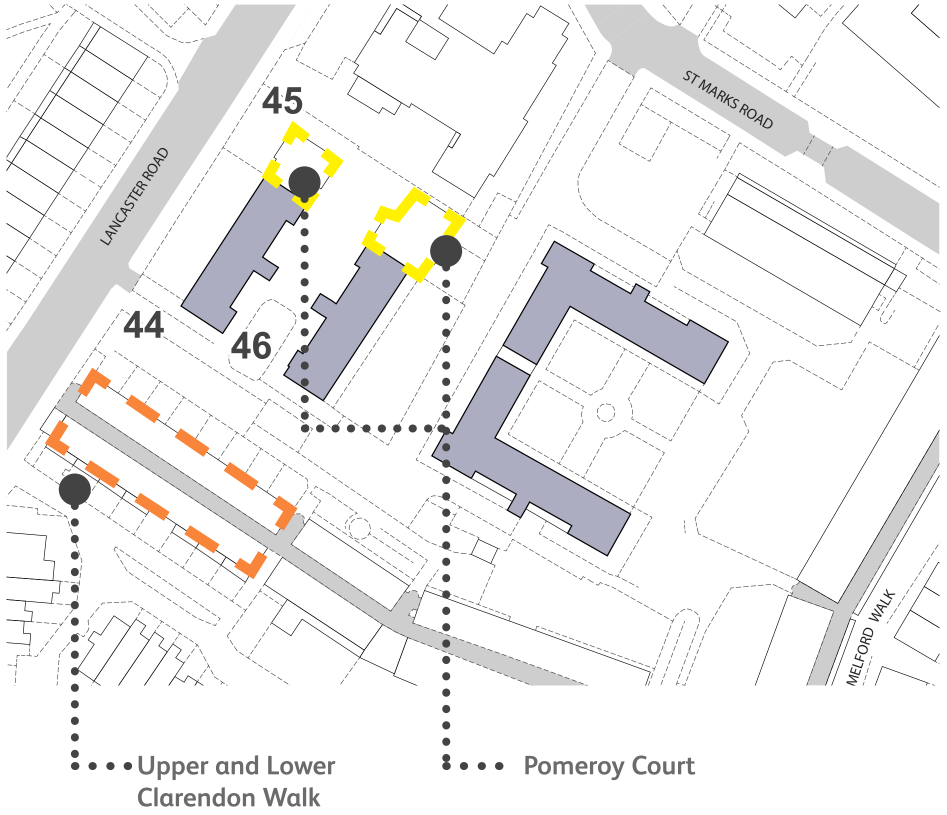


Figure 44 - Upper and Lower Clarendon Walk

Figure 45 - Pomeroy Court

Figure 46 - Upper and Lower Clarendon Walk

TALBOT GROVE HOUSE

Figure 47 - Talbot Walk

Figure 48 - Camerford Walk

Figure 49 - Camelford Walk

3.3 ENERGY ASSESSMENTS

From our initial investigations from site and previous reports provided by the client, it appears that Talbot Grove House and Morland House would benefit from extensive works to bring their energy efficiency to current/best practice standards. The existing buildings are leaky, cold, damp and the current windows are poorly maintained and are single glazed.

Talbot Grove House and Morland House have some existing Energy Performance Certificates (EPC) ratings, for some of the flats, as shown in the table below. EPC gives an approximate indication of a home energy efficiency.

	TALBOT GROVE HOUSE	MORLAND HOUSE
A	0	0
B	0	0
C	7%	38%
D	73%	54%
E	20%	8%
F	0	0
G	0	0

Figure 50 - EPC DATA (No EPC data for TGH: 30 flats, Morland House: 21 flats)

The table above suggests that most EPCs are in Band D which means with the correct measures being implemented, there is a scope to improve the energy performance of a majority of the flats to C and above.

As previously explained, EPCs cannot accurately describe a properties energy performance as they are based on SAP data.

EcoDesign Consultants were appointed by LWNT earlier in the year and provided a Passivhaus Options Report for Morland House back in May 2020.

They calculated that one of the Morland House's blocks has a current space heating demand of around 240kWh/m2a, and a heating load of 87W/m2, which is commensurate with the age and type of building. EcoDesign assumed that none of the flats have been renovated and there is no insulation in the walls, roof and floor and the windows are single glazed.

It can be seen in the graphs below, how the walls (29%), windows (22%), roof (18%), infiltration (12%) and ventilation (10%) account for the majority of the heat losses in this building.

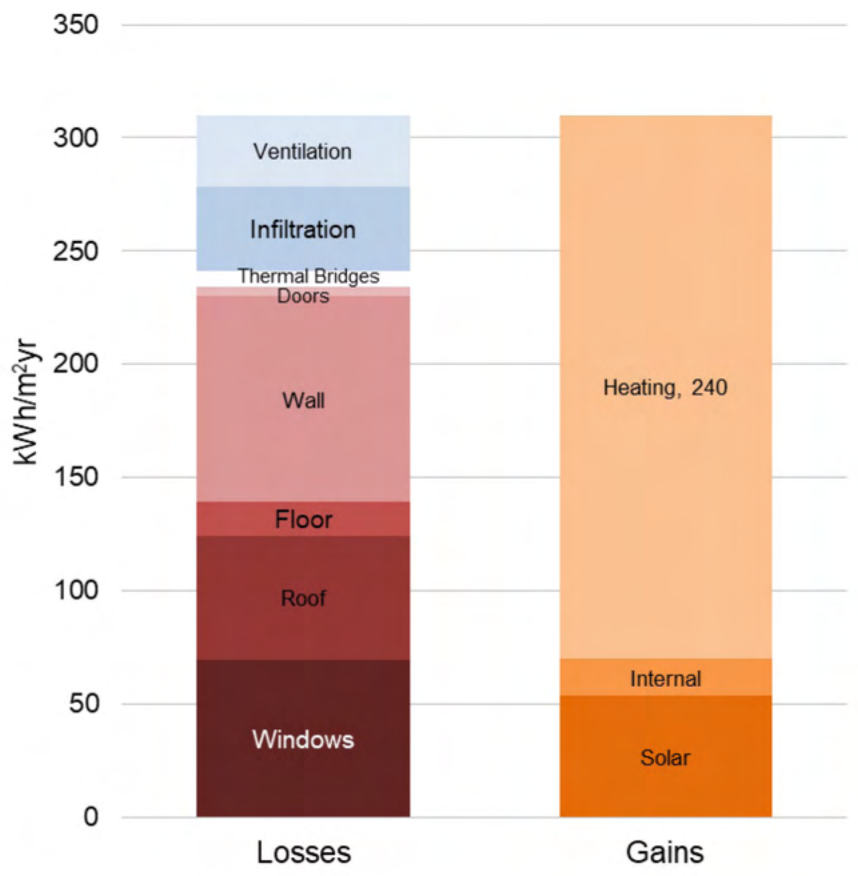


Figure 51 - EcoDesign Passivhaus Options Report - Existing Heating Demand figure of 240kWh/m2/a shown

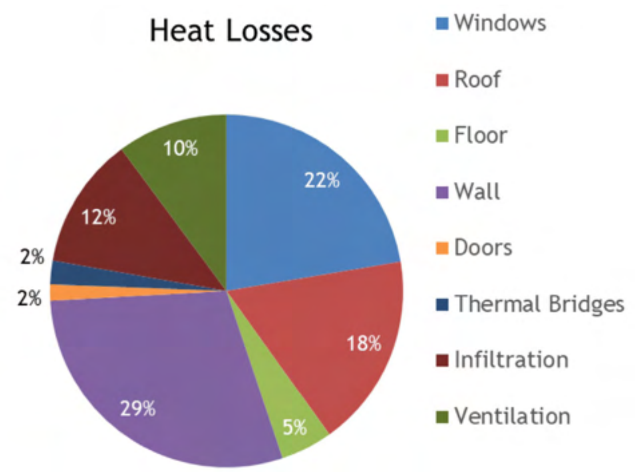


Figure 52 - EcoDesign Passivhaus Options Report - Heat Losses by component type

In their report EcoDesign investigated options to improve the following areas:

- Wall Insulation
- Floor Insulation
- Roof Insulation
- Skeilings and Dormers Insulation
- Soffit Floor Insulation
- Windows
- Airtightness and Ventilation

They also suggested improvements to the AECB and EnerPHit standards. The latter has two routes for certification, by Component or by Heat Demand methods. A simplified table with the suggested targets is shown below:

Space Heating	AECV Standard (kWh/m2a)	EnerPHit by Component (kWh/m2a)	EnerPHit by Heat Demand (kWh/m2a)
Base Case	240.2	240.2	240.2
Retrofit Case	35.5	29.2	19

Figure 53 - Improvements to AECB and EnerPHit standards from EcoDesign Passivhaus Options Report

To achieve EnerPHit, there are two methodologies available, by Heat Demand (max 20kWh/m2/a in London), and by Component, which needs to comply with a set of specific maximum u-values per building component. The latter method will likely be more appropriate for this project.

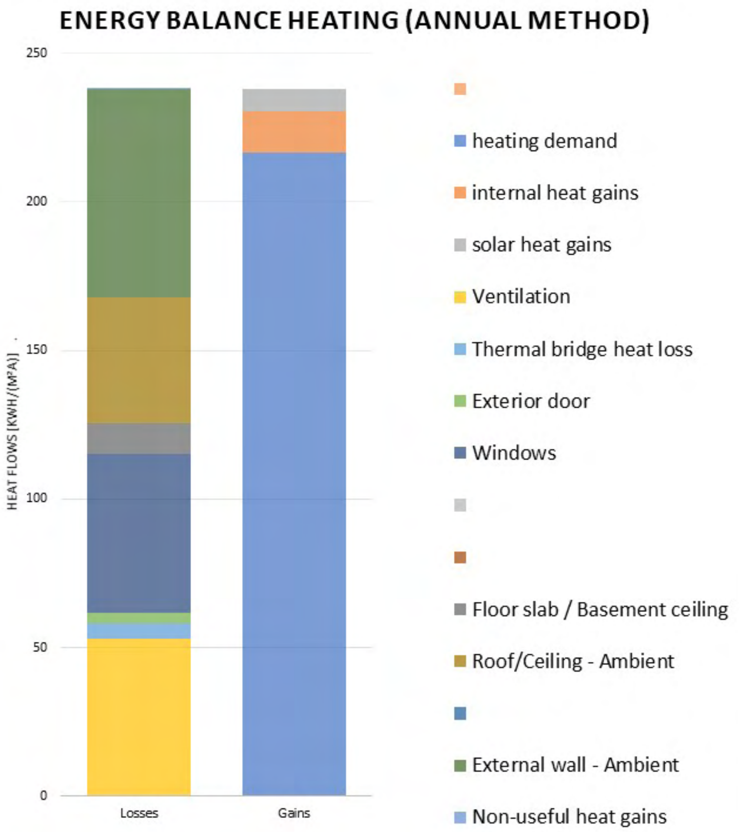
ECD Architects have built on this report and have utilised a similar PHPP energy model[1], to assess some of the options analysed in this report. This model will need to be updated after the measured survey for all blocks is received, as well as it will need to be created for Talbot Grove House and the other Morland House block. Each building will have its unique energy performance, as orientation, form and overall design affects their energy balance.

In the graphs shown here, it can be seen how the energy balance (heat gains and losses) is modelled before and after the retrofit works take place, in this case it is shown for an external wall insulation scenario.

These scenarios are analysed and detailed further in the Proposed Works section. These graphs are early stage and only indicative at this point and may change considerably depending on the internal / external type of insulation selected. Achieving EnerPHit required u-values is not guarantee until a detailed design and whole-building PHPP model and analysis is performed.

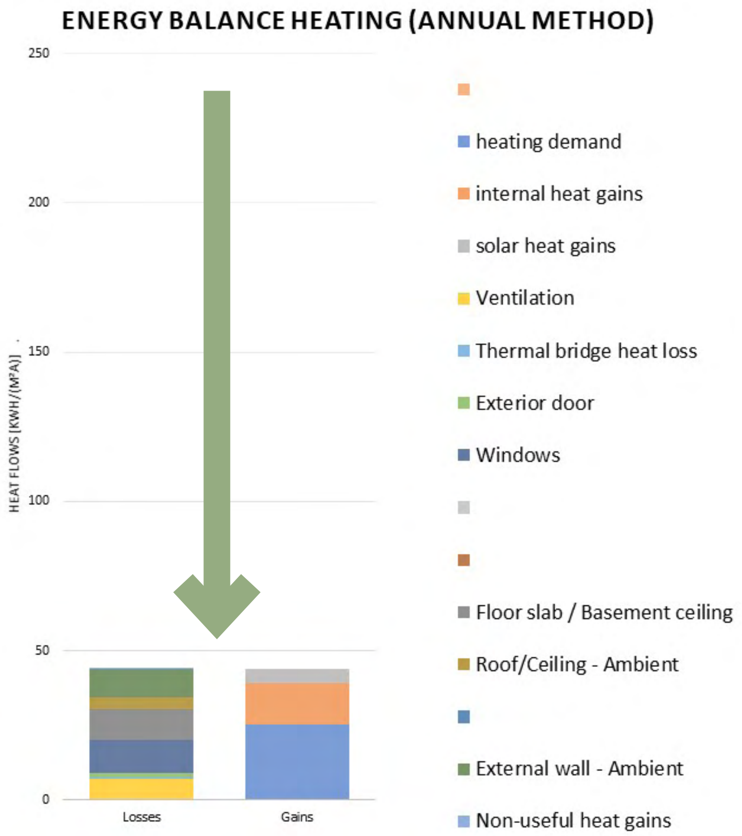
Figure 56 - Thermal Imagery of Morland House showing heat loss through facade (red/orange area)

1.PHPP - The Passive House Planning Package (PHPP) is a design tool which enables architects and designers to professionally plan and optimise their Passive House design. The PHPP contains dimensioning tools for windows (with regard to optimal thermal comfort), home ventilation (with regard to optimal air quality with adequate air humidity) and building technology, amongst other tools.



			Value		Criteria	Alternative criteria	Fullfilled?[2]
	Treated floor area	m²	665.2				
Space heating	Heating demand	kWh/(m²a)	235	≤	-	-	-
	Heating load	W/m²	87	≤	-	-	
Space cooling	Cooling & dehum. demand	kWh/(m²a)	-	≤	-	-	-
	Cooling load	W/m²	-	≤	-	-	
	Frequency of overheating (> 25 °C)	%	0	≤	10		yes
	Frequency of excessively high humidity (> 12 g/kg)	%	0	≤	20		yes
Airtightness	Pressurization test result n_{50}	1/h	8.0	≤	1.0		no
Non-renewable Primary Energy (PE)	PE demand	kWh/(m²a)	350	≤	399		yes
Primary Energy Renewable (PER)	PER demand	kWh/(m²a)	447	≤	-	-	-
	Generation of renewable energy (in relation to projected building footprint area)	kWh/(m²a)	-	≥	-	-	

Figure 54 - PHPP initial model - Existing Building - Energy Balance and verification sheet



			Value		Criteria	Alternative criteria	Fullfilled?[2]
	Treated floor area	m²	665.2				
Space heating	Heating demand	kWh/(m²a)	24	≤	-	-	-
	Heating load	W/m²	13	≤	-	-	
Space cooling	Cooling & dehum. demand	kWh/(m²a)	-	≤	-	-	-
	Cooling load	W/m²	-	≤	-	-	
	Frequency of overheating (> 25 °C)	%	0	≤	10		yes
	Frequency of excessively high humidity (> 12 g/kg)	%	0	≤	20		yes
Airtightness	Pressurization test result n_{50}	1/h	1.0	≤	1.0		yes
Non-renewable Primary Energy (PE)	PE demand	kWh/(m²a)	134	≤	145		yes
Primary Energy Renewable (PER)	PER demand	kWh/(m²a)	94	≤	-	-	-
	Generation of renewable energy (in relation to projected building footprint area)	kWh/(m²a)	-	≥	-	-	

Figure 55 - PHPP initial model - EWI option - Energy Balance and verification sheet

3.4 EXISTING STRUCTURE

PREPARED BY WILDE CONSULTING ENGINEERING

A number of drawings have been obtained showing the original construction of these blocks which are similar in their structural form.

The construction is load bearing masonry supporting concrete floors and concrete external walkways at the front of each building. There is a mansard roof with timber rafters and dormer windows.

The external walls are loadbearing and also the spine walls as noted on the annotated plan of Morland House.

The external walls are 330mm wide throughout reducing to 215mm where the parapet extends above third floor level. The internal load bearing brick walls look to be 215mm wide.

The external walls extend up forming a parapet in front of the mansard roof. The parapets are rendered.

There are brick flues on some internal load bearing walls and the end walls which run into chimneys which extend above the roof level.

The concrete floors are reinforced with steel ‘filler’ joists spanning onto the external walls and the internal spine walls.

The communal staircases are external and are also reinforced concrete.

At the top two levels on each block the units are maisonettes so there are internal stairs within these units up to the upper level which is in the roof space. At the upper level there are dormer windows in the roof construction.

The external walkways have an asphalt surfacing and metal handrails on the outer edge.

Details of the foundations are shown on the drawings as concrete strips with a formation 1500mm below ground level with. They are;

- External walls - 900mm wide x 450mm deep.
- Internal walls – 675mm wide x 375mm deep.

Morland house comprises two similar rectangular blocks 8.8m wide by 27.7m long facing each other with a communal garden between them. This block is four stories high.

Talbot Grove House comprises three similar blocks joined together to form a C-shape on plan with a communal garden in the centre. This block is five stories high.

Talbot grove house being five stories high is therefore Building Regulations class 2B for disproportionate collapse. This will not be an issue unless significant alterations to the structure are proposed.

In front of the communal staircase at the centre of each block a rectangular brick tower has more recently been constructed for form a refuge chute. There is a small bin store at ground level below the chute.

At the northern end Morland House there is some new construction at each end. These new sections are of similar scale and size as Morland House. Although these wings are adjoining Morland house they look to have separate end walls

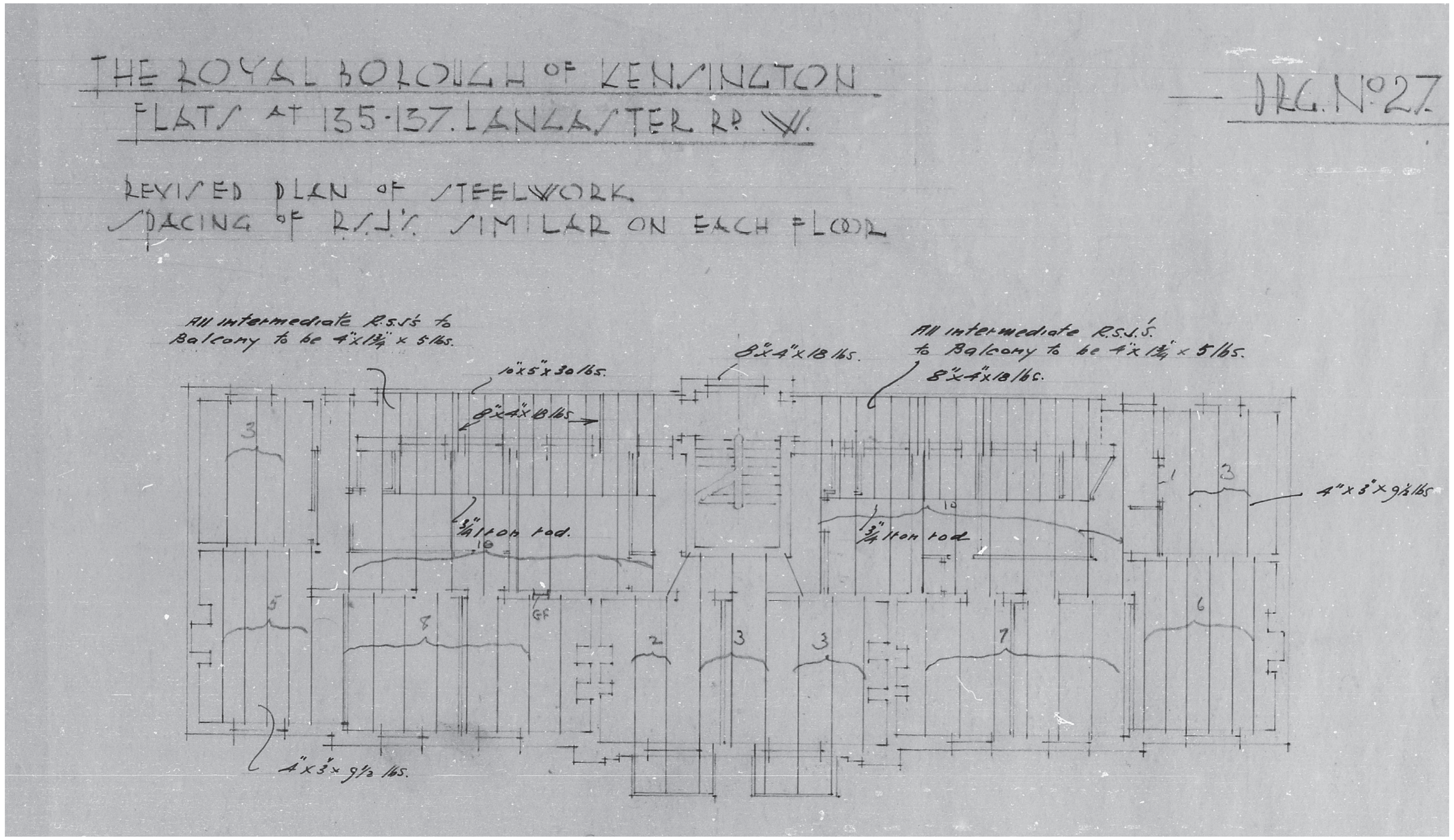


Figure 57 - Morland House. Historical Structural drawing

4.0 PROPOSED WORKS

4.1 PROPOSED SCOPE OF WORKS

The following Scope of works is the same regardless of the Envelope Options presented in this section, when there are options, these are clearly indicated. This Scope of Works is preliminar and relates to a RIBA Stage 1 design. After further site investigations and detailed design it will be confirmed and detailed further.

Proposed Scope of Works

- Asbestos surveys and associated works as required.
- Upgrade of existing single glazed windows. Installation of new windows with "sash-alike" casement triple glazed windows. Include airtightness tapes and thermally broken fixings as required.
- Upgrade of existing entrance doors. Installation of new highly insulated and airtight entrance doors. Include all ironmongery and discuss options for individual wall mounted letterboxes (not in door to ensure airtightness).
- Installation of new internal insulation OR external insulation, as per the options provided in this document, including fixings. Please refer to them for further details. Include the sealing of any existing openings, holes and vents in the brickwork to the outside.
- Option to insulate above existing GF slab (assumed solid slab TBC) – this will require new floorings, skirtings, decorations (which is already part of internal works refurbishment scheme, and separate budget). Implications on internal doors, bathrooms, kitchens, etc.
- New insulation to be applied to existing roof. Two options presented within this document (one includes replacement of existing roof coverings). Please refer to those for further details. Include waterproofing of new formed gutters and interface with windows, new fascias above windows and possibly replacement of dormers. Option to replace brick parapet with a thermally broken parapet.
- SVP vents on existing roof to be re-sealed around new roof coverings (or replaced if in poor condition – MEP Engineer to advise).
- Install mechanical ventilation with heath recovery (MVHR) system to each property, including internal ductwork and acoustic attenuators to all bedrooms, living rooms, kitchen and bathrooms. New suspended ceiling required on internal hallways, and perhaps localised bulkheads as well.
- If residents wish to improve acoustic levels between flats, acoustic mineral wool insulation could be installed on party walls and ceilings, with new suspended ceilings throughout. Further investigations will be needed. Also, if an IWI route is followed, the same IWI insulation could be extended to include all party walls.
- Communal areas / stair core: decorations, new flooring, LED lighting, etc. Include painting of all metalwork (railings, handrails, etc).
- Option for new private gardens to GF flats. This will require replacing some windows with glazed doors (assume 1no per GF flat), to be discussed with residents.
- New secured communal entrance gates to the block and new signage to be included throughout.
- New entry-phone and CCTV systems (separate budget and outside our scope).
- Testing and performance monitoring system/resident interface to make sure flats and energy usage are performing as expected.
- Option for photovoltaic arrays on the roof (if Design Option 3 is selected), including a fall protection system for maintenance if required.
- Repairs to brickwork and repointing as required and subject to further investigations.
- Remove gas (currently used for cooking only - TBC) from existing properties.
- If EXTERNAL insulation is to be included, then the following additional works will be needed:
- On Morland House blocks only, include insulation above the exposed party wall of Pomeroy Court, subject to further technical surveys and legal agreements.
- Facing materials (only if external wall insulation is selected): we propose the use of brick slips mechanically fixed to the insulation. Details such as special bricks and soldier courses, colours and finishes will have to be investigated and selected during the next design stages.
- External RWPs, hoppers and other rainwater goods to be replaced with new ones on the new envelope. Relocation of surface water manholes as required.
- Protruding slabs of existing Juliette balconies/railing may need to be cut or looked at in detail to ensure continuity of external insulation, and avoid thermal bridges.
- Replacement of existing waterproof coverings to external walkways and installation of new coverings with reverse falls (to outside). External corridors' gullies and RWPs relocated to external face. Fall of walkways to be changed to the outside with new insulation if space allows. Local breaks in the upstand may be required for the RWP connection. Include new fascias and/or decoration of edge of existing walkways.
- Temporary replacement of private and communal external gates in walkways and GF if adjacent to external walls. New gates may be required if existing ones cannot be reinstated.
- Replacement of existing soffits to the underside of external walkways, survey and possible relocation of any existing services or ducting. Include new insulation, lighting and soffits.
- Antennas and satellite dishes, etc. to be relocated to the main roof (if not redundant) and removed from walkways/external walls (new Integrated Reception System1 outside of our scope).
- If external insulation option is selected: any other elements, such as cables, signage, boxes and conduits on the outer façade must be surveyed and relocated onto the new envelope, as required.
- Lighting cables (if existing) to be relocated to external envelope.
- If INTERNAL insulation is to be included, then the following additional works will be needed:
- Short or medium-term resident decants will be needed, including storage for residents' properties and more resident liaison personnel. The programme could potentially be longer which will affect contractor's preliminaries.
- Temporary Replacement of residents' items and furniture from walls and roofs, as well as kitchens and bathrooms cabinets, hobs, fridges, baths, showers, baths, lighting, etc. (TBC)
- Replacement of internal linings on walls, ground floor and roofs. Localised or total replacement of floorings, as required. New skirtings throughout.
- Installation of internal insulation and linings, including new internal decorations throughout.
- Re-fixing of existing and/or new furniture, fixtures, fittings, lighting and appliances.

- Miscellaneous (outside our scope of works and budget allowance)
- Public realm / landscaping around blocks
- New secured cycle stores
- Entry-phone system to existing/new properties
- Integrated Reception Systems (IRS)1
- Options provided for new stand-alone lift towers. Assume 2no for Morland House and 3no for Talbot Grove House. This will result in new bin-chutes or complete relocation of bin stores, including the replacement of existing bin-chutes and any structural implications.
- Refuse/recycling strategy to be agreed with LWNT and residents to agree brief.
- New internal heat distribution/ hot water pipework as per MEP Engineers, possibly including new hot water cylinder and radiators
- Internal decorations are being carried out outside our scope of works, including new kitchens and bathrooms, lighting, fittings ¬and appliances.
- New internal doors. Carefully designed to work with the MVHR system (10mm undercut above floor finishes/carpets for internal trickle ventilation and sufficient space above door for ductwork, if required). LWNT has a separate programme for this.

