LANCASTER WEST
LOT 4 - TREADGOLD HOUSE

LONDON, W11 4HD

ROYAL BOROUGH OF KENSINGTON AND CHELSEA

0003-ECD-XX-XX-RP-A-03001

RIBA STAGE 1
INITIAL DESIGN IDEAS
FEASIBILITY REPORT

APRIL 2021

ECD Architects
ENERGY CONSCIOUS DESIGN

keegans

Wilde

LANCASTER WEST NEIGHBOURHOOD TEAM W11

This RIBA Stage 1 feasibility report has been prepared by ECD Architects on behalf of LWNT

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Lancaster West Neighbourhood Team

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RIBA Stage 1 Feasibility Report

Client: Lancaster West Neighbourhood Team

Signed by: Lizzy Westmacott

Date: 1st April 2021

Comments:

Author	Reviewer	Date	Rev.	Notes
MFF	LW	01/04/2021	-	First Issue
MFF	LW	27/04/2021	A	Second Issue
MFF	LW	20/05/2021	B	Third Issue
JS	LW	19/07/21	C	Fourth Issue

ACRONYM GUIDE AND DEFINITIONS

There is heat energy in cold, outdoor air. An **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.

An **Energy Performance Certificate (EPC)** give and approximate indication of a home's energy efficiency. The most efficient homes have A ratings and least efficient have a rating of G. The average in the UK is a D rating

A **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 **Passivhaus Planning Package (PHPP)** is software that helps us build a detailed model of a building's heat loss and energy use. It requires information about the building's size, shape and orientation. as well as how insulating the walls, floors and roof are, and detailed information about the windows

Passivhaus buildings are designed to use very little energy for heating, while being comfortable and draught free. They need to be designed and built with great attention to detail to allow them to use around 75% less heating than a standard UK new building.

Photovoltaic panels, also known as solar panels and PV panels, collect energy from the sun and turn it into electrical energy to power your home.

A **U value** tells us how quickly heat energy is lost through a part of a building. The lower the number, the less heat is lost.

CDM is short hand for **The Construction (Design and Management) Regulations.** CDM aims to improve health and safety in the industry by ensuring that all bodies involved in construction coordinate their works effectively, manage risk appropriately, and communicate risks to one another.

ECD Architects and their multi-disciplinary design team have been appointed to do design work for the retrofit of the 38 flats and maisonettes that form Treadgold House. This work is part of a co-design process across the Lancaster West Estate, which is seeing residents work with the Lancaster West Neighbourhood team (LWNT) and design professionals to create a model 21st Century Estate. Significant consultation has already been carried out across the estate, and the outcomes of this, combined with the need to create a zero carbon estate, form the brief for this design work. Treadgold House was previously the subject of a design competition using the Energiesprong model. This has proved the potential of the building to meet the Energiesprong standard. A vote by residents in favour of carrying out such a deep retrofit has allowed LWNT to access European funding to carry out works to the building to meet this standard. The funding is conditional on works being completed by the end of 2022.

The design that was previously proposed is indicative only, and may not be the one taken forwards. ECD Architects and their design team are appointed to review the existing building in more detail and provide a further indicative design. This will allow residents and LWNT to confirm any further parameters for the design that need to be included in the contract for the works. Additional works required to the building, that do not affect energy performance, have also been identified and ECD are developing the design for these.

Tender documentation will be produced by ECD to allow a design and build contract to be let. This will require the chosen contractor to complete the design of the works, carry them out and then guarantee the building's performance. This tender documentation will be a mixture of performance specification to meet the Energiesprong criteria, additional design parameters required by LWNT and residents, and more detailed design of those elements of work that do not relate to energy performance.

This report reviews the existing building's context, construction and current energy use, as well as the outputs of resident engagement events already undertaken.

It then sets out works required to the existing building's fabric and services to meet the Energiesprong requirements. It proposes two alternative solutions for the building's thermal line and looks at pros and cons of these approaches. These will need to be reviewed further with LWNT and with residents, particularly in light of the implications for fire escape and smoke ventilation. This decision will help to determine the most appropriate way of applying insulation to the building, a simpler thermal line making an off-site solution more likely, whereas following the line of the existing building more closely is likely to require more works on site.

As well as insulating and making existing walls more airtight, works to the roof are proposed to insulate this, and ensure it can support photovoltaic panels and plant required. New triple glazed windows will be needed to meet the Energiesprong requirements, as well as alterations to balconies. Proposals for these are set out in this report and along with the external finish to new external wall insulation will have a significant impact on the building's external appearance. These are likely to be areas where significant resident discussion is needed to reach agreement on what is acceptable.

High-level services proposals are set out to include mechanical ventilation with heat recovery to all homes as well as low-carbon provision of heating and hot water. These could both be communal or individual, and again pros and cons of these approaches are set out.

These works alone will not meet all of the residents' aspirations, and proposals are made for internal alterations to homes as well as for the building's access. Some works will be carried out by other members of LWNT's wider team.

The final section of the proposals addresses methodology for the works, covering the benefits of Building Information Modelling, the requirements for monitoring of energy use in homes and how all of these ideas will be developed further with residents.

The procurement of these works is critical to the success of the project. The procurement process needs to align with Energiesprong's methodology, and the project must be complete in time to allow monitoring over winter with a final report in 2023. These needs must be aligned with RBKC's tender processes and discussions around this are recorded and proposals for the process ahead are described.

It is clear from the work previously carried out, as well as the energy modelling carried out by ECD, that Treadgold House can achieve the Energiesprong standard, creating warmer more comfortable homes for residents in a financially sustainable way.

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2.0 INTRODUCTION

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The Lancaster West Estate is situated in Notting Dale in north Kensington, London. There are 795 homes across the estate, the majority of which are flats. The tragedy of the fire at Grenfell Tower in June 2017 highlighted the need for the estate to be maintained and refurbished and for its residents to be part of this process. LWNT have committed to ten core principles for the refurbishment and these have been agreed with residents:

- The refurbishment will be resident led.
- All refurbishment work will be done sensitively and in co-operation with residents.
- There will be no demolishing of people's homes on the Lancaster West Estate.
- We will create a model estate where the community can be proud to live and that the council can be proud to own.
- We will make sure residents can make real choices on the refurbishment.
- We will listen to all age groups and communities on what improvements they want to see.
- The refurbishment will aim to provide local jobs and skills training for local people
- The refurbishment will improve local services, so they are of a high quality.
- The refurbishment will create a sustainable estate that can be maintained to a high standard.
- There will be transparent decision-making and feedback provided by the council at each step.

The Royal Borough of Kensington and Chelsea (RBKC) have appointed ECD Architects to provide multi-disciplinary design services from RIBA Stages 1-3, to design a retrofit solution for the 38 flats that form Treadgold House, as part of this extensive programme of works within the Lancaster West Estate. This appointment will then continue through to the completion of the works with ECD providing client support and advice post-contract.

ECD Architects appointment includes the following disciplines:

- Architecture – ECD Architects
- Structural Engineering – Wilde Engineering
- Cost Consultancy & Procurement advice – Keegans

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

- Energiesprong UK
- 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
- Lift Consultant - Chapmanbdsp

This feasibility study is a result of Stage 0 and Stage 1 works to define the brief, to gather information on the existing buildings and social context and to look expansively at what possibilities might meet this brief.

It should be noted that a measured survey only recently become available, and survey information was not available at the time of writing the report.

2.1 BRIEF

The Lancaster West Estate is to become a 21st Century Model social housing estate. As part of the estate Treadgold House is to be refurbished to dramatically improve its energy efficiency, as well as addressing other issues raised by residents. The top priority in this work is the residents of Treadgold House and their lives and needs. LWNT have already done a lot of work to understand the residents' needs as well as the buildings' energy use and problems. Prior to ECD's appointment Treadgold House was the subject of the Mustbe0 Energiesprong competition, resulting in an outline design for how the building could be retrofitted to make it net zero carbon. Having gained resident approval for this outline strategy, LWNT intend to take up Mustbe0 funding to fund these elements of the work.

ECD's task is to work with LWNT, the residents and other consultants to develop an outline design that builds on this previous work. This will lead to a tender process that will chose a solution provider to complete the design and refurbish the building in a way that meets the residents' aspirations as well as the MustbeZero funding criteria.

OUTCOMES OF CONSULTATION & CO-DESIGN

Co-design events were run across the estate in 2018, recorded in the 'Books of Ideas'. At Treadgold House this revealed problems with the overall site layout, landscaping and security, maintenance issues, particularly around services including the lift, condensation and mould in flats, and frustrations around layouts and balcony spaces.

The more recent prioritisation workshop for Treadgold House picked up similar issues. While kitchens and bathrooms were the top priorities, issues around security and the route to front doors dominated the rest of the list.

ECD's scope mean that they will address some of these priorities, with others addressed by members of the wider consultant team. Some elements may form part of later works, supported by future funding.

Priority	Initial design ideas by
Kitchens	LWNT / ECD
Bathrooms	LWNT / ECD
Block Entry System	TGA Consultancy
CCTV	TGA Consultancy
Communal Entrance	ECD
Replace Lift	Chapmans
Maximise Hidden Storage	ECD
Redesign Car Park etc	Later works
Communal Decor	ECD
Pest Control (assumed to be pigeons)	ECD

Much of the work to the building will be necessary to meet the MustbeZero requirements, and an outline design will be provided for these elements, to prove the building's potential to do so. This outline design will also give LWNT and residents a chance to preclude or encourage any specific design elements which are of importance to them.

Other, non-Energesprong-related works are also needed to solve challenges raised by residents and these will be designed in a greater level of detail to give LWNT and the residents assurance that their aims will be met.

ENERGIESPRONG & MUSTBE0

LWNT have secured EU funding via the Must B 0 project for Treadgold House. This project is European-wide scheme supporting deep retrofit of residential apartments using the Energiesprong model. This project is designed to kick-start the market for affordable deep retrofit and improve the quality and performance of existing dwellings.

Post-retrofit, a net zero apartment generates enough energy for its heating, hot water and power appliances. Money that would have been spent on energy bills and maintenance funds the improvement. The aim is that the cost of living doesn't increase because real-life performance for energy use and indoor comfort is guaranteed for an agreed period (currently 10 years). In the Mustbe0 project, 9 housing providers in the UK, France, Germany and the Netherlands have already committed to collaborating on the retrofit of at least 9 demonstrator buildings (415 apartments) which includes 38 at Treadgold House.

This model requires the Solution Provider (typically a design and build contractor) to both design and deliver the proposal and guarantee performance for at least 10 years. In order to improve efficiency whilst delivering performance the contractor will focus on developing and improving retrofit packages (mass customised facades and roofs with fully integrated energy and climate systems). This enables the driving down of costs and installation times to reduce from several months to a few weeks. Aggregating additional demand, improving regulation, and financing structurally creates more market volume and drives the supply chain to industrially produce cheaper and better retrofits which kick-starts a self-sustaining market for affordable deep-retrofit.

The key criteria for this funding is that the works are completed before the end of 2022 to enable monitoring during a full winter season with the final report due in early 2023. Given the nature of the procurement route and in order to deliver this within the required timescales we have provided an extended tender period and allowed a 3-month design period prior to start on site in January 2022.

EXTERNAL WALL INSULATION

At the end of the MustbeZero competition a meeting was held with residents of Treadgold House to explain the proposals. This and other forms of engagement culminated in a vote in which the majority of residents supported the concept of having external wall insulation on the building. This has allowed LWNT to go ahead with seeking the full MustbeZero funding to carry out works. It is therefore essential that the refurbishment design meets the requirements of the funding.

PROCUREMENT

The Energiesprong model requires a solution provider to guarantee the performance of the building after the works. For this reason they need to also be both the designer and contractor, otherwise they would be being asked to guarantee work by others. Therefore the Energiesprong elements of the works will be procured under a design and build contract, tendered on the basis of a performance specification and some limiting parameters that will be established with residents and LWNT. Those elements of work that are outside the Energiesprong requirements will be designed in more detail, ensuring that LWNT and residents get the specific outcomes they are expecting.

DELIVERY

The works are to be carried out largely with residents in-situ. It will therefore be necessary to consider carefully how invasive and noisy works will be, and to make decisions with this in mind. Understanding each resident's specific needs around disruption, noise and how they use their homes will feed into finding the best way to offer respite as works progress in line with LWNT's respite facilities strategy. Derisk are appointed across the estate to ensure health and safety throughout the desing and build process as well as compliance with the Construction (Design & Management) regulations.

NON-COMBUSTIBLE MATERIALS & FIRE STRATEGIES

Given the tragedy at Grenfell Tower proposals are to go beyond the requirements of Part B of the Building Regulations. All insulation will be A1 or A2, s1-d0 rated for combustibility. Existing Fire Risk Assessments will be examined, so that necessary improvements can be incorporated in the designs and opportunities for further safety measures can be identified. An independent fire consultant forms part of the design team to provide an additional check on compliance with all regulations.

ENERGIESPRONG

Energiesprong is an approach to delivering net zero energy retrofit of homes, financed by savings and with performance guaranteed.

Dutch for 'Energy Leap', it was developed by the Dutch Government with their housing and construction industries between 2010 and 2017. The Netherlands has the same carbon reduction targets as those set by the UK Climate Change Act, requiring a zero-emission building stock by 2050. They realised that a radically different approach to the measure by measure, grant funded norm was needed. Delivery rates had to go up, and costs had to come down to enable financing without public subsidy.

Over 4,000 net zero energy homes have been delivered in the Netherlands so far, with 8,000 planned for 2019. A further 100,000 homes are part of a long-term contract between housing owners and construction companies. All financed from energy and maintenance savings alone, without subsidy.

Energiesprong UK is a not for profit organisation, 100% publicly funded, supported by the housing and construction industries and the Dutch Energiesprong team. Their mission is to adapt the Dutch approach for the UK and develop a volume market that can deliver net zero energy retrofit and new build, without public subsidy. They have completed the UK's first 10 homes in Nottingham and have a pipeline of over 300 homes in procurement or contracting phases across the country.

Figure 1 - Energiesprong Approach to Retrofit Homes

HOW IT WORKS

The Energiesprong approach is technology and company agnostic. A high-level Performance Specification requires >80% improvement to fabric thermal performance, plus renewable energy generation and heating equipment required to achieve annual net zero energy consumption. Indoor temperature, air quality and noise levels are specified, and disconnection from the gas network.

Contractors are procured to deliver a 'design, build and guarantee' contract against the Energiesprong Performance Specification. EnergieSprong suggests that contractors should have 15 working days per home (meaning 38x15) on site, which drives the offsite approaches required to reduce costs and improve performance through industrialisation of retrofit. Comfort, energy and maintenance performance and costs are guaranteed by the contractor long term, which enables building owners to finance capital investment from future energy and maintenance savings.

Typically, wall and roof panel cassettes are manufactured off-site and transported to site for quick, 'wrap-around' installation. Heating, hot water, ventilation, and monitoring equipment is integrated into a single easy to install and maintain module. PV generation is integrated into the roof system.

The structure of the contract incentivises inclusion of further energy reduction technologies, such as ventilation & heat recovery, smart controls, low energy appliances, thermal and electrical storage etc. The end result exceeds EPC A, covering all energy use including plug power and renewable on-site generation. Many Energiesprong homes will be capable of disconnecting from the grid at peak times, when grid balancing is required in our all electric, low carbon future.

MARKET DEVELOPMENT

Social housing is the launching market through which increasing volume is being brought to market, enabling companies to invest in industrialisation of their approaches and reduce costs.

Front runner social landlords are preparing to sign a Collective Commitment to bring the next volume to the market, ~1,000 homes initially with more to follow. A positive dialogue with Government is seeking tapered subsidy to match landlord investment and enable contractors to invest and reduce costs as volume increases.

Performance Criteria		Requirement
Energy	space heating energy	<40 kWh/m2/yr (21°C in living room when outside temperature is -5°C.)
Energy	kWh per annum allowance for lighting, cooking and sockets	2,300 kWh/yr. Lighting and standard appliances to be updated at installation. Gas appliances will need to be replaced where they are fitted.
Energy	hot water	System has the capacity to deliver 200 litres at greater than 45°C (or equivalent at higher temperatures) in one hour. Hot water consumption to be scaled by typical number of occupants (N) 64+26N, in litres.
Energy	net energy consumption	Net zero over the year should be achievable on certain well orientated house types. There is an allowance of <1,500 kWh/yr for other housing typologies. Net consumption is import (kWh) minus export (kWh) over the year.
Energy	feedback	Provide feedback to tenants against each of the allowances for heat, hot water and appliances energy use. Provide real-time and historical feedback to make comparisons.
Energy	payments from housing provider	State upfront payment, any ongoing (maintenance/other) payments, and how much the property stands to earn from generating energy.
Energy	tenant payments	Outline the energy service plan, cost, provisions and additional charges. Illustrate impact against pre-retrofit spending for the low, central and high-use case.
Comfort & Health	temperature in living room	21°C achievable when outside temperature is -5°C.
Comfort & Health	temperature elsewhere	18°C.
Comfort & Health	control	Provide options around heating pattern and whether zoning would be appropriate. Provide an override or 'boost' function.
Comfort & Health	summer overheating	Designed so that less than 11 days a year are over a comfort temperature of 26°C in all rooms, and minimum window opening of 1/20th the floor area or equivalent mechanical ventilation. Assume median climate conditions for 2050.
Comfort & Health	max air velocity (drafts)	<0.2m/s in heating season where people can be reasonably be expected to sit or sleep.
Comfort & Health	indoor air quality	Retrofit solution to comply with Part F of the Building Regulations as if the retrofitted home was a new dwelling.
Comfort & Health	daylighting	Daylight is not reduced by more than 10 % without agreement.
Comfort & Health	noise from ES services inside	30 dBA (equivalent to someone whispering a few feet away) absolute limit in living rooms/ bedrooms or where background noise is higher use relative limit of <2 dB.
Comfort & Health	noise attenuation from outside and neighbours	Noise attenuation from outside and between dwellings is the same or greater than existing.
Comfort & Health	noise from ES services outside	Noise from Energiesprong equipment will not exceed 42dBA (like bird-song outside) at 1m from window of habitable room.

Performance Criteria		Requirement
Installation	installation time	Installation time with occupants in-situ < 15 active working days per home. Maximum active time onsite two calendar months.
Installation	occupant satisfaction	As part of the overall engagement and feedback strategy obtain feedback before, during and after the installation.
Warranty, Maintenance & Monitoring	performance warranty	Aim is to provide guarantee of energy, comfort and health factors so long as maintenance and occupant protocol has been met.
Warranty, Maintenance & Monitoring	design life	Optimise design to satisfy performance warranty period but state which components are likely to last significantly longer and the advantages this may bring.
Warranty, Maintenance & Monitoring	maintenance	Provide a fully costed planned and preventative maintenance protocol for the lifecycle plan. Identify cost and resource requirements for each activity so that they can be costed by a third party.
Warranty, Maintenance & Monitoring	monitoring	Provide sufficient monitoring and logging to be able to exercise performance warranty. Make suitable data privacy and security arrangements.
Design	Kerb appeal, highly attractive design uplift, customer satisfaction	Demonstrate how the solution meets the design brief.

Figure 2 - Summary Energiesprong Performance Specifications – see Appendix 6.4 for full specification

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3.0 EXISTING BUILDINGS & CONTEXT

LANCASTER WEST ESTATE

The Lancaster West Estate is in north west Kensington, just south of the A40 (Westway). It is owned by the Royal Borough of Kensington and Chelsea and consists of 795 homes, most of which are flats. The majority of the homes are occupied by tenants, but some are leasehold, and 16 are freehold houses. The buildings that form the estate have been built at different times over the last century and have very different appearance, construction types and layouts.

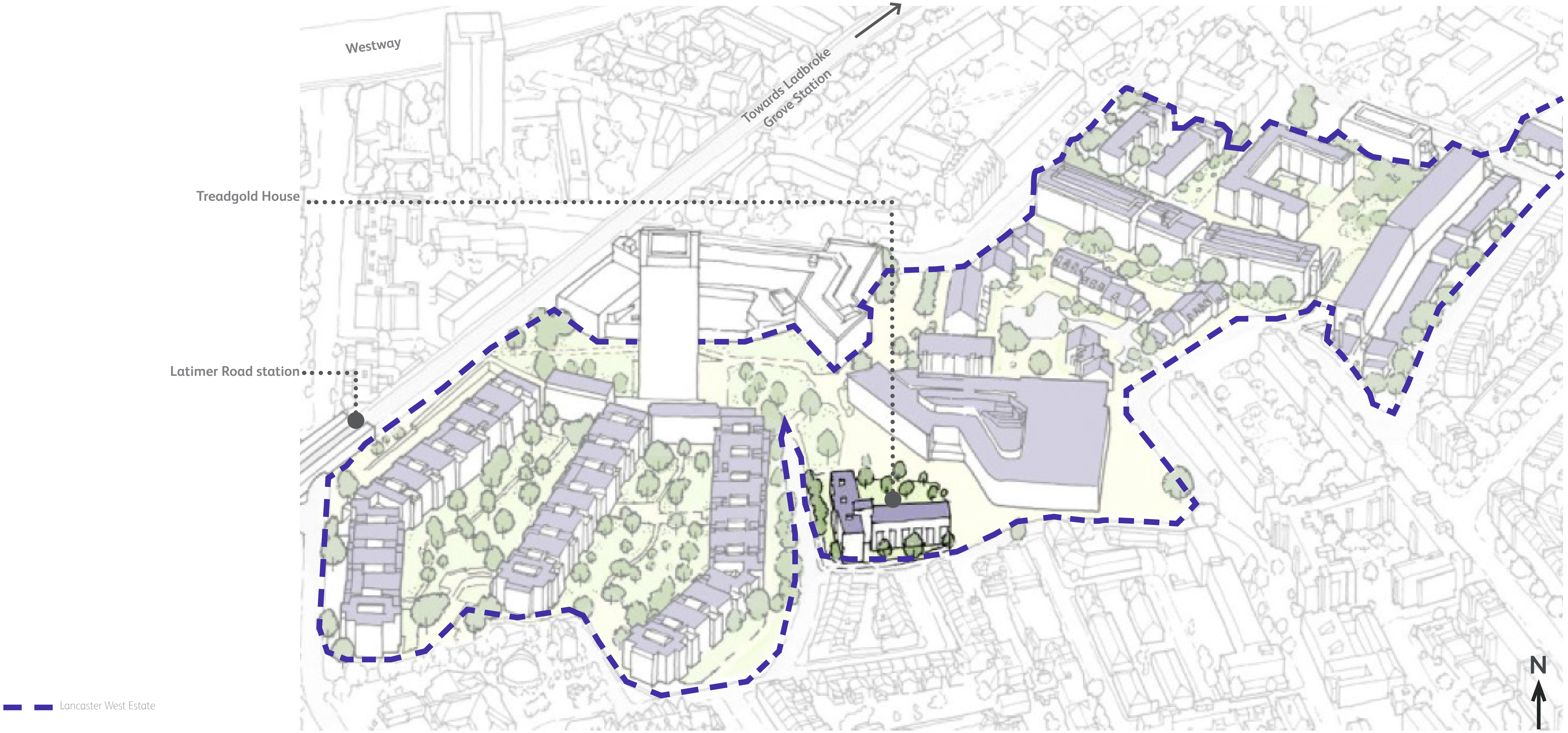


Figure 3 - Aerial view of Lancaster West Estate

TREADGOLD HOUSE - IMMEDIATE SURROUNDINGS

Treadgold House is located in the corner between Bomore Road and Grenfell Road. To the north of the site, where the once listed Silchester Road Baths used to be, is Kensington Leisure Centre, which opened in 2015. The modern centre is of similar height of Treadgold House and its main entrance is located to the north-east of the site with a network of good quality pedestrianised accesses connecting Silchester Road to Bomore Road through the estate.

The south side of Bomore Road is characterised by low rise terraced houses which sit outside the Estate boundary.

To the west of Treadgold House is what was originally phase 1 of Lancaster West Estate which comprises of 3 finger blocks: Barandon Walk, Testerton Walk and Hurstway Walk. These blocks were originally built above garages on a deck with a covered walkway along the centre of the deck (internal street) but the blocks were refurbished in 1992 and the walkway segmented, not keeping with the original concept of the architects which provided a 'street in the sky'. The 3 and four storey linear residential blocks enclose two large green spaces. Lancaster Green, just north of the site, complements this open green space provision.

Most surrounding roads have on-street car parks and street trees, with a Santander bike docking station located south of Treadgold House on Bomore Road.

The area is mostly residential except for the leisure centre and the Academy. Treadgold house is located a short walk away from Latimer Road underground Station.