As described in the Project Brief section, LWNT's Package of Options across the Estate includes 3 tiers of measures for the existing envelope. These options, namely 1, 2 and 3, as shown in the table below are described in further detail in this section.

ECD and LWNT will consult with the residents of Morland House and Talbot Grove House in order to identify their preferred solution.

Figure 58 - Morland House. Existing aerials on walkways

Figure 59 - Morland House. Existing bin chutes, which would need to be altered if lifts are installed in this location

IRS - Integrated Reception System: provides broadcast signals from multiple sources (typically terrestrial television, FM radio, DAB digital radio and tatellite TV) to multiple outlets, via a single aerial cluster and signal booster-distributor

4.2 ENVELOPE INTERVENTION OPTIONS

MATRIX OF POSSIBLE INTERVENTIONS

Measure	Image	Reason	Proposal	Combustibility	Spatial Implications	Intrusiveness	Pros	Cons
Insulate Ground Floor Break out existing screed/ concrete & install insulation in this space		Floor build up is unknown, but without insulation it loses heat and may feel cold Assumed current U-value = 0.7 W/m²K	Remove existing screed & install Aerogel insulation board over existing slab. New floor finish over.	Spacetherm Slentex A2 = A2,s1-d0	None - specify new floor build up based on replicating depth of existing screed		- Reduce heat loss through floor - Warmer floor - more comfortable for residents - Potential for underfloor heating improving heat pump efficiency	- Work to remove screed - Caution needed at internal wall/floor junctions
Insulate Ground Floor Add insulation above existing solid concrete ground floor		Floor is in contact with ground, so heat is lost through here and floor feels cold. Assumed current U-value = 0.7 W/m²K	Add new Aerogel insulation over existing floor	Spacetherm Slentex A2 = A2,s1-d0	Need to consider door thresholds & sizes throughout house and step or ramp up at front door.		- Reduce heat loss through floor - Warmer floor - more comfortable for residents	- Step up into house - Door sizes reduce - Floor to ceiling height reduced - Caution needed at internal wall/floor junctions - Bottom tread of stairs becomes shorter - Alterations to kitchens, bathrooms, doors, fixtures and appliances will be needed

MATRIX OF POSSIBLE INTERVENTIONS

Measure	Image	Reason	Proposal	Combustibility	Spatial Implications	Intrusiveness	Pros	Cons
Perimeter Insulation Dig down below ground level & install insulation to outside face of wall below ground		Create 'skirt' of insulation around the floor, so that the solid floor and ground below it are kept warmer.	Add new Foamglas insulation to outside face of external wall below ground level, up to 1m below external ground level	Foamglas = A1	No implications internally. Shape of foundations unknown at present so depth of dig TBC. Existing planting at edge of building disrupted		- Reduce heat loss through floor - Warmer floor - more comfortable for residents - Less disruptive than internal floor insulation	- Less effective than insulating floor - Existing foundations to be investigated to determine design & hence efficacy - Confirm no moisture risk

MATRIX OF POSSIBLE INTERVENTIONS

Measure	Image	Reason	Proposal	Combustibility	Spatial Implications	Intrusiveness	Pros	Cons
External wall insulation Add insulation to outside of external walls		Heat is lost through existing walls as there is no insulation in them	Mineral wool insulation to outside of existing external walls with brick slip system to outer face	Mineral wool insulation = A1 Parge coat plaster = A1 Other elements depending on construction type	No implications to internal space Assume around 250mm (TBC) extra thickness to walls externally		- Excellent reduction in heat loss through walls - Effective way to limit thermal bridges - Really warm comfortable home - Combine with parge coat below to improve airtightness	- Planning permission likely required - Careful consideration of ground & eaves - Provision of new rainwater pipes & adjustments to gulleys
Internal wall insulation Add insulation to inside face of external walls	 	Heat is lost through existing walls as there is no insulation in them.	Aerogel + magnesium oxide board (ie. Spacetherm Slentex A2) Refer to Table p.55 for further details on options	Aerogel + magnesium oxide board (ie. Spacetherm Slentex A2)	Loss of space to all rooms along their external walls. Assume around 100mm (TBC) extra build up internally		- Reduce heat loss through walls - No change to external appearance - Warmer more comfortable home than at present - Use same but thinner system along party wall to reduce heat loss here	- Care needed at internal wall/ external wall junctions - Loss of internal space - Smaller reduction in heat loss overall - Care needed where joists penetrate new insulation - Moisture risk -Thermal Bridge

MATRIX OF POSSIBLE INTERVENTIONS

Measure	Image	Reason	Proposal	Combustibility	Spatial Implications	Intrusiveness	Pros	Cons
Insulate Roof Add insulation between & over rafters		Heat is lost through roof	Mineral wool insulation between & over existing rafters. New tiling battens & roof finish required over	Mineral wool insulation = A1 Airtightness membrane - Procheck A2 = A2-s1,d0	None internally Roof height raised		- Reduce heat loss through roof - Include carefully installed airtightness layer - Opportunity to strengthen existing roof structure	- Planning permission required - Roof structure investigation required
Insulate Roof Add insulation between & below rafters		Heat is lost through roof	Mineral wool insulation between & below existing rafters. New ceiling required after works	Mineral wool insulation = A1 Airtightness membrane - Procheck A2 = A2-s1,d0	Reduction in height of sloped ceilings Roof pitch & height to be kept as existing, in line with adjoining roof.		- Reduce heat loss through roof - Include carefully installed airtightness layer - Opportunity to strengthen existing roof structure	- Ensure new build up is appropriately ventilated - Loss of head room at sloped ceilings - roof structure investigation required - Hard to ensure airtightness continuity with walls

MATRIX OF POSSIBLE INTERVENTIONS

Measure	Image	Reason	Proposal	Combustibility	Spatial Implications	Intrusiveness	Pros	Cons
New windows Replace all windows with airtight triple glazed windows		Heat is lost through existing windows - through uninsulated frames, glazing and at gaps around frames & opening window panes	New triple glazed windows, sealed to new airtightness layer on external wall / to existing wall	Glass is non-combustible. Choose frames for non-combustibility & thermal properties	None Avoidance of cold draughts near windows means that residents can enjoy full space within house		- Reduce heat loss through windows - No draughts near windows - more comfortable - Quieter internal environment	- Need to re-do plastering around windows - If done without other insulation works, expensive for limited gain
New doors Replace all external doors with insulated doors		Heat is lost through and around existing doors	New insulated doors, with triple glazing if glazing still required. Sealed to airtightness layer on existing wall	Choose doors for non-combustibility & thermal properties Glass is non-combustible	No implications for existing useable space		- Reduce heat loss through doors - No draughts near doors	- Need to re-do plastering around doors - Add new external wall mounted letterbox (to avoid opening in airtight door) - If done without other insulation works, expensive for limited gain

MATRIX OF POSSIBLE INTERVENTIONS

Measure	Image	Reason	Proposal	Combustibility	Spatial Implications	Intrusiveness	Pros	Cons
Full building airtightness Install airtight layer around inside of house's insulation. Aiming for less than 1 air change per hour		Warmed air is lost through gaps in existing building fabric, especially at window/ door junctions & services penetrations	Dependent on insulation strategies adopted, but likely include use of parge coat, airtightness membrane, tapes and paint	parge coat - A1 airtightness membrane - A2 airtightness tapes - B (TBC) airtightness paint - D (TBC)	None		- Excellent reduction in heat loss - Excellent improvement in resident comfort - No draughts so more comfortable even at lower temperatures	- Must be combined with MVHR or MEV to avoid mould risk - Must be completely & carefully implemented to be effective
Mechanical ventilation with heat recovery (MVHR) Install MVHR unit to each home with supply / extract to all rooms		Pre-heat incoming fresh air with warmth from outgoing stale air. Fresh air is supplied, but the heat in it is not lost	Install MVHR units with insulated intake & exhaust ducts to outside. Supply / extract ducts around house to serve all rooms	Use fire rated metal ductwork around homes	MVHR unit around 978mm high x 792mm wide x 601mm deep. (TBC) Access space additional. Insulated ductwork diameter around 200mm (TBC) Uninsulated ductwork at least 75mm diameter (TBC)		- Reduce heat loss through air while ensuring fresh air supply - Filters allow improved internal air quality - Engagement opportunity teaching residents about use of units	- Uses electricity (though saves energy overall) - Need to run ductwork to all rooms - Most effective if building is airtight - Filters to be changed a couple of times a year - Need trained staff to maintain - Quality unit needed to avoid noise issues - Ensure controls are easy for residents to understand

MATRIX OF POSSIBLE INTERVENTIONS

Measure	Image	Reason	Proposal	Combustibility	Spatial Implications	Intrusiveness	Pros	Cons
Notting Dale Heat Network Buildings are currently connected to estate-wide district heating	 	Estate-wide heat production may be more efficient than localised	New centralised district heating system supplies low temperature hot water to each home. HIU in each home uses this to provide hot water	-	Varies with unit size		- Low carbon heat source, supporting zero carbon aspiration - Supplies all heating & hot water requirements	- Ensure controls are easy for residents to understand
Photovoltaic Panels (PVs) Install panels on roof to turn sun's energy into electricity to add into building's power suppl		Reduce amount of electricity needed from grid, reducing energy bills	Install PV panels Install inverter internally (turns DC current from panels into AC current for use in the building)	Design team (including Fire Consultants) to design PVs carefully to eliminate any fire risk to roof	Inverter required internally		- Reduce electricity bills - Export electricity to grid at some times & make money - Low carbon energy source	- Occasional cleaning & maintenance required - Confirm possible output, considering surrounding trees etc - How best to split electricity amongst flats? - Ensure roofs can support panels

4.2.2 Option 1 - Bronze - Minimal Intervention

In this option, only minimal works to be envelope are being suggested, as detailed below. Further details will be provided in subsequent stages of the design process if this option is selected.

Please refer to the table describing the Benefits/Pros and Risks/Cons for this and other options.

- New double or triple glazed windows – please refer to the section about window options.
- Install high levels of roof insulation
- Install MEV ventilation system in each flat
- Connect to a renewable-based heat network for space and hot water heating – For the district heating system please refer to separate report on this, produced by TACE.

OPTIONS FOR TRIPLE GLAZED WINDOWS:

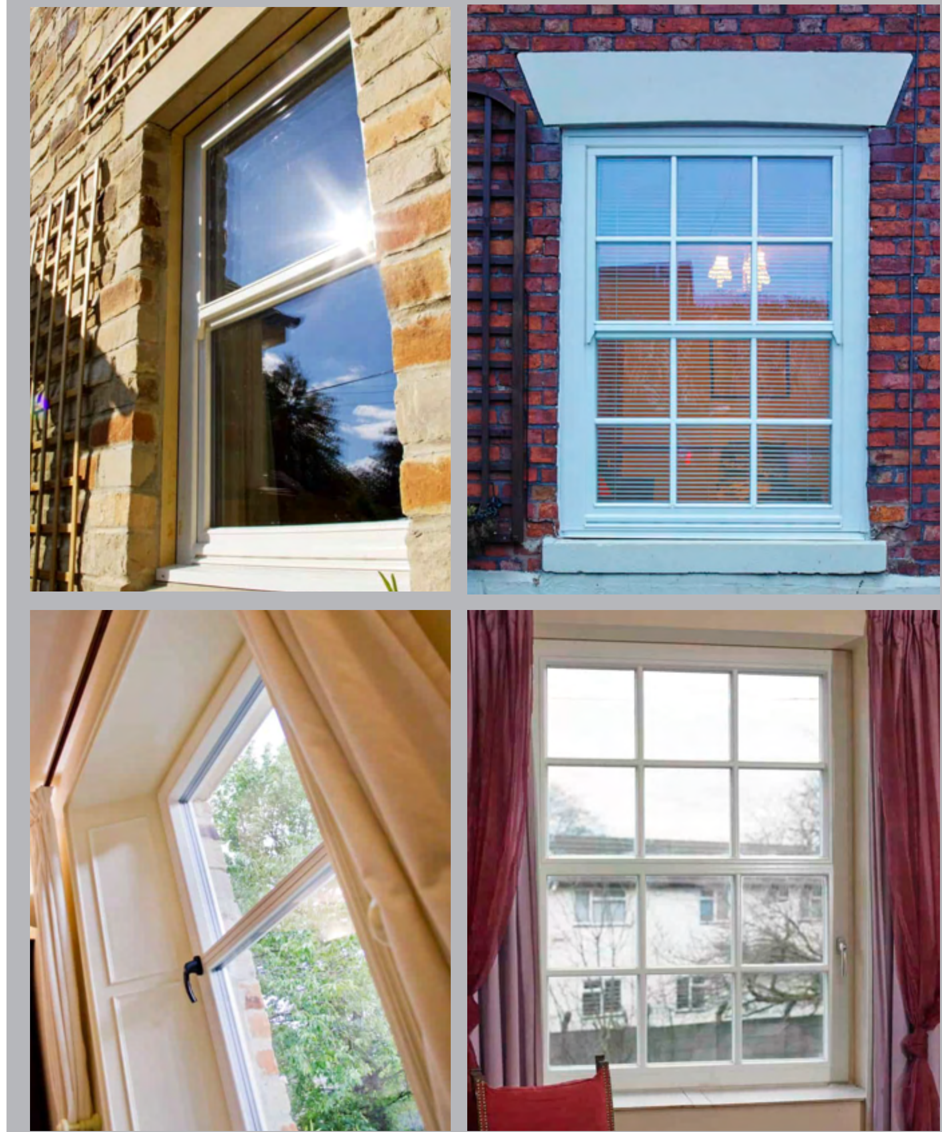


Figure 60 - Mock Sliding Sash

MOCK SLIDING SASH

Triple glazed FSC certified timber in redwood & oak mock sliding sash inward opening tilt and turn window. Cost-effective option for projects requiring a traditional appearance.

PASSI-SASH

Passisash windows use superior tilt & turn mechanism and sustainably sourced softwood, hardwood or Accoya timber. These windows have been successfully installed in certified Passivhaus / EnerPHit retrofit in London. The window has been approved for use in many conservation areas and are available with glazing bars and a wide range of bespoke options to closely match most UK traditional window styles.

Figure 61 - Passi-sash windows

4.2.3.1 Option 2A – Silver- High Performance Envelope - Internal Wall Insulation (IWI)

If this option is selected, further detailed analysis, as well as Hygroscopic and Interstitial Condensation Risk Analysis will be carried out in further design stages, to ensure that the products selected are of the highest quality and performance, safe and will not incur into any unwanted risks, such as interstitial condensation.

Installing internal wall insulation also has the added constraints of reducing even further the small existing rooms on these blocks, by reducing the floor area. For Talbot Grove house, we calculated that by installing an IWI system on a typical 3-bedroom flat of 71.4 m2, the area loss would be in the region of 3.5m2. This represents a reduction in overall floor area of around 4.9%. We calculated the same on a smaller 2-bedroom flat (64 m2) and the reduction of space is around 3.6%. Please refer to the images below.

Key performance considerations: fire safety (non-combustible), low thermal conductivity (thermally efficient), vapour permeable to minimise internal condensation risk, easy and quick installation to minimise disruption to the residents, easy to line internally.

The table below suggest different internal insulation systems, their fire classification, thermal conductivity, if they are vapour open and easy of installation. If internal wall insulation option is preferred, the design team will investigate these and other options in more detail to find the best balance between these variables.

INTERNAL WALL INSULATION IN TRADITIONAL BUILDINGS

In traditional buildings, it is crucial that buildings can dry out to both the inside and the outside. Wall insulations and finishes should be vapour open and/or capillary open with insulation limited thicknesses. In existing buildings, the uncontrolled air leakage (draughts) is being relied upon for background ventilation. Once the buildings are better insulated and airtightness is improved, it is essential that a mechanical ventilation is provided, ideally with a heat recovery element (MVHR). Many of the vapour open insulations (for internal applications) in the market are not A1/A2 in their Fire Classification, as they tend to be natural materials such as wood fibre insulation. Balancing vapour permeability, thermal efficiency and fire rating requirements is a current challenge of the construction industry.

Insulation Type	Fire Classification	Thermal Efficiency	Vapour Open	Installation
Aerogel + magnesium oxide board (ie. Spacetherm Slentex A2)	System is A2	Excellent 0.019 W/mK	Yes	Easy and dry installation.
Mineral glass wool insulation on studs + Plasterboard	A1 (timber studs are combustible)	Good 0.032 W/mK	Yes	Easy and dry installation. Later on a non-combustible stud system can be investigated further.
Woodfibre dry-line (ie. Pavadry) with 12.5 plasterboard	System with plasterboard is B1. Woodfibre is class E	Good 0.043 W/mK	Yes	Easy and quick installation.
Lime, cork and clay based insulating plaster (ie. Diathonite)	A1	Good 0.045 W/mK	Yes	Takes too long to dry, complicated and disruptive application.
Calcium Silicate insulated board (ie. Casitherm) + lime plaster	A1	Low 0.059 W/mK	Yes	Lime plaster coat on brick wall then board. Medium disruption.

Figure 62 - Internal insulation systems

4.2.3.2 Option 2B – Silver - High Performance Envelope - External Wall Insulation (EWI)

In this option, measures to achieve a high performing envelope are being suggested, as detailed below. Further details will be provided in subsequent stages of the design process if this option is selected.

Please refer to the table describing the Benefits/Pros and Risks/Cons for this and other options.

- High performing External Wall Insulation (EWI) systems to achieve maximum overall u-values of 0.2 or lower.
- Reduce thermal bridging on external walkways, SVPs, window cills, balcony slabs, and other structural and protruding elements, by providing internal or external insulation as required, and cutting balcony slabs, and other elements that may affect the proposed insulation layers.
- Best practice airtightness detailing. Include airtightness coats or membranes within the preferred IWI / EWI system. Seal with proprietary tapes around openings, such as windows, doors, vents, etc.
- New efficient triple glazed windows – please refer to the section about window options.
- Install high levels of roof insulation
- Install whole-house efficient MVHR ventilation system in each flat. Minimum efficiency 75% but ideally better.
- Connect to a renewable-based heat network for space and hot water heating – For the district heating system please refer to separate report on this, produced by TACE.

ROOF AND FLOOR INSULATION

The roof and Ground Floor insulation options are the same for both the EWI and IWI options.

ROOF

The historic archive drawings show 120x44mm joists but the spacing is not shown. Further investigations to understand the spacing (ie. 350mm or 450mm) would be needed to confirm any spare dead load capacity. After this verification, the extent and the level of disruption of the insulation works can be confirmed.

We propose two different options for the roof works:

a) TO REPLACE EXISTING COVERINGS: To strip existing roof finishes, install new mineral wool (A1- non-combustible) insulation between (blanket) and above (compressed) the rafters and install new roof finishes. These works would be quite disruptive and will need the residents to move out from their properties temporarily. A temporary “roof tent” would be required to protect the flats, as well as to make good internally. It is understood that all top floors are part of maisonettes.

b) TO INSULATE ON TOP OF EXISTING ROOF COVERINGS: To install new insulation on top of the existing roofs, using the T-cosy system, as per the external walls. This system will result in thicker roofs, with less prominent dormers. Careful attention to the gutters and waterproofing around the new windows will be required.

In case of installing External Wall Insulation (EWI), for both roof options, works on the final waterproofing layer, as well as on the gutters and existing parapets will be needed. The existing parapet may need to be removed and replaced with an alternative facing material, to prevent cold bridges (as shown indicatively in the sketches on this page). LWNT contacted Langley Roofing Systems, who provided us with the following indicative specification, however, further investigative works will be needed to confirm the design options for these areas.

Possible build up (by Langley):

Pararock – Compressed Rockwool Euroclass A1 non-combustible
- LPCB* approved (LPS 1181: Part 1 Ext A)
- FM approved
- Excellent acoustic properties
- BB93: acoustic design of schools - performance standards compliant
- Zero ODP and GWP
- Recyclable

Typical density of core: 160 kg/m3
Thermal conductivity (U– value): 0.039 W/mK
Compressive strength: Typically exceeds 80 kPa at 10% compression when tested to BS EN 826:1996.

GROUND FLOOR

Information received so far indicates that the existing ground floor structure is made of a solid uninsulated floor (pending intrusive investigations to confirm). Therefore, we would suggest that Ground Floor’s slabs are insulated internally, after the replacement of the existing screed, with a product such as Spacetherm Slentex A2, which is a flexible high-performance silica aerogel-based insulation of limited combustibility (A2), including an A1 MgO board as part of its system. Ground floor insulation would be particularly feasible as part of the separate Internal Refurbishment Works Programme

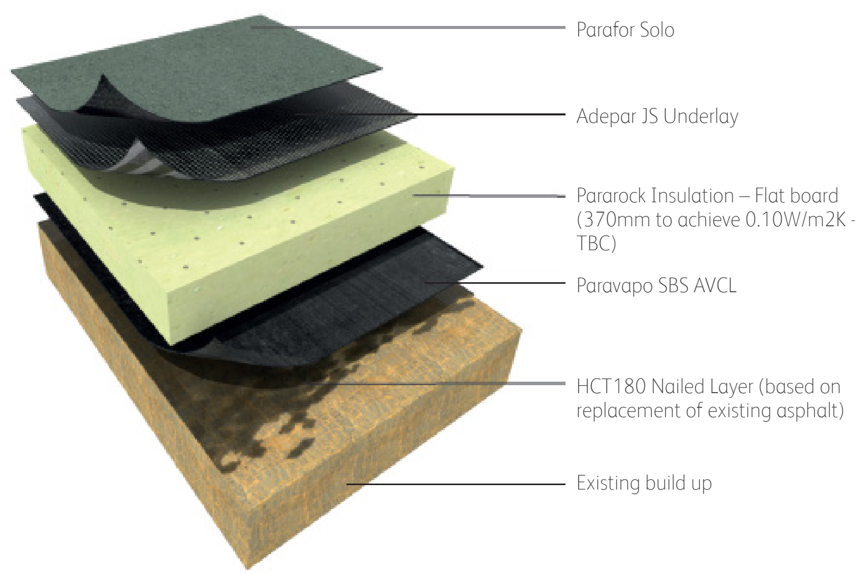


Figure 63 - Langley's proposed roof build-up

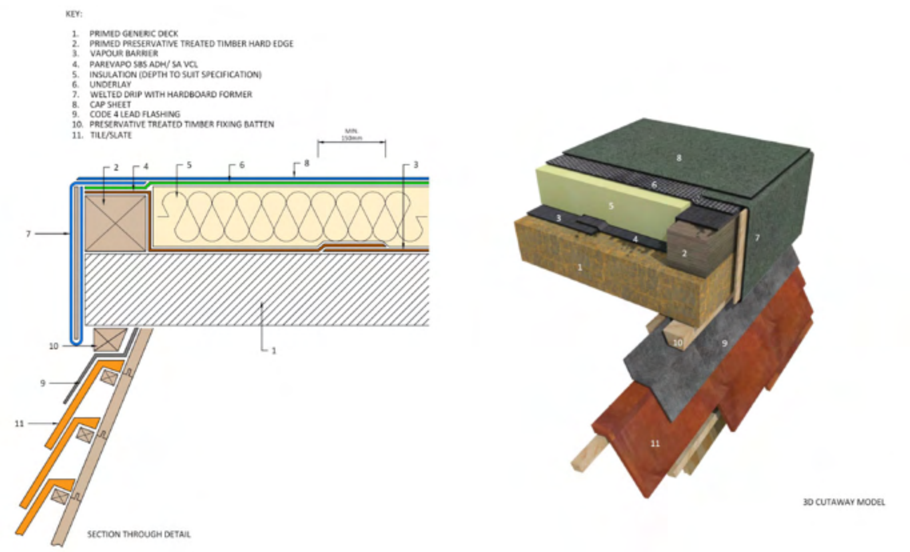


Figure 64 - Langley's proposed roof build-up on mansard roofs

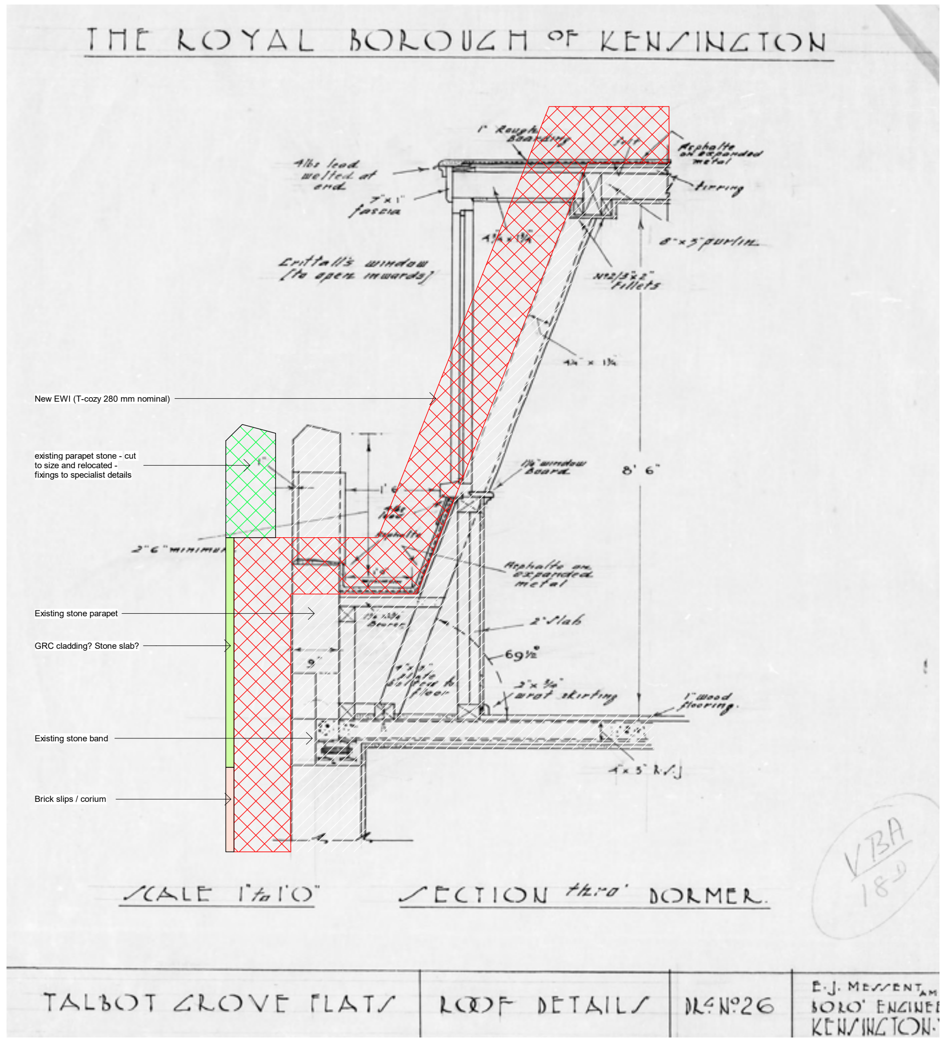
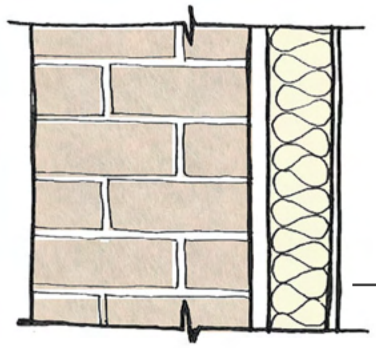


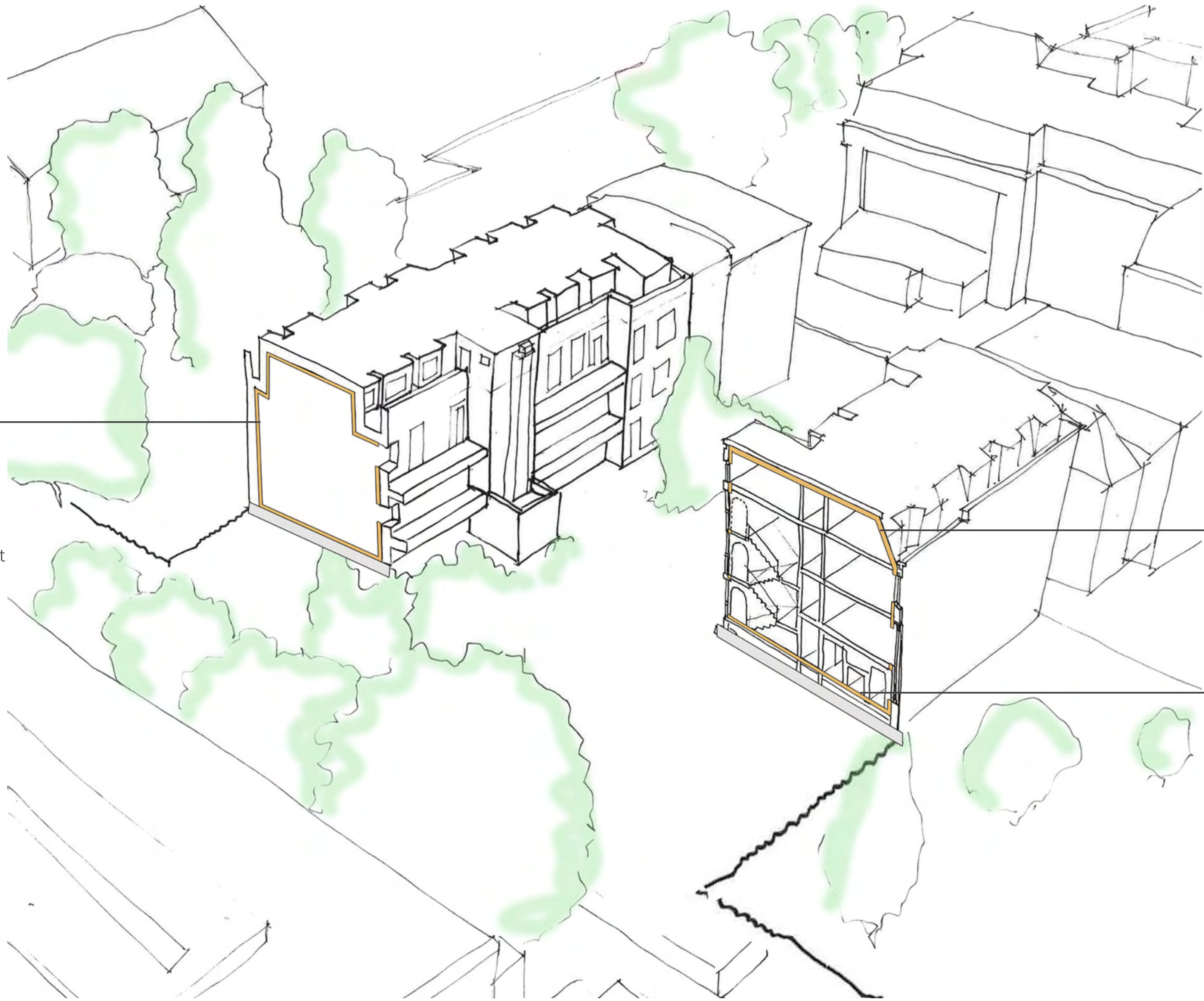
Figure 65 - Indicative extent of EWI - T-cosy system above existing mansard roof, replacement of parapet and creation of new gutter

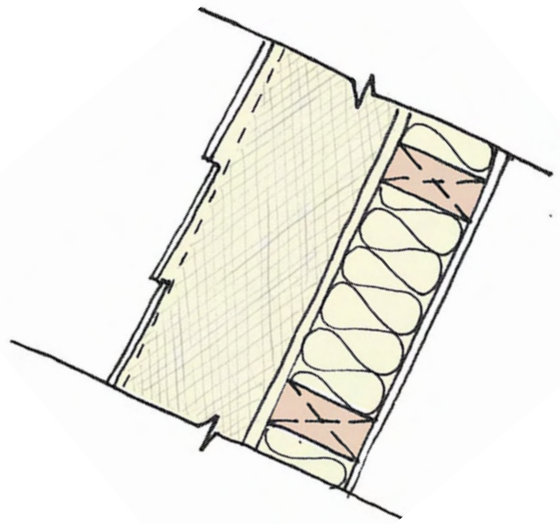
4.2.3.1 OPTION 2A - SILVER - INTERNAL WALL INSULATION (IWI)



Internal Wall Insulation

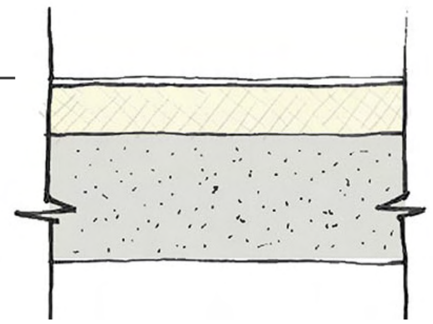
Refer to table showing different IWI options





Roof insulation between and above rafters.

Refer to roof section for further details on options



Floor insulation

Refer to floor section for further details

Figure 66 - Morland House - Axonometric section showing internal wall insulation (IWI)

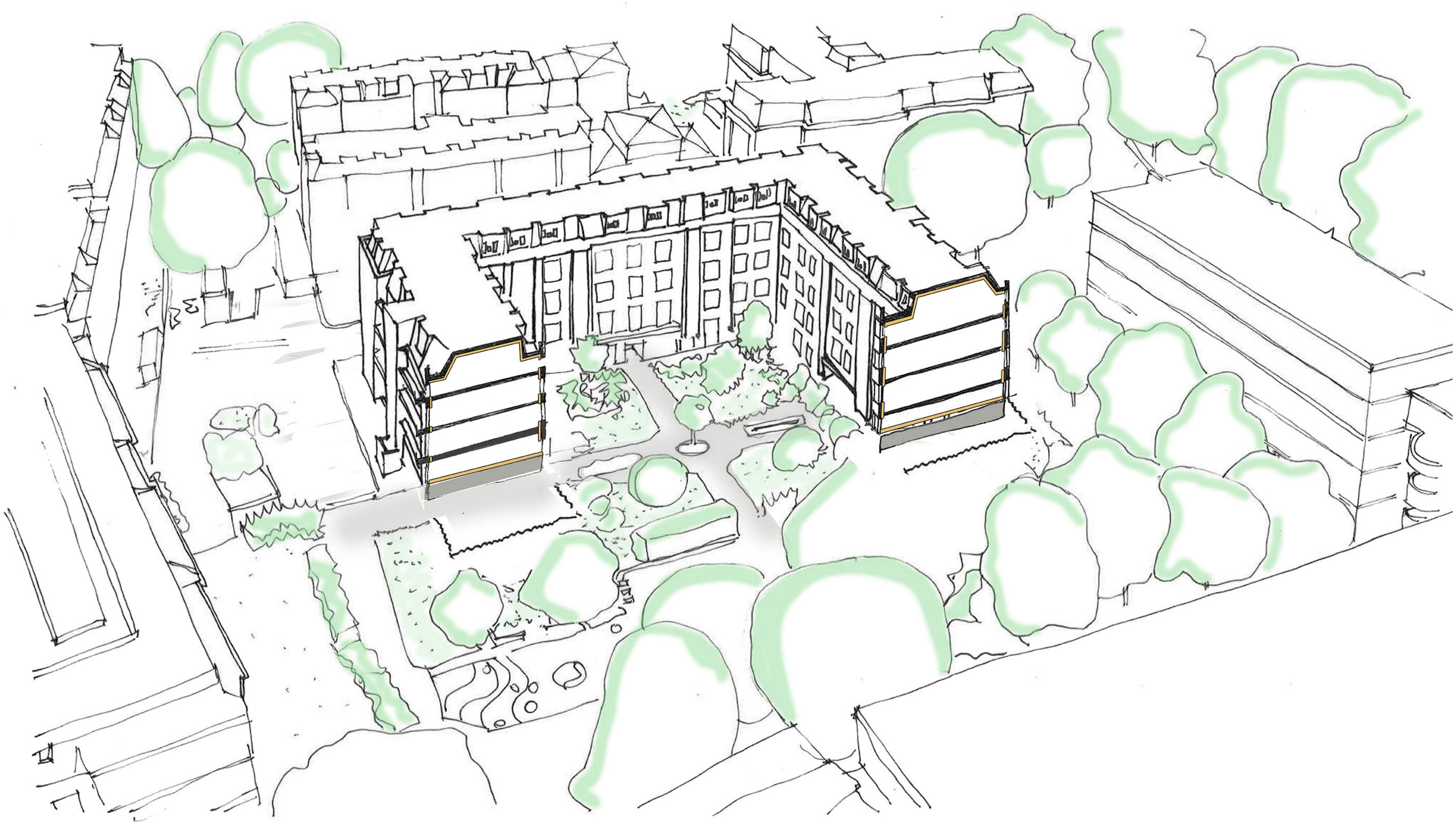


Figure 67 - Talbot Grove House - Axonometric section showing internal wall insulation (IWI)

4.2.3.1 OPTION 2A - SILVER - INTERNAL WALL INSULATION (IWI)

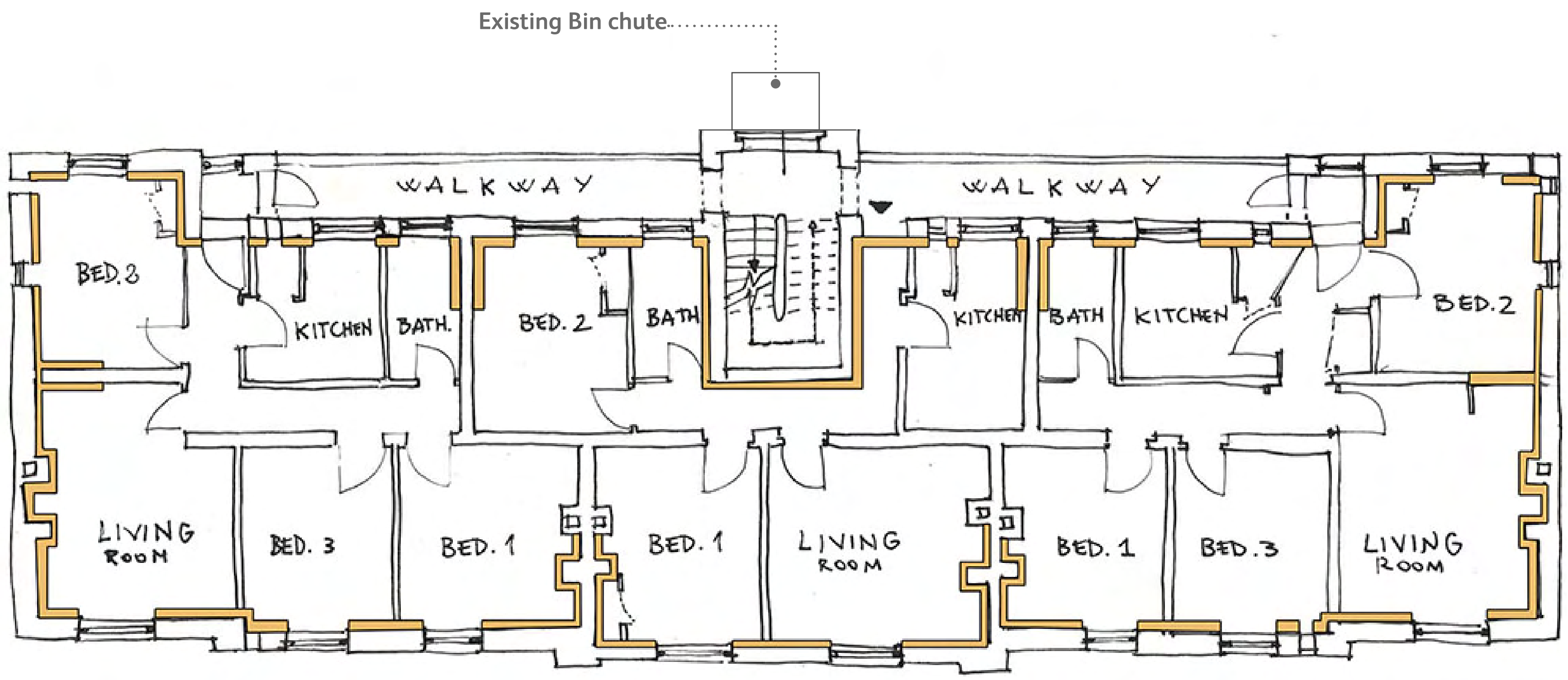


Figure 68 - Proposed IWI Ground Floor Plan (Morland House)

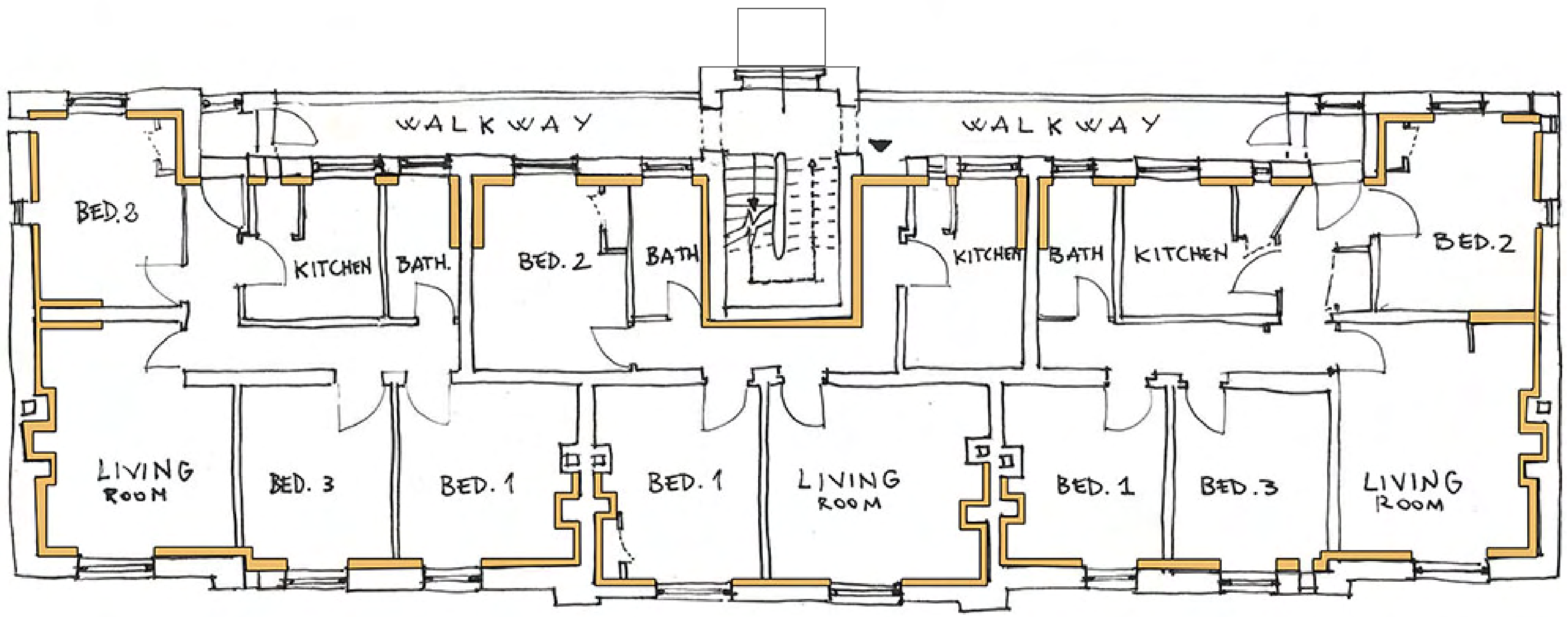


Figure 69 - Proposed IWI First Floor Plan (Morland House)

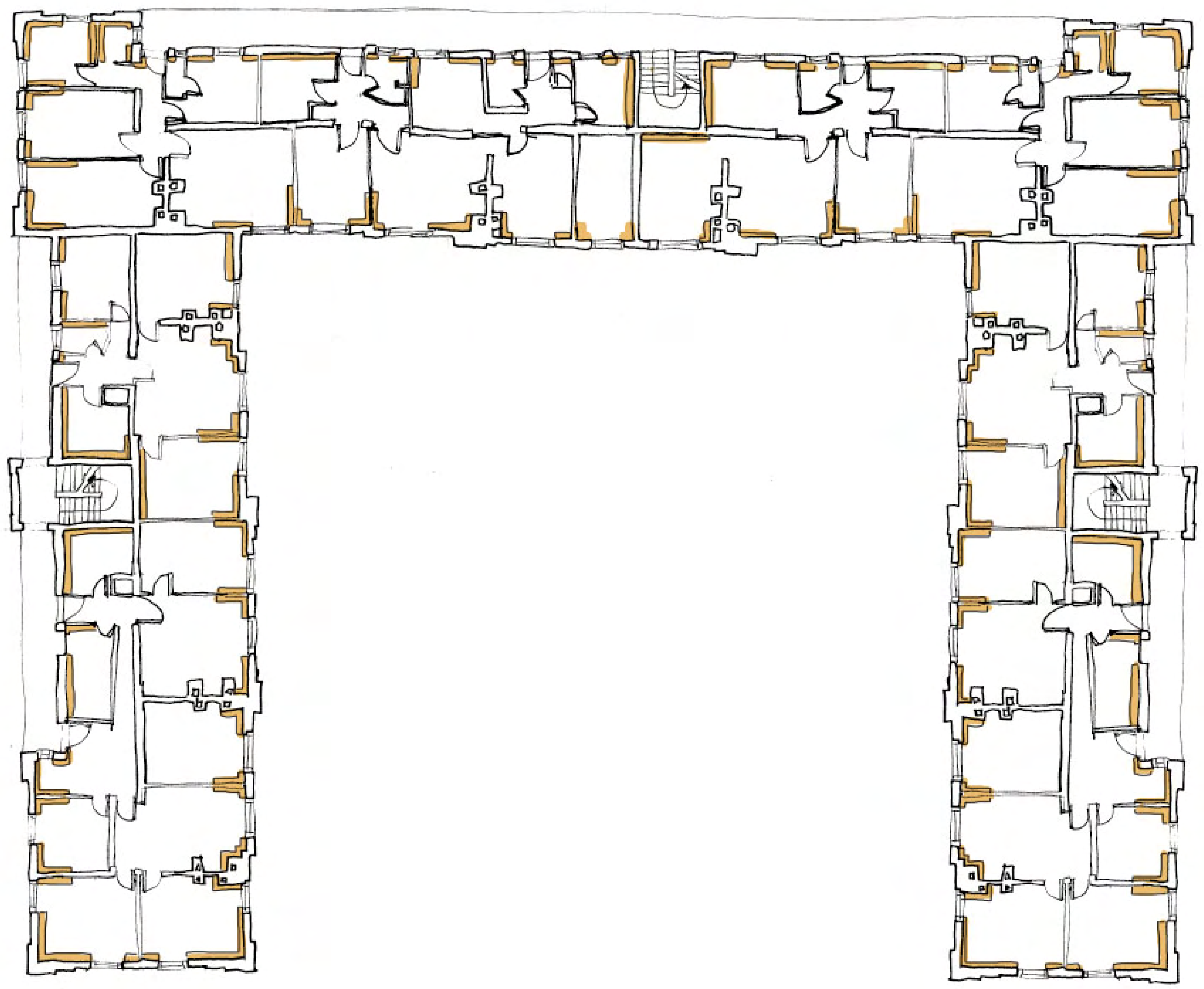


Figure 70 - Proposed IWI First Floor Plan (Talbot Grove House)

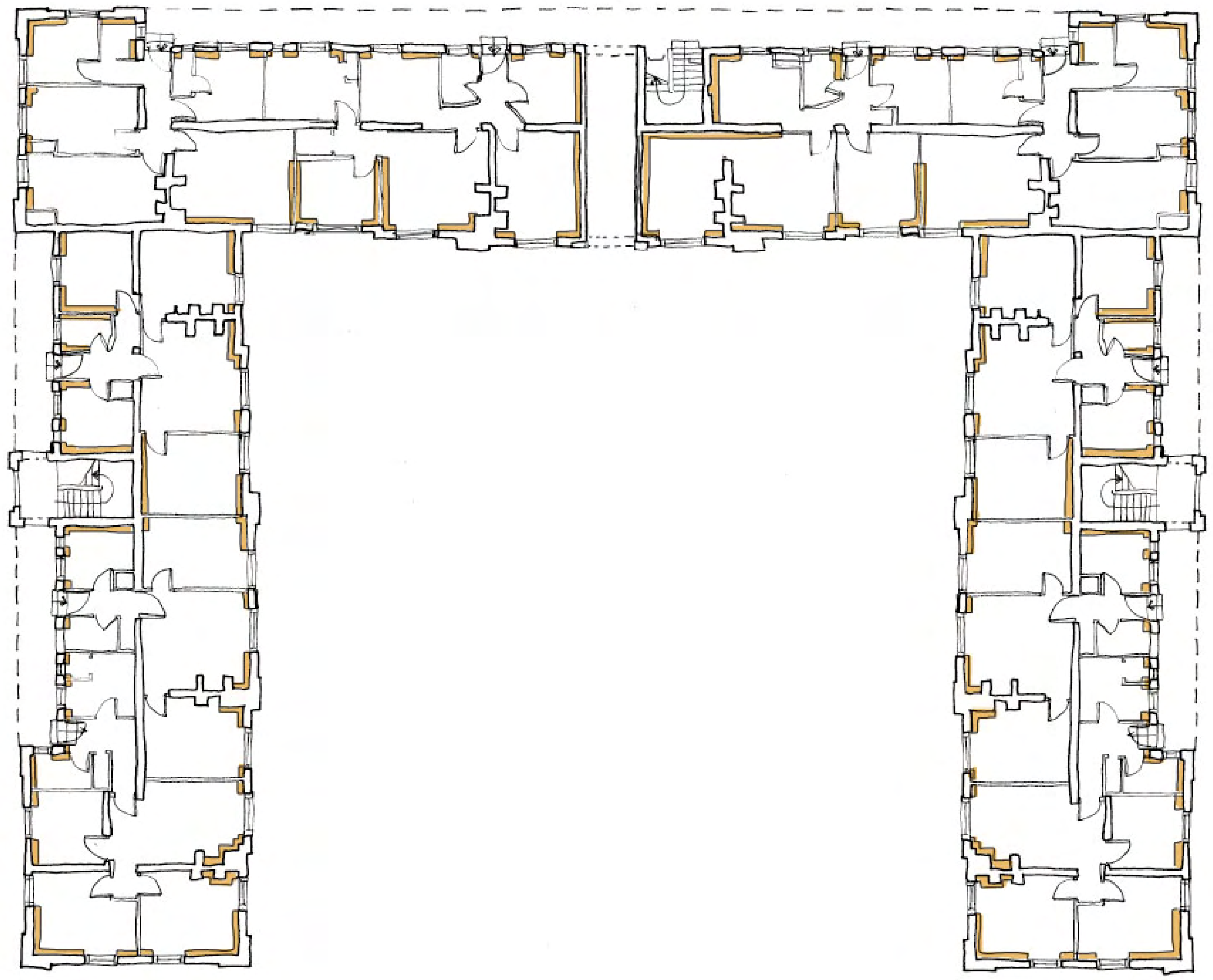


Figure 71 - Proposed IWI Ground Floor Plan (Talbot Grove House)

TYPICAL APARTMENTS PLAN - FLAT 19

Floorplan showing the likely area almost and possible location of Internal Wall Insulation measures within some typical flats.

This can assist LWNT and residents to understand the implications of IWI installation and levels of disruption.




Internal Wall Insulation (IWI) approximated thickness that will be installed to the internal faces of the flat

2.3 sqm or 3.6% of the overall flat area will be lost

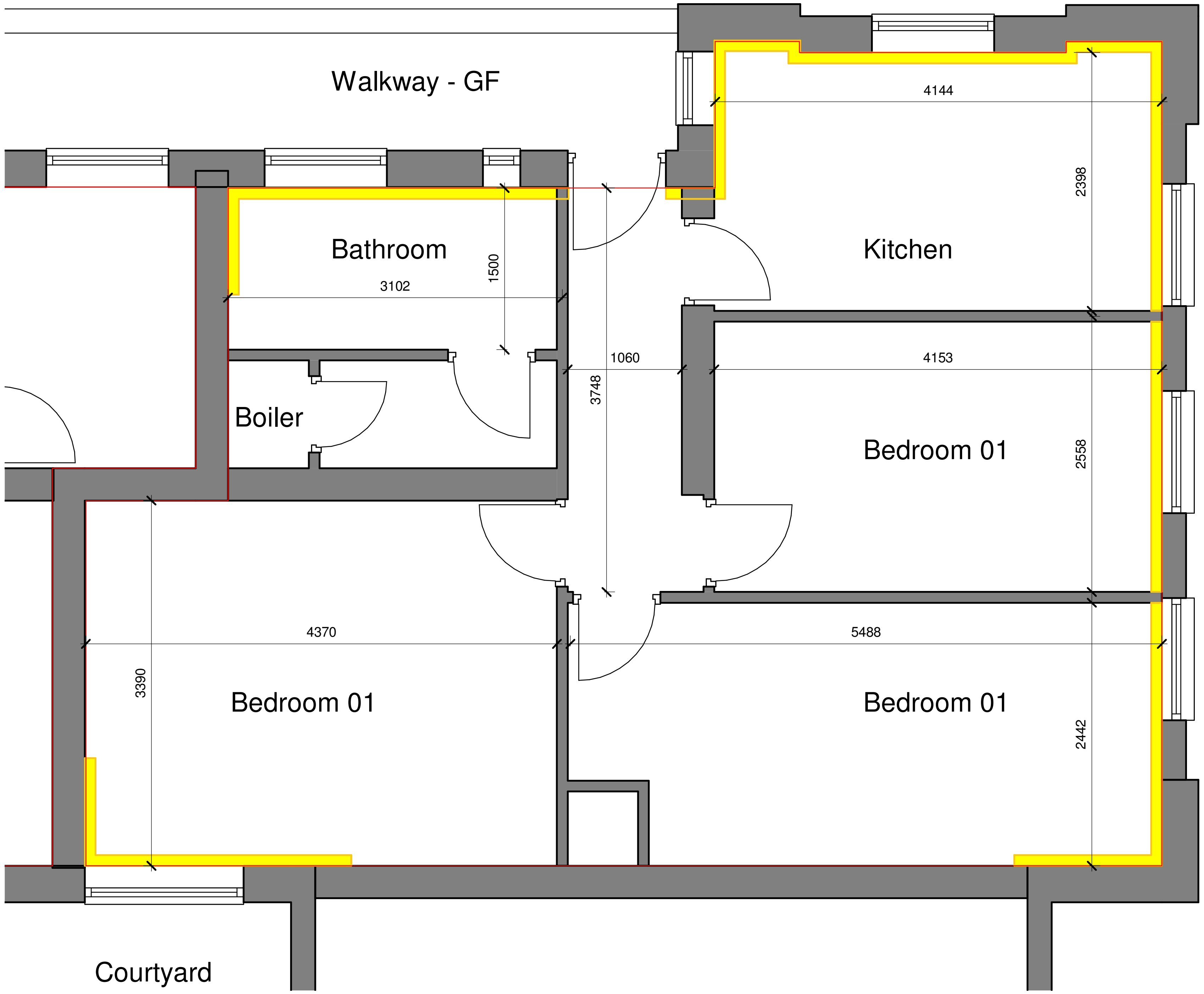



Figure 72 - Talbot Grove House, Flat 19 Ground Floor Plan

TYPICAL APARTMENTS PLAN - FLAT 20

Floorplan showing the likely area almost and possible location of Internal Wall Insulation measures within some typical flats.