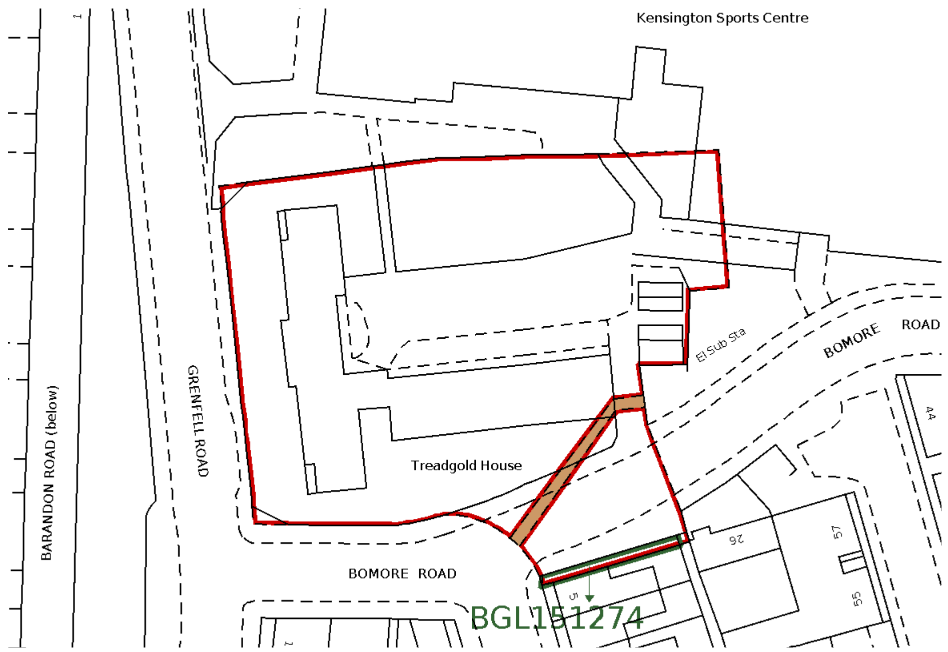


Figure 4 - Title Plan

3.1 SITE

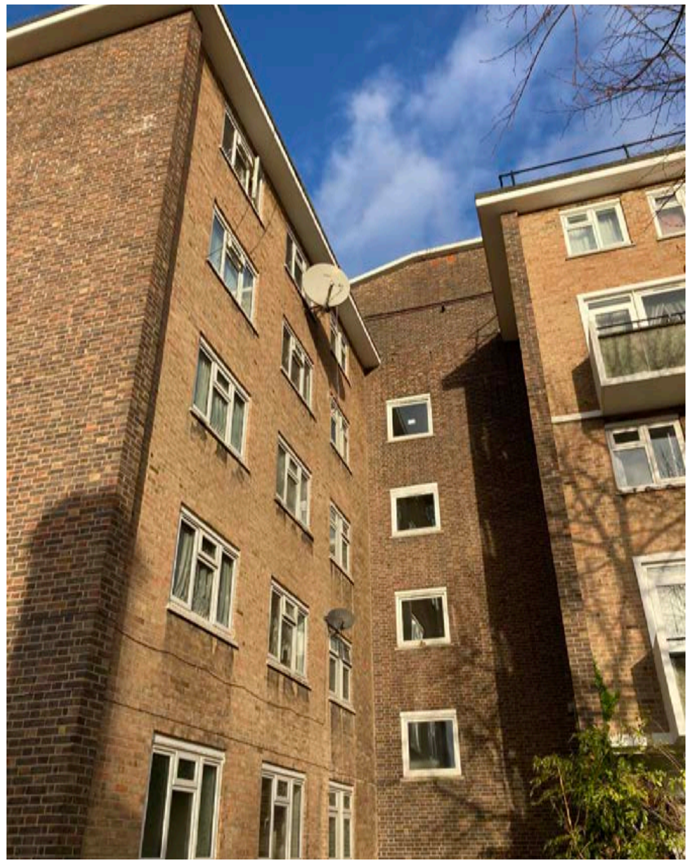
The building is set back from the surrounding streets leaving a strip of grass along the south and west boundaries. A line of mature trees provide shading on the west and north side of the property where the community garden space is located with tables and benches.

The perimeter is secured with a metal fence hidden by evergreen hedging on the south side and a combination of metal fence and brick wall all around the rest of the site. The only access to the site is through the main gate on the south-east corner. The vehicular gate opens to an internal courtyard which includes 13 car parking spaces. A line of bollards separates the vehicular route from the pedestrian route which runs along the east wing to access the stair core in the middle.

A storage shed is located on the western side of the site, just beyond the main gate, and a number of bins are scattered around the storage shed as there is no formal recycling bin store.

The building comprises of two blocks of 5 storeys (13.6 m high) forming a T-shape in plan. The distribution core (stair case and lift) connects the two blocks in the centre of the development giving access to the units via open decks facing the car park.

1 *Treadgold House south facade from Bomore Road*

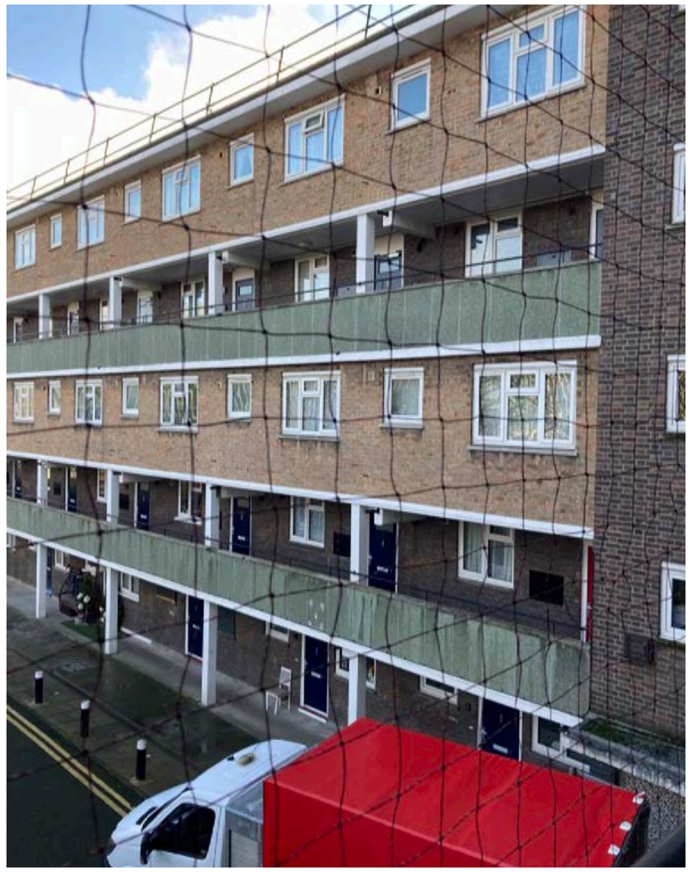


2 *Treadgold House staircore from Bomore Road*

3 *Treadgold House car parking*

4 *Storage spaces adjacent to the main gate*

5 *Estate boundary to the north*



6 *Treadgold House north facade*

BUILDING TYPOLOGY

Treadgold house comprises of 38 units of which 3 are leasehold properties. The wing parallel to Grenfell Road consists of 20 deck access flats spread across 5 identical floor plans of two 1-bedroom flats and two 3-bedroom flats. The second wing running east-west includes 18 units: 6 studio flats on the ground floor with the entrances facing onto the car park; and two storeys of 6 three-bedroom maisonettes above accessible from the first and third floor decks.

In the west wing, a storage cupboard is located outside the front doors of each unit. At the end of both access decks, two rubbish chutes service the east and west wings connected to two bins that can be collected on the ground floor. These bins stores can be accessed through a door near the pedestrian gate and on the north-west corner of the car park.

Internally, the flats have a ceiling height of 2.5 m and a redundant fire place in the living room and some bedrooms. All the units have a separate kitchen and one bathroom – except for the 3 bed flats which have a separate WC. A balcony provides an external private space in each unit which is too small in the majority of the cases.

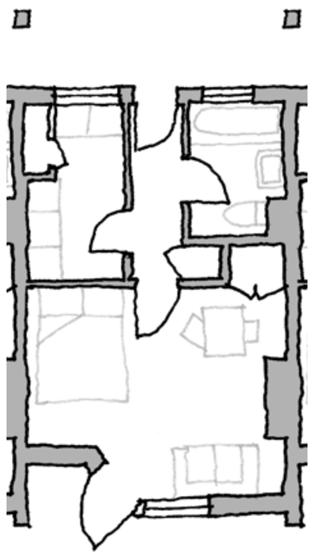
Overall, the units require to be modernised and refurbished to align with current living standards.

	Total	Studio	1 bed	3 bed (flat)	3 bed (maisonette)
Ground floor	10	6	2	2	
First floor	10		2	2	6
Second floor	4		2	2	
Third floor	10		2	2	6
Forth floor	4		2	2	
Total	38	6	10	10	12

Figure 6 - Schedule of accomodation

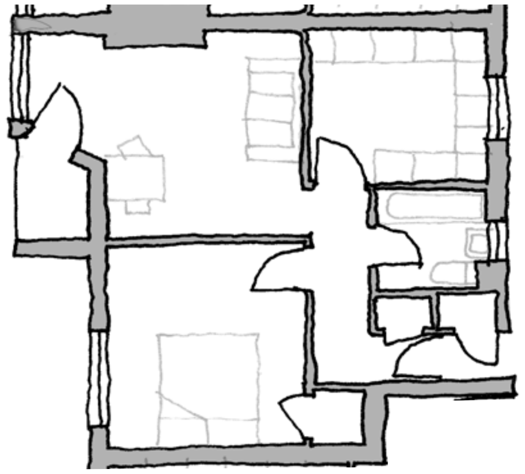
FLAT 18	TREADGOLD HOUSE
FLAT 35	TREADGOLD HOUSE
FLAT 36	TREADGOLD HOUSE

Figure 5 - Leasehold properties



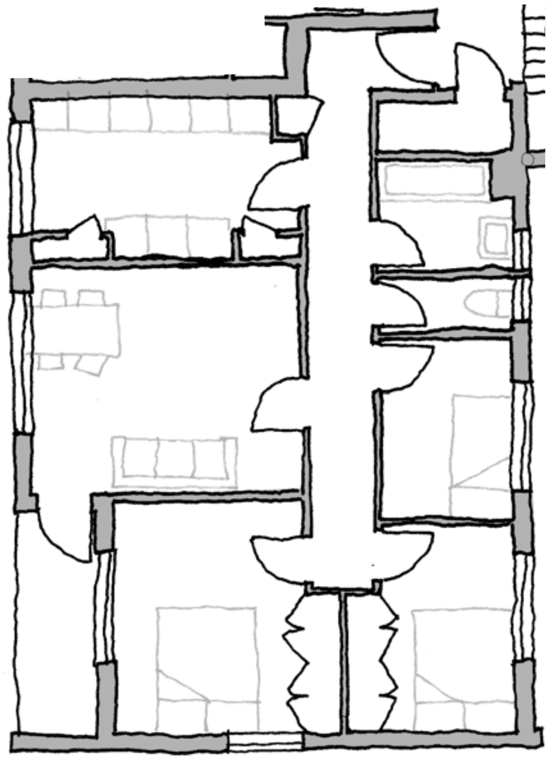
STUDIO FLAT

Internal floor area: 31m²



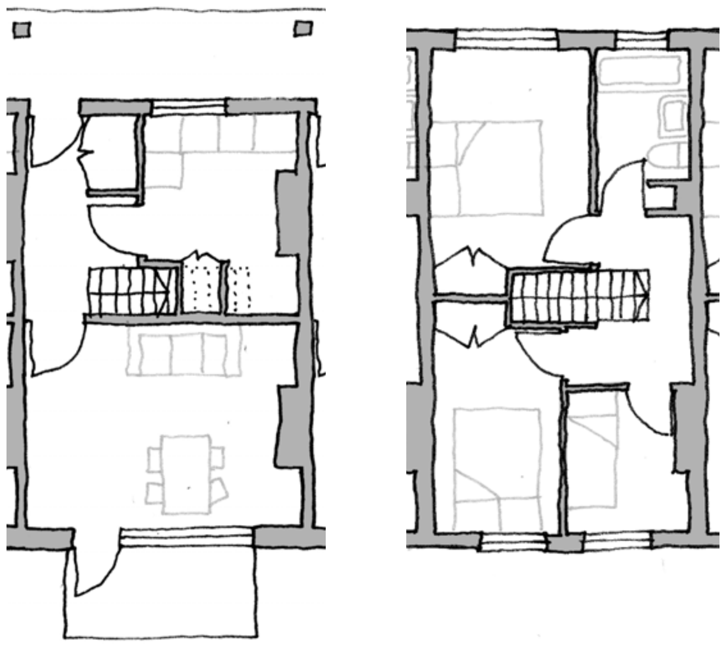
1 BED FLAT

Internal floor area: 42m²



3 BED FLAT

Internal floor area: 69m²



3 BED MAISONETTE

Internal floor area: 74m²

GROUND FLOOR PLAN - EXISTING

FIRST AND THIRD FLOOR PLAN - EXISTING

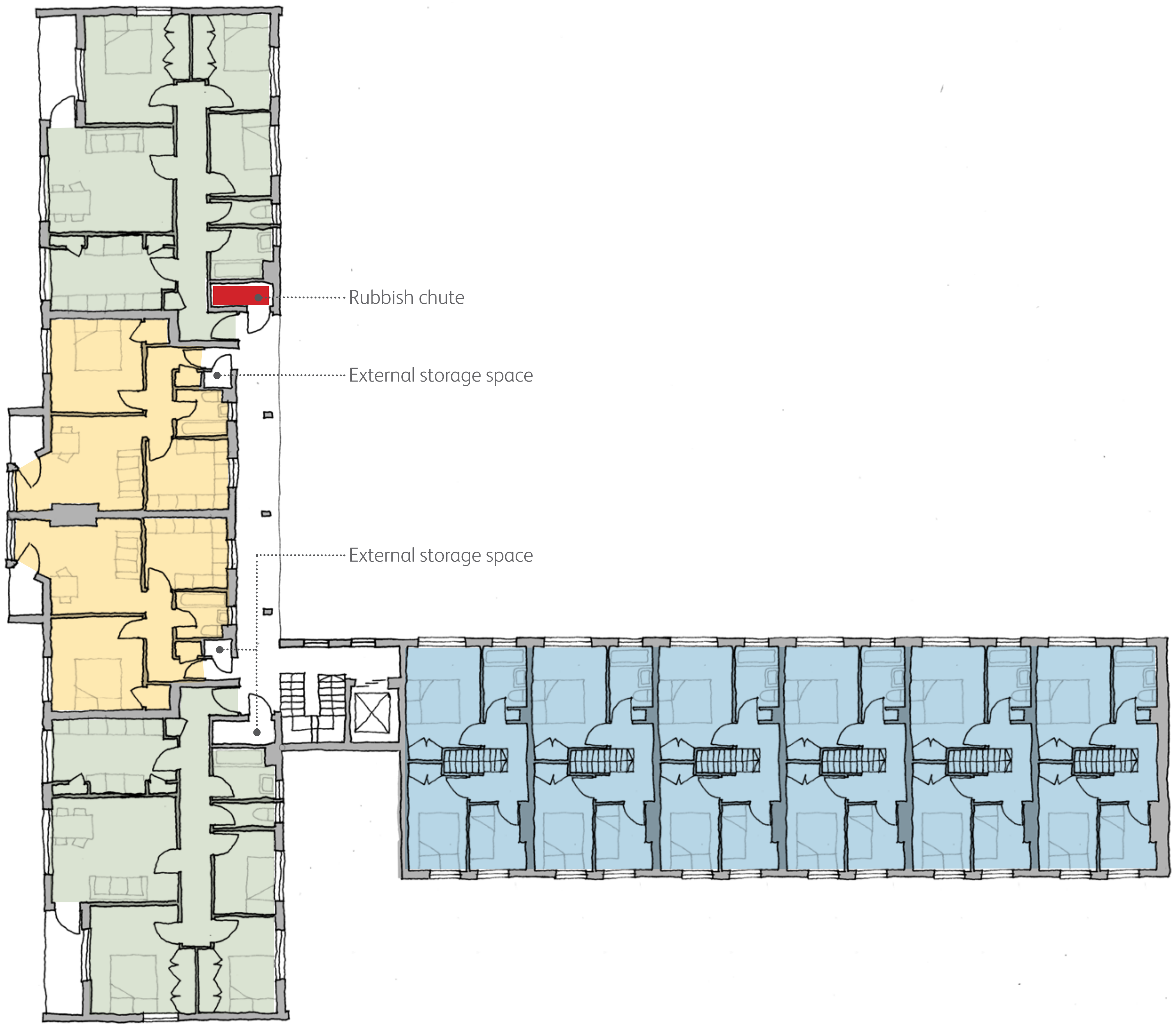
SECOND AND FOURTH FLOOR PLAN - EXISTING

Studio flat

1 bed flat

3 bed flat

3 bed maisonette



EXTERNAL APPEARANCE

Treadgold House presents a regular façade rhythm reflecting the repetition of the internal layouts. The external fabric is mainly constituted of buff bricks with the flank walls of the two wings built with brown brick.

The elevation along Bomore Road is divided horizontally by white slab edges, highlighting the maisonette typology, and supporting the white U shape concrete balconies with green concrete panel parapets.

The West elevation, along Barandon Walk, presents inset balconies for the one and three bedroom flats located on both ends of the building and in the centre of the elevation. The central part of this elevation is set forward from the building line.

The façades facing the car park and the communal garden are characterised by the open deck access at the first and third floor and the white concrete columns forming the structure of the building.

Figure 7 - East wing - South facade

Figure 9 - East wing - North facade

Figure 8 - West wing - West facade

3.3 EXISTING CONSTRUCTION

STRUCTURE

The construction is generally load bearing masonry supporting 225mm deep concrete floors and a flat roof.

The east wing, which incorporates duplex units at the upper levels, has external access walkways at second and fourth floor levels. In this wing there are brick cross walls between the units supporting the concrete floors over.

Over the walkways there are upstand concrete beams which are supported on the brick cross walls at the internal end and 225x 225xnm square concrete columns at the external end on the outside line of the workways.

The load bearing cross walls are solid brickwork but the front and rear walls of these units are cavity wall construction with brick outer skin and block inner skin.

Also at the second and fourth floor levels, there are projecting reinforced concrete balconies.

The west wing comprises apartments at each level. The internal layouts are unknown so it's not clear where the load bearing walls are. The external walkway only extends for part of the length of this wing from the stair core where concrete columns can be seen. There is then a solid brick external wall. It is not known if this wall is loadbearing.

In the west wing there are recessed balconies in the outer corners on the west face. There are also projecting balconies on this elevation towards the centre of this wing at the upper levels. These balconies look to span across onto supporting flank walls.

The central stair and lift core look to have been formed with solid load bearing brickwork. The lift core has an overrun an additional storey above the main building.

The communal staircase is reinforced concrete with 225mm deep concrete landings.

Clearly there has previously been some extensive refurbishment of the building since it was originally constructed. The lift shaft and cavity wall construction are not original.

CONSTRUCTION

The building appears to have a ground bearing concrete slab, which extends to the outer limits of the building's footprint, even where the building steps in at ground floor. It is assumed that columns and solid brick party walls, which are loadbearing, have larger foundations below ground.

Upper floors are constructed of concrete, which extends beyond the external walls to form the deck access to the maisonettes and flats. Concrete columns span between the floors of this deck access providing support for the decks and the projecting upper floors of maisonettes. Balconies are also formed as an extension of the concrete floor slabs, with thinner concrete walls forming the balustrades to balconies and decks.

External walls are a mixture of cavity infill walling and solid brick walls. The cavity brick walls appear to have been insulated at some point in the building's life, as plugs are visible in the external brickwork where insulation would have been pumped in. Thermographic surveys and in-situ U value measurements will help to establish how continuous and effective this is. Original coal hatches penetrate deck-side wall to each home.

End walls, and the staircore area appear to be of solid brick construction, 215mm thick, as can be seen from the bricklaying pattern. Separating walls between homes appear to be solid brickwork, with blockwork used where maisonettes project. Internal partitions appear to be of blockwork.

The roof is formed of a concrete slab which overhangs the walls. It has 90mm PIR insulation across it at present under a bituminous felt waterproofing layer. Falls to the roof drain to sumped outlets into internal rainwater pipes. The roof is accessed via a ceiling hatch outside the lift at the 4th floor. This is understood to lead into a room above which leads out via doors onto each of the two main roof areas. Fixed railings allow safe access once on the roof. 9 chimney stacks protrude through the roof, originally serving fireplaces in each flat. These are constructed of brick, and several now have satellite dishes attached. Other services and fixtures are also visible on the roof at present.

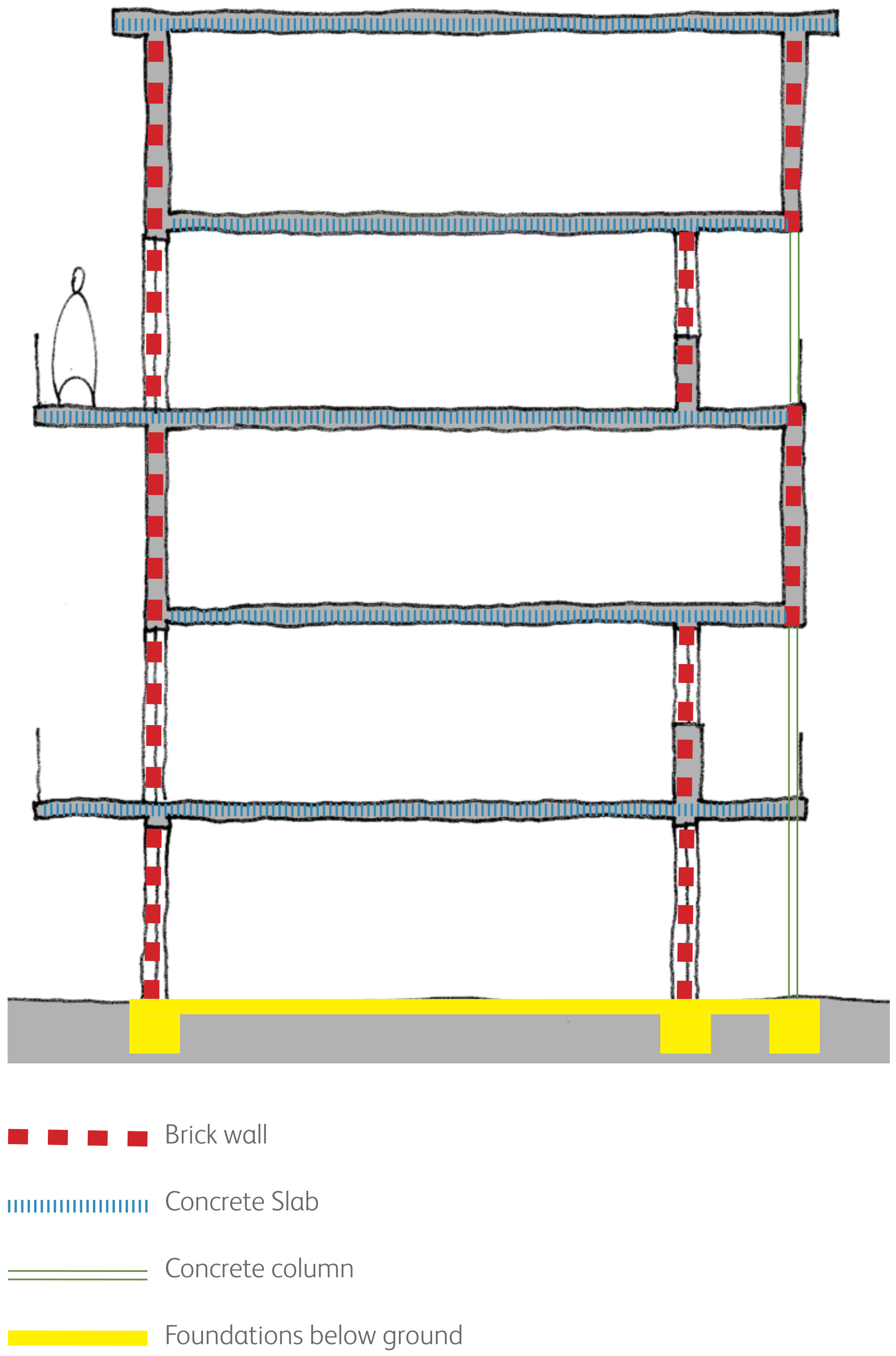


Figure 10 - cracking to floor screed, overhang maisonette floor

Figure 11 - Assumed Concrete foundation edge line (view from the car park)

Figure 12 - Assumed Concrete foundation edge line (view from the main gate)

Figure 13 - Brick separating walls

Figure 14 - Block work internal partitions

ROOF ACCESS AND CONDITIONS

The only access to the roof is from a ladder on the 4th floor. The ladder is kept within the adjacent cupboard but it is very old and requires replacement. The two access hatch doors are heavy and narrow and they require fixing into place. Once through the hatch there are handholds to facilitate the access. The landing itself is hazardous until the hatch doors are closed as you need to walk across the opening to access the roofs. Moving to the roof, the narrow access doors require a large step over the threshold.

The Eastern side of the roof presents six chimney breasts and is easier to access. The roof covering appears to be in poor condition, with significant ponding and soft areas. There are several TV aerials installed and animal cages which will require removal. The roof doesn't have an appropriate parapet but a free-standing guard rail which has been installed around the perimeter.

The Western side of the roof includes three chimney breasts and it is more difficult to access than the Eastern side. The access is through the water tank room which is flooded and requires large steps over existing pipework. There is at present a large water leak in the room, which probably comes from the pipework rather than from one of the two tanks. There is significant ponding on the roof, particularly around the north end. The guard rails enclose the perimeter but they stop 4-5m short of the northern edge. There are also several aerials that will require removal. New fibre optic cabling runs on the external wall of the water tank room.