This can assist LWNT and residents to understand the implications of IWI installation and levels of disruption.

Internal Wall Insulation (IWI) approximated thickness that will be installed to the internal faces of the flat

3.5sqm or 5% of the overall flat area will be lost

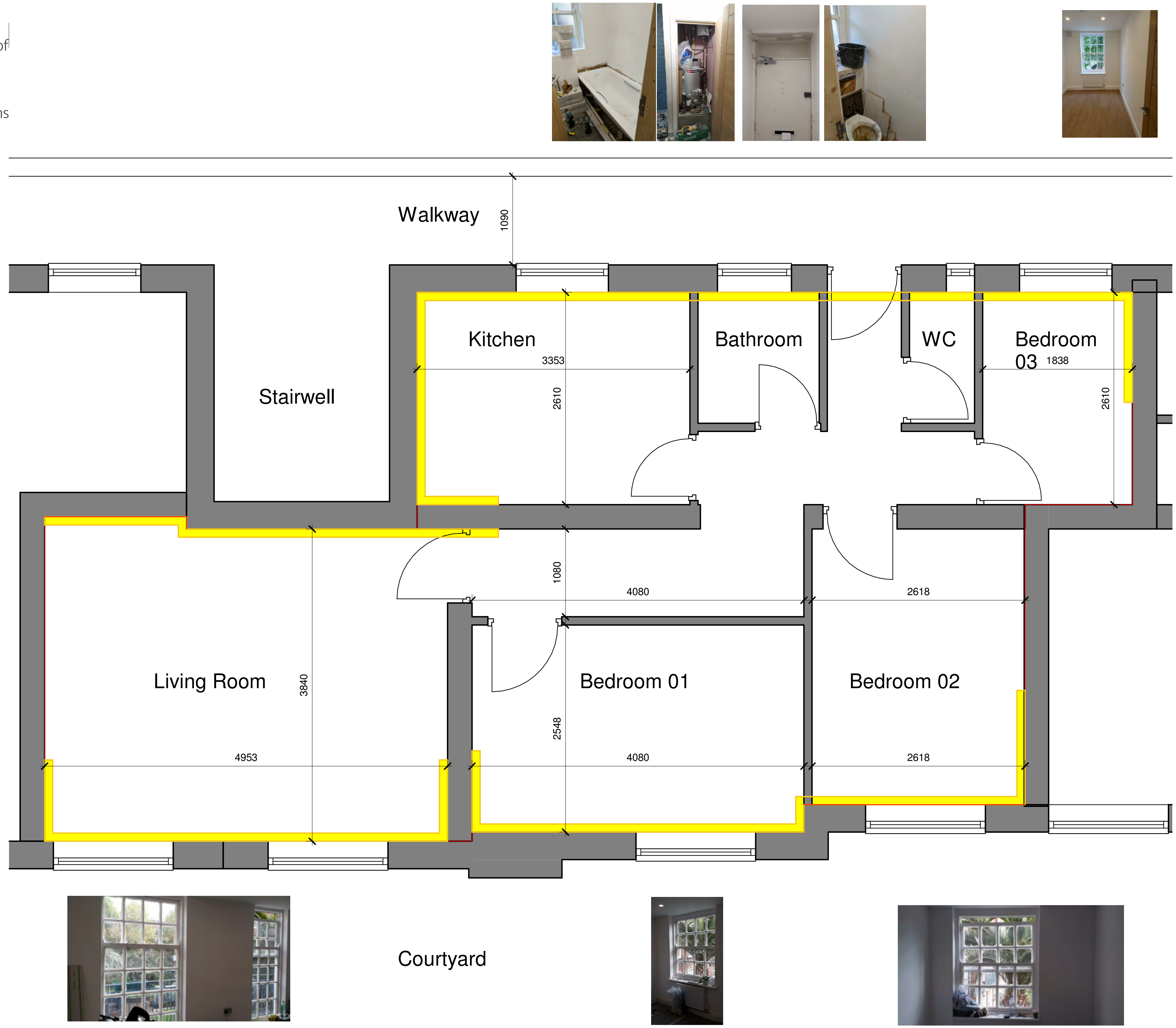
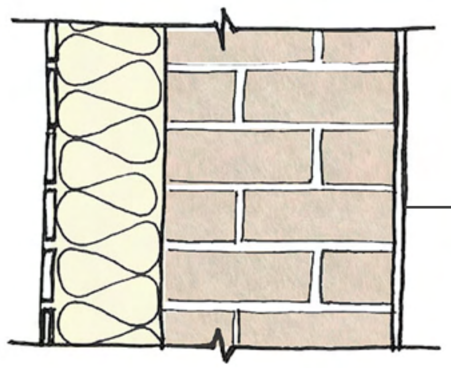


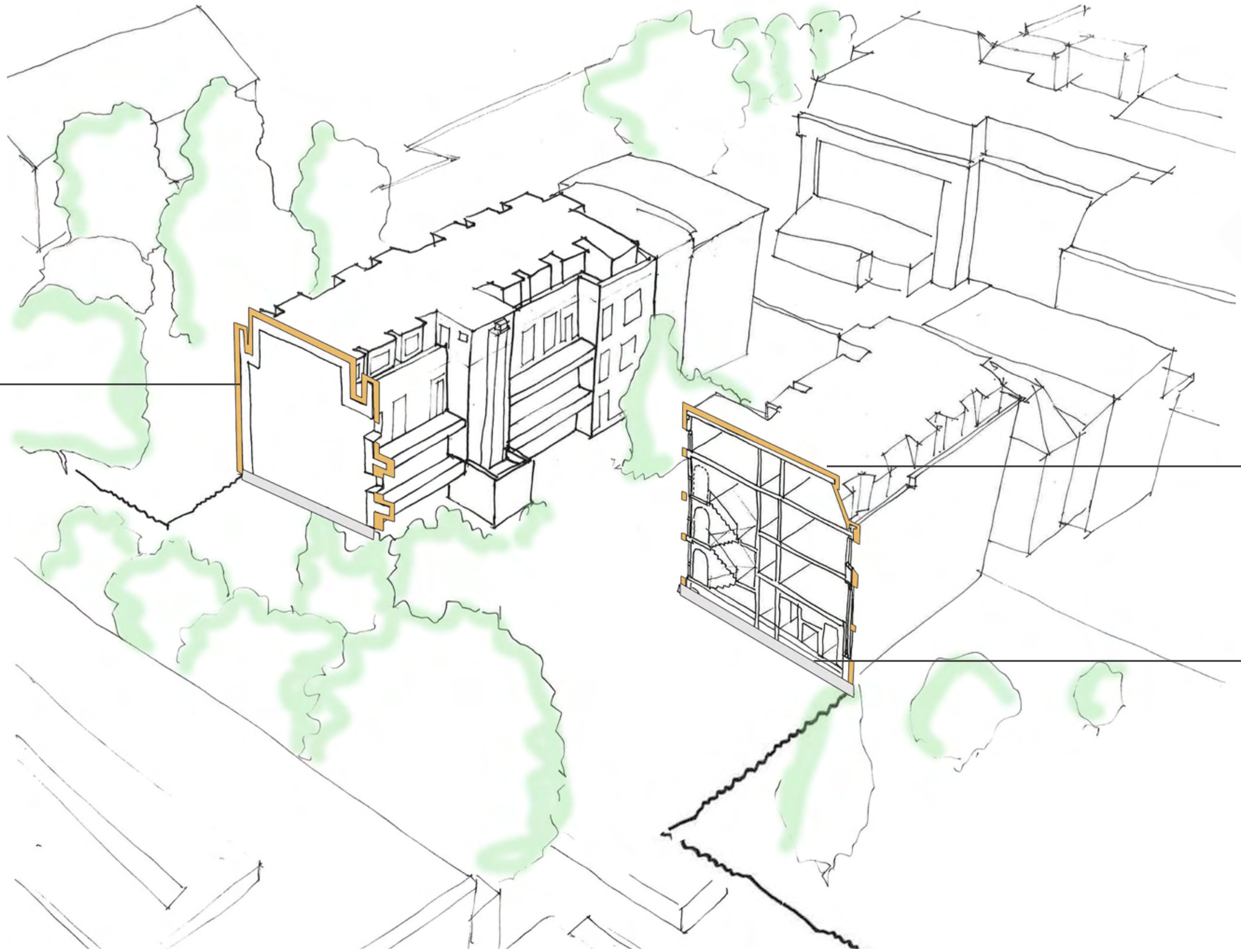
Figure 73 - Talbot Grove House, Flat 20, 1st Floor Plan

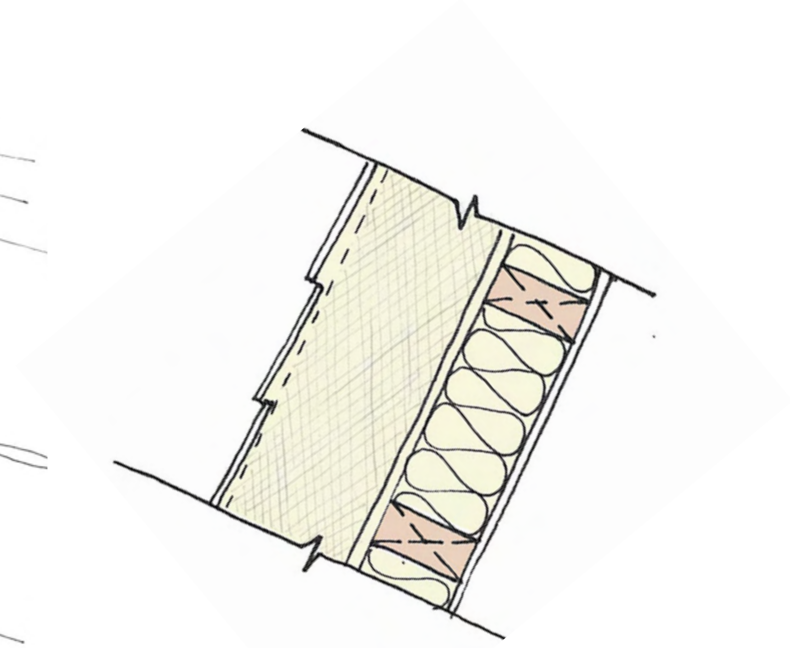
4.2.3.2 OPTION 2B - SILVER - EXTERNAL WALL INSULATION (EWI)



External Wall Insulation

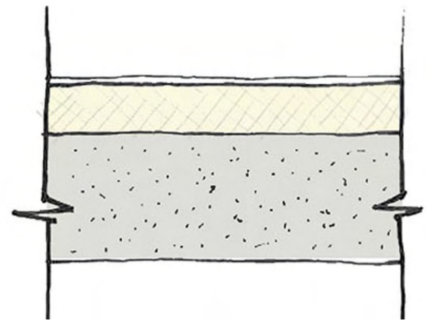
Refer to section showing different EWI systems





Roof insulation between and above rafters.

Refer to roof section for further details on options



Floor insulation

Refer to floor section for further details

Figure 74 - Morland House - Typical Section drawing with EWI

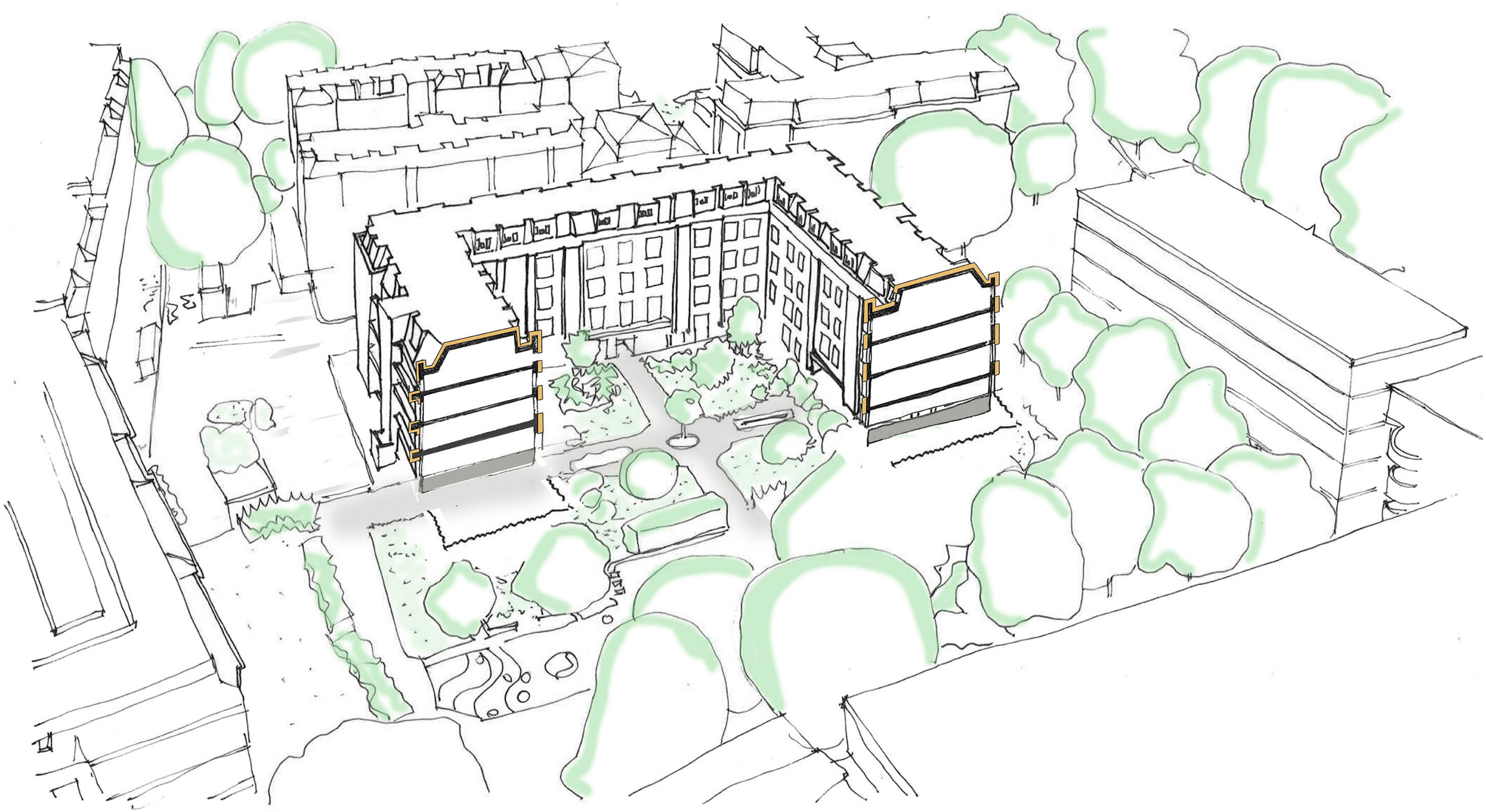


Figure 75 - Talbot Grove House - Typical Section drawing with EWI

4.2.3.2 OPTION 2B - SILVER - EXTERNAL WALL INSULATION (EWI)

Another way of achieving the required highly efficient envelope is by installing insulation on the outside of Morland House and Talbot Grove House. After analysing and discarding several options and having the fire safety of the residents as the utmost priority, we recommend that the two systems presented in this report are further analysed in subsequent design stages, should EWI is selected as the preferred option.

EWI generally provides a more robust solution, as it avoids some of the challenges of intersticial condensation that may come with poorly detailed IWI. External insulation also massively reduces thermal bridges and provides a continuous protection of the existing structure. It is also much less disruptive than internal insulation, but changes the aesthetics of the buildings.

The areas around the walkways may prove particularly challenging to insulate externally, as to avoid thermal bridges and not compromise the clear widths on stairs and external corridors. Further investigations are required to confirm these implications.

Both EWI options presented in the following pages offer a low-disruption solution to residents, specially if compared with internal wall insulation systems.

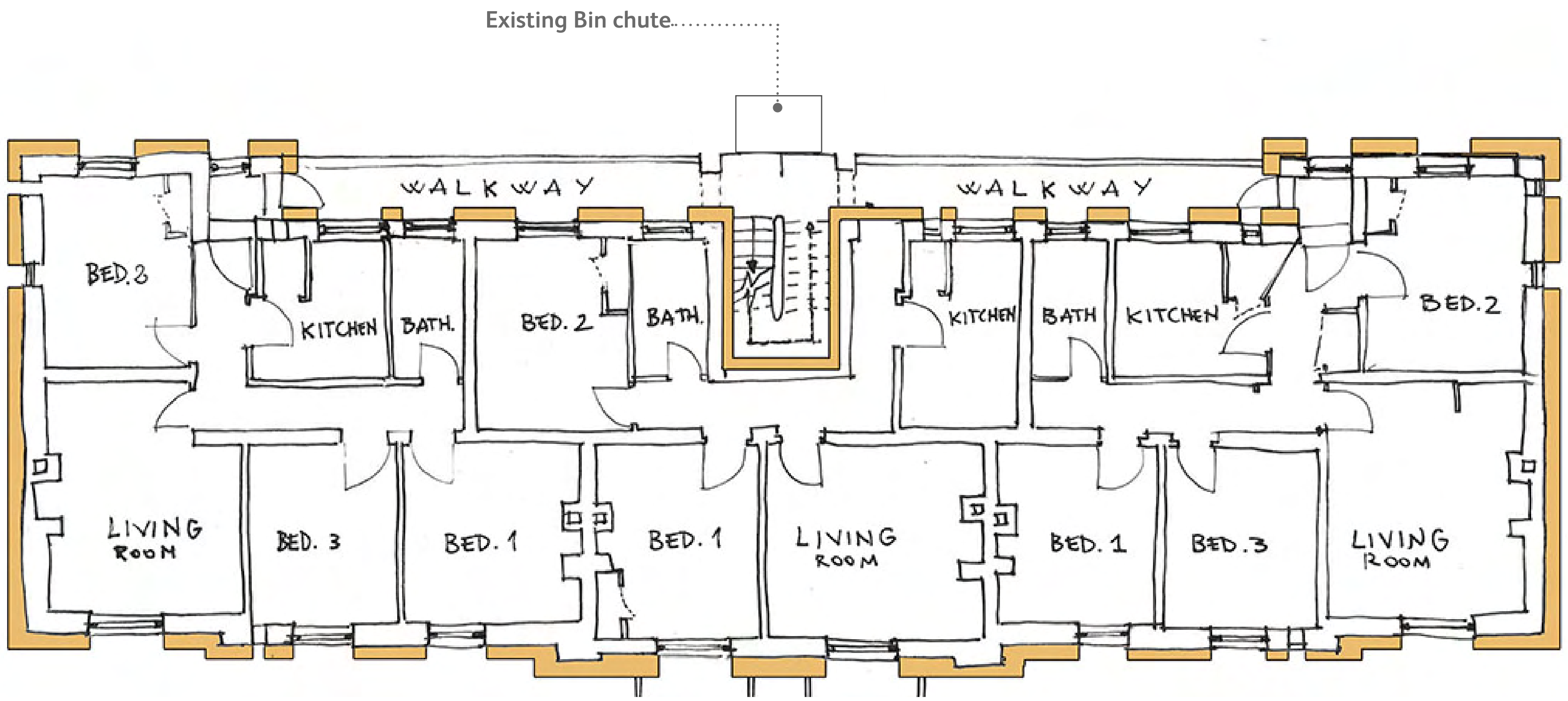


Figure 76 - Proposed EWI Ground Floor Plan (Morland House)

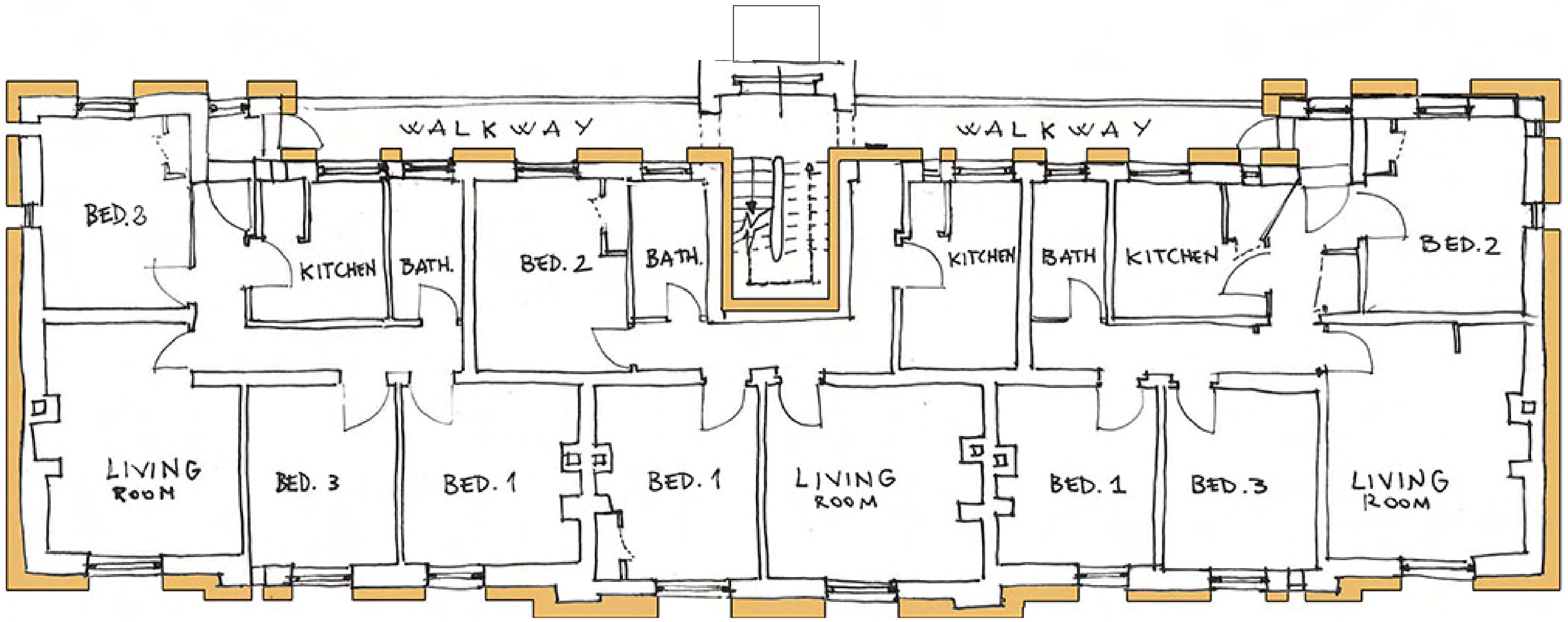


Figure 77 - Proposed EWI First Floor Plan (Morland House)

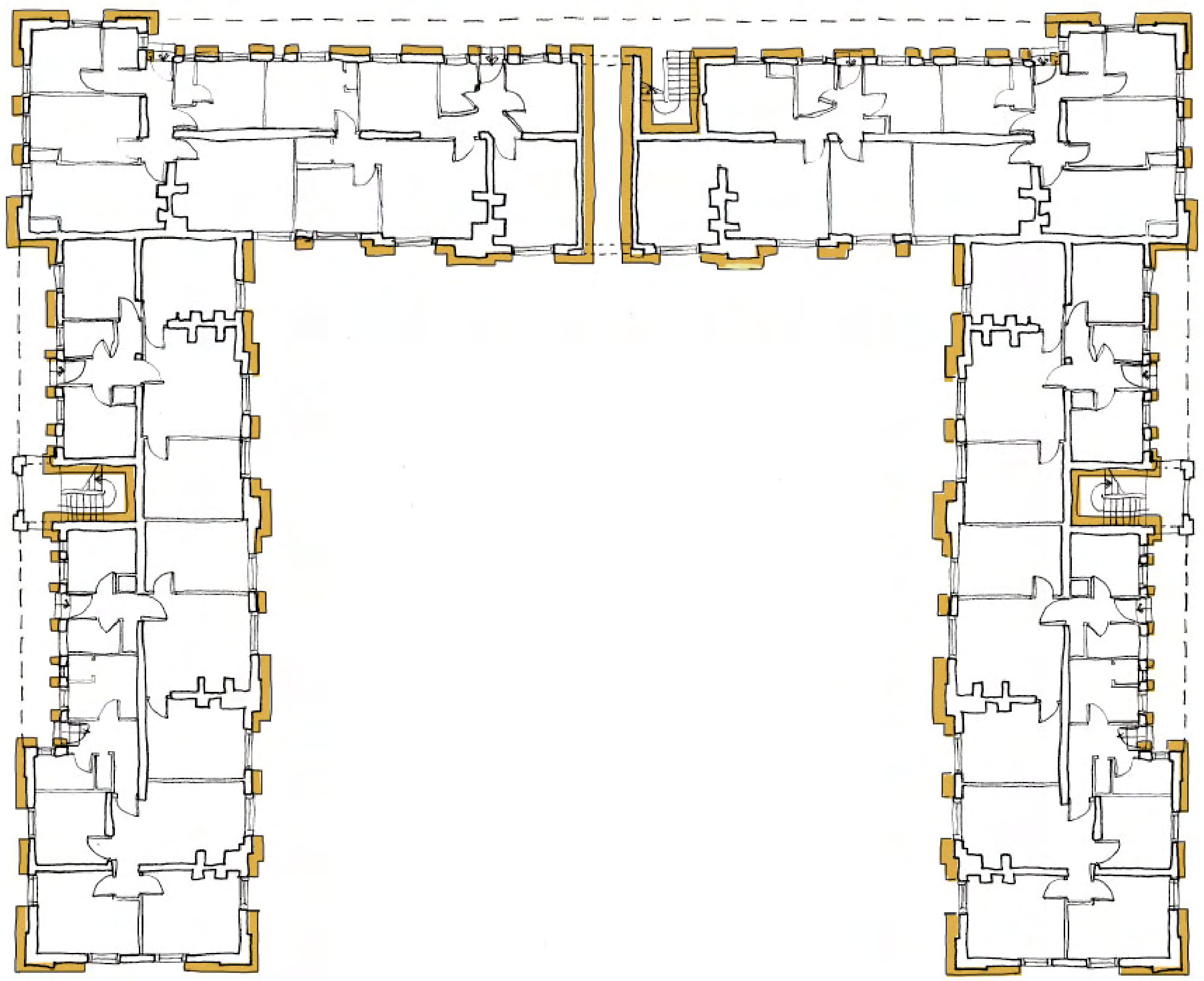


Figure 79 - Proposed EWI Ground Floor Plan (Talbot Grove House)