The existing roof construction is as follow:

- Deck - Screeded Concrete
- Vapour Control Layer - Bituminous Vapour Check - Thickness: 3 mm
- Insulation - Rigid PUR - Thickness: 90 mm - State: Dry
- Waterproofing - Built Up Felt - Thickness: 8 mm

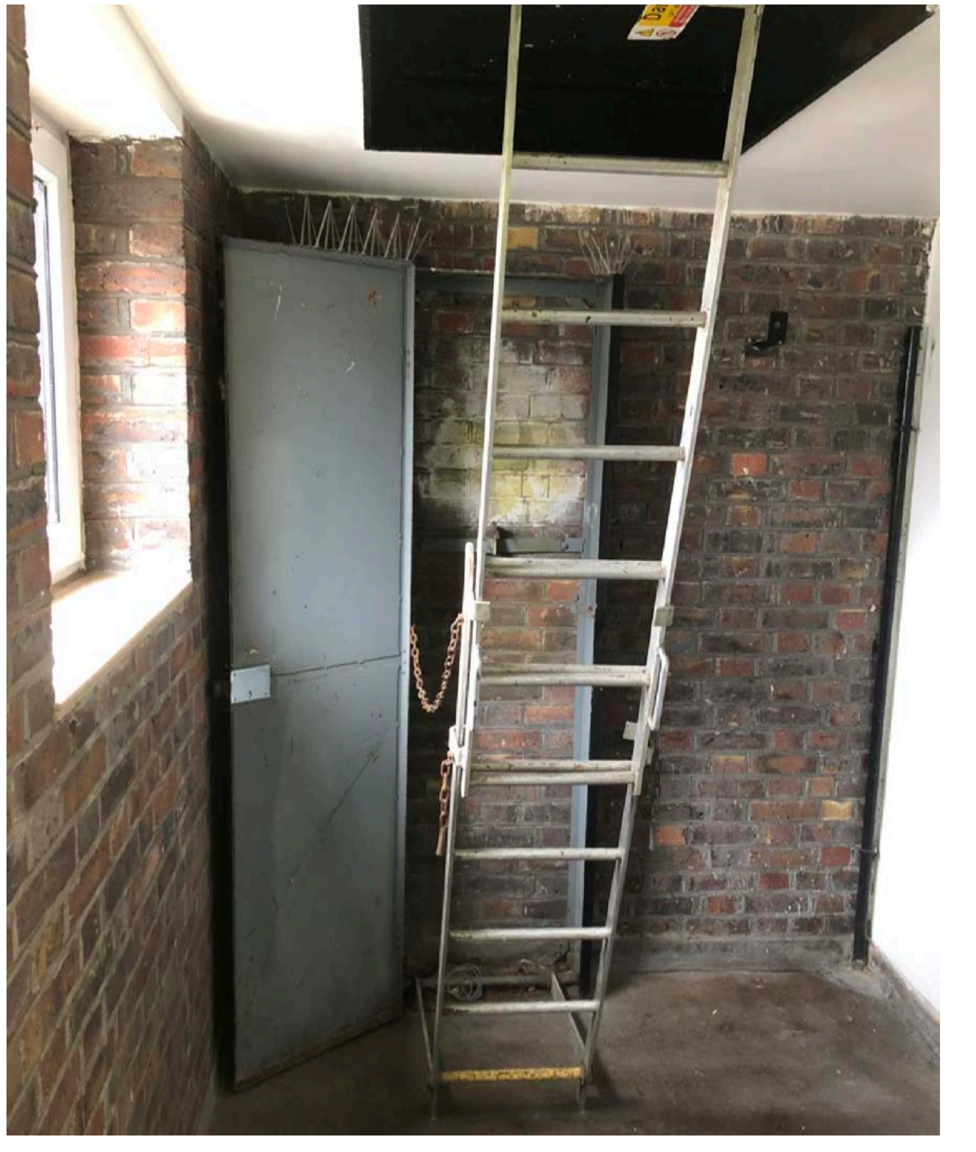


Figure 15 - Access to the roof from the third floor

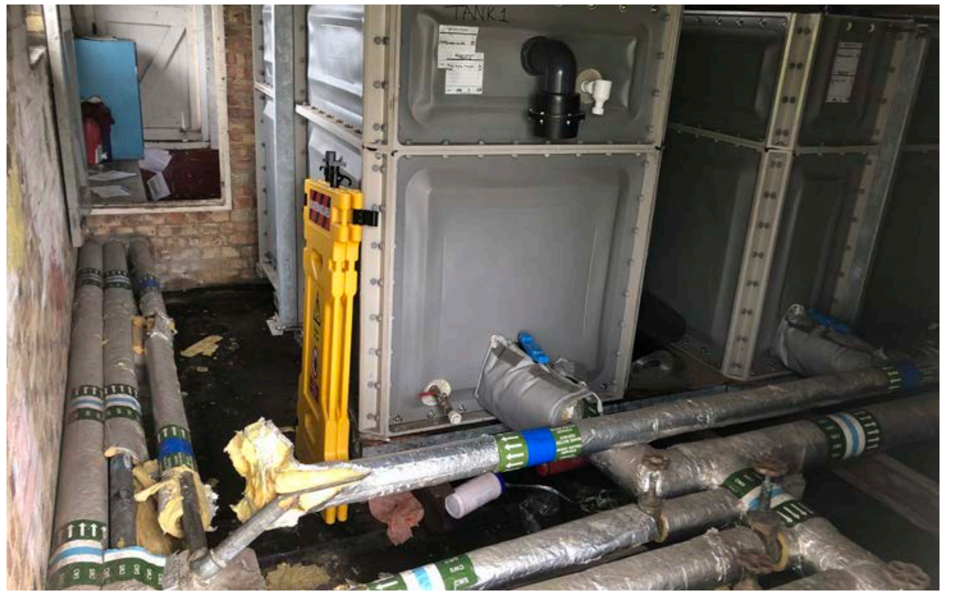


Figure 17 - Water tanks

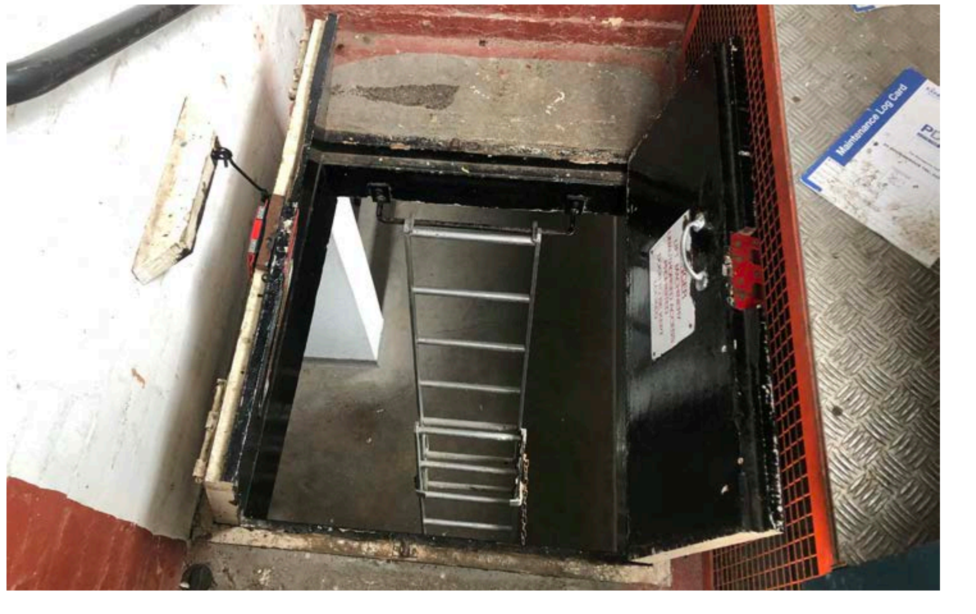


Figure 16 - Access to the roof from above

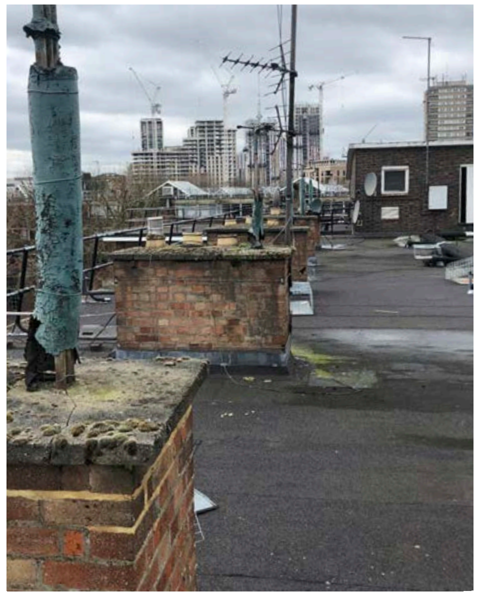


Figure 18 - East wing roof conditions

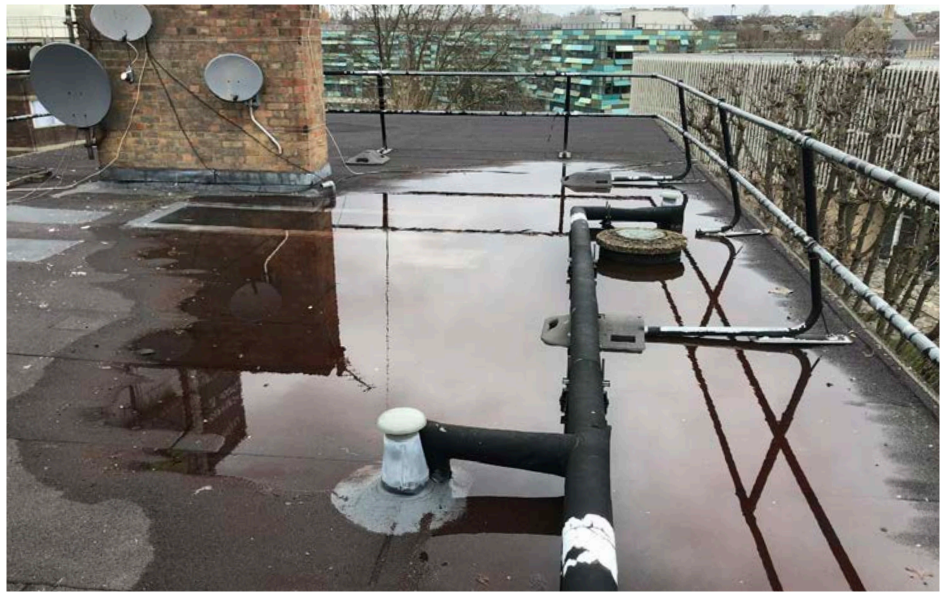
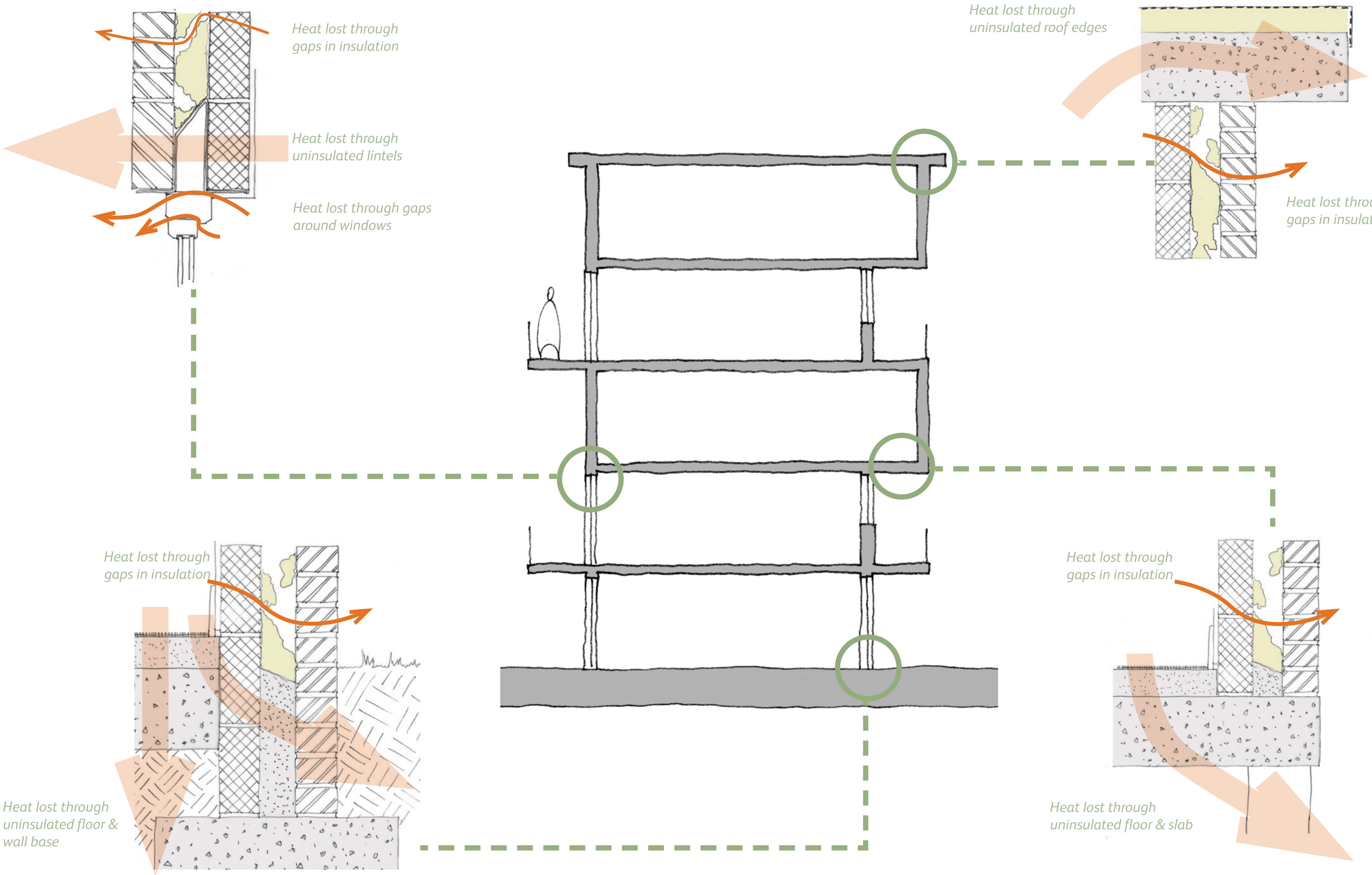


Figure 19 - West wing roof conditions


Heat lost through
gaps in insulation
Heat lost through
uninsulated lintels
Heat lost through gaps
around windows
Heat lost through
uninsulated roof edges
Heat lost through
gaps in insulation
Heat lost through
gaps in insulation
Heat lost through
uninsulated floor &
wall base
Heat lost through
gaps in insulation
Heat lost through
uninsulated floor & slab

While there is insulation in the cavities of some of the external walls of the block, and insulation to the roof, there are still significant areas where heat is lost from the building. Of particular note are:

- Thermal bridges where concrete floor slabs run from inside to outside. The wall above & below may be insulated, but the concrete passing through provides a 'bridge' for the heat to escape across.
- Not all external walls appear to be cavity walls. It is assumed that the solid walls are uninsulated, and therefore heat loss through these is likely to be greater
- There is assumed to be no insulation to the ground floor, so heat is lost through the screed and concrete floor into the earth below
- The roof insulation is less than 100mm thick, so could definitely be improved
- The building is currently ventilated by trickle vents in windows allowing cold air in and via mechanical fans from kitchens and bathrooms extracting warm air. This solution may provide sufficient ventilation, but wastes much of the heat that is supplied to air inside the home.
- Residents noted draughts around windows (Ideas Day, 2018) and additional warm air will escape here, where windows do not close well or are not sealed into the walls
- Existing windows are double glazed, but the uPVC frames are unlikely to be insulated, so heat will be lost through these. Additionally lintels over windows are probably metal, crossing the insulation line, creating a further 'thermal bridge' for heat to escape.

At the 2018 Ideas Day a number of residents noted mould and condensation in their homes. This is caused by a many of the items above, as specific areas of heat loss will cause cold spots on the inside of walls where moisture in the air can condense. Poor ventilation adds to this problem as moist air is not cleared away.

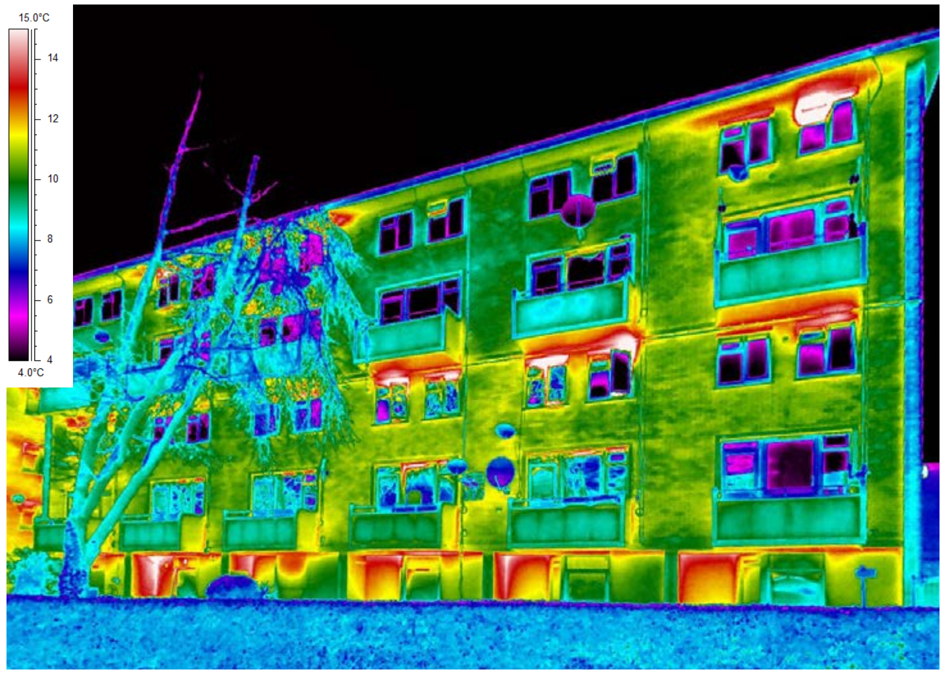


Figure 20 - Thermographic image of south facade of east wing, showing significant heat loss through balcony slabs and at edge of roof - Survey date 16/03/2021

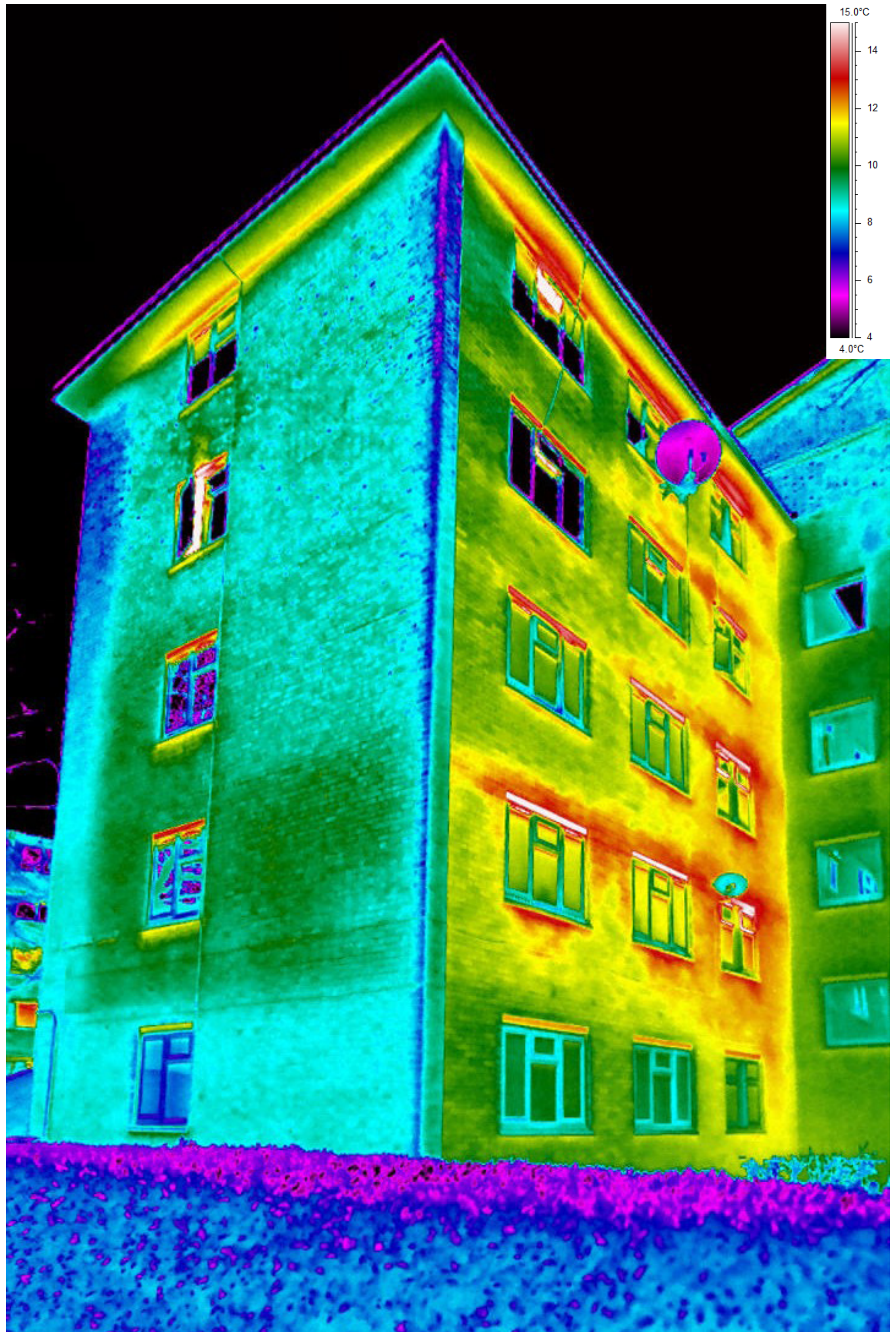


Figure 21 - Thermographic image of eastern side of west wing, showing significant heat loss at window lintels & sills. The latter perhaps suggestive of water ingress here - Survey date 16/03/2021

RETROFIT ACCELERATOR/CARBON TRUST SUMMARY

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) is based on EPC data and other energy data as well as a site walkaround. It sets out the existing energy use of the homes at Lancaster West and 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.

RESULTS

For Treadgold House the existing heat demand was calculated to vary between 92 and 177 kWh/m²/year, varying slightly between the east and west wings and varying more widely depending on whether the property is ground floor, mid-level or top floor. This suggest Treadgold has a lower heat demand than Lancaster West as a whole, but a higher heat demand than an average UK flat.

Based upon the limited information available at that time this high-level report made several important assumptions about the build-up and condition of the buildings and therefore the authors advise that the results should be treated with caution. Nevertheless, this study highlights the way heat loss and hence energy demand and bills, is likely to vary significantly within Treadgold House, given the variation in size, orientation and location of properties.

Proposals are made for different levels of intervention to reduce heat demand, suggesting this could be brought as low as 22kWh/m²/year in some cases using external wall insulation, triple glazing, roof and floor insulation and improvements to airtightness along with a mechanical ventilation with heat recovery system.

The report then goes on to raise some key questions to be addressed as more detailed investigations and design work are carried out:

- Need to fully understand and address thermal bridges, particularly at balconies and around windows.
- Need to improve ventilation

EPC RATING

These EPC ratings have been acquired in the past 12 years but they don't include all the 38 units of Treadgold House. As shown in the table below, all the units surveyed have a "C" EPC rate which is a better performance than the national average. The EPC gives an approximate indication of a home's energy efficiency but as it does not include any accurate monitoring of the heat demand, it is difficult to be sure of the reliability of the results.

Property number	Type	Floor	EPC band	year	Floor area (m²)	Primary energy use (kWh/m²/yr)	CO_2 emissions (tonnes)	Space heating demand (kWh/yr)	Specific space heating demand (kWh/m²/yr)
2	Flat	ground	C	2015	32	200	1.1	2353	74
5	Flat	ground	C	2020	25	227	1	2156	86
6	Flat	ground	C	2020	25	262	1.2	2807	112
9	Flat	ground	C	2009	43	302	2.2		
14	Flat	mid	C	2011	76	142	2.1	4775	63
17	Flat	mid	C	2017	72	132	1.7	3811	53
19	Flat	mid	C	2020	49	129	1.1	2146	44
20	Flat	mid	C	2009	66	188	2.1		
28	Flat	top	C	2020	74	153	2	5435	73
34	Flat	mid	C	2009	65	231	2.5		
	Flat	**Average**				**197**	**1.7**	**3355**	**72**

Figure 22 - Available EPC information

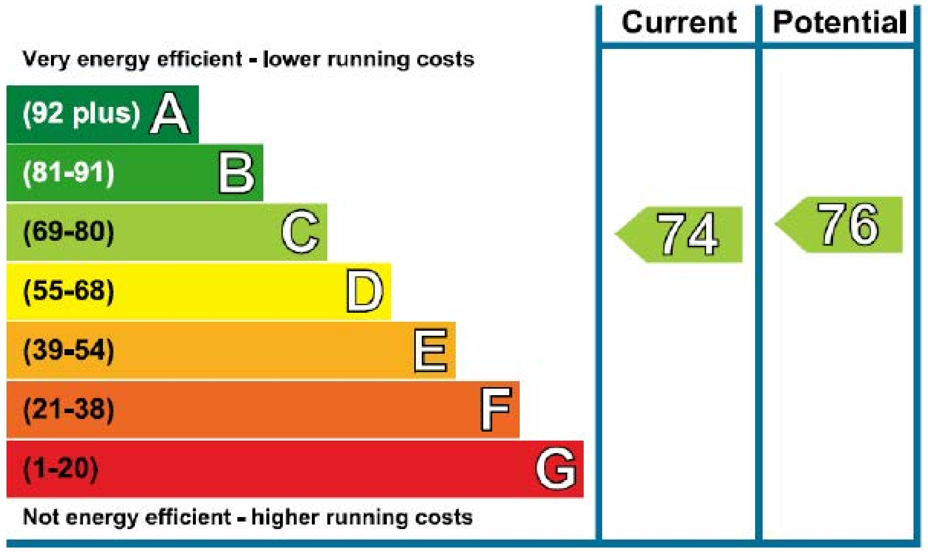


Figure 23 - Energy Efficiency Rating - Example of flat 2

ENERGY PERFORMANCE CERTIFICATES

An Energy Performance Certificate (EPC) give and approximate indication of a home's energy efficiency. The most efficient homes have A ratings and least efficient have a rating of G. The average in the UK is a D rating

EVALUATION

While this study is based on relatively limited information, it offers a really useful baseline to test ideas and outcomes against. In the event the Energisprong requirements set out a clear target that needs to be achieved, which is similar to the best case scenario set out by this report.

BOWTIESPRONG MODELLING

SUMMARY

As part of the Mustbe0 competition Bowtiesprong produced an energy model of the east wing of Treadgold House using the Passivhaus Planning Package (PHPP). The model assumes the following existing constructions

- External walls - plaster, brick, 50mm cavity, brick. No insulation
- Roof - 150mm rigid mineral wool insulation
- Ground floor - concrete slab with 50mm screed. No insulation
- Air change rate of 35 air changes per hour

RESULTS

This model suggests that the existing building uses 289.3kWh/m^2/year, far more than the EPCs suggest.

EVALUATION

Far more detailed information is used in a PHPP model than that which goes into EPC models. However Bowtiesprong did not have access to all constructional information, so inevitably assumptions have had to be made. Further time constraints led to modelling half of the building. While it is likely that the two wings of the building are relatively similar constructionally, the differing orientation and inset balconies to the west wing will mean this does perform a little differently.

Investigations since the Bowtiesprong model was made suggest the building may perform better than this suggests. Alteration to wall and roof insulation and to the airtightness suggest a lower heat demand of 158kWh/m^2/year.

3.4 EXISTING ENERGY USE & SERVICES

SUMMARY

The homes were originally heated by fireplaces, and chimney breast, chimney stacks and original coal hatches remain. It is assumed that chimneys have largely been closed up, though this may not be the case in all leasehold flats. The homes are now heated by gas boilers. These burn gas to heat hot water, which is then provided to taps and to radiators which heat the homes. Boiler flues run across the soffit of the access decks.

Gas appears to be supplied via an external pipe running up the building's west facade. This appears to be distributed around the building via pipes running across the roof. Internal routes are still to be confirmed.

There are water tanks in the plant room above the stairwell. These are assumed to serve all the flats. However at the Ideas Day it was noted that most residents find their water pressure to be inadequate.

There are no external rainwater downpipes on the building, and it appears that rainwater runs to sumped outlets on the roof. At the west wing of the building rainwater downpipes run at the rear of the inset balconies. It is assumed that in the east wing these run internally, though routes at to be confirmed.

A room below the main communal stairs appears to house the electrical intake for the building.

An intercom system by the car and pedestrian gate to the east of the building is linked to each flat to allow residents to let visitors in. This is audio only.

Coal	Gas	Renewables
1960s	1970s	2022

Figure 24 - Boiler flues to soffit of deck access

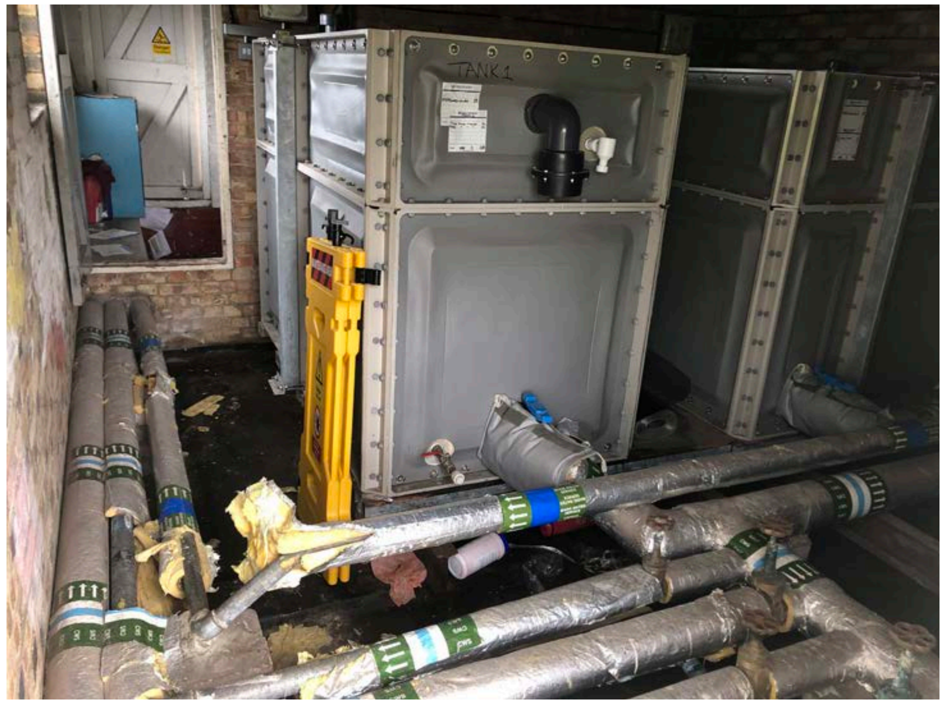


Figure 26 - Water tanks & pipes in rooftop plant room

Figure 28 - Coal chute door

Figure 25 - Rainwater pipes run down rear corner of inset balconies

Figure 27 - Gas pipes running across rooftop

PROCESS

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 ensuring 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 (Building information Modeling) model and will be handed over to RBKC on completion of the works thereby ensuring a 'Golden Thread' of information is maintained from design to completion.

IFC (International Fire Consultants) are to be appointed from RIBA Stage 2 onwards to support the development of this work

OVERVIEW OF EXISTING

A Type 4 fire risk assessment of the existing building has been carried out for LWNT by Frankhams in April 2020 and this should be referred to for a detailed assessment of the building. This looked at communal areas as well as a sample of flats.

The buildings' overall provision for means of escape in the case of a fire is simple and robust with open deck access allowing smoke to be ventilated easily. A 'stay put' evacuation policy is in place and solid concrete floors and masonry party walls mean that compartments are typically compliant. However a few instances were noted where fire stopping needs to be improved where services pass into risers or through floors. LWNT are working with RBKC's fire safety team to prioritise these items and to confirm whether such works will form part of this contract or be carried out separately.

ASBESTOS REMOVAL

Frankhams carried out refurbishment asbestos surveys in July 2020, prior to fire risk assessment surveys being carried out. Thiese covered the communal areas as well as internal areas of 5no. flats. Asbestos containing material was confirmed in the roof of external stores (away from the main building) and is also presumed to be present in soffits above the ground floor walkway areas. Some areas, such as private stores and the rooftop plant room were not able to be accessed so presence or absence of asbestos could not be established. The report assumes that asbestos will be removed during the refurbishment works, noting that safe working procedures will be required to be put into place in-line with the Control of Asbestos Regulations 2012.

Within the flats asbestos was confirmed to be present in two of the five flats inspected in the bitumen adhesive below carpets and below laminate flooring and in floor tiles.

3.6 CO-DESIGN & DECISIONS THUS FAR

Lancaster West Resident Associacion held a a series of co-design events for Treadgold House between January and March 2018.

An extensive engagement programme was carried out during this period, including ideas day events, leafleting and door-knoocking across the estate, block and cluster meetings, attendance at Residents' Association General Meetings, home visits where requested, and telephone and email correspondence.

After various discussions with residents, the following concerns were made about Treadgold House:

- Poor security and access including broken gates, inadequate lighting and limited overlooking.
- Regularly broken and noisy lift causing access issues for residents and general inconvenience.
- Condensation and mould in homes.
- Underused external space. Parking issues, storage is oversubscribed, the garden is not used and there is no play equipment.
- The building and its entrances are hard to find.
- Home layouts do not reflect current patterns of living.
- Balconies are small and of limited use.
- Roosting pigeons are limiting the use of balconies and causing mess on the building.
- Concerns about the general lack of maintenance.

DISCUSSED IDEAS

In response to the issues raised by the residents during the consultation events the consultant team proposed a series of ideas.

All these ideas require further investigation to examine feasibility and costs. They will be discussed with and reviewed by residents.

- Re-plan access and entrances for better safety.
- Install new lift and secure doors to improve circulation.
- New insulation and ventilation plan to improve the temperature and air quality in homes.
- A more usable external space with new entrances, easier to use parking areas, improved storage lockers, bin storage and an improved
- garden and playspace.
- New building boundary with recognisable gates and signage.
- A lighting strategy for the building and outside space.
- Options for homes that maximise available space with a focus on kitchens and bathrooms.

WORKS ACROSS THE ESTATE

These are possible projects that apply to most homes, blocks and external spaces across the estate, and could start before the main refurbishment begins.

- Improve community safety through; additional and better street lighting, providing video door entry systems, and increased CCTV.
- Improve signage across the estate.
- Improvements to refuse areas, including providing space for recycling and disposal of larger items.
- Investigate interim home improvements in advance of full refurbishment, e.g. mechanical ventilation systems, heating, plumbing and water pressure.
- Introduce a local lettings policy to meet local needs.
- Provide secure bike storage, and improve play spaces.
- Make improvements to nursery facilities, and identify options for future location.
- Investigate and resolve pest control issues.
- Usable balcony or garden space.
- Ensuring that designs will stand the test of time, age well and consider future maintenance.

WIDER NEIGHBOURHOOD IDEAS

Key ideas, developed together with local residents, consider safety and security, the quality of open spaces and local streets, architectural identity and the provision of community spaces. As part of the refurbishment of the wider estate, the design and location(s) of nursery and other childcare provision for the estate would be reviewed with residents and service providers with a view to enhancing the current provision.

For more details please refer to the 'Wider Neighbourhood' book which details key concerns, key ideas and possible early projects.

TREADGOLD HOUSE

Safety and security as well as quality of garden space have been identified as priorities for residents of Treadgold House. Lighting and landscape strategies have been proposed that will benefit both local residents and the wider neighbourhood in helping to reinforce safer streets and open spaces.

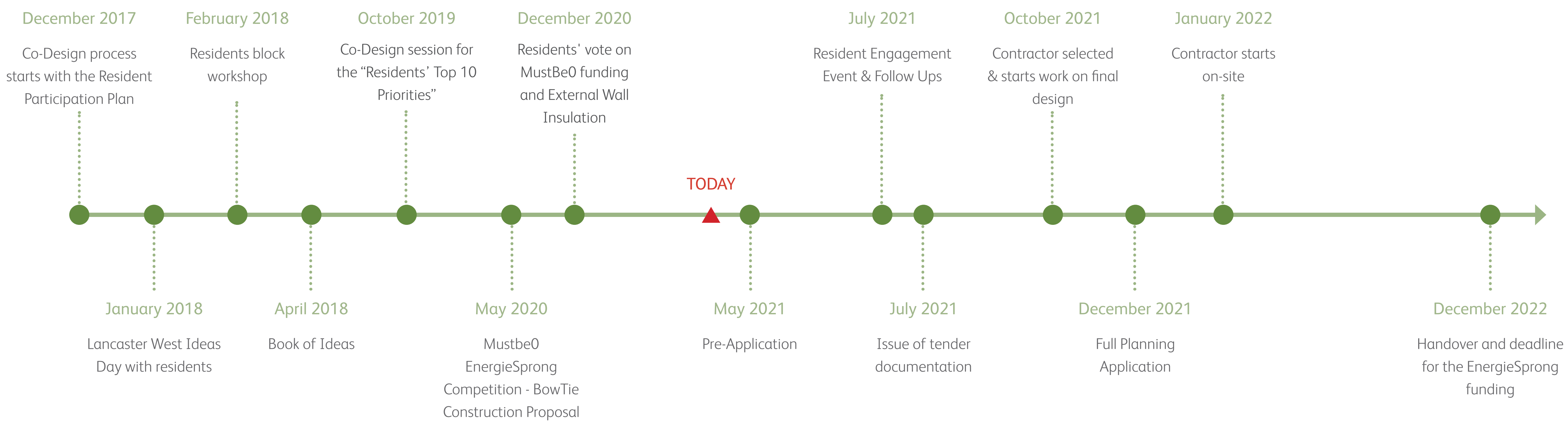


Figure 29 - 'Journey so far' for Treadgold

RESIDENTS' TOP 10 PRIORITIES

On the 9th October 2019 the Resident Engagement Team organised a Co-Design session with Treadgold House. This was to establish each residents' priorities for the refurbishment programme from the items available. The residents were contacted via paper invitation, digital invitation and Whatsapp. At that time there were 6 empty properties in Treadgold House and 21 households took part of the Co-design session.

The data collected were ultimately used to write out the "Residents' Top 10 Priorities".

LATEST ENGAGEMENT

An online event was held in November 2020 to inform the residents about the Mustbe0 funding opportunity. On the 9th December 2020, 87% of the residents voted for the Mustbe0 funding which include the adoption of External Wall Insulation. The result was that 96% of the residents who voted are in favor of EWI. This vote, which is part of the ongoing consultation with the Lancaster Estate residents, was an important step forward for the completion of the design stage for Treadgold House.

Figure 30 - LWNT online event presenting the Mustbe0 funding opportunity

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4.0 PROPOSALS

4.1 PROPOSALS OVERVIEW

THERMAL IMPROVEMENTS

The most significant works to be carried out at Treadgold House are those to reduce heat demand and carbon emissions to meet the Energiesprong criteria.

On the following pages individual elements of the building are reviewed in more detail with suggested interventions set out against implications for access, resident experience in the short and longer terms, fire mitigation & escape and energy use.

Meeting the Energiesprong criteria will be possible but will involve significant disruption and changes to the way residents use their homes, so discussion with residents of the relative benefits is crucial to establish the best way forwards.

OTHER WORKS

Other issues raised by residents will be addressed alongside these works. Some form part of this feasibility study, and are presented in more detail here. Others are outside the scope of this study but need to be integrated into the same programme, and this is expanded upon further at the end of this section.

Within this study:

- Communal area redecoration
- Refuse storage improvements
- Internal & external doors

By others, but integrated:

- Door entry systems
- Lighting
- CCTV
- Landscaping works
- Plumbing
- Below ground drainage
- New kitchens & bathrooms
- Fire stopping improvements

OTHER PROPOSALS

This section of the report also addresses proposals for the way the design and construction work will be carried out to ensure safety, good record keeping and an engaging co-design process throughout.

PASSIVHAUS

Passivhaus buildings are designed to use very little energy for heating, while being comfortable and draught free. They need to be designed and built with great attention to detail to allow them to use around 75% less heating than a standard UK new building.

ENERPHIT

This is like the Passivhaus standard, but for existing buildings. It is a little less stringent, but still requires excellent detailing and creates more energy efficient, comfortable homes

PASSIVHAUS PLANNING PACKAGE

The Passivhaus Planning Package (PHPP) is software that helps us build a accurate model of a building's heat loss and energy use. It requires information about the building's size, shape and orientation. as well as how insulating the walls, floors and roof are, and detailed information about the windows

U VALUES

U value tells us how quickly heat energy is lost through a part of a building. The lower the number, the less heat is lost.

ENERGY MODELLING

A Passivhaus Planning Package (PHPP) model of the building has been built to reflect the existing building, and then adapted to reflect proposed changes. The outcomes of this modelling are shown in the table to thr right as well as represented in the graphs below

This suggests that it is possible to meet the Energiesprong requirement of 40 kWh/m²/yr and indeed to surpass this. Whether the block can then meet the net zero carbon aim will depend on the addition of renewable technologies to supply energy to the building.

Standard	Specific heat demand kWh/m²/yr	Total heat demand (av. flat = 57m²) kWh/yr	Electricity needed to supply this via ASHP (COP3) kWh/yr	CO_2 emitted to do so kgCO2/yr
Existing	131	7467	n/a	1374*
Enclosing deck access - Option 1	18	1026	342	120
Open deck access - Option 2	22	1254	418	147

Figure 34 - Heat demand & CO_2 figures for the various thermal upgrades.
Note that figures do not cover all operational energy use

MODELLING ASSUMPTIONS

It is assumed that the existing cavity wall insulation is mineral wool and that this is reasonably consistent through out the walls, and remains in place in all scenarios. The existing building and the open deck access options are modelled as 2 separate thermal areas, the east wing and the west wing. The east wing performs slightly worse and figures of this are shown here.

CO_2 figures assume carbon emission factor for electricity of 0.351 kg/kWh. *Carbon emission factor for gas = 0.184 kg/kWh

The graphs here each show heat losses on the left hand column of each- heat losses through walls for example are shown in turquoise and are much reduced in both proposed options, but more so in the enclosed decks option. The right hand column of each graph shows heat gains in the building - yellow is gains from the sun through windows, orange is gains from people and equipment in the building and red is the heat needed to make up for all the losses and keep the building wam.

LOSSES
- Non-useful heat gains
- External wall - Ambient
- Roof/Ceiling - Ambient
- Floor slab / Basement ceiling
- Windows
- Exterior door
- Thermal bridge heat loss
- Ventilation

GAINS
- solar heat gains
- internal heat gains
- heating demand

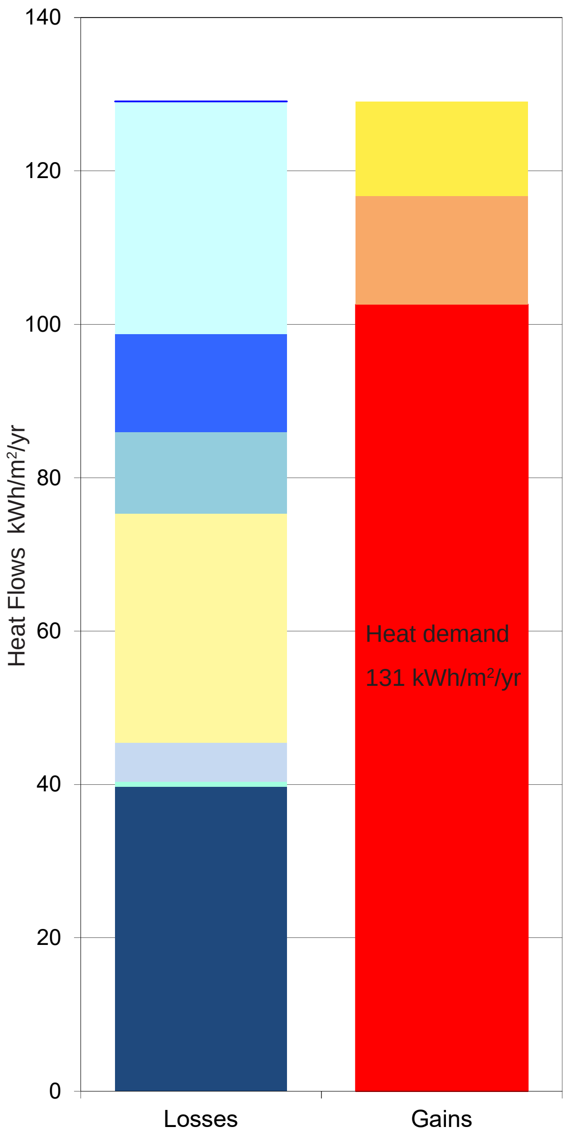


Figure 31 - Existing Building Energy Balance

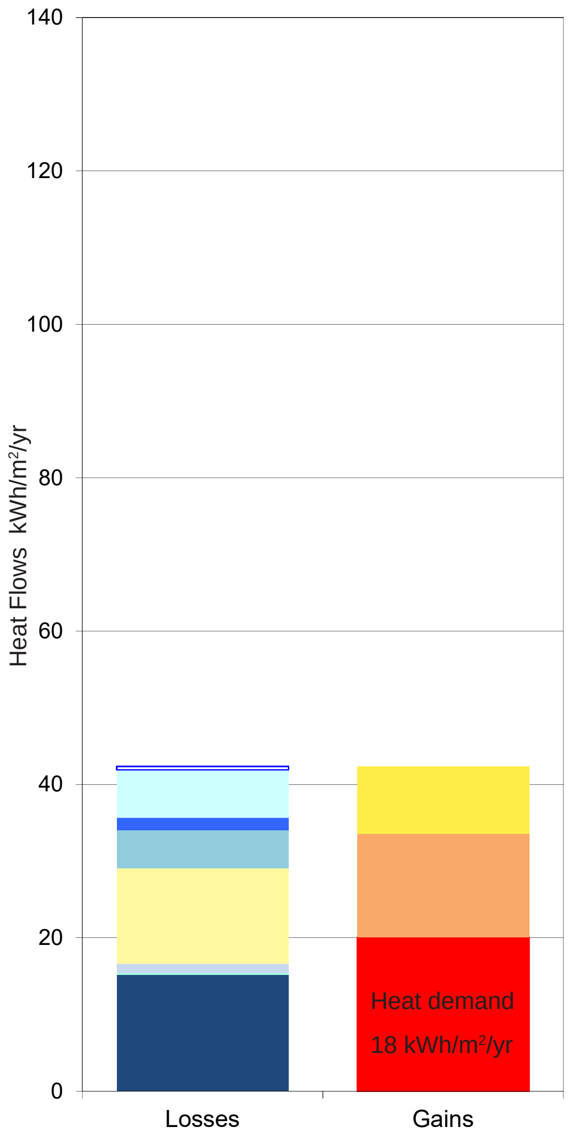


Figure 32 - Energy Balance with External Wall Insulation Enclosing Deck Access - Option 1

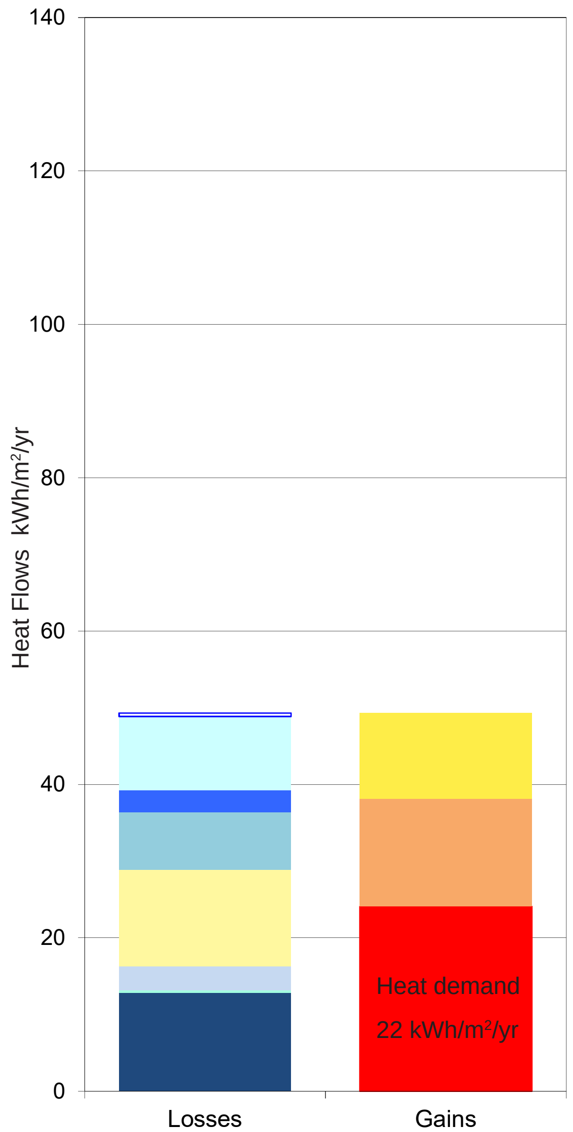


Figure 33 - Energy Balance with External Wall Insulation Following Line of Existing decks - Option 2

4.2 INSULATION STRATEGY OPTIONS

As the potential for heat loss reduction using external wall insulation has already been proved and residents have voted in favour of going ahead with this, internal wall insulation has not been examined for Treadgold House. However options still remain about the line of this new external insulation.

Further considerations have been made regarding EWI options and fire strategy in the section 4.13 showing four different design scenarios.

HEAT DEMAND

18 kWh/m2/yr

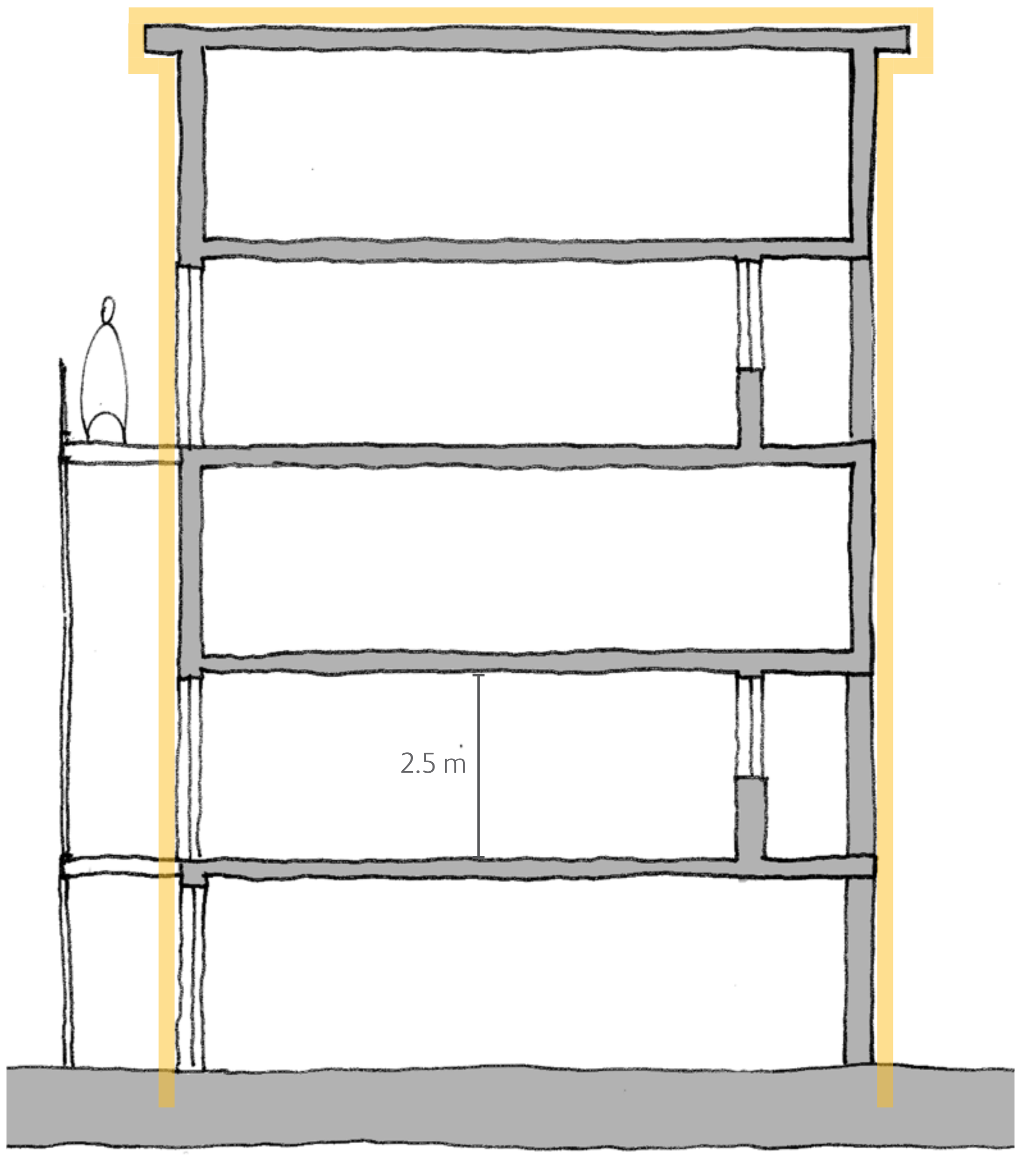
EXTERNAL WALL INSULATION - OPTION 1

Parge coat over existing walls to ensure airtightness.