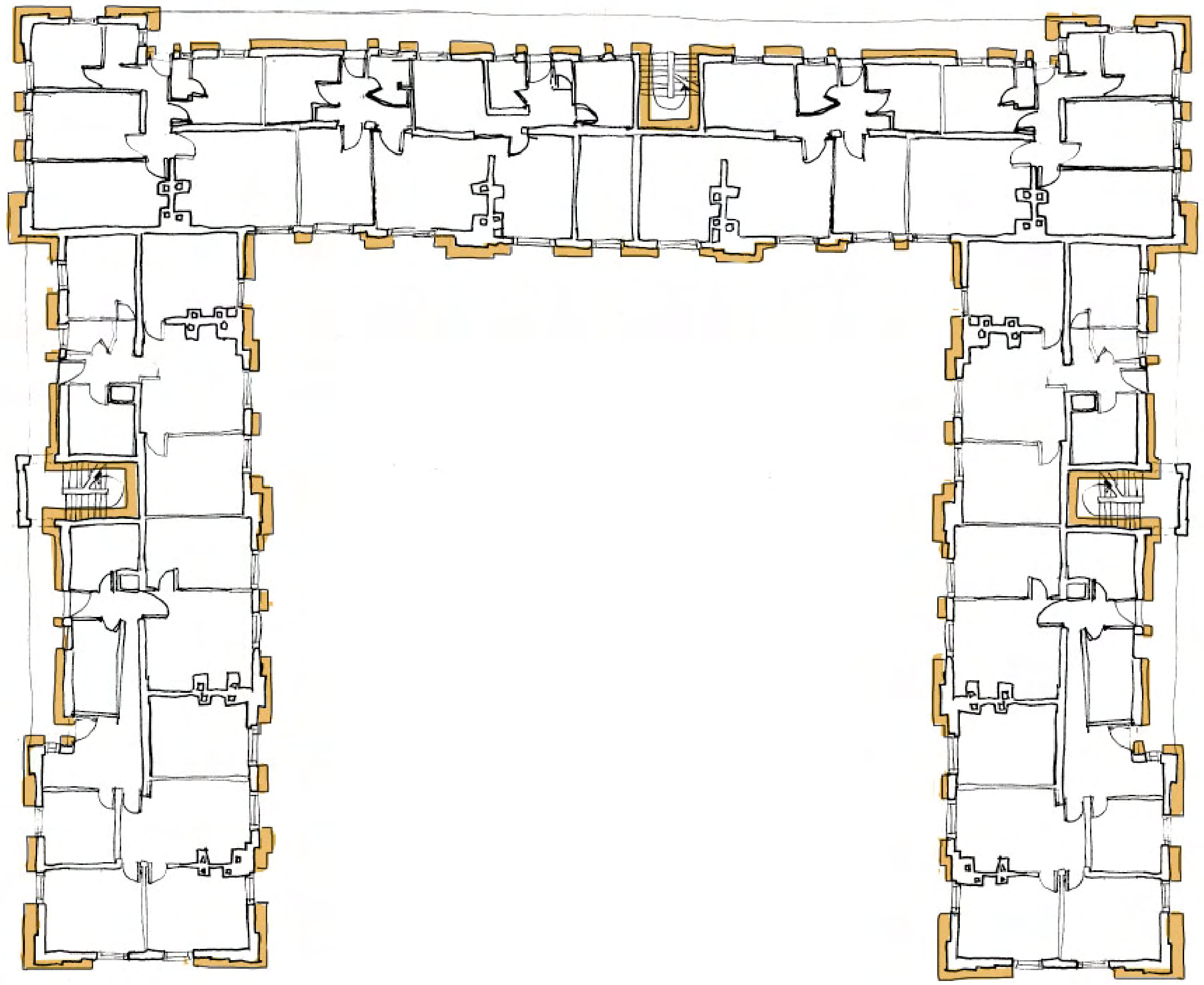


Figure 78 - Proposed EWI First Floor Plan (Talbot Grove House)

4.2 ENVELOPE INTERVENTION OPTIONS

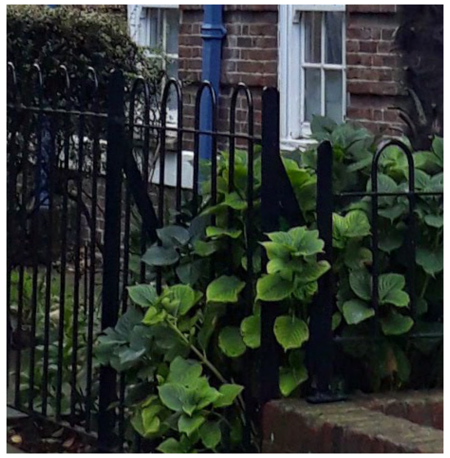
If External Wall Insulation is chosen, the following pages provide some facade options for the use of brickslips.

GREEN FEATURE

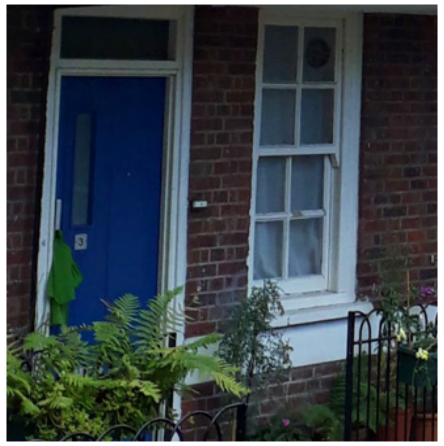
A proposed facade option of the Talbot Grove and Morland House is to use a mixture of the colours of the existing brick (buff and red brick) combined with green glazed brickslips.

Residents have applied green ribbons on their balconies in commemoration of the Grenfell Tower tragedy.

This particular green has been chosen originally because 'Grenfell' used to mean 'Green field', and has been used through-out the Grenfell campaign to demonstrate support and reflect the message of solidarity; the colour has now become synonymous with remembering those affected by the Grenfell Tragedy and the whole neighbourhood has glimpses of green, from balconies to windows to walls filled with support.





TALBOT GROVE HOUSE
BLOCK 3

MORLAND HOUSE - GREEN FEATURES

Option 01

In this option, the glazed brick will be applied to match the existing pattern in between the piers of the front elevation; the side elevation would have a characteristic pattern on mixed between buff and green glazed brick. The back elevation will emphasise the recessed façades on the walkways.

Option 02

Option 02 for this block emphasises the piers on the front elevation; for the back and side elevations, instead matches every other floor of the recessed façades. Additionally, balconies will have a proposed new green balustrade, matching existing surroundings.

OPTION 01

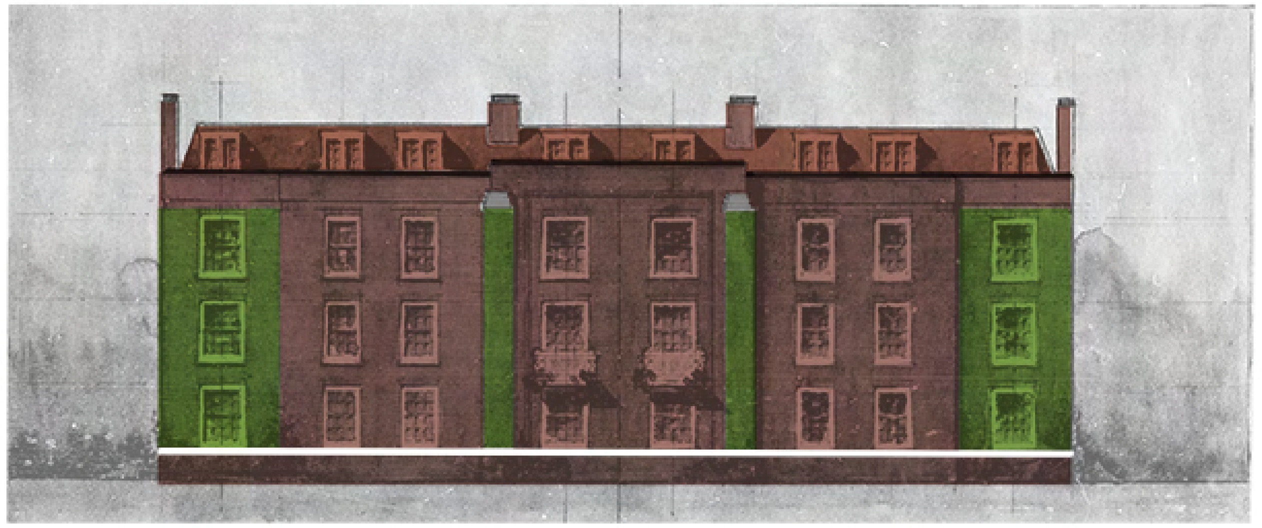


Figure 80 - Front Elevation

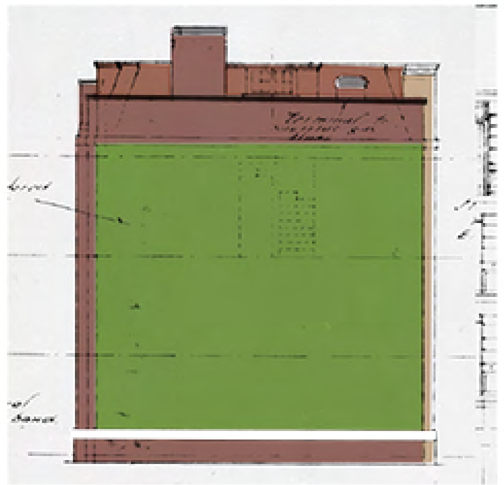


Figure 81 - Side Elevation

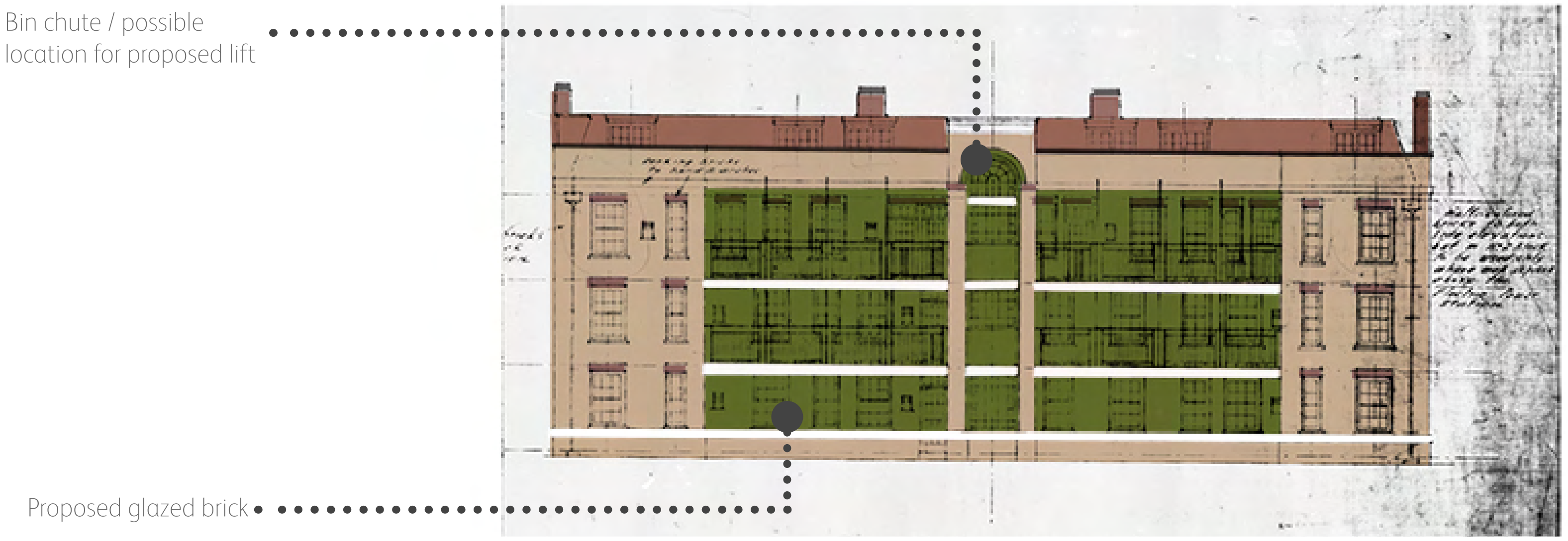


Figure 82 - Back Elevation

OPTION 02

Figure 83 - Front Elevation

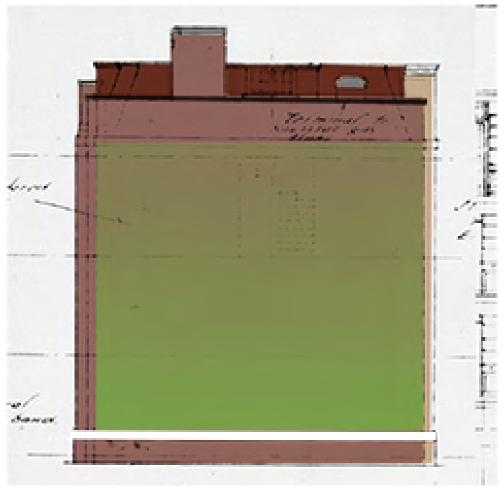


Figure 84 - Side Elevation

Figure 85 - Back Elevation

PRECEDENTS

TALBOT GROVE HOUSE - GREEN FEATURES

Option 01

In this option, the glazed brick will be applied to match the pattern between the existing piers of all elevations.

Option 02

Option 03 for Talbot Grove looks into emphasising the piers on the front elevation; for the back and side elevations, instead matches every other floor of the recessed façades. Additionally, balconies will have a proposed new green balustrade, matching existing surroundings.

OPTION 01

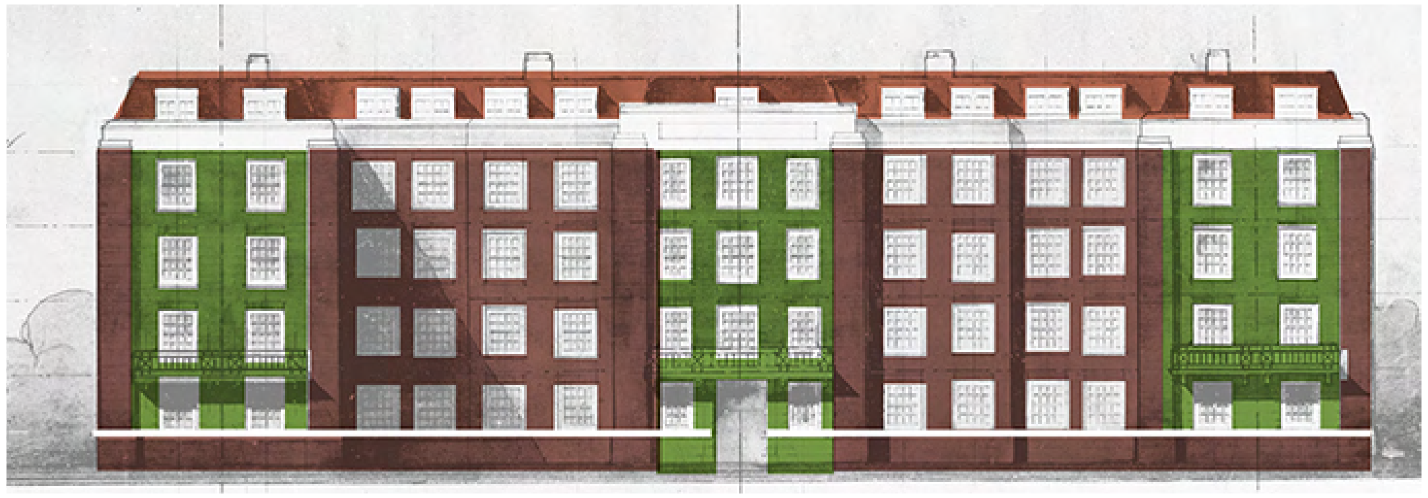


Figure 86 - Front Elevation

Figure 87 - Back Elevation

Figure 88 - Side Elevation

OPTION 02

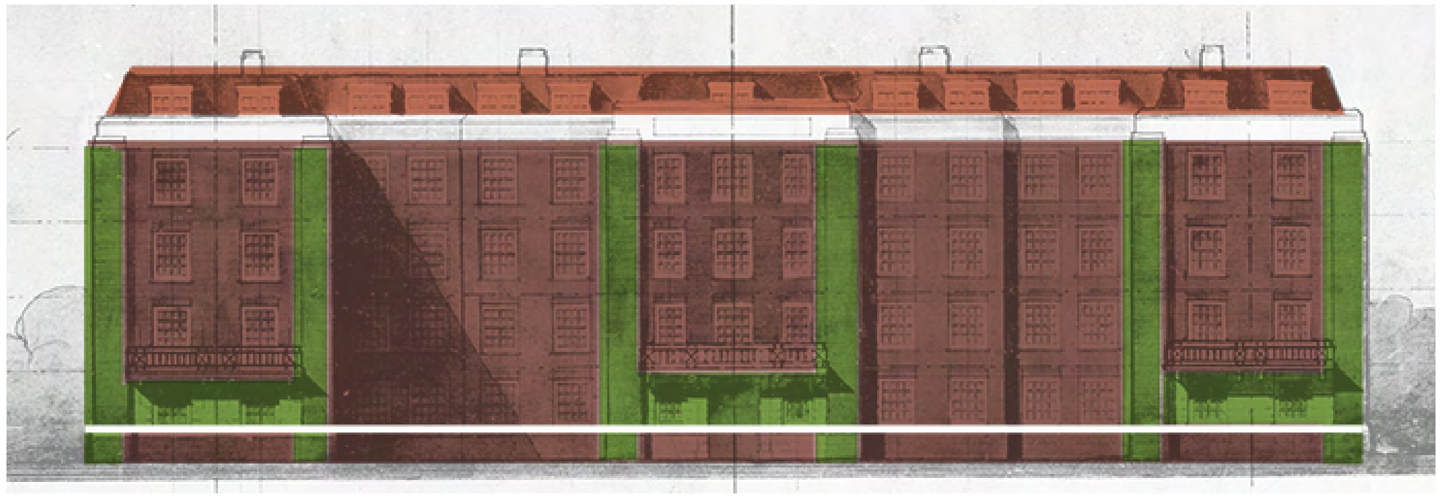


Figure 89 - Front Elevation

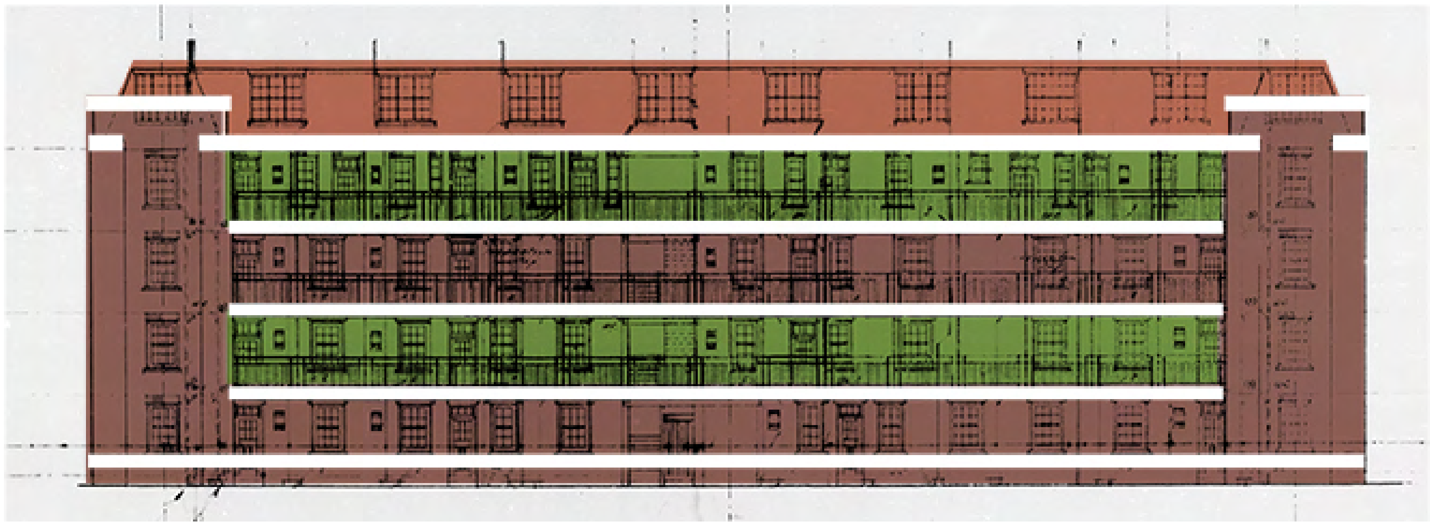


Figure 90 - Back Elevation

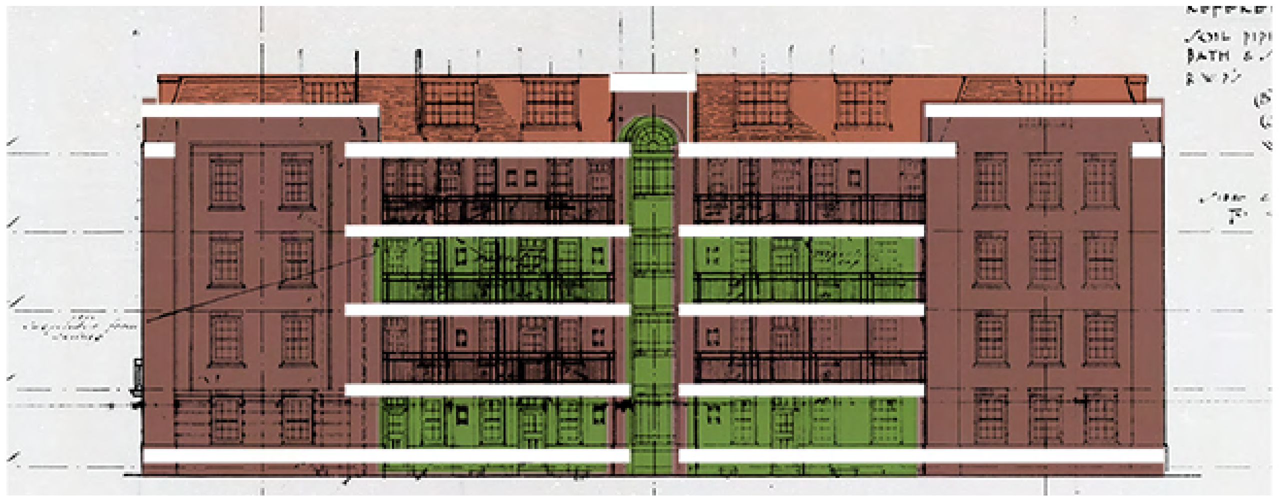
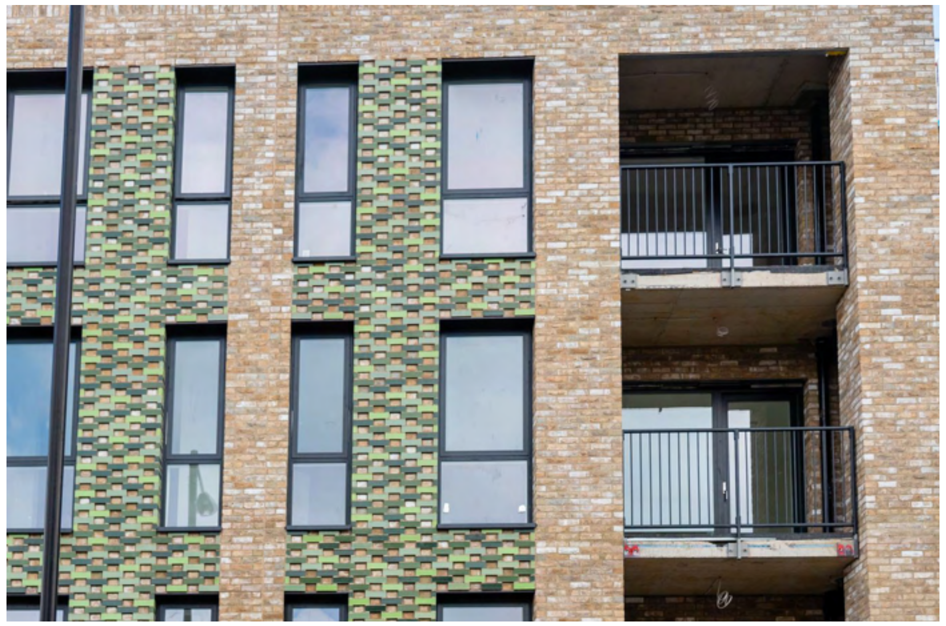
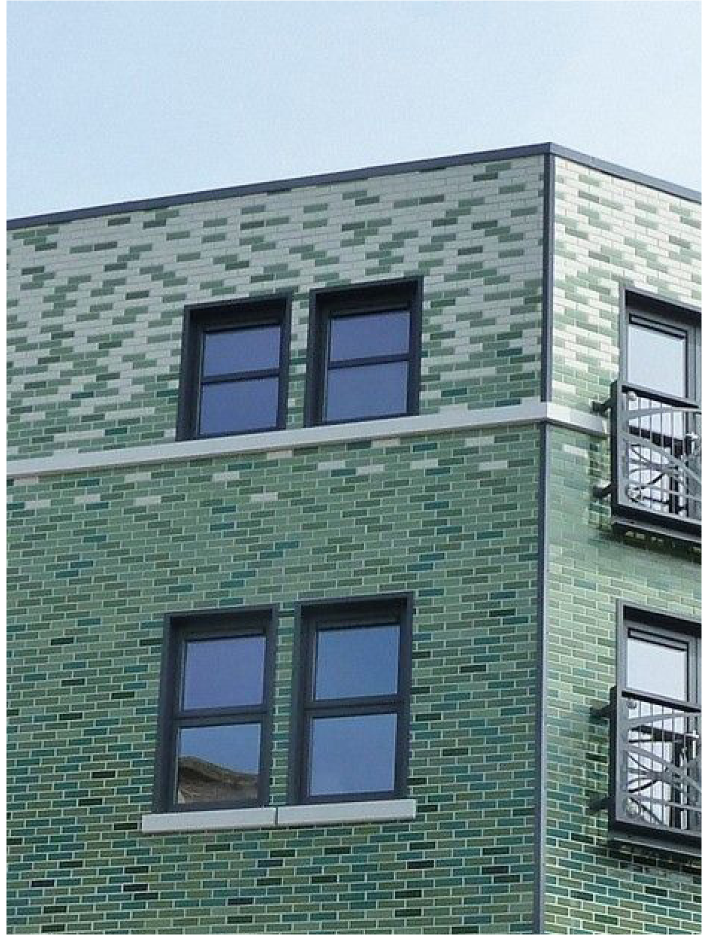


Figure 91 - Side Elevation

PRECEDENTS



ADDITIONAL PRECEDENTS


4.2 ENVELOPE INTERVENTION OPTIONS

EXTERNAL WALL INSULATION SYSTEM OPTIONS

A) BEATTIE PASSIVE T-COSY + BRICKSLIPS

Beattie T-Cosy will provide high quality, non-disruptive, non-combustible insulation around the whole building. Unlike traditional EWI systems, the 'T-Cosy' system provides an airtight layer on the face of the existing building and brackets with a non-combustible board to form a 250mm void. This is extended to the roof to create a single continuous void subsequently pumped with non-combustible insulation (Knauf Supafil or similar). New replacement windows and doors will be installed in the new outer layer ensuring thermal continuity with suitable airtightness tapes to seal all junctions. Decorative brick slip will then be added to the robust face. This solution is a Passivhaus certified and patented system, but a new product which has only been used on a couple of schemes in the UK.