200mm layer of mineral wool insulation over roof and all external walls, enclosing the deck access areas.

- Existing wall U value = 0.58 W/m²K
- Proposed wall U value = 0.14 W/m²K

New structurally separate balconies



Pros

- Simple continuous line of insulation is easier & quicker to install
- Continuous line of airtightness is easier to achieve
- Building's 'form factor' is reduced
- Opportunity for changes to external appearance (if desired)
- Ground floor studio flats enlarged
- Thermal bridging of floor slabs removed as enclosed on one side and removed on other side

Cons

- Some residents may prefer open deck access
- Knock-on impacts of fire escape & smoke ventilation
- Some kitchen & bathroom windows fixed shut & less light gets in (though always properly ventilated)
- Risk of overheating in the enclosed access corridors
- Additional measures required for fire mitigation are likely to cause additional disruption to the residents

MAXIMISING FIRE SAFETY

All insulation would be A1 rated, non-combustible insulation

If deck access routes become internal corridors these are too long to meet statutory requirements for fire escape unless additional works are implemented. This could be either:

A new staircase to each corridor, to allow escape in two directions.

OR

All flats have sprinklers installed and corridors to have automatically opening vents and mechanically assisted smoke extraction.

FORM FACTOR

'Form Factor' describes the relationship between the external surface area (A) and the internal Treated Floor Area (TFA).

It is a useful measure of the compactness of a building and the more compact a building is, the easier it is to be energy efficient.

EXTERNAL WALL INSULATION - OPTION 2

Parge coat over existing walls to ensure airtightness.

200mm layer of mineral wool insulation over roof and external walls.

- Existing wall U value = 0.58 W/m²K
- Proposed wall U value = 0.14 W/m²K

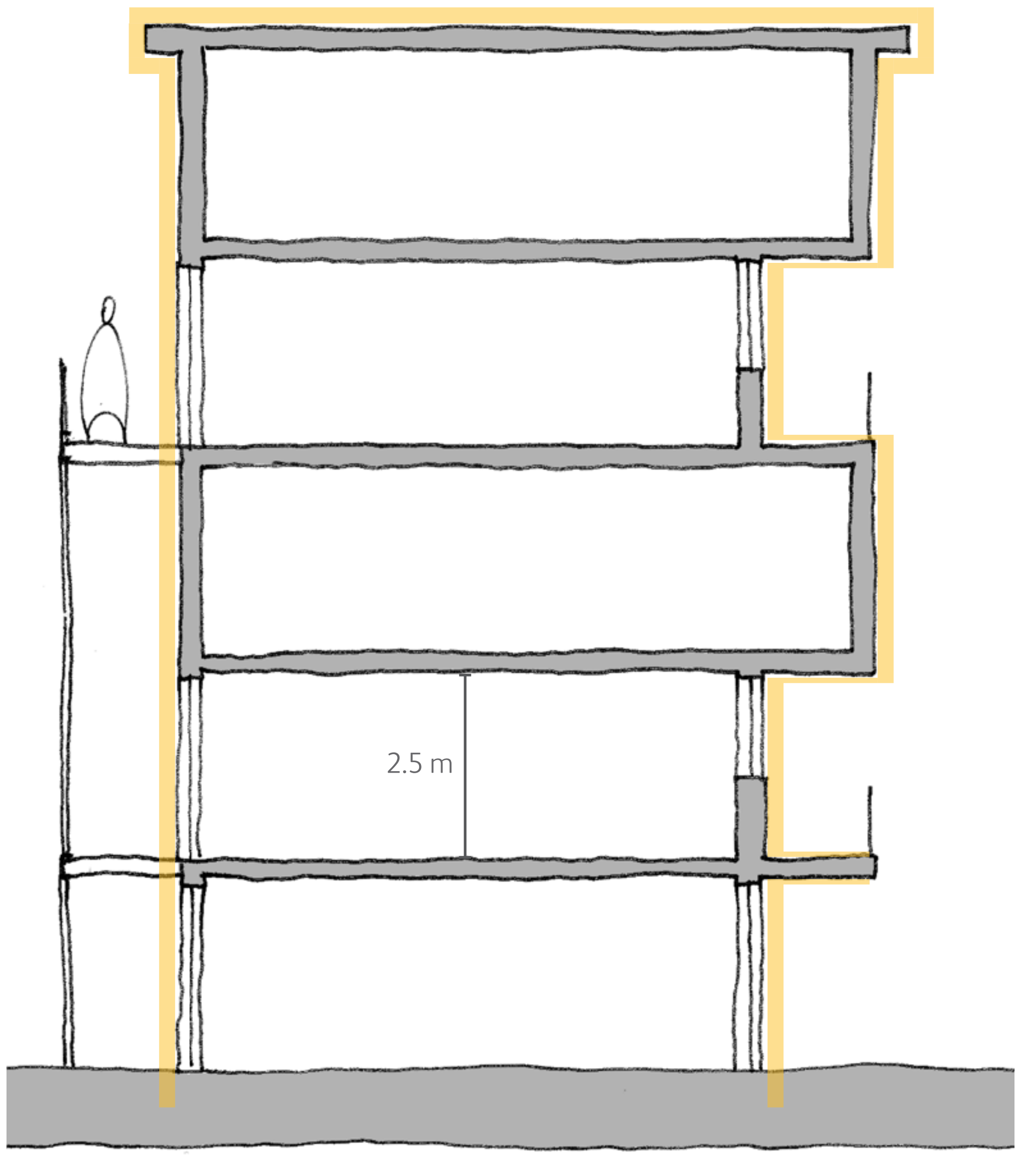
40mm layer of thinner Aerogel insulation to floors, walls & ceilings of deck access

- Existing wall U value = 0.58 W/m²K
- Proposed wall U value = 0.26 W/m²K
- Existing floor / ceiling U value ≈ 3 W/m²K
- Proposed floor / ceiling U value ≈ 0.4 W/m²K

New balconies fixed back to existing structure with thermally broken fixings

HEAT DEMAND

22 kWh/m2/yr



Pros

- Retains open deck access, so less change to way building works
- Kitchen & bathroom windows function as at present
- No balcony 'frame' so block looks more similar to existing
- Reduced risk of overheating
- Fire escape strategy remains similar

Cons

- Access deck narrowed - need to use thinner insulation here to retain sufficient width
- Harder to install so less likely to be done well
- Insulation to access decks has to be thin to avoid level changes, so will be less effective
- Challenge to design appropriate insulating, waterproof floor detail for these deck areas
- Letterboxes through individual front doors would compromise airtightness, so separate letterboxes by front doors, or boxes in the communal area would be necessary

MAXIMISING FIRE SAFETY

All insulation would be A1 or A2 rated non-combustible insulation

Fire strategy would broadly remain as existing, though maintaining sufficient width to corridors will be essential to success of strategy

4.3 EXTERNAL WALL INSULATION SCENARIOS

SCENARIO A - TRADITIONAL ON-SITE

INSTALLATION

- install parge coat
- site apply external wall insulation
- site apply external finishes (render/brick slip)

BENEFITS

- Better suited to irregular shapes
- Less large equipment on site
- More traditional construction techniques

FIRE RISK MITIGATION

Non-combustible facade materials and junctions with existing building sealed with intumescent materials.

Quality of workmanship on site must be overseen to ensure no voids created behind insulation etc.

SCENARIO B - 'KIT OF PARTS'

INSTALLATION

- install parge coat
- install brakets on existing fabric
- install the steel frame and the substrate board
- infill cavity created with mineral insulation
- apply facade finish

BENEFITS

- Shorter construction period
- Better control over junction details
- Less material stored on site
- Fewer people working on site
- Quality control in the factory

FIRE RISK MITIGATION

The main products within the system are all class A non-combustible

(Bracket, Knauf Insulation, Magply, Brickslips)

SCENARIO C - MODULAR

INSTALLATION

- install parge coat
- build the facades in the factory
- bring the modular pieces on site
- fix the module into place

BENEFITS

- Fastest construction system
- Better control over components assembly (walls/windows/doors)
- Less material stored on site
- Less people working on site
- Quality control in the factory

FIRE RISK MITIGATION

The system can be designed and tested in detail in the factory.

Better control over the assembly of the parts.

More guaranteed systems are usually available if the product is built off-site.

Figure 36 - EWI construction process

Figure 35 - Brick slips being installed over EWI

Figure 37 - Airtight window installation

Figure 40 - Beattie Passive system construction process

Figure 39 - Beattie Passive system completed / in-progress retrofit schemes

Figure 38 - Melius Homes Modular construction process

Figure 41 - Melius Homes Modular completed retrofit schemes

4.4 NEW WINDOWS

New windows and external doors are proposed to reduce heat loss through windows and allow a more airtight seal to the existing walls.

At present there are PVC double glazed windows installed in Treadgold House with an estimate U value of 2.5 W/m2K. The majority of them are divided in 4 parts, 3 parts openable (2 on the side and one on the top) and one fixed in the center.

NEW WINDOWS

All existing windows are to be replaced with new triple glazed windows, ideally Passivhaus certified. If they are not certified, the airtightness of the proposed windows seals will need to be assessed when closed (for example Rationel AURA and AURAplus with a U value < 0.80 W/m2K). Triple glazing will lose far less heat than double glazing, reducing heating bills. This improvement is even greater when the windows seal closed properly and are well sealed to the walls, as warm air cannot escape around them.

New windows would most likely be side hung, top hung or tilt and turn. However further discussion with residents is needed to understand whether they like the way their windows look and open at present, as it may be an opportunity to make windows easier to open, with handles at more appropriate heights.

In parallel, the colour of the outside of window frames and window frame material (UPVC, timber internal with PPC aluminium external, aluminum) will have an impact on the overall appearance, and it is suggested that this is developed with residents.

In the case that the access decks are enclosed as part of the general EWI strategy, additional fire measures will be required for the windows overlooking the deck. They will have to be appropriately fire rated and not openable. Furthermore, based on the Energiesprong requirements, the new windows shouldn't reduce the indoor daylight by more than 10%. The windows onto the access corridor (currently access deck) will have to be carefully aligned with the internal windows of the units in order to maximise daylight. Windows size and G value will be specified according to the preferred strategy.

Windows will also need to be Secured by Design certified in some areas, as well as ensuring safe opening heights.

Figure 42 - Exisisting typical window divided in 4 parts

Figure 44 - Example of rationel AURA & AURAPLUS window

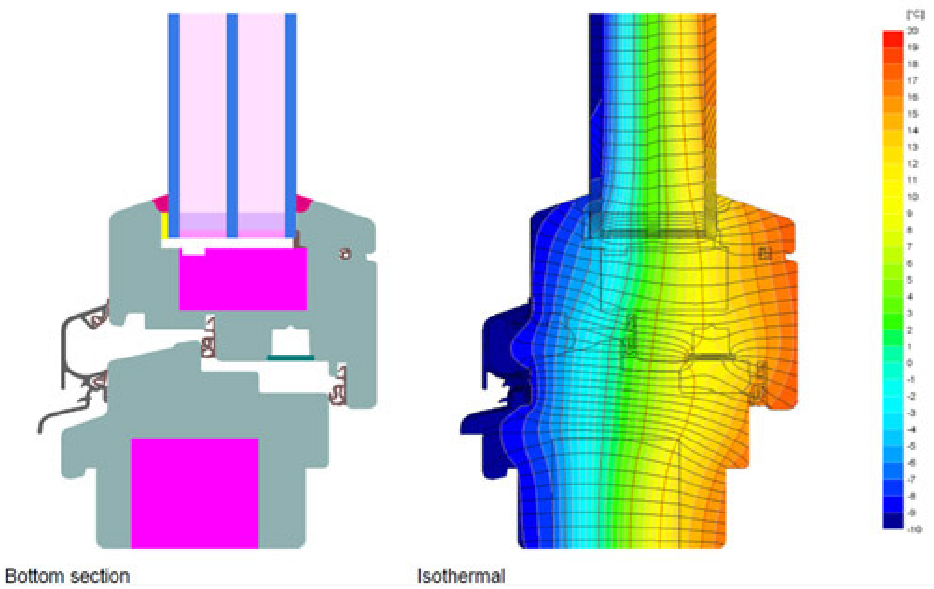


Figure 43 - Isothermal image of a Passivhaus window

Figure 45 - Example of a triple glazed window

As the ground floor appears to have no insulation, we propose two main approaches (or a combination of the two) to reduce heat loss through the floor.

The first option consists of leaving the ground floors as they are and extending the external wall insulation down below ground level. This creates a thermal 'skirt' around the earth below the slab, so that this earth will not lose heat as fast as it would normally do, reducing heat loss through the floor slab. The extent of this 'thermal skirt' will depend on the depth and form of the existing foundations, but ideally this would extend 600mm – 1m below the external ground level. The type of insultation suggested for this is Foamglas insulation which is non-combustible. This is the preferred solution because it involves less internal disruptions.

The second option consists of a thin and breathable insulation board installed above the existing screed. This Aerogel Magnesium Silicate Board is made of staggered 3mm and 6mm rigid Magnesium Silicate Boards laminated to an Aerogel Insulation Blanket. It is the thinnest and most thermally efficient flooring panel system available which interlocks to create a robust, durable and inert sub-floor. The Aerogel Magnesium Silicate Board is available in a A2 fire rated version.

Figure 46 - Insulation 'skirt' being installed below ground

Figure 47 - Aerogel insulation with Magnesium Oxide Board

4.6 ROOF

The roof requires a complete refurbishment and rearrangement of the existing equipment (water tanks). The proposal includes the removal of the existing 90 mm Rigid PUR insulation and the installation of a new 370mm substratum of mineral wool insulation protected with a waterproofing layer. The 9 chimney stacks are also proposed to be removed to ensure a simple insulation and airtightness line. These are also likely to be a good location for new roof-mounted equipment (communal air source heat pumps, water tanks, etc) and will allow adequate space for the photovoltaic panels. The brick from the existing chimney stacks could potentially be reused to build the bin storage on the ground floor.

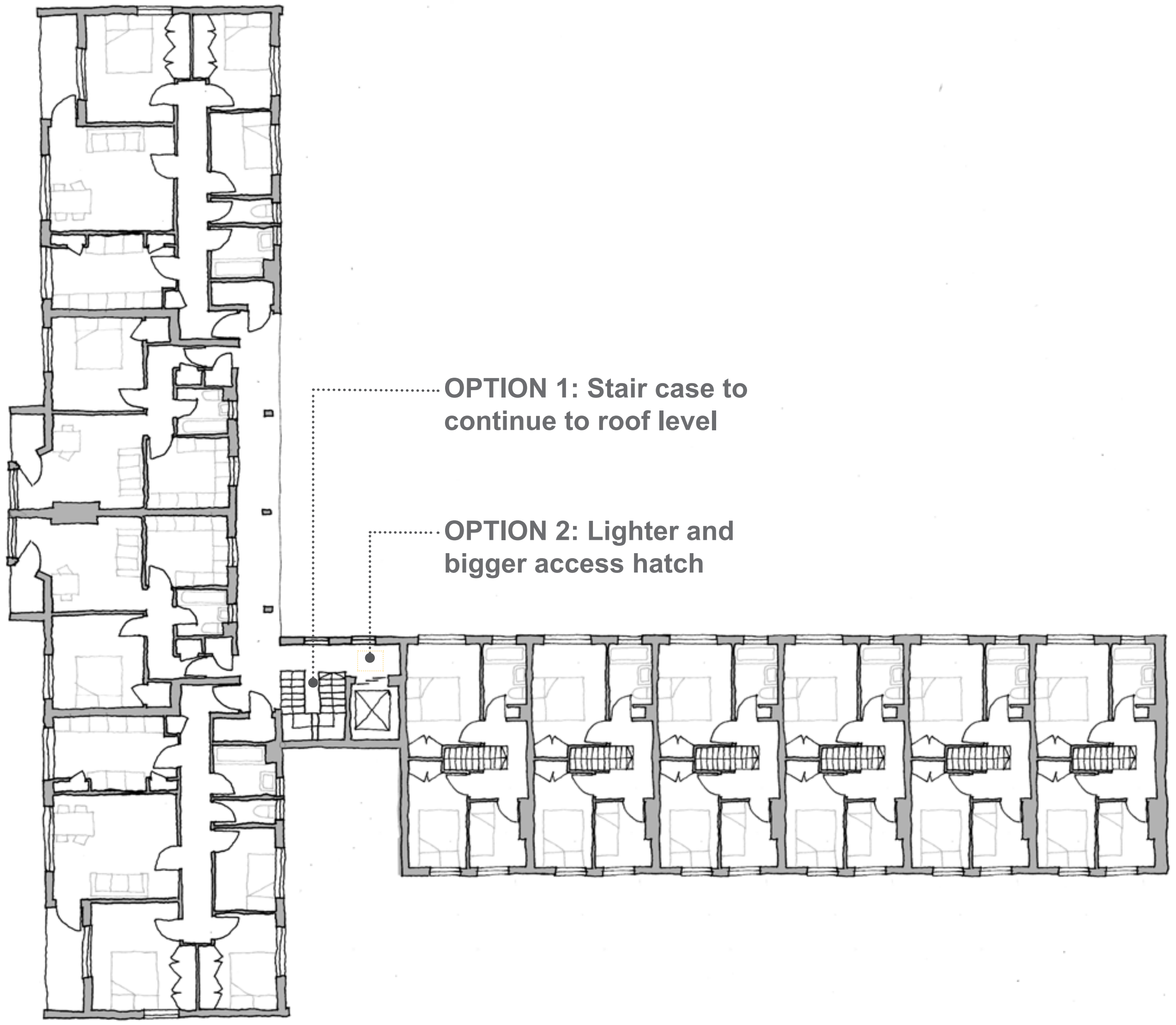
- Existing roof U value = 0.328 W/m2K

- Proposed roof U value = 0.102 W/m2K

ROOF ACCESS

As described previously, the existing roof access is through two access hatch doors which are heavy and narrow.

There are two main options to improve the roof access. The first one is to increase the size of the hatch and install a suitable ladder allowing for a more comfortable access for maintenance. The second option consists of extending the existing staircase up to the roof top. This would require demolishing part of the roof slab with the new stair landing where the water tanks are currently located. The stairs will be gated on the fourth floor allowing access for maintenance only.



MECHANICAL AND ELECTRICAL PLANT

There will be some equipment that could be placed on the roof and discussions are undergoing to choose the best option. One of the options includes a communal heating system that would require the installation of Air Source Heat Pumps on the roof with insulated pipes feeding low temperature hot water to each unit.

Battery backup could be required to ensure the functioning of the communal air source heat pumps in case of power cuts. Fire concerns about the location and storage of the batteries will be addressed in line with the general fire strategy.

PHOTOVOLTAIC PANELS

Also known as solar panels and PV panels

These collect energy from the sun and turn it into electrical energy to power your home.

Based on Energiesprong requirements, photovoltaic panels are necessary in order to meet the net zero carbon target. The PVs will be south facing, installed on an angled steel structure placed on the roof. The panels could also be combined with a green roof reducing the urban heat island effect and improving air quality. An inverter will be required to transform the electricity from continuous to alternate. The electricity collected from the PV panels will be split among the residents following the Energiesprong comfort plan. Further investigation is required to assess the structural condition of the roof and the overall strategy will be confirmed with the M&E engineers during stage 2.

Figure 48 - Mineral wool insulation being installed on a roof

Figure 49 - Photovoltaic panels on flat roof

Figure 51 - Communal air source heat pump

Figure 50 - Photovoltaic panels on green roof

4.7 BALCONIES

The existing balconies are one of the main causes of cold bridges. In the studios, one and three bedroom flats, the inset balconies have exposed ceiling and floor slabs while in the maisonettes the projecting balconies have exposed concrete slabs.

Two options have been explored to enclose and/or replace the existing balconies. This addresses the issues with the thermal envelope as well as creating much needed space in homes and providing opportunities for new larger balconies to provide more private outdoor space.

Options have also been put forward for the construction of the projecting balconies: A steel frame structure detached from the main building would create less perforations through the external wall insulation as the system would be self supporting and just be restrained back to the building. The other option would be to go for a thermally broken bolt-on steel balcony system which would be connected to the slab. Further investigation is required to understand the structural implications of this option.

The final balcony design will also need to take into consideration the problem of pigeons roosting in the area.

BALCONY STRATEGY - OPTION 1

In the west wing:

- Transform the existing balconies of the three bedroom flat to winter gardens.
- Incorporate the existing balcony area of the one bedroom flat into the living room and add new bigger balconies to the outside.

In the east wing:

- Replace the existing U shape concrete balconies with a steel thermally broken balcony system.

BALCONY STRATEGY - OPTION 2

In the west wing:

- Transform the existing balconies of the three bedroom flat to winter garden and add new bigger balconies to the outside.
- Incorporate the existing balcony area of the one bedroom flat to the living room and add new bigger balconies to the outside.

In the east wing:

- Replace the existing U shape concrete balconies with a steel thermally broken balcony system.