This system offers a quick installation process, which provides high levels of insulation, fire protection and acoustic attenuation.

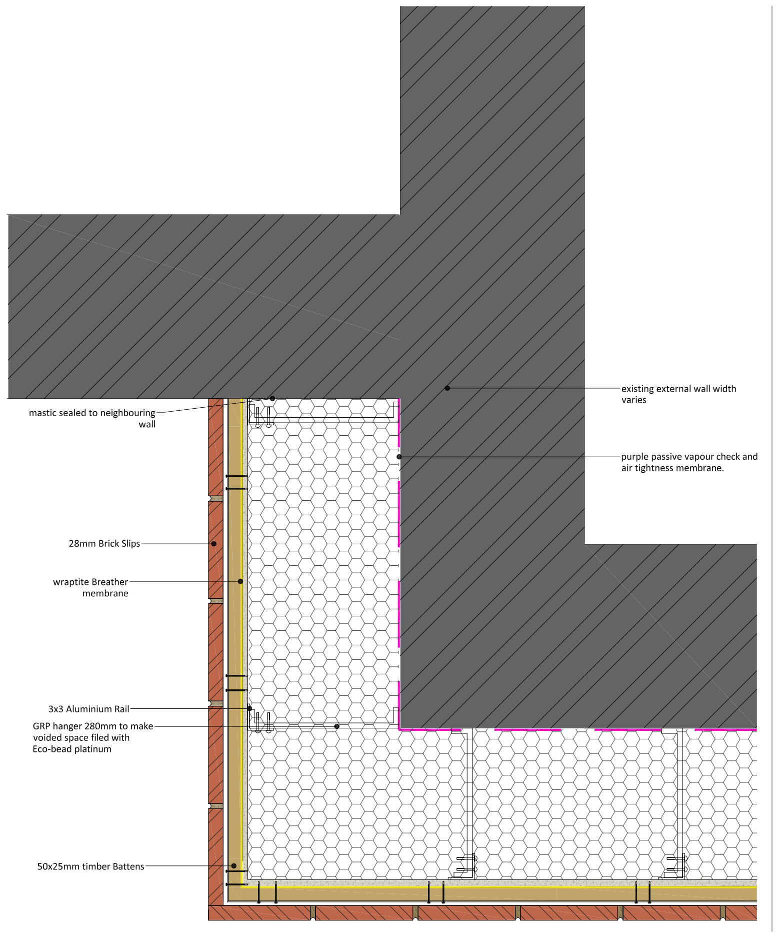


Figure 93 - Beattie Passive Pattented System. Plan detail

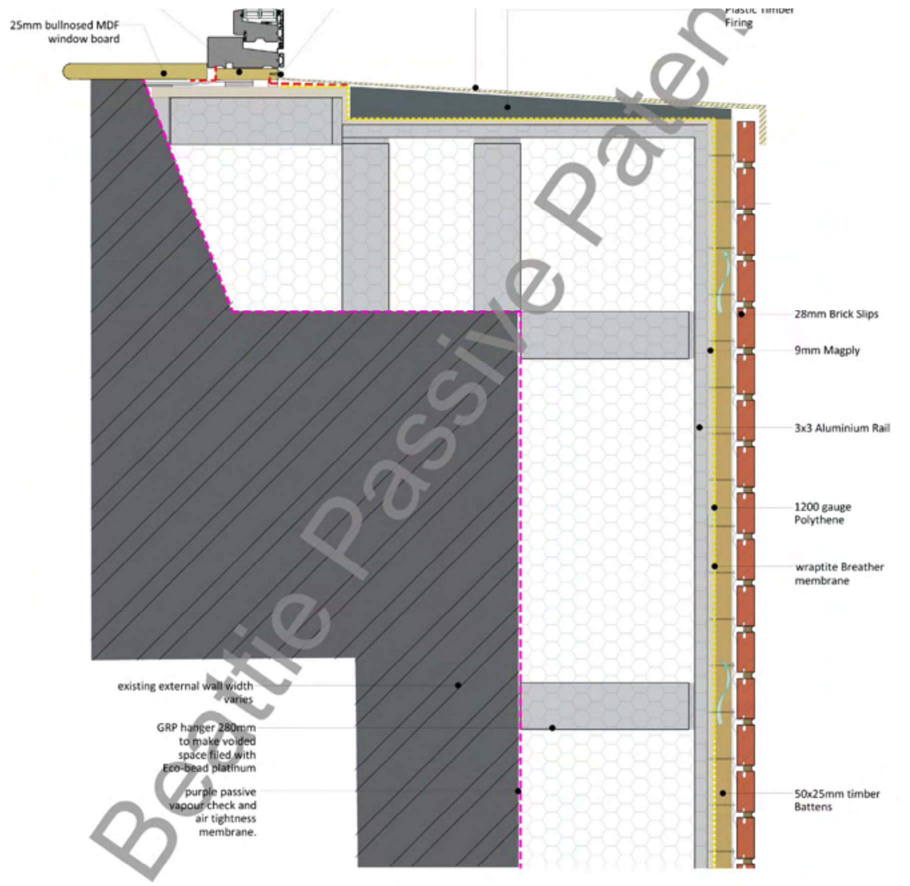


Figure 94 - Beattie Passive Pattented System. Dormer cill detail

Figure 92 - Beattie Passive Pattented System. Dormer roof detail

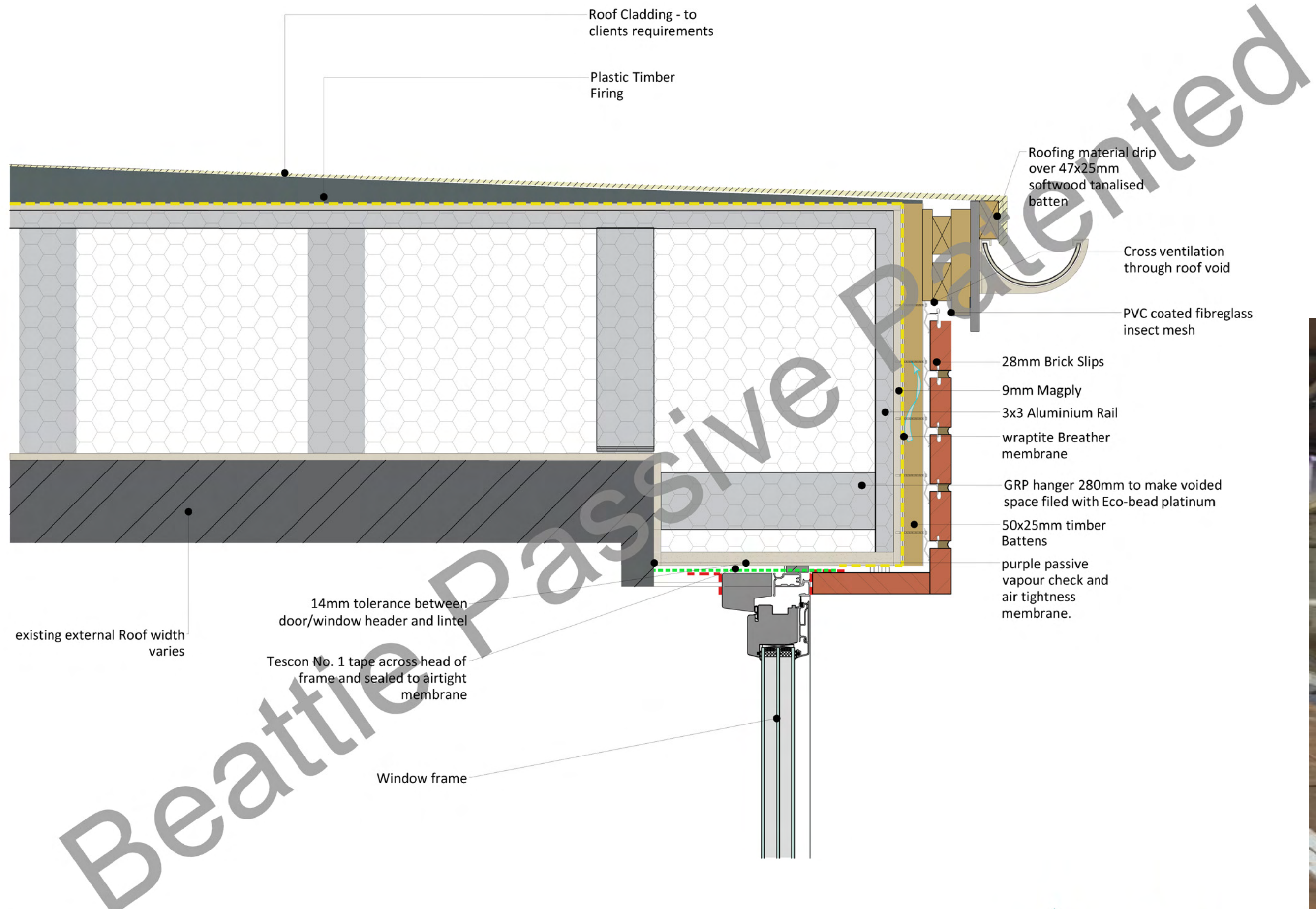


Figure 95 - Beattie Passive system during construction

B) RAINSPAN + BRICKSLIPS

The Rainspan system has been developed as a robust insulated panel offering a structural support for a range of rainscreen systems. The panel blends together the benefits of composite panel systems and rainscreen applications to provide excellent freedom for architectural finishes.

The through fixed joint detail enables simple and fast construction, eliminating wet trades and promoting single component through wall construction. The system can be used in combination with different finishes, such as corium or standard brick slips.

The system includes a 120kg/m³ density stone wool core, and all panels are made from A1 class materials but once bonded together (because of the adhesive) the panels are A2-s1-d0 combustibility and are tested from 60 mins to 4 hours integrity and insulation.

Other considerations:

STRUCTURAL SPAN. Panel lengths up to 14m with span capability up to 8m (subject to wind loads & rainscreen weight if using Rainspan)

ENVIRONMENTAL. Responsible sourcing to BE6001

ACOUSTICS. Up to 36dB sound reduction and class A sound absorption with the addition of a perforated liner

Suggested thickness of EWI system is 175mm, which provides a U-value of 0.23 W/m2K (excluding brick wall).

This system also offers a quick installation process, which provides high levels of insulation, fire protection and acoustic attenuation

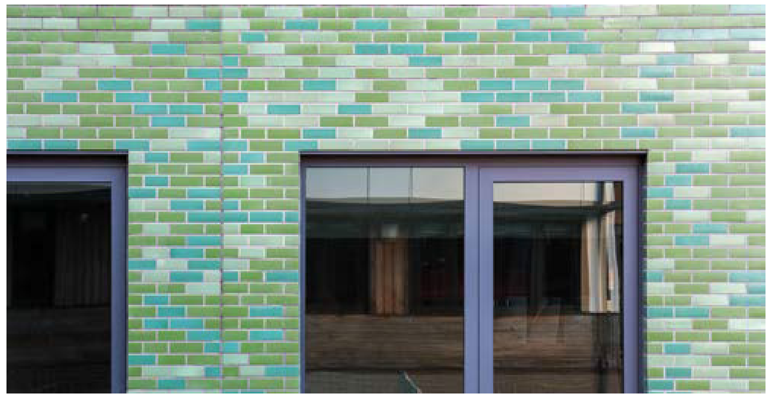


Figure 96 - Corium brickslips

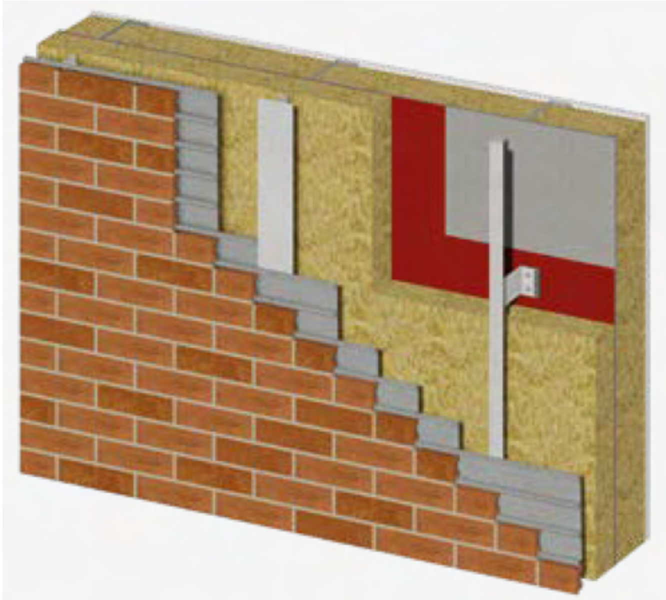


Figure 97 - Lightweight steel frame fixing mechanism

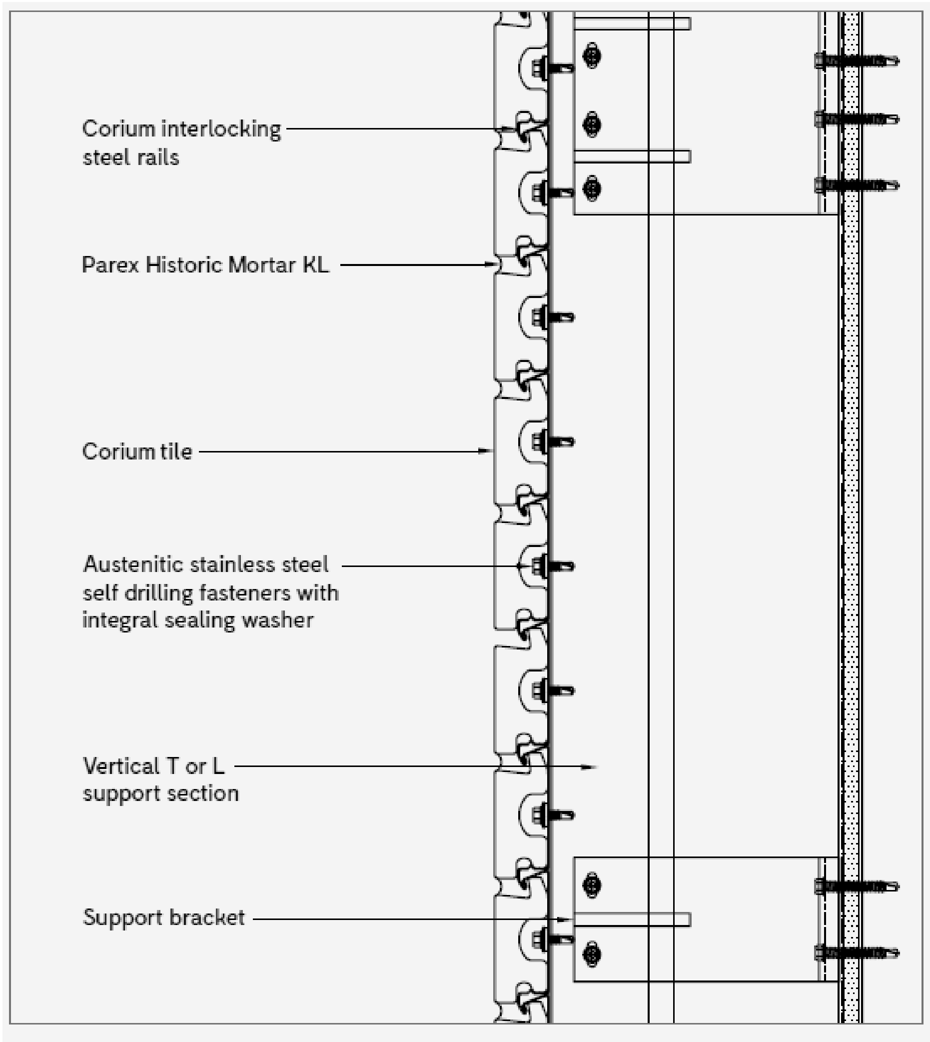
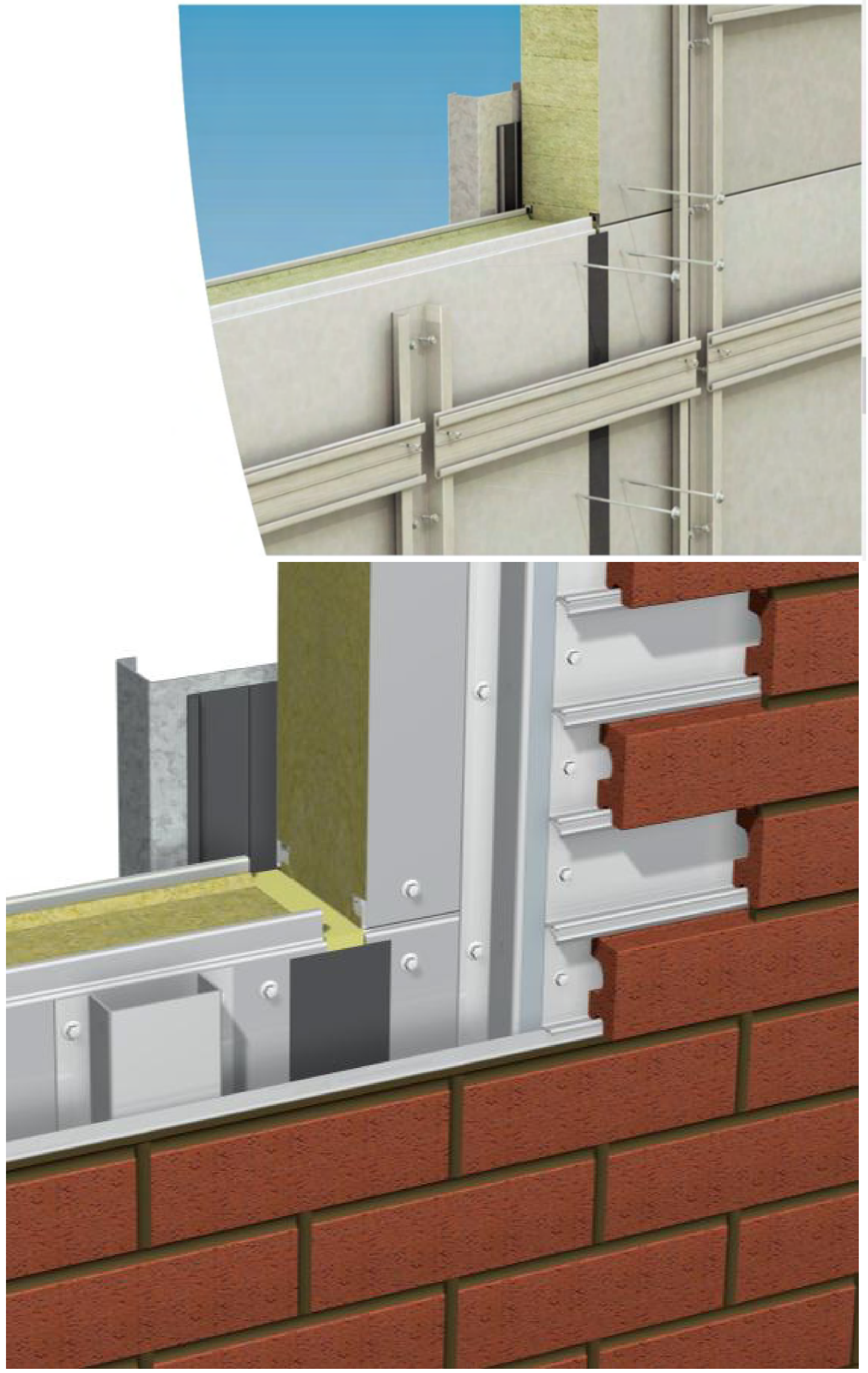


Figure 98 - Lightweight steel frame fixing mechanism

Figure 99 - Rainspan + brickslips system



4.2.4 OPTION 3 - GOLD - HIGH PERFORMANCE ENVELOPE + SOLAR PV AND STORAGE

In this option, measures to achieve a high performing envelope are being suggested as well as options to provide renewable energy and storage on site, as detailed below. Further details will be provided in subsequent stages of the design process if this option is selected.

Please refer to the table describing th Pros and Cons for this and other options.

- High performing Internal Wall Insulation (IWI) or External Wall Insulation (EWI) systems to achieve maximum overall u-values of 0.2 or lower.

- Reduce thermal bridging on external walkways, SVPs, window cills, balcony slabs, and other structural and protruding elements, by providing internal or external insulation as required, and cutting balcony slabs, and other elements that may affect the proposed insulation layers.

- Best practice airtightness detailing. Include airtightness coats or membranes within the preferred IWI / EWI system. Seal with proprietary tapes around openings, such as windows, doors, vents, etc.

- New efficient triple glazed windows – please refer to the section about window options.

- Install high levels of roof insulation

- Install whole-house efficient MVHR ventilation system in each flat. Minimum efficiency 75% but ideally better.

- Connect to a renewable-based heat network for space and hot water heating – For the district heating system please refer to separate report on this, produced by TACE.

- Install new solar Photovoltaics on top of the flat roofs. Output/yield calculations must be undertaken by specialists, and in conjuction with TACE / MEP designers. It is likely that the existing roof structure needs to be reinforced to allow for this installation (subject to Structural Investigations). Even if PVs are not considered to be installed inmediately is highly recommended that the roof is reinforced at the time of the insulation works, to allow for future installation of PV panels.

- The slope created by the original mansard roof considerably limit the flat surface area. With the potential implementation of PVs, there is not enough space for green roof to be considered as a viable option

Figure 100 - Flat roof areas which may be available for the installation of PVs, subject to further surveys

Figure 101 - Types of PVs mounted on flat roofs

4.3 PROS AND CONS OF THE DIFFERENT DESIGN OPTIONS

	Pros	Cons
Bronze - Minimal Intervention	• Relatively quick installation • Lower upfront/capital cost	• It would be a "business as usual" solution, that may not be able to achieve a "model 21st century housing estate" • Will result in high operational costs and energy bills for residents (but potentially lower than existing) • Low levels of thermal comfort and indoor air quality. Cold and wall damps may continue
Silver - High Performance Envelope (IWI or EWI)	• Will help Lancaster West Estate become net carbon by 2030 • It would provide a best practice solution, that will help to create a model 21st century housing estate • Will help to achieve the resident's aspirations for the estate • Will result in significantly lower operational costs and energy bills for residents • Excellent levels of thermal comfort and indoor air quality. Cold and wall damps will be eliminated	• Longer installation process • Higher upfront/capital cost
Gold - High Performance Envelope + PV and storage	• Will help Lancaster West Estate become net carbon by 2030 • It would provide a best practice solution, that will help to create a model 21st century housing estate • Will help to achieve the resident's aspirations for the estate • Will result in significantly lower operational costs and energy bills for residents • Excellent levels of thermal comfort and indoor air quality. Cold and wall damps will be eliminated • If sufficient renewable energy is installed on site and on the estate (as part of renewable district heating) + sufficient storage is available, then the estate will be achieving or getting much closer to the zero carbon goals (this is subject to further nvestigations and modelling with other MEP consultants and wider estate renewable calculations is outside of current scope)	• Longer installation process • Higher upfront/capital cost • Technical aspects and suitability of the roof substrates to carry additional load of PVs must be confirmed, as well as calculations related to the angle and orientation of the existing roofs in order to ascertain expected electricity output from PV array and storage.

Figure 102 - Benefits and Risks of the different design options

4.4 FURTHER CONSIDERATIONS

4.4.1 FURTHER CONSIDERATIONS

In addition to the envelope works suggested in the previous sections of this report, there are also other design considerations that are included as per below.

In subsequent design stages ECD Architects will work closely with LWNT and the residents to provide tailored solutions to the following other aspects, which are part of the residents' top ten priorities:

- Acoustic improvements between floors and flats. If internal wall insulation option is selected this may be extended to all party walls to also improve acoustic levels throughout. Mineral wool insulation could be fitted to all ceilings, to improve noise transfer vertically between flats. If MVHR systems are going to be installed into each flat, then this would be a good opportunity to install suspended ceilings for the ductwork, at the same time as acoustic insulation. Even if External Wall insulation is fitted, the client and residents may consider installing acoustic insulation to party walls and ceilings, despite the disruption.

- Communal area redecoration. All communal areas will be redecorated, to include new wall and floor finishes, as well as new external walkways waterproof covers. Further information on this separately in this report.

- Refuse storage improvements. ECD Architects will include this item in future resident consultation, to discuss different options to improve the refuse and recycling provision. This must be done in conjunction with the feasibility of new lifts. If new lifts are to be provided, then the existing bin chutes must be removed and incorporated into the new lift enclosures.

- We would need to carefully review the implications of thermal bridges ocurring due to the large amount of steel/aluminium brackets, which will affect the overall u-values of the system.

4.4.2 STRUCTURAL WORKS

BY WILDE CONSULTING ENGINEERING

It is proposed to significantly improve the insulation to these buildings. Insulation to the external walls can in theory be applied on the inside or outside face of the walls. Also, the addition of PV's is an option to be considered.

From a structural viewpoint it will be much easier to fix the insulation on the inside face. As long as suitable fixings are used into the external brickwork than this should be straightforward.

The form of construction of these buildings is quite heavy so the net increase in weight by adding insulation on the external elements is not considered to be an issue in overall terms but local areas will however, need to be checked.

Roof

At present the rafter spacing is not known but it is anticipated that there will be some spare capacity in the roof structure for the additional loadings. It is envisaged that there will be sufficient spare capacity for the weight of additional insulation but if PV's are also to be installed on the roof then it is likely that's some strengthening of the roof structure will be necessary. This would most likely mean the doubling up of the timber rafters at the proposed PV locations.

The detailing of the insulation around the dormers and at the interface with the roof and the vertical insulation and the parapet will need to be carefully considered to ensure its stability.

Walls

The load bearing walls and their foundations will have more than enough capacity for the anticipated additional insulation loadings for whatever system is selected. The issue will be to ensure that appropriate fixings are used to properly fix the insulation to the walls and with enough embedment.

Walkways

The projecting cantilevered concrete walkways are currently a cold bridge into the existing floor structures. Insulation will therefore be required around the walkways. Clearly the upper surface is trafficked, and the underside of the walkways carry services. The insulation chosen will clearly need to ensure that they do not compromise the use of the walkways. The concrete slab forming the walkways will be capable of supporting additional insulation loads.

Replacement of refuse chutes

As the refuge chutes were not part of the original construction they can be relatively easily removed as they play no part in the structural integrity of the buildings.

Existing Condition

There are a number of minor structural defects on these buildings. As part of the refurbishment and before areas are concealed the structural defects need to be repaired. There is some cracking of the external brickwork, cracking and spalls to the concrete walkways and stairs and some damage to the asphalt walkways.

There needs to be a structural survey of the buildings and all structural defects clearly identified and a schedule of repairs produced.

4.4.3 EXTERNAL WALKWAYS

Langley Waterproofing Systems Ltd have been working with LWNT to carry out roof surveys across the estate and recommendations for both Talbot Grove House and Morland House in 2020. The below is not a proposal, but a description of the suggested solution by Langley.

Unfortunately, there was no roof access to both roof areas therefore the report focuses on the visual inspection of the walkways to the two blocks at Morland House.

The report was written on the basis that the substrates, roof deck and structure are sound and durable. The following areas on the walkways were inspected, defects noted and design considerations recommended.

- Main Area
- Drainage/Falls
- Perimeters
- Skirtings
- Penetrations
- Cills
- Handrails

The report identifies that the current mixture of Mastic Asphalt / Liquid finishes waterproofing coverings to the walkways are in poor condition with signs of fatigue caused by ultraviolet degradation. Cracks in the waterproofing/ deck were also visible during the survey and therefore it was deemed that the waterproofing is coming to the end of its serviceable life. The quality of the other identified areas on the walkways was in poor condition overall.

Langley Waterproofing Systems Ltd recommend the direct application of their cold applied PR-20C Pararapide Liquid System Overlay over the existing Mastic/ asphalt walkway finish for Morland House. The benefit of this system is that the existing finish provides a sub-base for the proposed waterproofing system protecting the dwellings from unnecessary exposure to the elements during the proposed works phase.

For the walkways to 3 elevations on Talbot Grove House PR-20 Liquid System has been specified. This system is for refurbishment projects where a skid-inhibiting finish is required, and like the PR-20 C system the existing walkway finish acts as a sub-base.

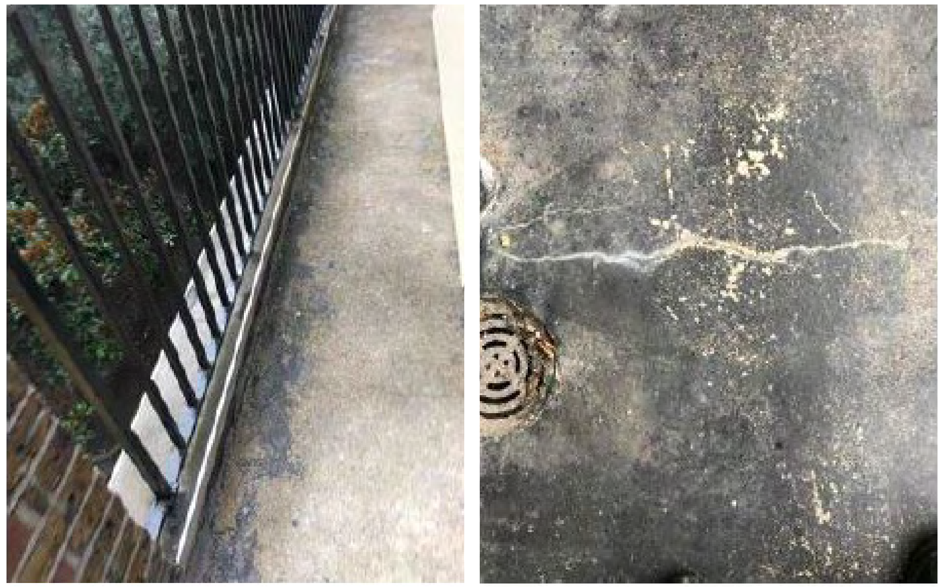


Figure 103 - Condition of main walkway areas

Figure 104 - Condition of existing perimeters

Figure 105 - Condition of area around existing door cills

Figure 106 - Condition of existing roof areas

Figure 107 - Condition of existing drainage

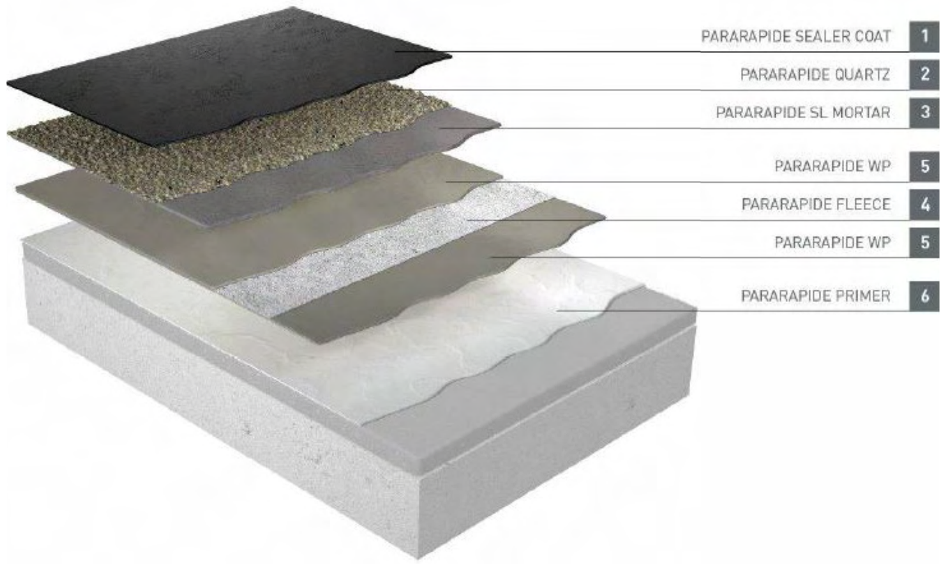


Figure 108 - Proposed liquid system to walkway areas, by Langley

4.5 COORDINATION WITH INTERNAL REFURBISHMENT WORKS PROGRAMME

INTERNAL AND EXTERNAL WORKS PROGRAMMES

LWNT has a separate refurbishment programme to replace kitchens, bathrooms, new wiring, plumbing and electric works, amongst other. The following are some of the aspects that could clash or may need works to be re-done if done out of sequence.

1. Entrance doors	Entrance doors are integral to the external envelope of the buildings and should achieve specific u-values and airtightness values. It is recommended that letterboxes are wall mounted on the wall adjacent to the door (and not on the door itself) so as not to compromise the required levels of airtightness.
2. Internal Doors	The flats and maisonettes will probably have a whole-house mechanical ventilation with heat recovery (MVHR) system. This system will require internal ductwork to all bedrooms, living rooms, kitchens and bathrooms at high level, most probably the main route will be underneath the internal hallway ceiling (within a lower suspended ceiling). This means that internal door dimensions may vary from those existing. It is important that internal doors have a specific background ventilation requirements (under-cut of 10mm clear above floor finishes) to allow the MVHR to work.
3. Windows	If windows are going to be replaced throughout the blocks, attention must be paid to where within the existing wall or new insulated layer they are going to be installed. If new decorations (paint, finishes and/or tiling) are to be applied around the existing windows, before the new windows are installed, then residents should be made aware that these works may need to be re-done at a later date, after the new windows are installed. This installation may require the introduction of internal insulated boards to reduce thermal bridges around the windows frames and cills.
4. Cabinets, appliances, plumbing, electrics, bathrooms and other elements fixed to external walls	It is yet to be determined if internal or external insulation is to be adopted throughout these blocks, therefore, if internal wall insulation is preferred, works to all external walls, and those adjacent (up to ~1.5mts) should be delayed, until the insulation is installed. The internal insulation specifications, thickness and finishes are yet to be determined in subsequent design stages.
5. Ventilation	As explained above, a whole-house MVHR system may be required, which will involve new ductwork and suspended ceilings on the internal hallways, as well as potential bulkheads on some rooms, and/or wall mounted ceiling valves on top of doors or adjacent to them. If decorations around these areas are to be done, some of this work may need to be re-done at a later date. Similarly, if existing traditional extract fans on kitchens and bathrooms are to be replaced within the internal refurb programme, they will need to be discarded as will become redundant if a whole-house MVHR system is in place.
6. Plumbing	If new plumbing is to be installed careful consideration must be made at its design stage, to be able to account for all internal heat gains and losses, which must be included within the energy modelling of the whole building. Pipes must be insulated, and their lengths should be minimised. This information must be fed to the energy model, in order to understand its implications, especially if an energy standard target, such as EnerPHit, is adopted.
7. Heating/Radiators	If new radiators are fitted in, it is likely that they may become redundant if the blocks are set to achieve the EnerPHit standard targets. Such low-heating demand may make traditional wet-system radiators redundant; and other heating systems such as an Air Source Heat Pump[1], or even direct electric systems in some instances, may be more suitable if there is a very low heating demand. ASHPs also work with a wet heating system, albeit radiators must be sized according to a low-temperature flow to suit the system's requirements.
8. Appliances/Lighting	Same as with plumbing above, the EnerPHit energy model will need to include the electricity usage of all main appliances, white goods and lighting, and may inform the final Primary Energy Demand value, which must be below a certain target.
9. Cupboards/Storage	If the internal refurbishment works include the provision of improved cupboards this must also take into account possible new space requirements for the installation of new hot water cylinders, new MVHRs and/or ASHP (air source heat pumps) if required in a non-district heating scenario.
10. Flooring	If new flooring is to be installed on GF flats, this would be the perfect opportunity to also include floor insulation. Floor insulation may affect the whole floor-to-ceiling height, as well as the need to raise kitchens and bathrooms accordingly. Again, if new kitchens and bathrooms are installed, this would be the perfect time to install floor insulation.
11. Internal decoration to mansard roof and dormer areas	The existing roofs will probably need added insulation to achieve the set energy and comfort targets, and this may need to be installed from the inside of the properties (TBC on option selected), in that case, any decoration works will need to be redone if applied in advance of the thermal improvements.
12. Airtightness	It is noted on site that there are some external wall's vents. It is unclear what is currently included within LWNT's Internal Refurb programme to finish these elements from the inside, however, it is likely that these holes in the external fabric will need to be insulated and filled appropriately, to achieve the targeted airtightness and u-value levels.

1.Air Source Heat Pump (ASHP) takes this small amount of heat energy from lots of air and concentrates it, and transfers the energy to water, heating it up. This hot water is then used to heat your home and provide you with hot water from the taps.

With regards to services our strategy has been to simplify wherever possible and ensure that heating and hot water demand are minimised through improved fabric and reduced ventilation losses. Assuming good air-tightness can be achieved, MVHR (Mechanical Ventilation with Heat Recovery) would be required to deliver the low energy demand as it is is an essential part of really good retrofit.

In a typical flat internal air is heated by radiators, keeping residents warm. However, much of this heated air then escapes through gaps in construction. Cold air gets in through the gaps and then this needs to be heated up too, wasting energy. Having a complete line of airtightness around the building means that the heat energy that is put into the building stays in the building.

Once the building is made airtight, residents still need fresh air. An MVHR unit brings in fresh air and pre-warms this with the heat from outgoing air. This fresh, warmed air is then distributed to living areas, while stale air is extracted from kitchen and sanitary spaces. Windows can still be opened, but the building will still work even if windows are kept shut.

This would also offer improved air quality and it is assumed that this would be done on an individual basis per flat.

Both Talbot Grove and Morland House are part of the local district heating system which is subject to a separate review (by others). Depending upon the outcomes of this study and associated funding applications the energy performance target and associated services strategy may change from a communal system to an individual system per flat. If an individual system were required to provide heating and hot water (via a Heat Pump) this may be coupled with the MVHR system in a space-efficient compact unit. Any individual heating or ventilation system would (like a gas boiler) require an annual maintenance check.

TACE Engineers have been appointed by LWNT to look into the viability of the LWE district heat system. They have also provided us with the HWC indicative layout shown in this page.

ECD Architects reached out to Zehnder, to look at feasibility options for the MVHR system. Depending on the unit, this can be located in the entrance hall within a new suspended ceiling or in an adjacent cupboard. All ductwork can be then routed via the hallway, and valves can be located on top of internal doors, or extended further into the rooms via bulkheads. There are two options for the ductwork: rigid metal and plastic ductwork, we wouldrecommend the metal ones for this project, due to it's robustness, efficiency and fire performance. All of these aspects will need to be determined at later stages in the design, once measured surveys are received and a detail designand calculations are carried out.

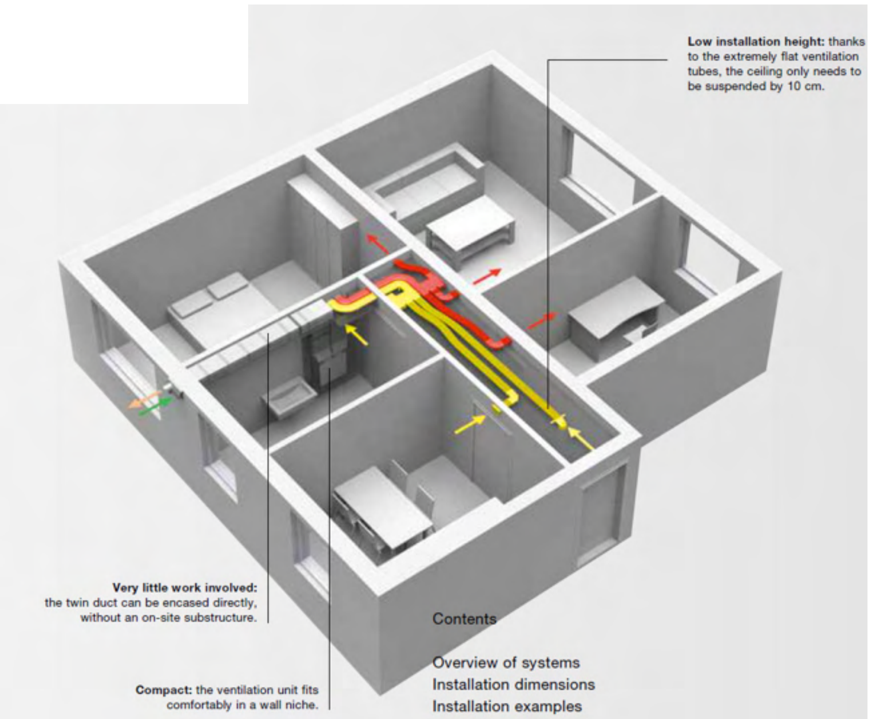


Figure 112 - Example of MVHR ductwork within a flat

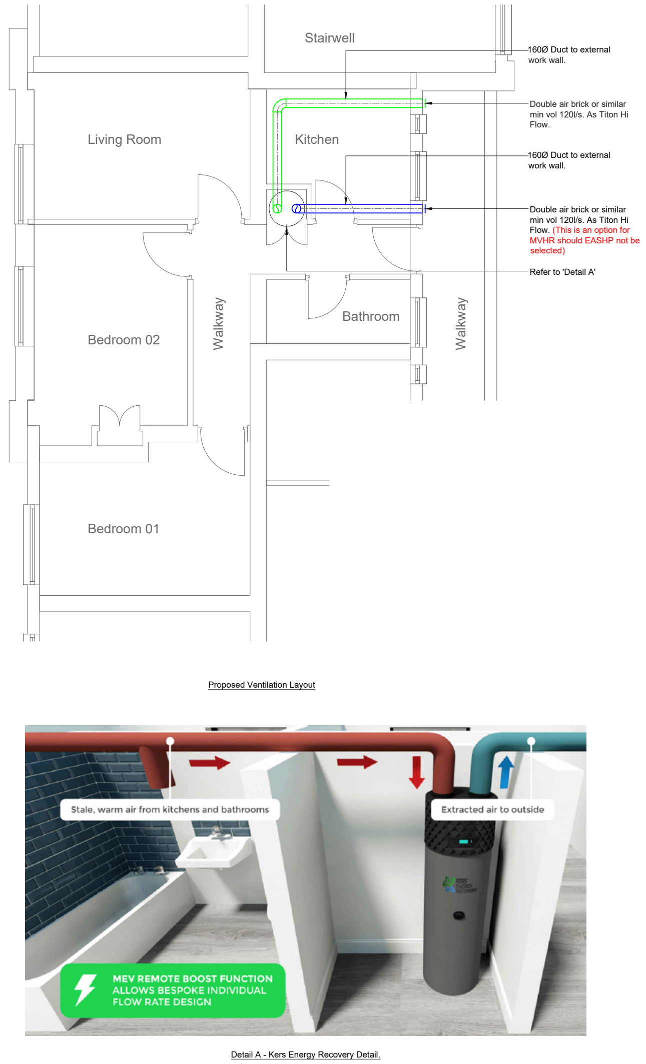


Figure 109 - TACE - Typical Floor Plan and schematic of Gas Heat With Water Cooling Unit (HWC)

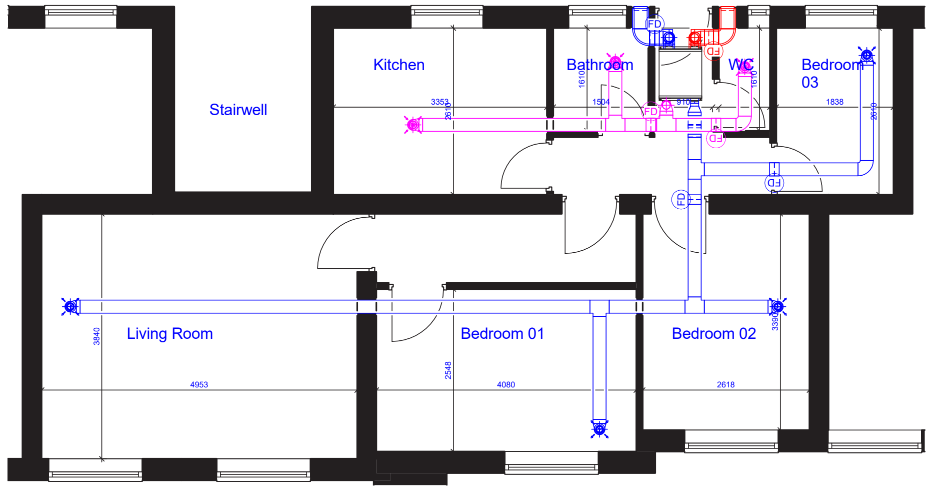


Figure 110 - Zehnder - Typical Floor Plan with MVHR on suspended ceiling

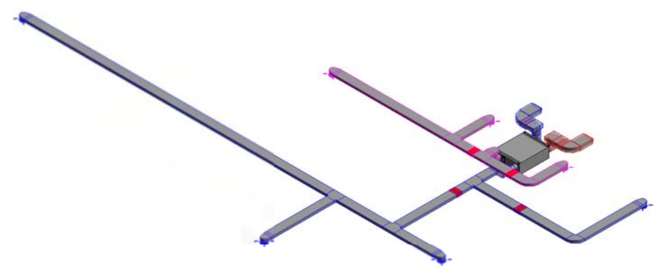


Figure 111 - Zehnder - 3D view of MVHR

4.7 PRINCIPAL DESIGNER

Section prepared by Mark Allen - DERISK

Much of the design work at this stage comprises the gathering of existing information and arranging surveys to identify gaps in information and provide clarity on the current status of the buildings. At this stage in the design process construction materials and processes are yet to be firmed up, though initial discussions are taking place with all consultants and tentative proposals are being reviewed from a health and safety perspective.

Currently there are minimal health and safety hazards impacting upon residents that need to be controlled. These are limited to the surveyors undertaking investigation works, with the potential for the transmission of coronavirus during this pandemic a concern. Prior to their appointment all surveying companies confirm that their operatives are 'Covid Secure' and this extends to site works for the protection of residents, visitors, and staff working on the estate. The number of persons attending Talbot Grove and Morland House is kept strictly to a minimum, with the mandatory wearing of face coverings and ID badges enforced alongside other construction industry control measures.

There may be noise and vibration transmitted to residents during intrusive investigation works. Tasks which generate these are tightly controlled with employers providing risk assessments and method statements to ECDA and the Lancaster West Team where required. Residents will be informed well in advance of such works taking place to ensure disruption is kept to a minimum. There are anticipated to be temporary restrictions placed within the 2 buildings with work areas barriered off to ensure the investigation works can be undertaken safely, however again residents will be consulted during the planning stages of this to reduce any impact.

CDM 2015 requirements (the Construction Design & Management Regulations) are being monitored by the Principal Designer (Derisk) and the Lot 3 works are considered by Derisk to be in full compliance with the Regulations at present. ECDA are legally required to communicate design risk information to the Project Team and all persons affected by the refurbishment works, this is being demonstrated partly in the form of written CDM Risk Registers. These are developed with Derisk and are reviewed frequently, with revised versions issued at a minimum of each RIBA work stage. The risk register is retained within the Site-Wide Refurbishment Risk Register under Lot 3 Project Risks.

The planned extensive construction works will present health and safety hazards to the residents of Talbot Grove and Morland House. It is the utmost priority of the Project Team to identify what these hazards are at the earliest possible stage and work with the team, the contractors, and of course the residents to reduce the associated risks to as low as reasonably possible to ensure the safety of all persons within Talbot Grove and Morland House. As stated, the design proposals and construction methodology are still at a very early stage, however Derisk and ECDA anticipate the following hazards to be addressed as a minimum.

- Maximising Fire Safety – is at the foremost of all works on the Estate. IFC Consultants (Fire) are in the process of reviewing the existing buildings and are now imbedded within the design team. Of significant risk is the need for a collaborative approach between respective organisations and Lots, as several separate packages of work are being planned that must all tie in together to ensure fire safety not only meets but exceeds current standards. Regular fire safety meetings are diarized within the design team meetings, and this will be agenda item on all team meetings. Fire Safety during construction is also a priority and the Fire Engineers will support the contractors to develop fire plans that keep all persons within the 2 buildings safe during the refurbishment works. It is of note that discussions are taking place between the lead consultants for all of the Lots, the LWE team, and internal RBKC Fire Team to review and prepare a standard 'estate-wide' approach to fire design safety. Meetings to progress this commenced January 2021 and are programmed frequently to assist collaborative working and ensure the maximization of fire safety is captured within our proposals.

- Interface with local residents, business, schools, and members of the public. Both buildings are accessed by road from St Marks Rd which is immediately adjacent to Thomas Jones Primary School – there are significant numbers of children and passers-by periodically throughout the day. Although the works compound is expected to be located away from the road, a comprehensive traffic management and logistics plan will need to be developed that considers the volume of foot traffic passing by the works area, protections from falling materials and contact with construction machinery.

- There are expected to be several contractors undertaking works concurrently once refurbishment works begin. ECDA will work closely with the LWE Team to ensure that they (a) cooperate with one another; (b) coordinate their work; and (c) take account of any shared interfaces between the activities of each project (e.g. shared traffic routes along St Marks Road). It is of key importance that where there are shared interfaces (as there will be within the close) that one contractor is responsible for retaining control over these areas.

- Interface with other projects (particularly Clarendon Walk and Camelford Walk (Lot 2 works) and the Internal refurbishment and void works) – all planned works that may impact upon these works are closely managed to prevent any clashes or interference. Derisk are involved with the separate Internal refurbishment programme and will assist the LWE Team to develop programmes and specifications that cause minimum disruption to the Lot 3 works and ultimately to the residents.

- Residents remaining in their homes during the works. All works where possible will be carried out without requiring residents to leave their homes. These will be planned so that hazardous works are undertaken at a time during the day when fewer residents are in the buildings. If Internal Wall Insulation is not to be installed then this will greatly reduce this risk for this aspect of the works. There are expected to be isolated communal areas that may be temporarily closed to residents but this will kept to as short a period as possible. Works to the services systems will include localised isolations so that residents retain power, water, lighting etc. as much as possible. Inevitably though there will be some aspects of the works carried out that are simply not safe enough to be undertaken with residents remaining in their homes, such as asbestos removals for example. The temporary relocation of residents is being discussed with the Estate team, with proposals developed over the coming weeks in full consultation with residents.

- Asbestos containing materials are noted to be present within the buildings. Though currently being managed by the Estate team these are proposed to be removed during the refurbishment works unless it is deemed acceptable to retain (encapsulate) it through the process of risk assessment. Asbestos is an extremely hazardous material and for the safety of all persons on the estate all works will be carried out in strict accordance with the Control of Asbestos Regulations 2012. Historical asbestos information is available to the team has been subject to a review by the team and Derisk. A number of more detailed asbestos refurbishment surveys have been undertaken to Talbot Grove (nos 2, 19 & 20 and Morland House (nos 12 and 23) in 2020. Further surveys are likely to be required to identify gaps in asbestos information over the coming weeks.

The appointment of a specialist Asbestos Consultant has been recommended by the Principal Designer and Manestream (Asbestos Consultant already utilised by RBKC) has been made and they are currently providing consultancy services to the Team. To ensure that the management of asbestos is kept consistent across the Lots, Derisk have issued an Asbestos Communications Procedure to the Project Teams.

- All works where possible will be undertaken without the need for site operatives to work at height to reduce the risk of falling materials and tools around residents. However there are many elements of the works that cannot be undertaken from ground level (such as roof works and window replacements) and so suitable access platforms will be used. These are likely to include scaffold and tower scaffold systems, mobile elevated work platforms, hoists, and traditional ladders and step ladders.

All present different risks to residents and site staff, however construction methodologies will be considered during the design phases to ensure that the hazards and risks are outlined and controlled. Derisk have proposed the undertaking of Construction Hazard workshops with ECDA over the coming weeks to review work at height and general construction requirements for all proposed designs.

- RBKC as the Client (for the purposes of CDM 2015) are required to ensure that the contractors put in place suitable welfare (toilets, hand washing facilities, changing areas, water supply, etc.) during their works. Due to the numbers of persons proposed to be undertaking these works it is unlikely that use of void properties will be suitable, and defined welfare areas or cabins will be required. These will need to be sited close to the 2 buildings and so parking spaces or small areas of the landscape may need to be temporarily closed to accommodate these. All proposals will be considered by the Project Team and developed in consultation with residents.

- Larger construction works will require an area or compound to house offices, cabins, material storage, tools and plant etc. Due to the limited space available around the estate this may impact upon existing parking areas or the landscaping as discussed above.

- Security – contractors are required to ensure that their sites are kept separated and secure from persons other than their own staff. This will require physical and electrical security measures to be installed around the 2 buildings which may impact upon residents free movement around the estate. All proposals for alarm systems, herras fencing, hoarding, etc. will be reviewed by Derisk and the wider Project Team.

- Logistics and waste removal. The works will increase vehicle traffic around the estate and the carrying of waste and other materials to the work areas will present a hazard to residents. Derisk and the Project Team will support contractors to develop their waste management and logistics plans to ensure that they impact upon residents as little as possible.