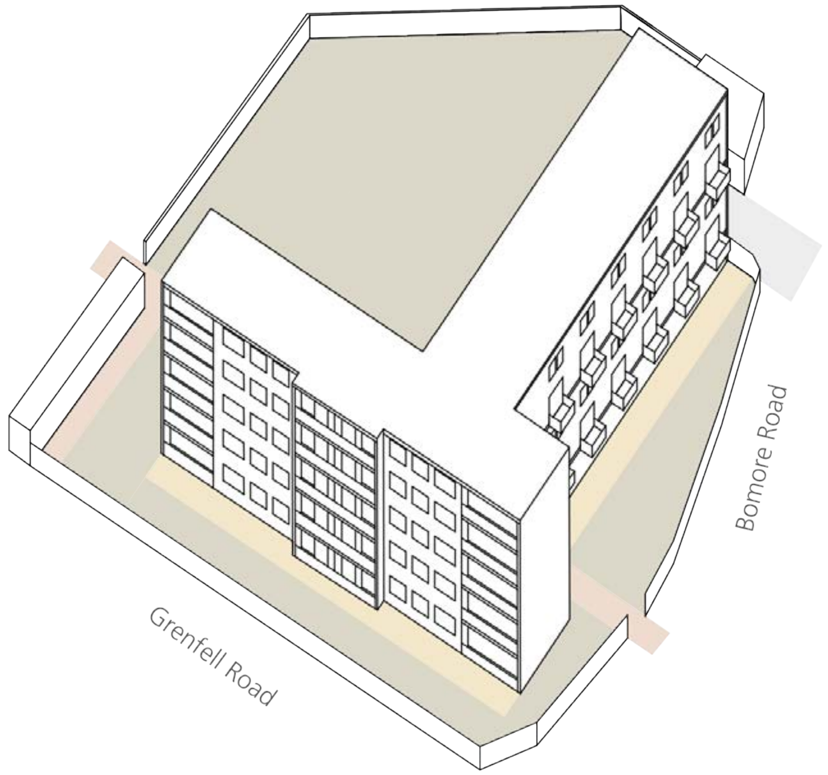


Figure 52 - Existing building

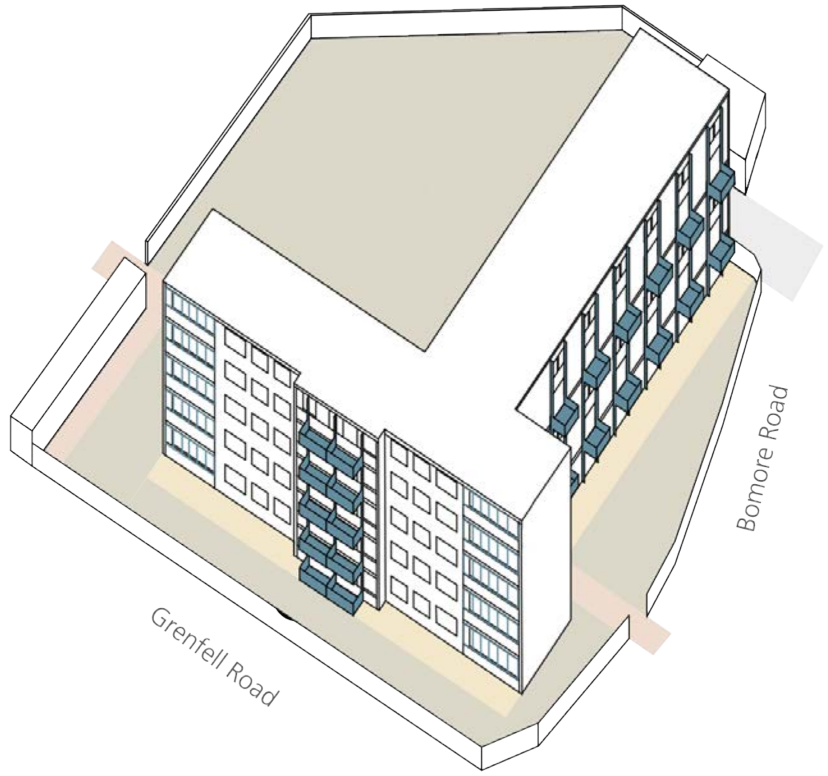


Figure 53 - Balcony strategy - option 1

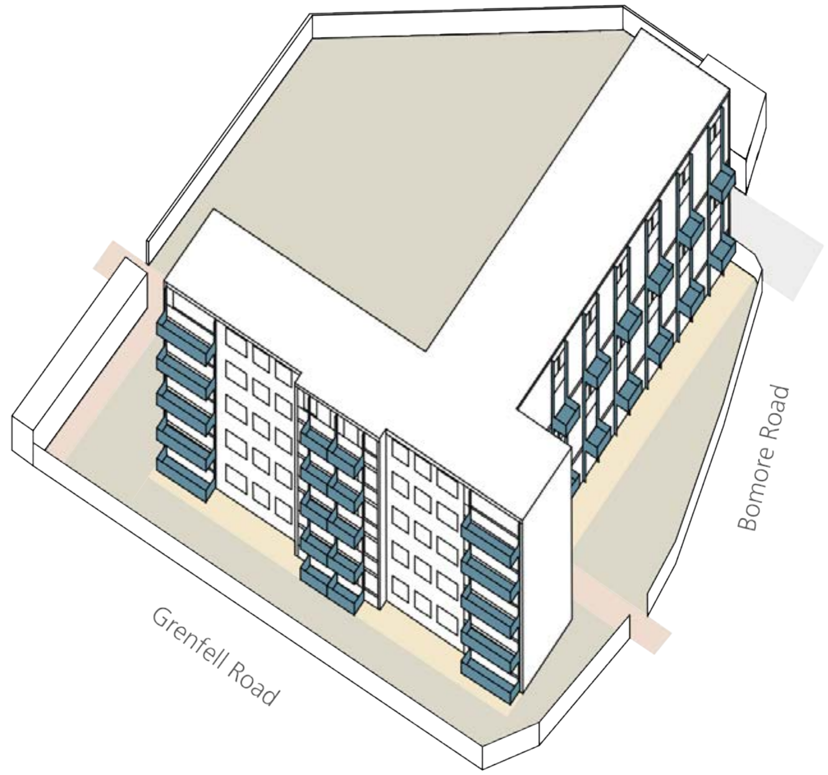


Figure 54 - Balcony strategy - option 2

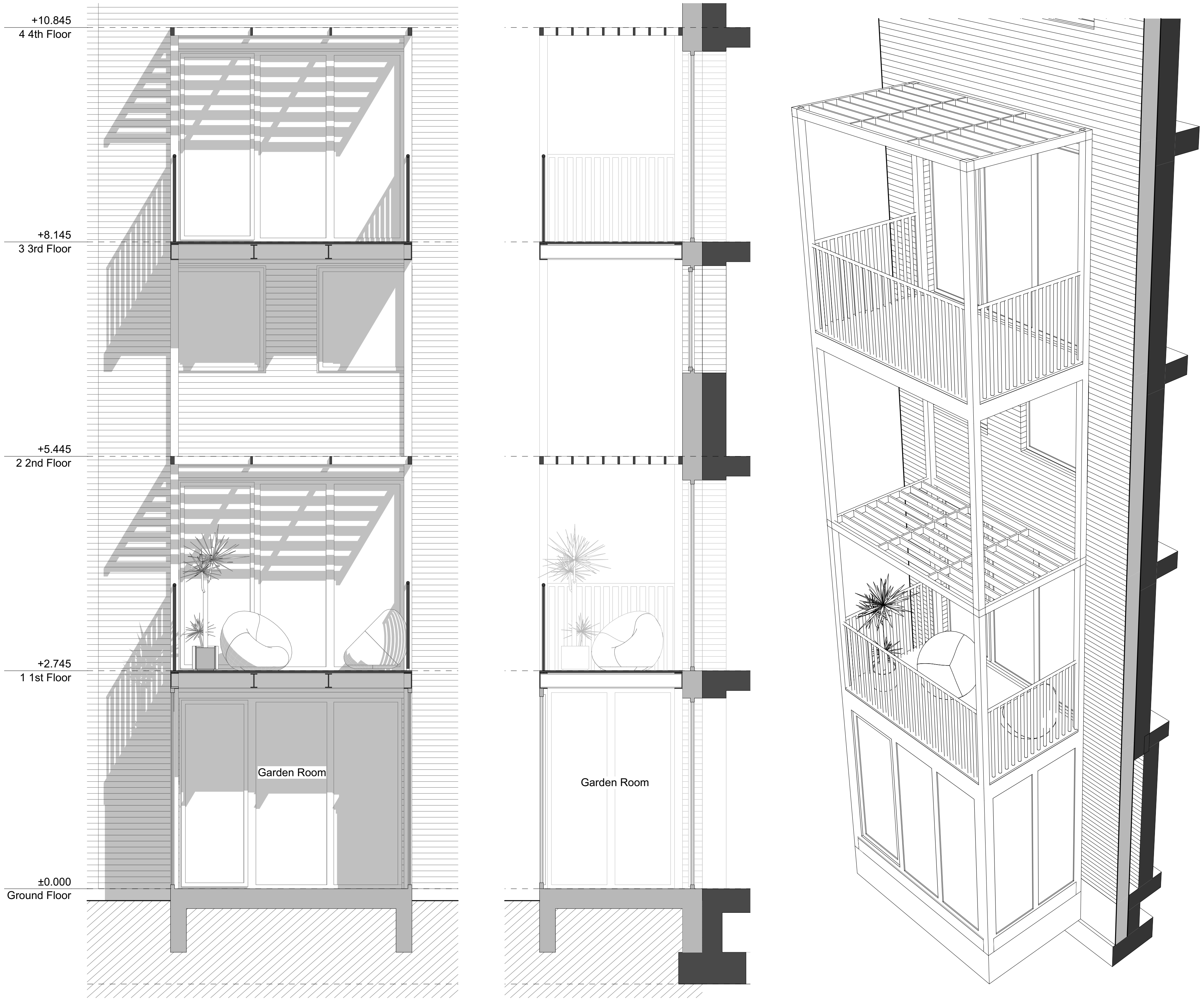


Figure 57 - Bow Tie Construction proposal for the East wing projecting balconies. This is for a structurally separate frame, tied back to the main structure. This limits thermal bridging.

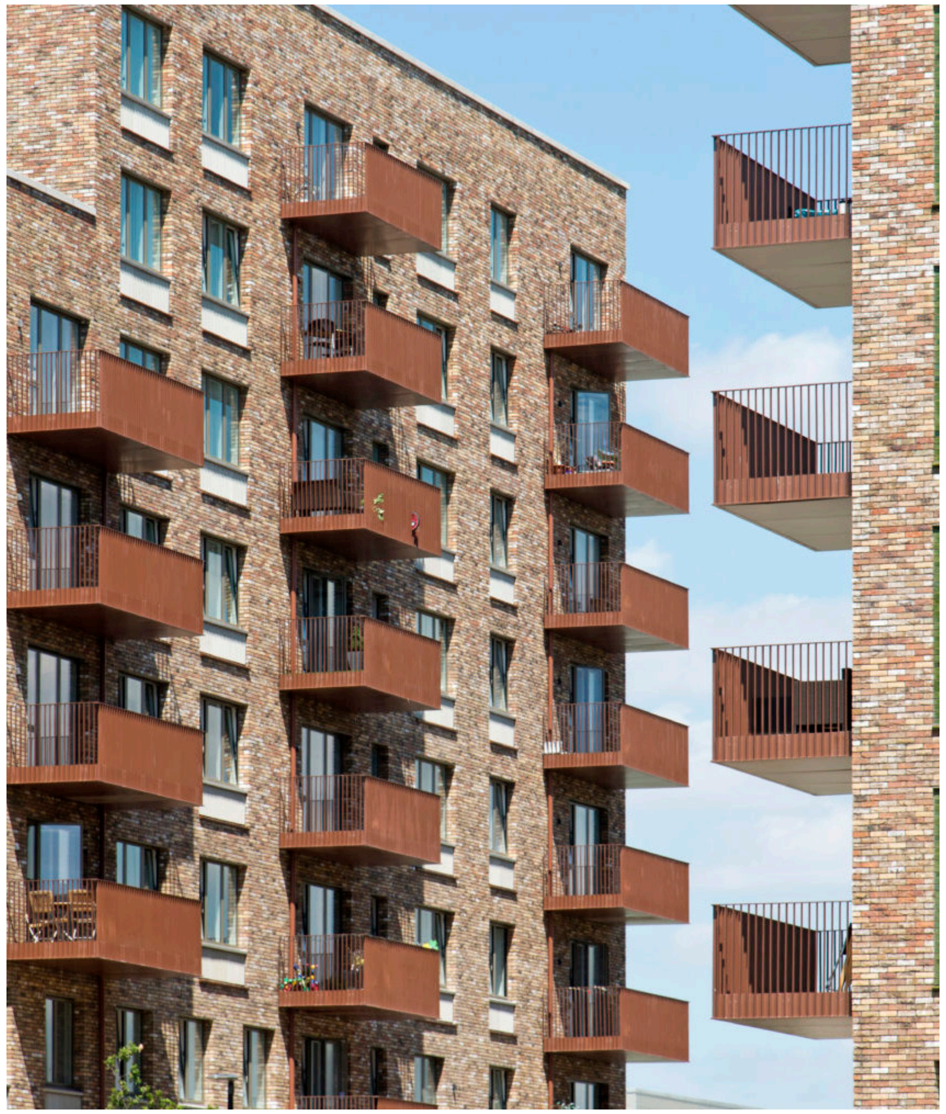


Figure 55 - Bolt on balconies example

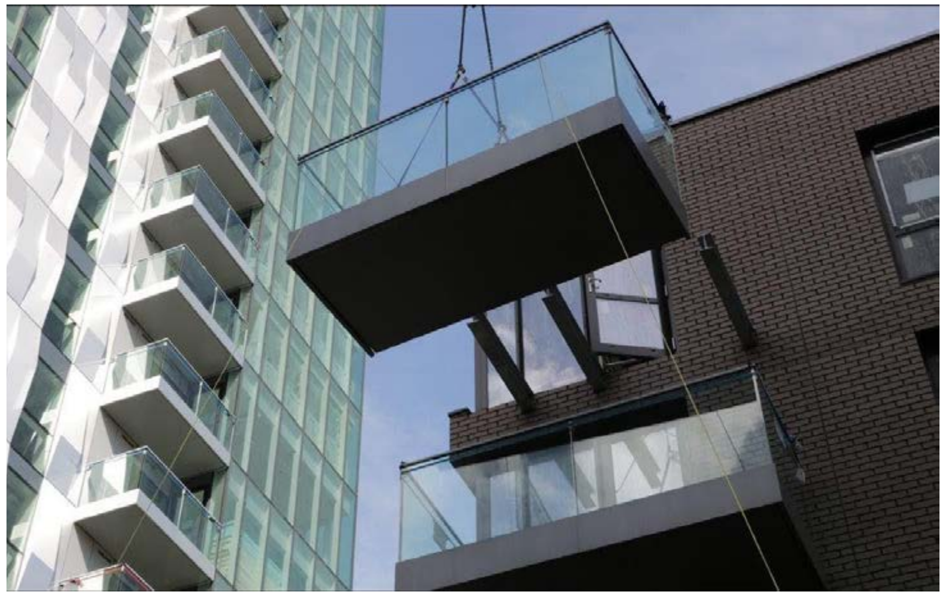


Figure 56 - Bolt on balconies installation

MECHANICAL VENTILATION WITH HEAT RECOVERY

A 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.

Making homes airtight and introducing mechanical ventilation with heat recovery (MVHR) is an essential part of really good retrofit, and will be a necessary part of reaching the Energiesprong standard.

In a typical house or 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. Most homes, including the flats at Treadgold House have mechanical ventilation at present, in the form of bathroom and kitchen extract fans. These are intended to remove moist or smelly air from these rooms and extracts it to outside. Again, this takes air that has been warmed inside the home and pushes the heat outside, wasting energy. These fans often get clogged up, or don't run for long enough to do their job properly. This can lead to mould inside the home.

A 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 sanitary spaces. Windows can still be opened, but the building will work even if windows are kept shut.

Because air is supplied continuously, it does not need to move very fast, so the system is quiet and does not feel draughty. In order to make sure the system works efficiently and quietly it is important to get the layout of ducts right for each home.

The MVHR unit contains a filter, ensuring good indoor air quality. This filter needs to be changed every 3-6 months, which is easy to do. It is important therefore than the unit is easy to access.

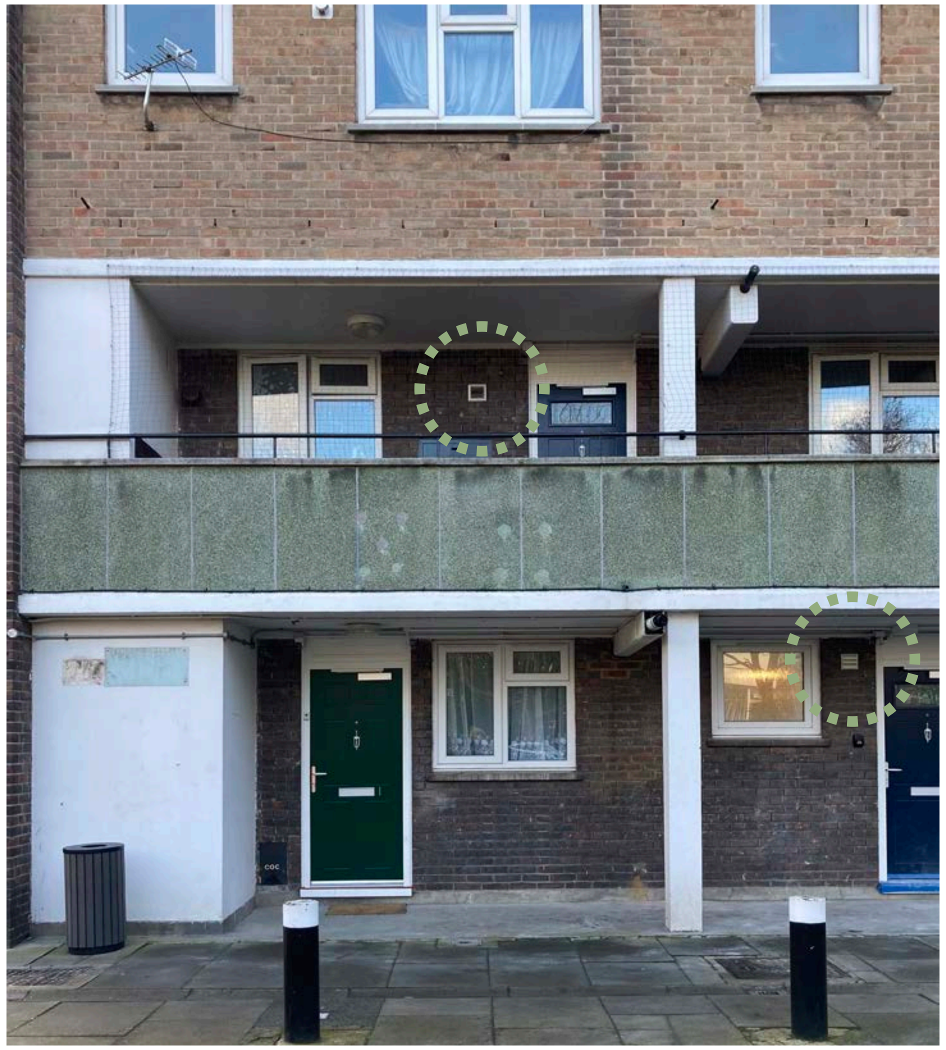


Figure 61 - Extract fan grills on external wall

Figure 58 - Ceiling mounted air supply and extract valves

Figure 59 - Typical control unit for MVHR

Figure 60 - MVHR unit with insulated exhaust & intake ducts and uninsulated, metal extract & supply ducts

Mechanical ventilation with heat recovery systems can be communal, or there can be one per home. Each has advantages and disadvantages.

INDIVIDUAL MVHR UNITS

An MVHR unit would be installed in the flat, with an intake and an exhaust duct running through the external walls. These ducts would need to be very well insulated, and ideally as short as possible. The unit itself would be a similar size to a boiler. Inside the home supply and extract ducts would run to each habitable room, supplying air to the living room and bedrooms and extracting it from the kitchen and bathroom. These ducts would be non-combustible and would likely run on the underside of ceilings in boxed out areas, or above a lowered ceiling in the hallway. An outlet or inlet would then sit in the ceiling, or at high level of the wall of each room.

Pros

- Each home's MVHR system is entirely within the single fire compartment of that home - ductwork does not cross fire compartment lines
- Residents have feeling of complete control over their own system
- Simpler billing, as input energy use is per unit

Cons

- Space needs to be found for MVHR unit in each home
- Ducts need to be installed within homes
- Dropped ceilings or boxing out to small areas of ceilings

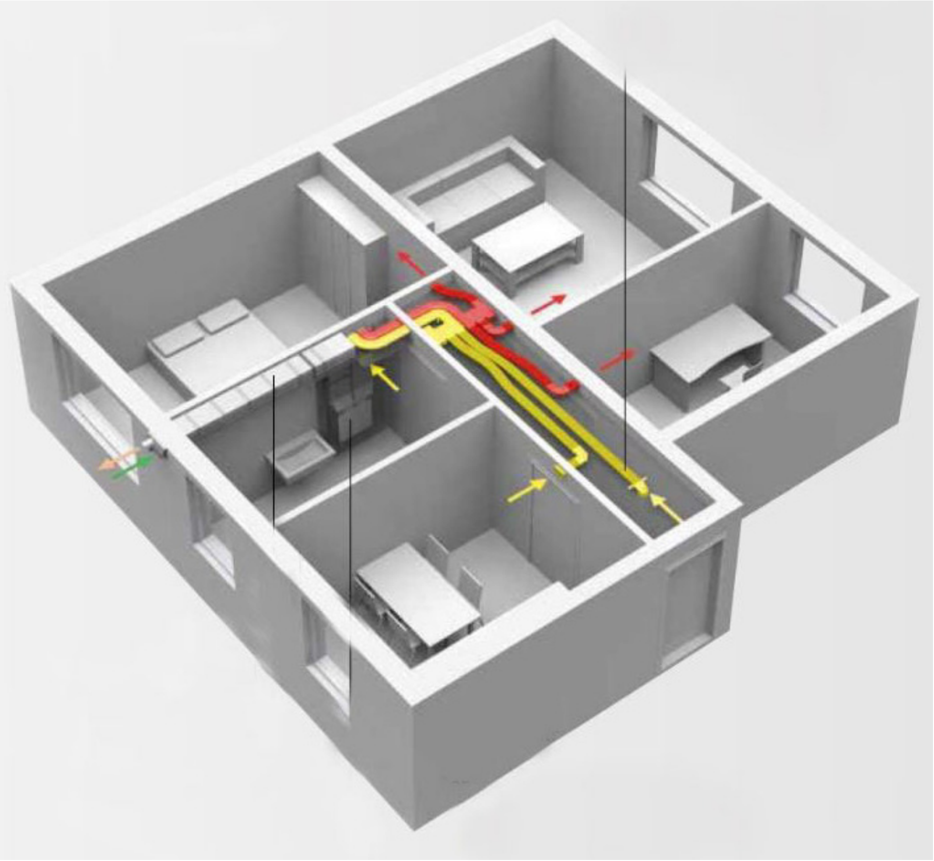


Figure 62 - Typical flat layout showing an indivdual flat system with MVHR ductwork running to and from individual rooms via corridor

Figure 63 - External ductwork runs prior to application of external wall insulation. This would be used with a commuanl system

COMMUNAL MVHR UNITS

In this case a larger unit would sit on the roof or in a new outside plant area next to the building. Supply and exhaust ducts could be kept very short, improving efficiency. From the unit supply and extract ducts would run to each home. These would either need to run inside the building's thermal line (its insulation) or be insulated. If cleverly laid out this system could reduce the need for internal disruption, by running ductwork within the new external insulation layer and then into the building next to new windows.

Pros

- Less internal disruption
- Less space taken up in each home
- 1 filter change at the communal unit ensures clean air for all - no risk of residents forgetting to do this

Cons

- Ductwork would pass compartment lines, so would need to include fire dampers, significantly increasing size of ducts
- Maintenance of main unit is crucial as all homes are dependant on functioning of the unit.
- Ductwork is encased in external walls, making cleaning almost impossible

HEATING & HOT WATER

The 'Mustbe0' requirements effectively rule out the use of gas boilers to provide heating and hot water, as it will not be possible to achieve net zero homes while burning gas on site. Therefore electrically-powered hot water generation is required. In order to do this as efficiently as possible heat pumps are proposed, so that each unit of electricity is used to create several units of heat energy.

AIR SOURCE HEAT PUMPS

There is heat energy in cold, outdoor air. An 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.

Air source heat pumps could also be installed either communally or individual to each unit.

COMMUNAL AIR SOURCE HEAT PUMPS

A communal system would require several air source heat pump units on the roof or at ground level near the building. These would create low temperature hot water. This would then be piped around the building in insulated pipes, feeding each home. Each home would have a heat interface unit (HIU) which would transfer this heat energy to the home's hot water, providing higher temperature hot water for heating and to supply hot water from taps.

Pros

- Less space taken up in each home (though HIU still needed)
- Larger units may be more efficient
- Centralised maintenance may be easier to carry out
- No need for hot water cylinder

Cons

- Pipework running around building would be insulated but would still lose heat, making the system less efficient and adding to overheating risk

INDIVIDUAL AIR SOURCE HEAT PUMPS

Alternatively individual air source heat pumps could be installed in each flat or maisonette. These would supply hot water to a hot water cylinder for use for heating and hot water. The cylinder would be needed as the air source heat pump would not be able to supply hot water for a bath or several showers at once.

Pros

- No rooftop plant needed
- Residents may feel more in control of their own heating
- Less overheating risk

Cons

- Each home will have an external air intake on external wall or roof
- Hot water cylinders in each home will take up space

GROUND SOURCE HEAT PUMP & COMMUNAL SYSTEM

A ground source heat pump works simliarly to an air source heat pump, but rather than taking heat energy from the air it takes it from the ground. Pipework is installed below ground, either in vertical boreholes running deep into the ground, or as coils buried at a shallower level. This pipework would run to the heat pump unit which would produce low temperature hot water which would be piped around the building. Again heat interface units would be needed in each home to produce higher temperature hot water.

Pros

- Less space taken up in each home (though HIU still needed)
- Less external plant
- Centralised maintenance may be easier to carry out
- No need for hot water cylinder

Cons

- Pipework running around building would be insulated but would still lose heat, making the system less efficient and adding to overheating risk
- Cost and disturbance of installation of below ground pipework

HEAT NETWORK

Lancaster West Neighbourhood Team are investigating the possibility of a renewably powered heat network across the estate and beyond. While this would not be ready to serve the building at completion of the refurbishment, the building could be linked into this later. This would be relatively simple to acheive if the building were already served by a communal system, adding an extra advantage to implementing such a system.

However it is an important part of the Energiesprong method that the Solution Provider be allowed to design the building's performance, including its heating system. Therefore unless LWNT are determined that the buildings must ultimately become part of the heat network, it is suggested that tenderers be made aware of the potential heat network, but not be required to design a communal heating system.

INSULATION STRATEGY

External wall insulation is proposed for this building. Two options are being considered (this refer to the EWI options in section 4.2).

Option 1 – It is proposed to wrap the building in its entirety with 200mm of mineral wool insulation. The additional weight of this material is considered to be insignificant and can therefore be safely carried by the existing building structure.

As part of this proposal however, it is proposed to enclose the external walkways. A lightweight supporting structure will be required for this which will need to be designed with a sliding head restraint to ensure that load is not picked up from the structure above.

At ground floor level a new wall will be required with a similar head restraint but also a new supporting foundation will be required.

Option 2 – With this proposal the external walkways will not be enclosed and the walkway surface and exposed slab soffits will have a 40mm layer of Aeogel insulation applied. The additional weight of this material is also not considered to be a structural significance and can therefore be safely supported by the existing structure.

BALCONIES

Strategies are being considered to deal with the cold bridges with the existing balcony detail. They involve either infilling the balconies to form a winter garden or removing the cantilever balconies and constructing new steel framed balcony structures with external framing.

BALCONY WINTER GARDENS

Any infilling structure needs to be extremely lightweight. The existing balconies are cantilevered from the main building and therefore very sensitive to load increase. From a structural viewpoint it would be preferable to remove them and replace with an independently framed structure.

NEW INDEPENDENTLY FRAMED STRUCTURE

Providing new independently framed balcony structures provide flexibility to design the balconies to suit to requirements of the properties. From a structural viewpoint they could be located anywhere on the building as required although they need to align vertically. Although they could be independently framed, the new balcony structures will need to be restrained against the main building and it should also be possible to take some support from the building at locations where there were previously cantilevered balconies.

MAIN ACCESS PROPOSALS

To provide improved access it is proposed to revise the stair and lift core area. This involves swapping over the lift and staircase areas within the core. Clearly this would be a major structural intervention.

It has been previously advised that it is considered that the current lift and stair core layout were not part of the original construction of this building. If drawings of the structural alterations are not available then some detailed investigation work will be required in this area. Opening up will be required to confirm the load path through this area and the existing foundation details at the interface with the core area. In particular where a new lift pit will be required.

When details of the adjacent structure have been established a new core structure can be designed to suit accordingly.

4.10 NON ENERGIESPRONG WORKS

The previous pages have set out works needed to the building to meet the Energiesprong standard. While there are decisions to be made about exactly how these are implemented, all of these elements will need to be addressed to meet this standard. These decisions will be taken in discussion with LWNT and with residents. This will lead to a performance specification that will require the contractor to design and build works that will meet both the Energiesprong standard and also the client and residents' aspirations.