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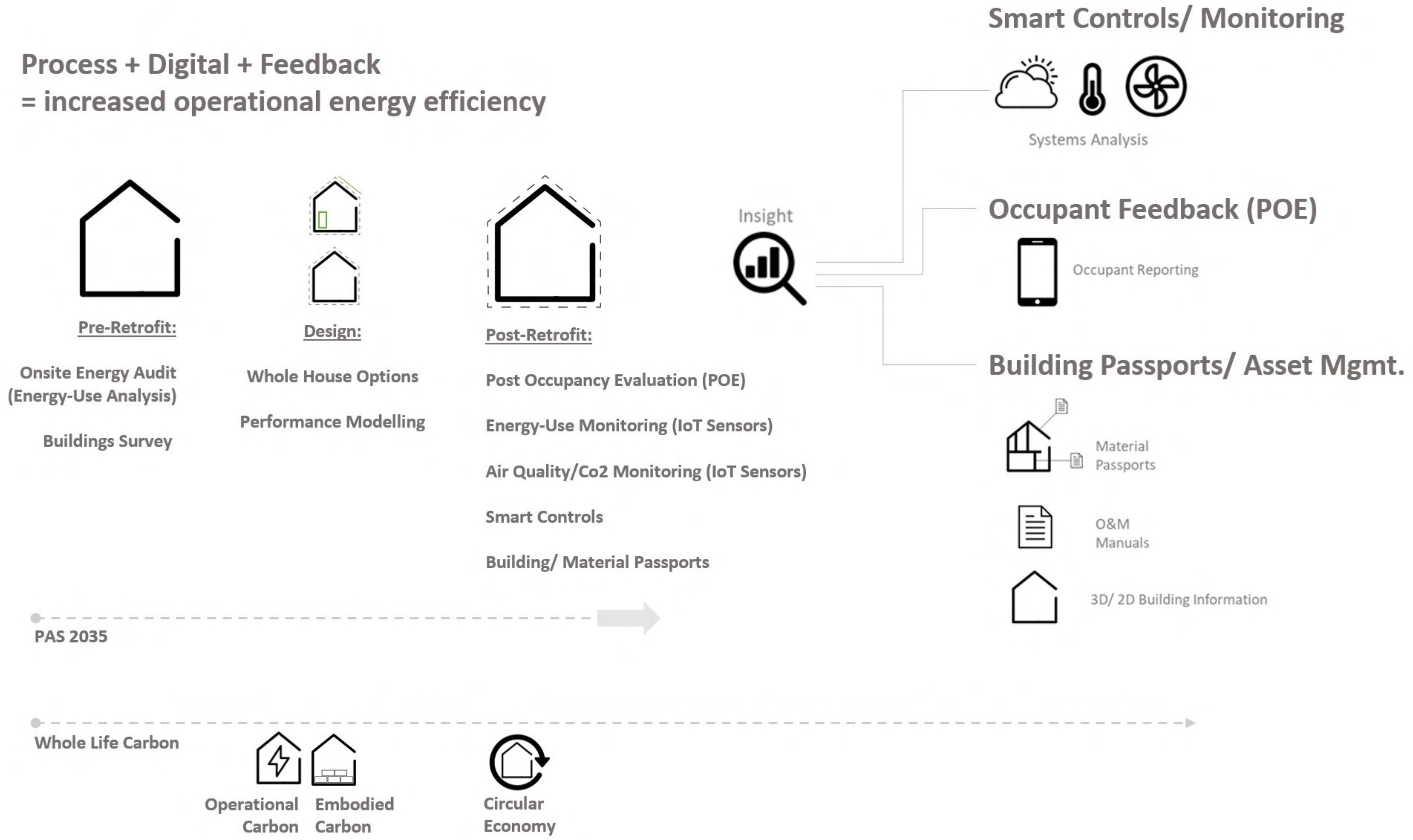
5.0 MONITORING & POE PROPOSALS

MONITORING & POST OCCUPANCY EVALUATIONS



Smart monitoring and reporting of energy use form a fundamental basis of the project's delivery to ensure performance is delivered 'as-designed'.

Fabric and whole building performance will be evaluated pre- and post-retrofit on 100% of properties subject to retrofit works using non-disruptive innovative methods for the following reasons:

1. Pre-Retrofit: to test existing situation and identify core issues.
2. Post Retrofit: to test as-built situation and verify 'as-designed' performance.
3. In-Use: Long-term monitoring via consumer unit such as Switchee or Nest to feed into a remote monitoring dashboard for asset performance analysis.

The results of each stage will as a whole contribute to optimization of operational energy use, thus reducing carbon in-use.

Pre/Post Retrofit: The methodology for pre- and post-installation is to use innovative non-invasive methods including Smart HTC to measure whole building thermal performance and Pulse air tightness testing. We will use Build Test Solutions' Smart HTC technique: which enables whole building heat loss to be determined with just 21 days of internal temperature and energy consumption monitoring using 4-5 temporary sensors.

The pre-retrofit analysis will feed into the design process to ensure an accurate reflection of existing scenario.

In Use: Over the long term this will be complemented by energy use and environmental data from smart monitoring, Both Nest and Switchee smart thermostats will be trialled to measure energy consumption and enable LWNT to measure performance, address concerns around fuel poverty, and address any potential performance gaps. In the long run, this could also allow HTCs to be calculated remotely further reducing disruption to residents.

All assessment and evaluation will be fully documented, and results will be shared broadly through LWNT's research partnership with LSE and networking with colleagues across the housing and retrofit sectors to support future projects and help meet the UK's target of going net-zero by 2050.

Furthermore post-handover performance through smart monitoring data could be benchmarked against actual resident Post Occupancy Evaluation (POE) detailing their experience. The POE feedback could in line with LWNT & W11 Digital Innovation objectives be obtained through digital platforms to inclusively harness community feedback on satisfaction with works undertaken.

Combined, this data will build up an evidence base to inform other projects, including the actual performance data as well as an evaluation of the use of these methods to feed back into design models to formalise understanding of our assets.

The aforementioned BIM process and possibility of a Digital Twin will argument smart monitoring to form a cohesive holistic approach to asset monitoring and proactive management, supported by a transparent platform for residents which could play host to all manner of their buildings actual performance and succinct records of their constituent parts.

6.0 BIM OPPORTUNITIES

BIM/DIGITAL DESIGN OPPORTUNITIES

In order to maintain a robust approach to data management and BIM information quality in line with industry standards it is proposed subject to client agreement that the design team and wider consultant and contractor teams will work in a collaborative BIM environment. Details of this will be further outlined in the upcoming BIM Strategy document.

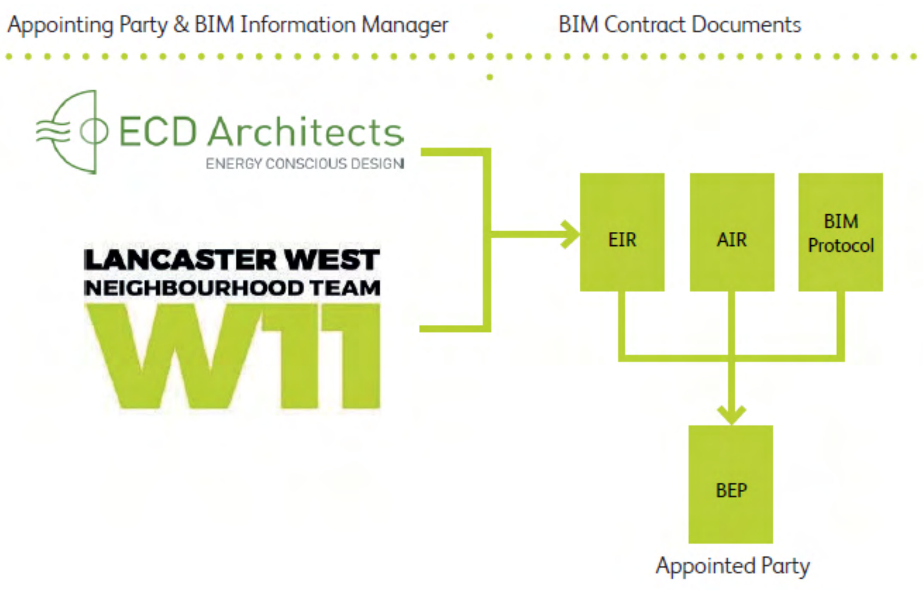


Figure 113 - BIM Strategy

Beyond the delivery of the projects through BIM the following further opportunities could come from the use of BIM:

1. Smart Asset Management

2. Iterative Whole Life Carbon Design Optimization

3. Visualization/ Resident Engagement

1. Smart Asset Managment

A key opportunity arising from BIM derived datasets is the value it lends to Asset Management. When set-out in a Building Execution Plan (BEP) & Asset Information Requirements (AIR) documentation a predetermined dataset can be obtained for managed and non-managed assets.

To augment this approach a Digital Twin could present an innovative approach to capturing BIM data in a 'golden thread' of information, via CoBie datasets for the lifecycle management of the estate. Coupled with live monitored environmental data (further outlined in the following section), valuable insights could be provided to contribute to the undertaking of predictive and proactive maintenance to ensure a safe and healthy built environment is provided for residents.

Furthermore in line with clients sustainability agenda for a zero carbon estate this data based approach could provide the backbone for contributing to a Circular Economy. In so far as the acurate recording of assets through Building/ Material Passport could allow the facilities management to keep products, components, and materials at their highest utility and value for as long as possible and are repaired, reused or recycled, minimizing waste, from an built asset point of view. Supported by active monitoring to give advanced insight for predictive maintenance.

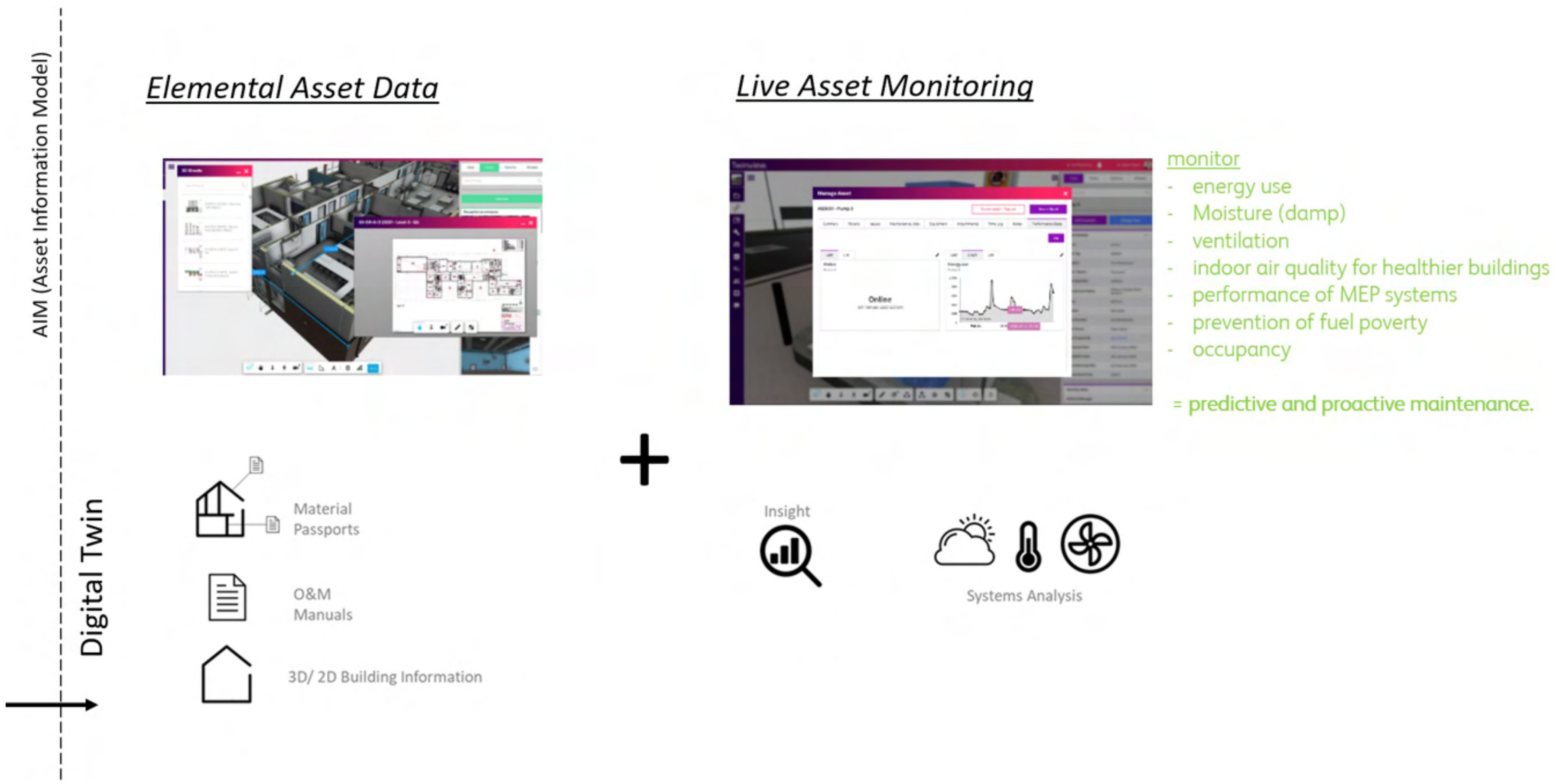


Figure 114 - Digital Twin

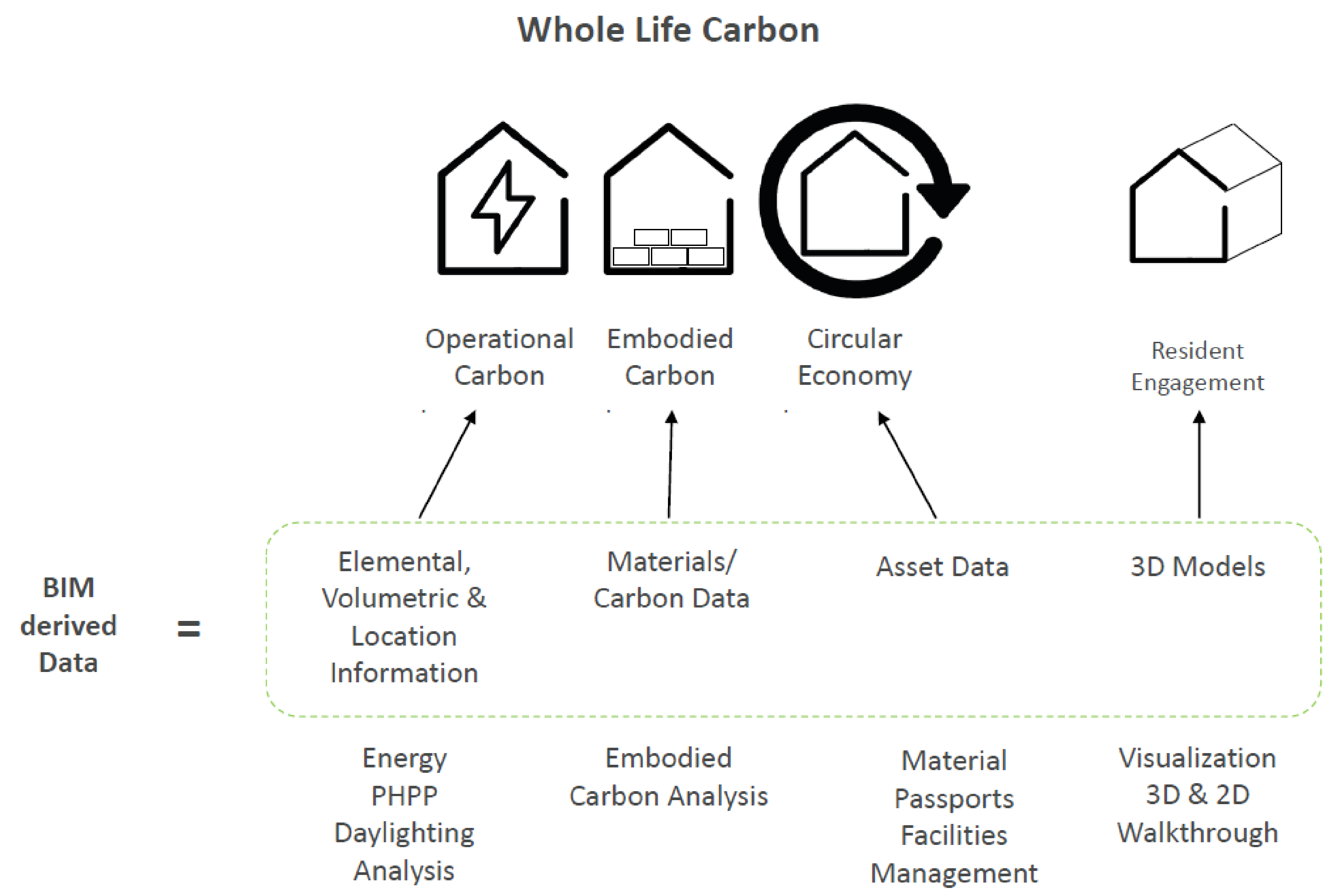
2. Iterative Whole Life Carbon Design Optimization

A robust and accurate BIM design model with both geometric information and elemental data could prove particularly useful information for developing iterative design solutions and providing data for operational and embodied carbon analysis (in-house and for sub-consultant information purposes).

From an embodied carbon perspective to appraise constructional systems to help reduce core contributers.

In respect to operation carbon/energy use reduction; linked plug-ins between PHPP and BIM software could provide a more accurate volumetric and geolocation data for analysis

The diagram below illustrates the possibilities of BIM based design processes and and links to external softwares.



3. Visualization/ Resident Engagement

3D design environment could provide opportunities for a digitally inclusive approach to design communication and engagement. The potential exists alongside plug-in rendering software to utilise 3D modelling to provide immersive virtual reality walk through and design visualisations to illustrate design proposals to residents as the co-design collaboration evolves

Figure 115 - Digital Visualisation

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7.0 CO-DESIGN
AND RESIDENT CONSULTATION

7.0 CO-DESIGN AND RESIDENT CONSULTATION

Building on LWNT's track record of co-design with residents and engagement of them in the physical changes to their homes and environment they live, a co-design approach will be applied to this project, forming an essential part of the retrofit process. ECD fully support LWNT in their commitment to being resident-led, acting with sensitivity, having adult to adult conversations, making decisions collaboratively with residents as well as being open and transparent about everything we do.

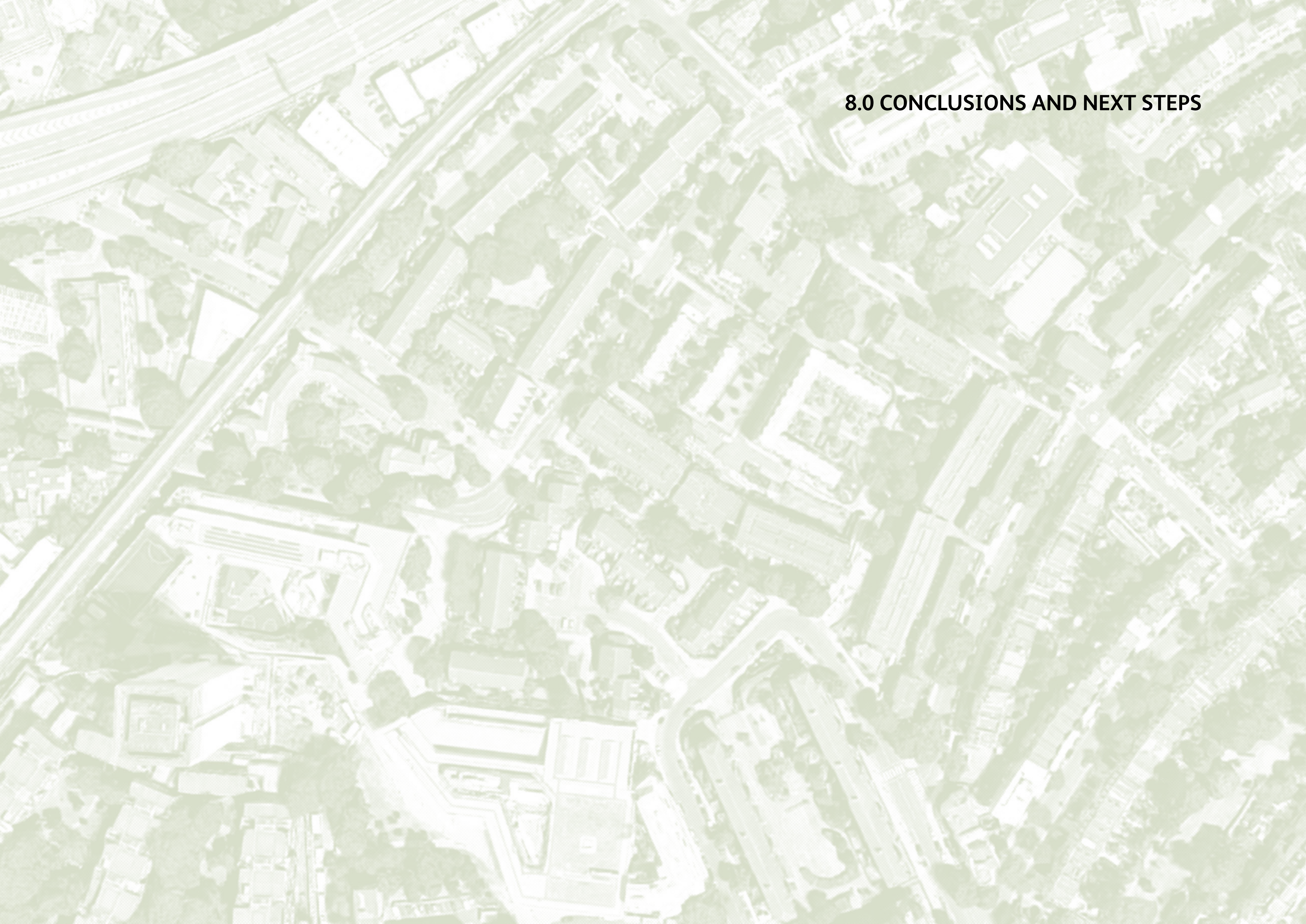
Residents have been involved in every stage of the refurbishment process so far, through ideas days, prioritisation workshops to household interviews as well as being part of the wider LWNT team. Following initial resident consultation undertaken by Cullinan Studios from January to March 2018, ECD reviewed the outcomes and mapped the priorities of Residents and of LWNT to highlight where aspirations overlap. The conclusion to this is twofold. Firstly, a strong overlap is evident between the 'Net Zero' aspiration of LWNT and the residents. Secondly outside of the scope of 'Net Zero' energy conservation core objectives, several resident concerns regarding the communal estate facilities will be addressed and should not be lost sight of. There are however some priorities raised by residents which are outside the scope of ECD's work, and this will be made clear to residents to avoid them feeling let down.

In the next stage of this work, ECD will work with LWNT staff and residents to find solutions which prioritize the well-being and satisfaction of residents to create a vision for their estate retrofit they are proud of and the warm healthy home they desire. Residents will continuously be engaged throughout design, delivery, and during post-work evaluation, using innovative inclusive methods of engagement.

To support a collaborative design process, we wish to ensure that we connect the engagement workshops with meaningful design decision making, generating real social value and impact. We hope that by undertaking the design development process in this manner that we foster in the community a greater sense of responsibility and respect for their neighborhood.

Figure 116 - 'Open House' engagement events organised by LWNT

8.0 CONCLUSIONS AND NEXT STEPS



CONCLUSIONS

The options put forward in this feasibility report demonstrate that substantial energy savings can be achieved in Talbot Grove House and Morland House offering lower fuel bills and improved thermal comfort for all residents. The options put forward follow a 'Whole House' retrofit strategy in compliance with PAS 2035 tackling the building fabric first thereby enabling improved ventilation and highly efficient heating and hot water. These proposals offer a variety of methodologies for delivery which will have a greater or lesser impact upon existing residents and this will be a key factor in the co-design process, enabling residents to select the right option to suit their needs.

This study is also affected by ongoing investigations into the local district heating system therefore any conclusions must be compared against recommendations from this parallel study by others. Of the three options put forward only the 'Gold' standard can deliver a net zero Carbon outcome in a single project. However, all three options offer a trajectory towards net zero Carbon at a variety of timescales. The 'Bronze' option is the cheapest solution; however, this does not adequately address the main sources of heat loss and would require further extensive work to achieve net zero Carbon in the near future. The 'Silver' option offers perhaps the most desirable outcome as this tackles the main sources of heat loss through all building elements and reduces heating demand to a minimum. This option also enables future low carbon energy sources, (i.e.: PV, ASHP/ GSHP, Low-Carbon Heat Network, etc) to be provided separately.

Talbot Grove and Morland House are a common typology across R.B. Kensington & Chelsea and inner London with numerous similar solid wall inter-war blocks across which this solution could be delivered. The Committee on Climate Change estimate that approximately 50% of all solid wall properties in the UK will need to be insulated by 2050 to meet UK Carbon reduction commitments. The existing buildings offer good quality homes which are generally popular with residents. However, resident feedback has also identified a number of issues related to the poor energy efficiency of the blocks, especially the existing windows and heating system. By tackling these issues and addressing other sources of heat loss we can improve the energy efficiency of each home and address carbon emissions whilst maintaining the character and qualities of the existing buildings.

NEXT STEPS

Fire Safety consultant (to Maximise Safety)

A fire safety consultant has been appointed (after the writing of this report) to maximise safety and to ensure compliance in all aspects of the work, as well as to recommend best-practice solutions where these exceed statutory compliance. This will further reassure residents that fire is the top priority in the design and implementation of the works.

Services consultant

ECD's multidisciplinary team needs input from a services consultant, both to ensure the existing services are fully understood, and that residents understand all the systems available for their homes and how this can improve their quality of life and reduce carbon emissions. LWNT has recently appointed TACE to this end; however, this was done after the writing of the main body of this report. ECD and TACE will work together from RIBA Stage 2 to address the topics raised in this report, such as services and PVs.

Building Investigations

Further investigations are needed as follows:

1. Confirm structure within flats, particularly roof structure and floor/ceiling build up. This will be carried out during Stage 2. There will need to be a structural survey of these buildings to establish and record the extent of the minor structural defects previously noted.
2. Thermographic imaging of outside of buildings will help to confirm where there is cavity wall insulation and if this is being effective, as well as particularly poorly performing windows and doors and other leaks in the structure. These surveys have been undertaken after the body of this report was concluded, and its findings will be included in our Stage 2 report.
3. Whole building fabric heat loss measurement will give a real world figure for heat loss from the buildings. SmartHTC is carried out by leaving temperature and relative humidity sensors in a home for several weeks, and taking meter readings at the start and end of this period, to establish how much energy has gone into the house over the period and what the temperatures this has resulted in.
4. Air permeability testing of a few homes will allow more accurate figures to be put into the PHPP models of the homes, giving a better understanding of both the current heat demand and how effective particular interventions might be at reducing this.
5. In-situ U value measurements will also allow more accurate inputs into the existing model, again leading to more reliable outputs.

Planning

A preliminary meeting was held with Martin Lomas and Laura Fogarty of RBKC planning department on 9th December 2020. As this was not a formal pre-application process feedback was informal, but it was noted by LWNT that many proposed elements of work would not require planning permission and that a Planning Performance Agreement would likely be the best way to address the various elements of work that will be needed over time, and confirming which of these require planning permission. It was also suggested that if residents want refurbishment to happen, it will hold great sway and the planning department will not be minded to refuse (all things being equal).

The buildings at Talbot Grove and Morland House were explained, along with options for EWI / IWI and some aesthetic implications. The intent then being to work with residents to choose their preferred envelope strategy as well as a suitable palette of materials and arrangements. ECD will work with LWNT to establish the best approach for ongoing liaison with the planning department to ensure that all works that require planning permission are granted in a smooth and timely manner.

Building Regulations

ECD hope to have an initial meeting with building control at the start of Stage 2 to confirm to what extent the proposed works will require building regulations approval, and at what point proposed works trigger requirements for upgrades. Particularly attention will need to be paid to compliance with Part B (fire) and Part L (energy efficiency). While Envelope Options 2 and 3 will lead to far better energy efficiency than that called for by Part L, Option 1 in particular would need to be designed with reference to the building regulations standards for refurbishment works.

Party wall matters

If Options 2 and 3 are adopted it will be necessary to agree party wall matters with the freeholders neighbouring the LWE owned properties, as the works will impact on the party walls between properties, particularly with Pomeroy Court.

ECD Architects
ENERGY CONSCIOUS DESIGN