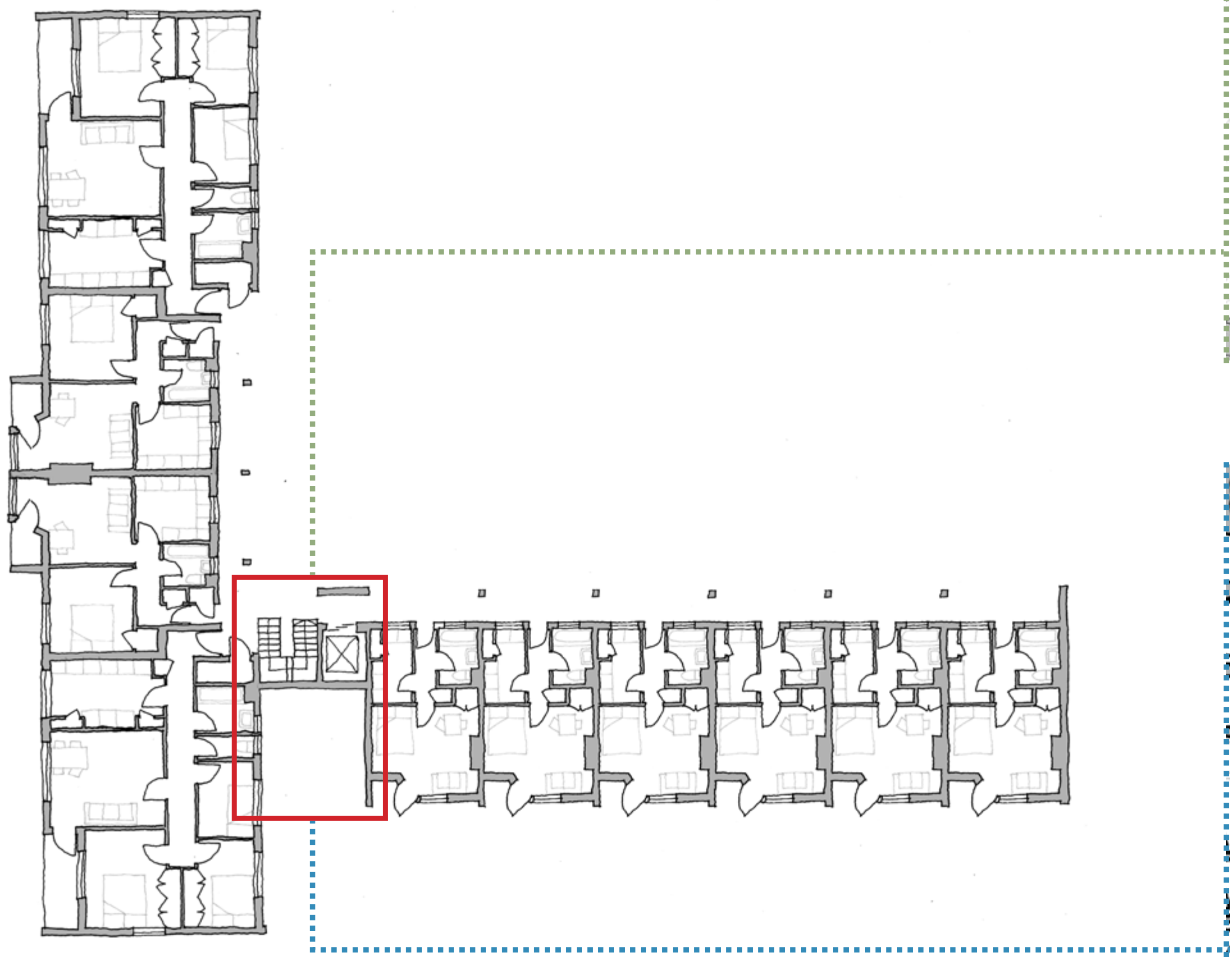
In addition to energy use improvements there are other works that are needed to address issues raised by residents and to maintain the building. Some of these are essential, while others need to be examined in more detail to determine whether they will form part of these works. Those that are to be taken forwards will then be designed in more detail and form part of the same tender package that the contractor will then build.

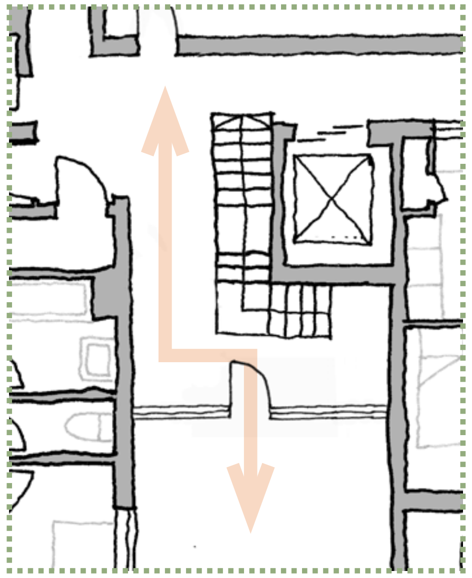
These items are set out in the table opposite and explored in more detail in the following pages

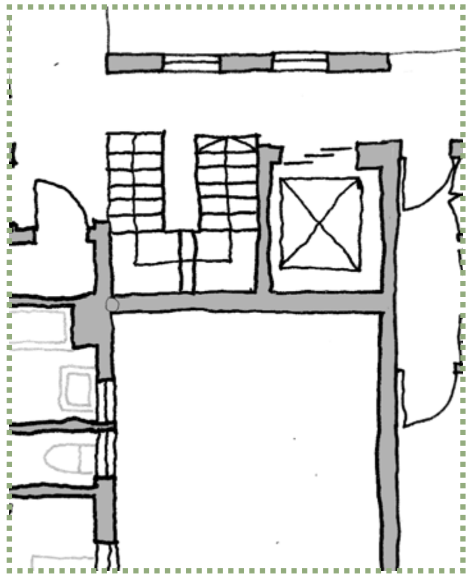
Item of work	Level of certainty	Comments	Decision based on
Replacement of lift	Certain	Consider new entrance layout as raised at Ideas Day	Cost, resident feedback
New communal front door	Certain	Design depends on thermal strategy	Resident discussions, Energiesprong design by contractor
New video entry system	Certain		
Communal area redecoration	Certain	Details depend on whether deck access is enclosed	Details to be agreed with residents
Enlarge studio flats	To be discussed	Depends on whether deck access is enclosed	Cost, resident discussions, Energiesprong design by contractor
External stores by flat front doors incorporated into flats	To be discussed		Cost, resident discussions
Inset balconies become winter gardens & new balconies added	To be discussed	Depends on Energiesprong strategy, but balcony size could form part of performance specification	Cost, resident discussions, Energiesprong design by contractor
Rearrange maisonette kitchens	To be discussed	Raised at Ideas Day	Cost, resident feedback
New kitchens (tenants only)	Certain	Potential to remove from main contract if this means contract takes too long to achieve funding deadline Gas to be removed from properties, so new heating & cooking appliances needed All appliances need to be low energy to enable residents to achieve 2,300 kWh/year useage (includes those in leasehold homes)	
New bathrooms (tenants only)	Certain	Potential to remove from main contract if this means contract takes too long	
Works to existing car park	To be discussed	May be required if Energiesprong design requires additional fire escape stair	Energiesprong design by contractor
Alternative refuse strategy	To be discussed	May be required if additional fire escape stair occupies site of current refuse chute. If refuse chutes remain, store for recycling bins still recommended	
Communal electrics improvements	Certain	Further investigation required by services engineer to determine extent of works	
Fire stopping remediation & other items raised by fire risk assessment	Certain	LWNT and design team to agree whether all works carried out under this contract - eg. fire door replacement already underway under separate arrangements	

MAIN ACCESS - PROPOSAL

The access to Treadgold House and to the lift and stair core could be drammatically improved. Several options have been discussed in order to accommodate a second entrance from Bomore Road which would greatly improve the circulation and the safety around the estate. Further investigation is required to assess the structural and economic viability of these options.







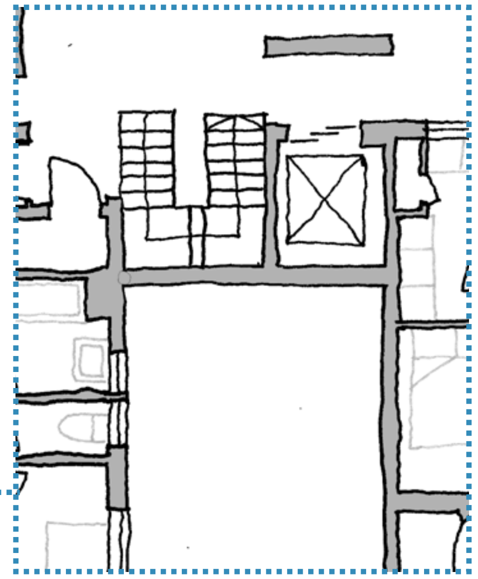
NEW ENTRANCE FROM SOUTH

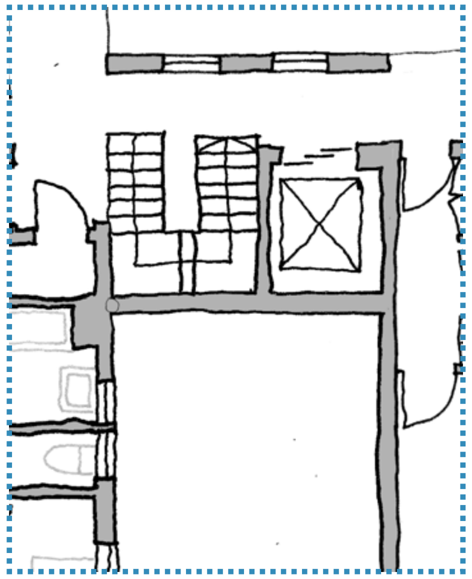
Pros

- Second entrance from Bomore Road
- Lift replaced

Cons

- Partial demolition of the wall enclosing the core
- Bathroom windows overlooking the entrance on the ground floor to be romeved.





MAINTAIN EXISTING ACCESS

Pros

- Minor refurbishment works
- Lift replaced

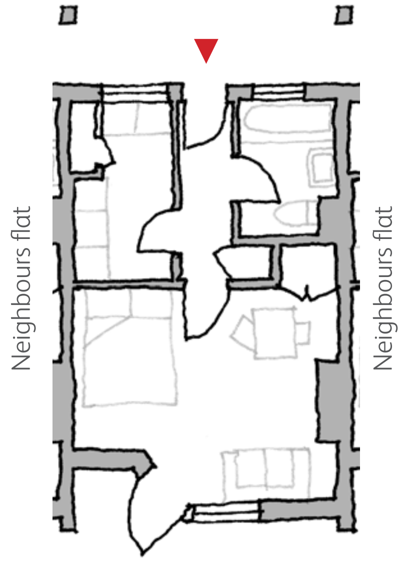
Cons

- Single entrance from the car park as existing
- Entrance difficult to find
- No street presence

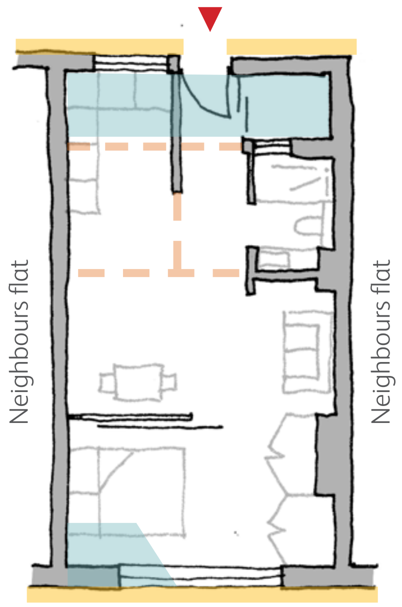
4.12 OTHER WORKS - INTERNAL LAYOUTS

The proposal includes the modernisation of the internal layout of the units, taking into account the residents' top 10 priorities. Additional works aim to increase the storage space inside the units, when it is possible, and update the internal layout to an open plan living space in the studio and one bed flats. Bathrooms and kitchens will be replaced in all tennanted units.

STUDIO FLAT **Internal floor area**	
Existing	**Proposed**
31 sqm	41 smq (EWI option 1) 35 sqm (EWI option 2)



Existing



Proposed

ENERGIESPRONG REQUIREMENTS

- External Wall Insulation
- External windows and front door replacement

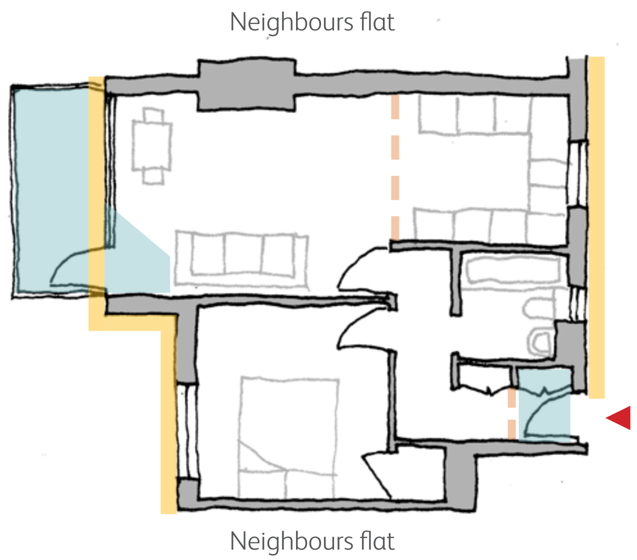
ADDITIONAL WORKS

- Enlarged and new kitchen (depending on EWI option)
- New bathroom
- Additional storage space (depending on EWI option)
- Internal layout aligned with modern lifestyle

1 BED FLAT **Internal floor area**	
Existing	**Proposed**
42 sqm	49 sqm

- ▶ Entrance
- External Wall Insulation
- Demolitions
- Proposed works

Existing



Proposed

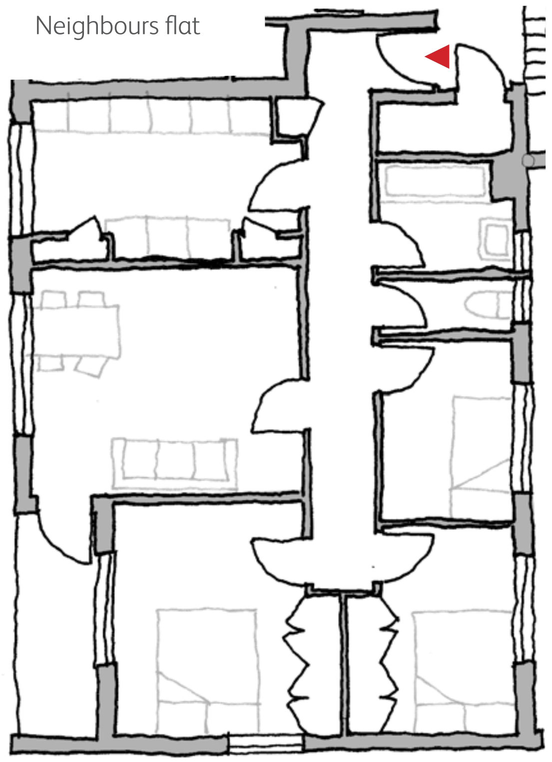
ENERGIESPRONG REQUIREMENTS

- External Wall Insulation
- External windows and front door replacement

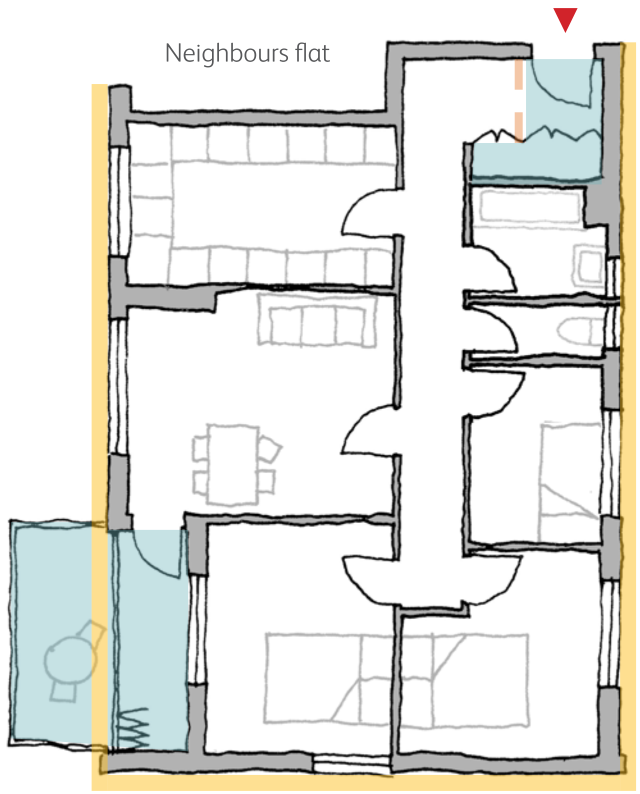
ADDITIONAL WORKS

- New kitchen in an open plan layout
- New bathroom
- Entrance door moved creates additional storage space
- Existing balcony area added to the living area
- Increased outdoor space with new balcony
- Internal layout aligned with modern lifestyle

3 BED FLAT	
Internal floor area	
Existing	**Proposed**
69 sqm	74 sqm



Existing



Proposed

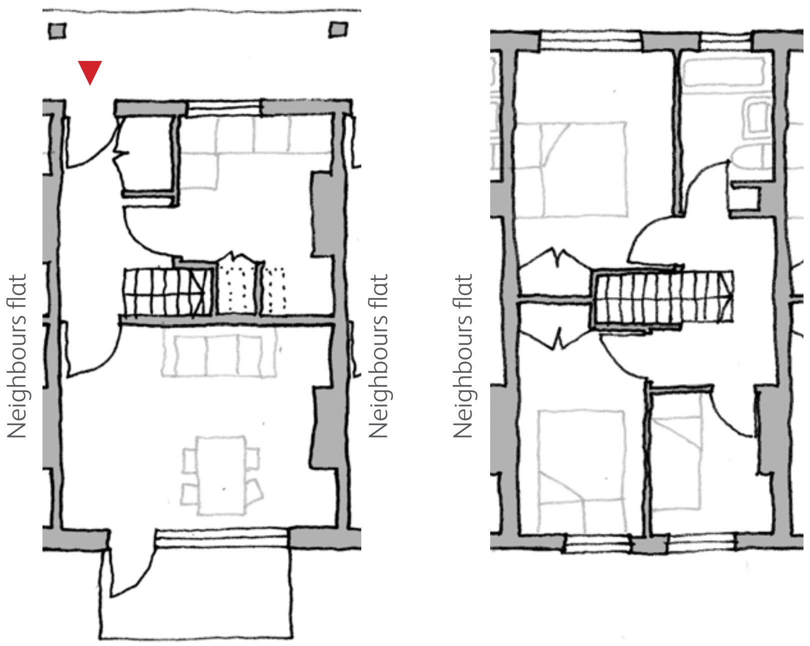
ENERGIESPRONG REQUIREMENTS

- External Wall Insulation
- External windows and front door replacement

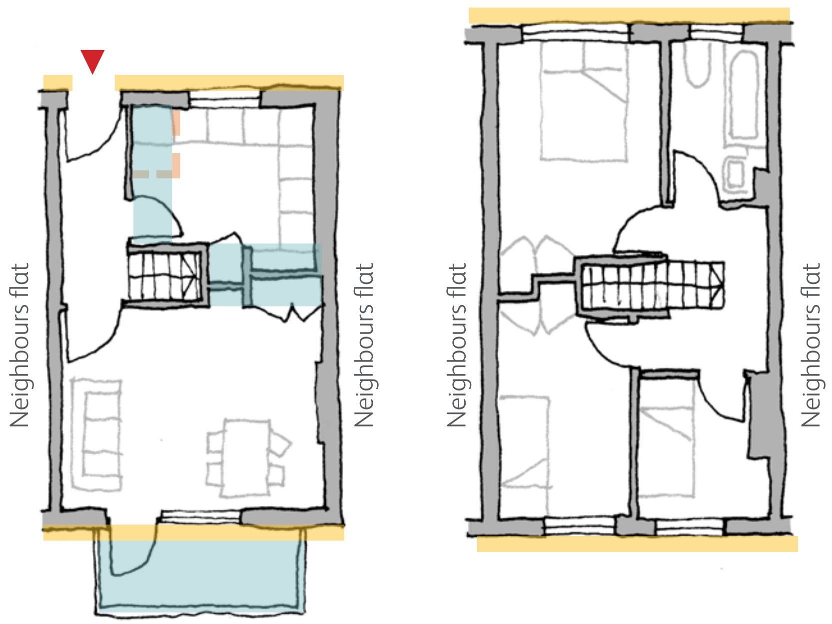
ADDITIONAL WORKS

- New kitchen
- New bathroom
- Entrance door moved creates additional storage space
- Existing balcony to become a winter garden
- Increased outdoor space with new balcony
- Internal layout aligned with modern lifestyle

3 BED MAISONETTE
Internal floor area
74 sqm



Existing



Proposed

ENERGIESPRONG REQUIREMENTS

- External Wall Insulation
- External windows and front door replacement

ADDITIONAL WORKS

- New bigger kitchen
- New bathroom
- Increased outdoor space with new balcony
- Internal layout aligned with modern lifestyle

4.13 SCENARIO 1

Section 4.2 demonstrated two options for the line of new external wall insulation. These have since been explored in more detail and implications are set out in four scenarios.

In scenario 1, the access decks remain open. The thickness of the insulation wrapping the external wall facing the access decks needs to consider the pinch-point in between the columns and the wall.

Building Regulations Part M4(2) requries minimum 1200mm generally with 1050mm minimum at localised obstructions while Building Regulations Part M4(1) requries minimum 900mm generally. This thinner insulation will mean more heat is lost through these walls. Additionally the challenges of insulating the deck and columns may mean the design will not be completely thermal bridge free.

Modelling thus far suggests that it is still possible to meet the Energiesprong standard in spite of this, but more detailed modelling is requried to confirm this. It is assumed in this case that each wing would be separately insulated, leaving the stair and lift core as an enclosed but unheated space.

FIRE SAFETY CONSIDERATIONS

- Flats not required to be sprinklered, as at present
- Decks remain open, allowing natural smoke clearance
- Stair core need to be enclosed
- Access deck narrowed - need to use thinner insulation to retain sufficient width
- The walls need to be fire-rated up to 1100 mm from deck level

ENERGY CONSIDERATIONS

- Insulation to access decks has to be thin to avoid level changes & maintain width, so will be less effective
- Structural columns will be exposed and difficult to insulate
- Potential unresolved thermal bridges
- Flat front doors may need to be replaced to improve airtightness (to be discussed in light of replacement fire doors already installed)

CONSTRUCTION AND ARCHITECTURAL CONSIDERATIONS

- Insulation harder to install so greater risk of imperfections
- Challenge to design appropriate insulating, waterproof floor detail for these deck areas
- Maintains appearance of block similar to existing
- Less change to residents' lives as access to homes is similar to existing
- Access deck width may be reduced but still compliant with Building Regulations Part M4(1) which requires a minimum 900mm width
- Windows on the north elevation, overlooking the plant area are likely to be removed to mitigate the ASHP noise inside the units.

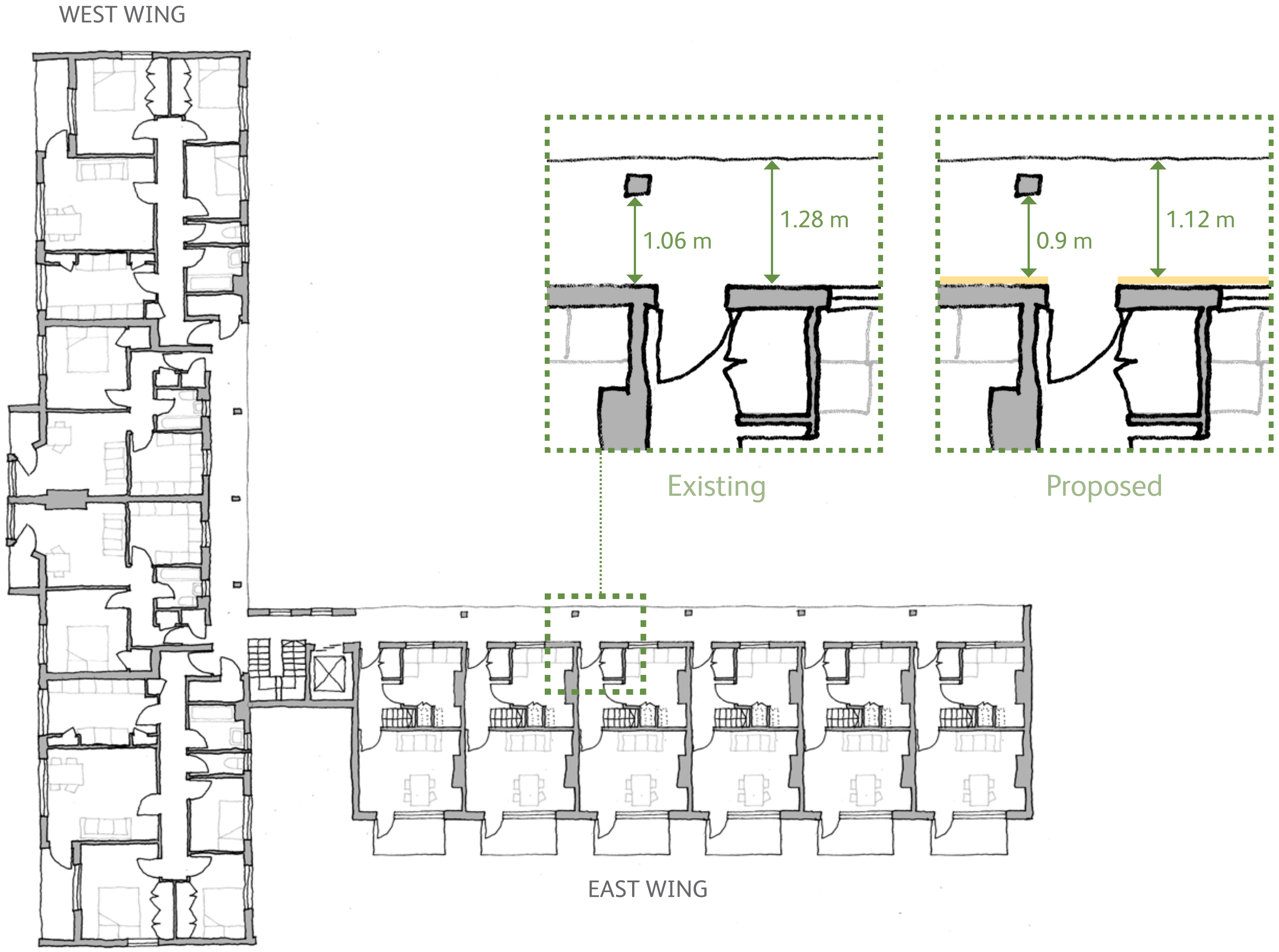


Figure 65 - Existing first floor plan

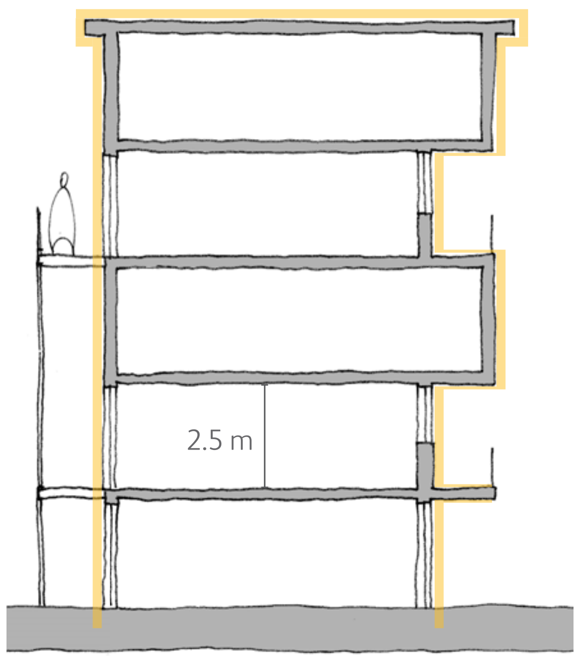
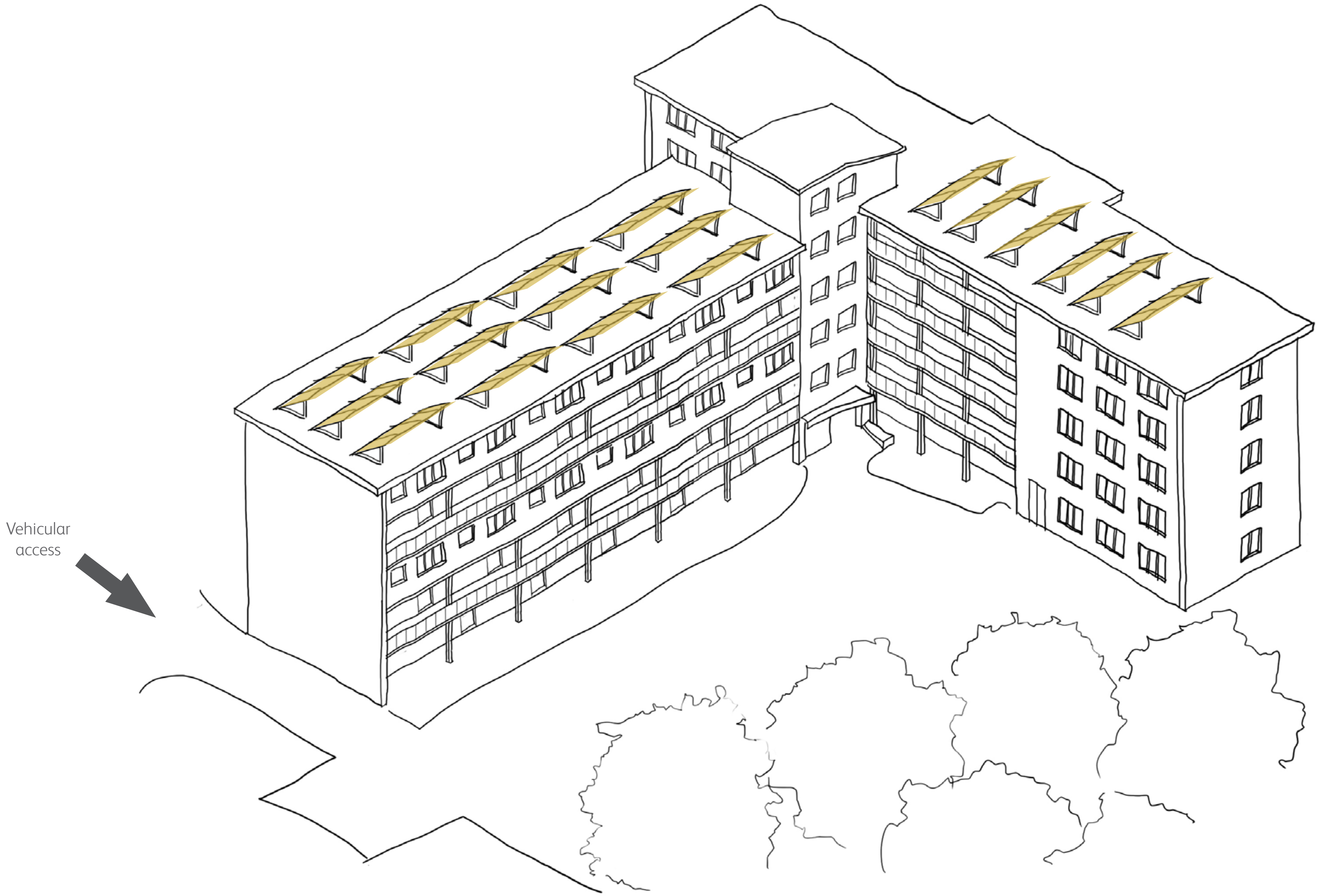


Figure 64 - Insulated but open access decks


Vehicular
access

In scenario 2, the access decks are enclosed creating corridors. Dead end corridors longer than 7.5m are not allowed under part B without additional measures to suppress fire and to clear smoke.

As the east wing travel distance from the furthest flat door to the stairs is 28m, and that on the west wing is 12m further measures are needed. These are mechanical smoke ventilation to the corridors and the installation of sprinklers in all the units. Two smoke shafts will serve the long corridor in the east wing while the west wing corridor could either be naturally or mechanically ventilated.

A simple continuous line of insulation will be easier and quicker to install and lead to less heat loss and avoid any thermal bridging. The use of off-site construction methods is more likely in this scenario. It is assumed in this case that the staircore itself would also become and enclosed space.

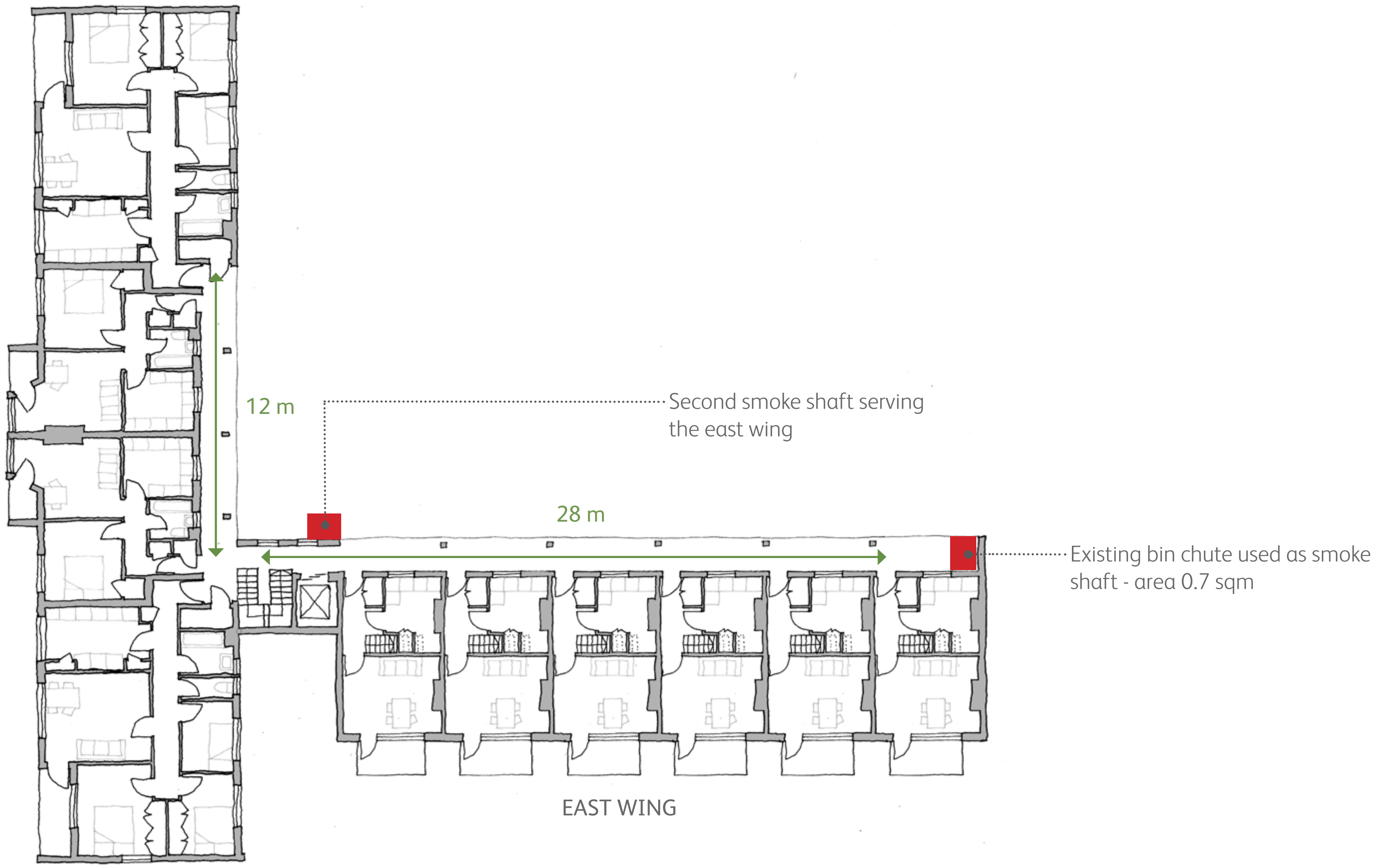


Figure 67 - Existing first floor plan with possible smoke shafts marked

FIRE SAFETY CONSIDERATIONS

- Add sprinklers to flats, including water tank etc
- Construct 2 smoke shafts with mechanical extract system (supply and return) for the east wing corridor. The west wing corridor could be ventilated via a single AOV through the external wall.
- Add secondary power supply (more likely a generator placed on the roof) for the mechanical ventilation.
- Bin chute in the east wing to be used as smoke shaft.
- If an extra extract fan to kitchen is requested, it will be necessary an additional intake to avoid upsetting MVHR air balance, which also needed fire dampers as it passes through the wall between the flat and the corridor.
- Kitchen windows to be fixed and fire rated.

ENERGY CONSIDERATIONS

- Continuous line of airtightness is easier to achieve
- Thermal bridging of floor slabs removed as enclosed on one side and removed on other side
- Building's 'form factor' is reduced

CONSTRUCTION AND ARCHITECTURAL CONSIDERATIONS

- Simple continuous line of insulation is easier & quicker to install
- Opportunity for changes to external appearance (if desired)
- Ground floor studio flats enlarged
- Sprinklers & mechanical extract & AOVs will require maintainance
- Daylighting to kitchens will be reduced sligthly
- Corridor width remains as existing deck width
- New bin stores required
- Challenging integration of the external smoke shaft on the facade design
- Windows on the north elevation, overlooking the plant area are likely to be removed to mitigate the ASHP noise inside the units.

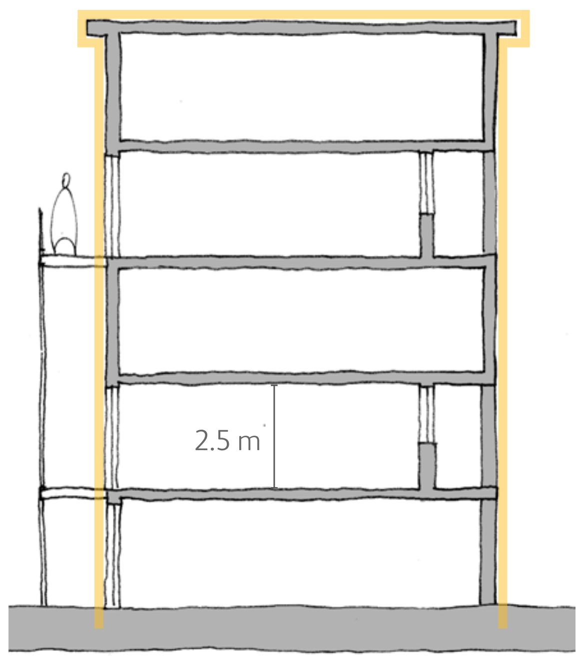
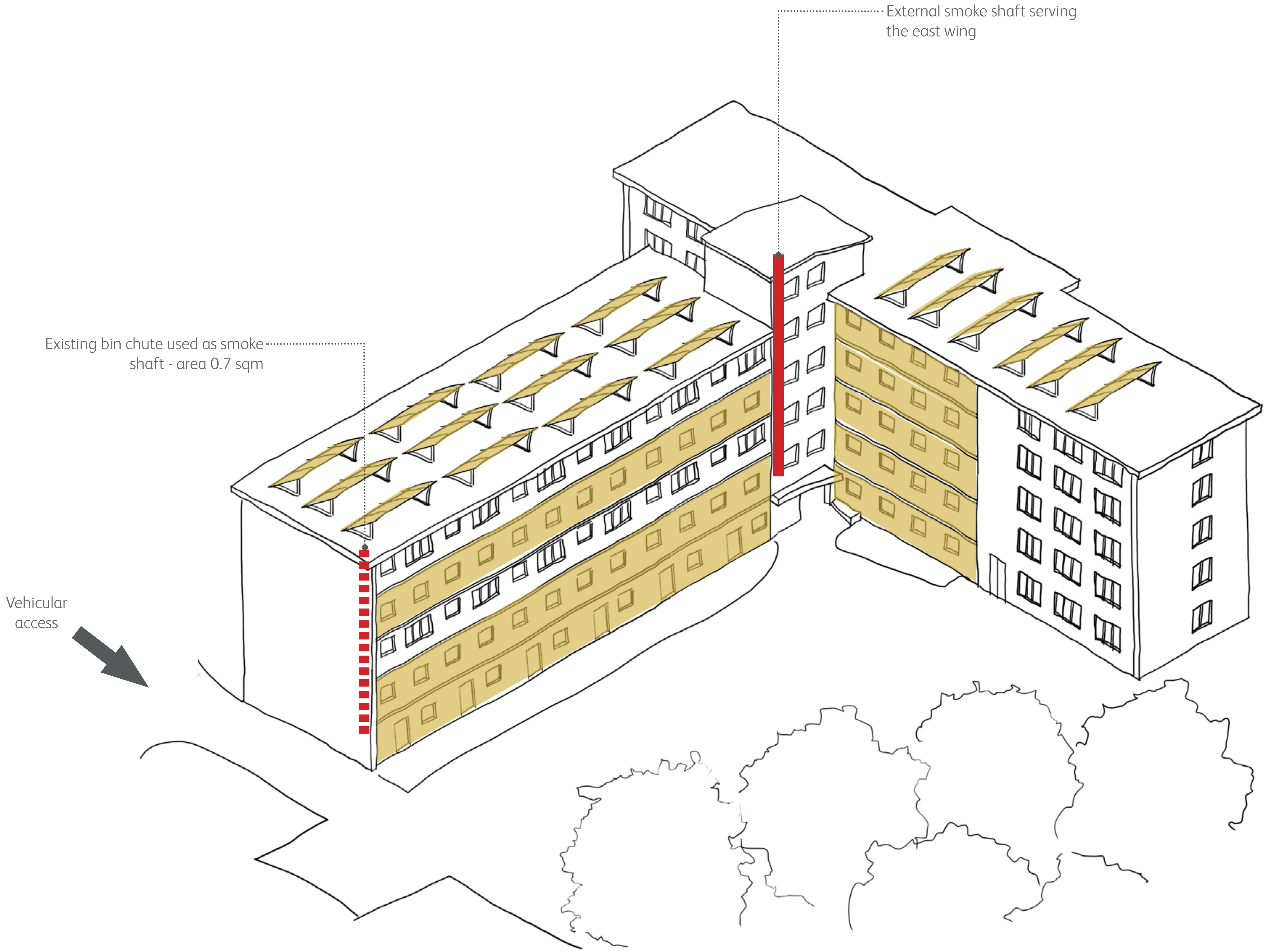


Figure 66 - Access decks enclosed


External smoke shaft serving
the east wing
Existing bin chute used as smoke
shaft - area 0.7 sqm
Vehicular
access

4.13 SCENARIO 3 - A

In scenario 3 - A, the access decks are also enclosed but the flats remain unsprinklered. This requires the construction of 2 stair cases, one serving each wing. This means that all residents have an alternative means of escape, allowing for longer corridors.

A simple continuous line of insulation will be easier and quicker to install and reduce overall heat loss and avoid any thermal bridging. The use of off-site construction methods is more likely in this scenario due to a simpler building form.

FIRE SAFETY CONSIDERATIONS

- Flats remain unsprinklered
- If an extra extract fan to kitchen is requested, it will be necessary an additional intake to avoid upsetting MVHR air balance, which also needed fire dampers as it passed through the wall between the flat and the corridor.
- Add a stair at the end of the east wing corridor; the corridor could be ventilated via AOVs
- Fire brigade access to the car parking is blocked by the additional stair case. Further discussions are required with the fire consultants.

The only difference from the scenario 3-B is the west wing fire strategy:

- Add another stair at the end of west wing corridors (in principle this would make the existing stair redundant) - ventilated via AOV

ENERGY CONSIDERATIONS

- Continuous line of airtightness is easier to achieve
- Thermal bridging of floor slabs removed as enclosed on one side and removed on other side
- Building's 'form factor' is reduced

CONSTRUCTION AND ARCHITECTURAL CONSIDERATIONS

- Simple continuous line of insulation is easier & quicker to install
- Opportunity for changes to external appearance (if desired)
- Ground floor studio flats enlarged
- 2 staircases to be added
- Boundary line and entrance to the car parking to be moved to accomodate new stair
- Potential for new stairs to extend to create better roof access without requiring works to existing roof access.
- New bin stores required
- Windows on the north elevation, overlooking the plant area are likely to be removed to mitigate the ASHP noise inside the units.

Figure 69 - Existing first floor plan with possible new stairs indicated

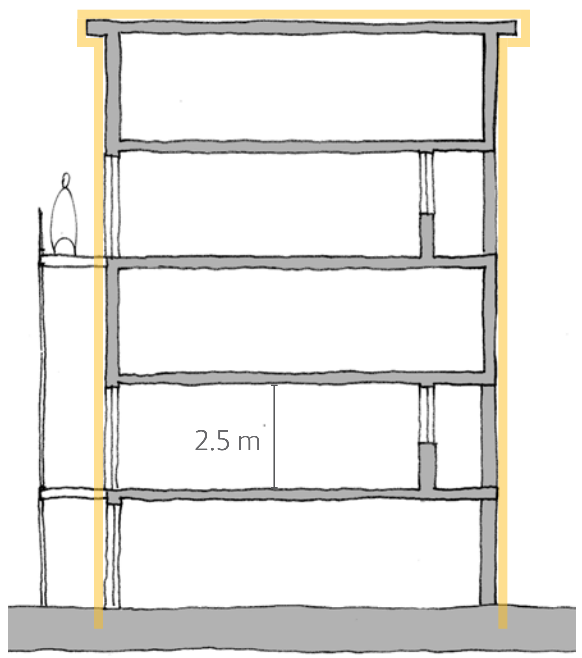
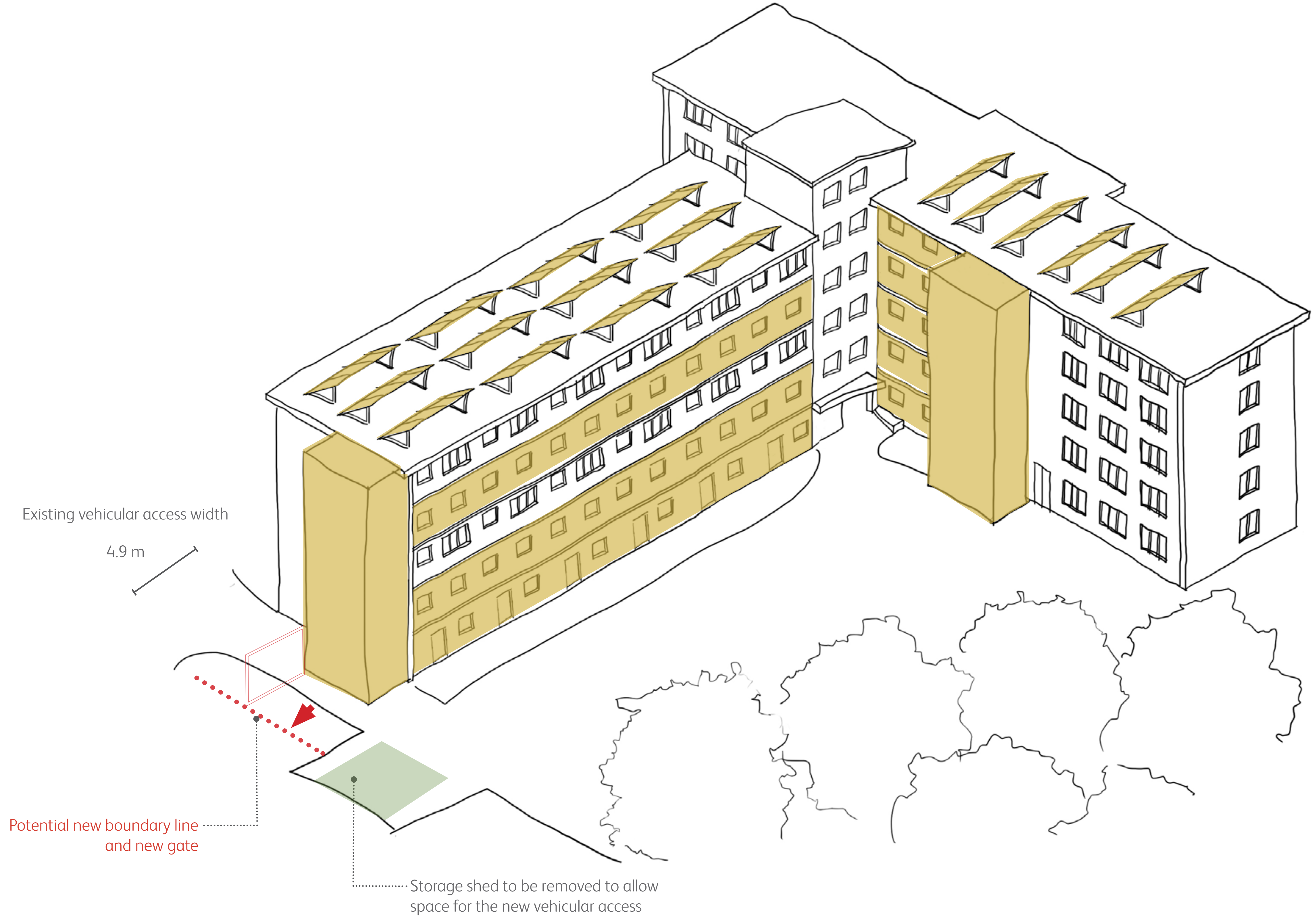


Figure 68 - Access decks enclosed


Existing vehicular access width
4.9 m
Potential new boundary line
and new gate
Storage shed to be removed to allow
space for the new vehicular access

4.13 SCENARIO 3-B

In scenario 3 - B, the access decks are also enclosed but the flats remain unsprinklered. This requires the construction of one stair case serving the west wing and a mechanically ventilated smoke shaft serving the east wing.

A simple continuous line of insulation will be easier and quicker to install and reduce overall heat loss and avoid any thermal bridging. The use of off-site construction methods is more likely in this scenario due to a simpler building form.

FIRE SAFETY CONSIDERATIONS

- Flats remain unsprinklered
- If an extra extract fan to kitchen is requested, it will be necessary an additional intake to avoid upsetting MVHR air balance, which also needed fire dampers as it passed through the wall between the flat and the corridor.
- Add a stair at the end of the east wing corridor; the corridor could be ventilated via AOVs
- Fire brigade access to the car parking is blocked by the additional stair case. Further discussions are required with the fire consultants.

The only difference from the scenario 3-A is the west wing fire strategy:

- Replace the bin chute with a smoke shaft at the end of the west wing (secondary power supply like a generator is required for the mechanical ventilation)

ENERGY CONSIDERATIONS

- Continuous line of airtightness is easier to achieve
- Thermal bridging of floor slabs removed as enclosed on one side and removed on other side
- Building's 'form factor' is reduced

CONSTRUCTION AND ARCHITECTURAL CONSIDERATIONS

- Simple continuous line of insulation is easier & quicker to install
- Opportunity for changes to external appearance (if desired)
- Ground floor studio flats enlarged
- 2 staircases to be added
- Mechanical extract and generator will require maintainance
- Boundary line and entrance to the car parking to be moved to accomodate new stair
- Potential for new stairs to extend to create better roof access without requiring works to existing roof access.
- New bin stores required
- Windows on the north elevation, overlooking the plant area are likely to be removed to mitigate the ASHP noise inside the units.

Figure 71 - Existing first floor plan with possible new stairs indicated

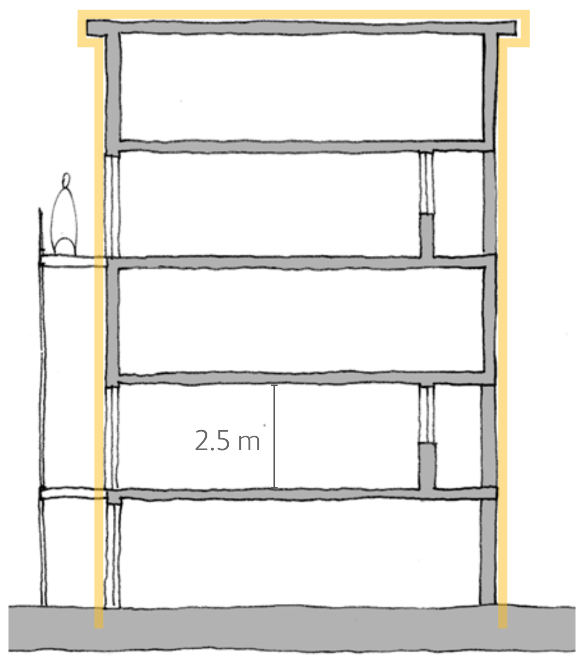
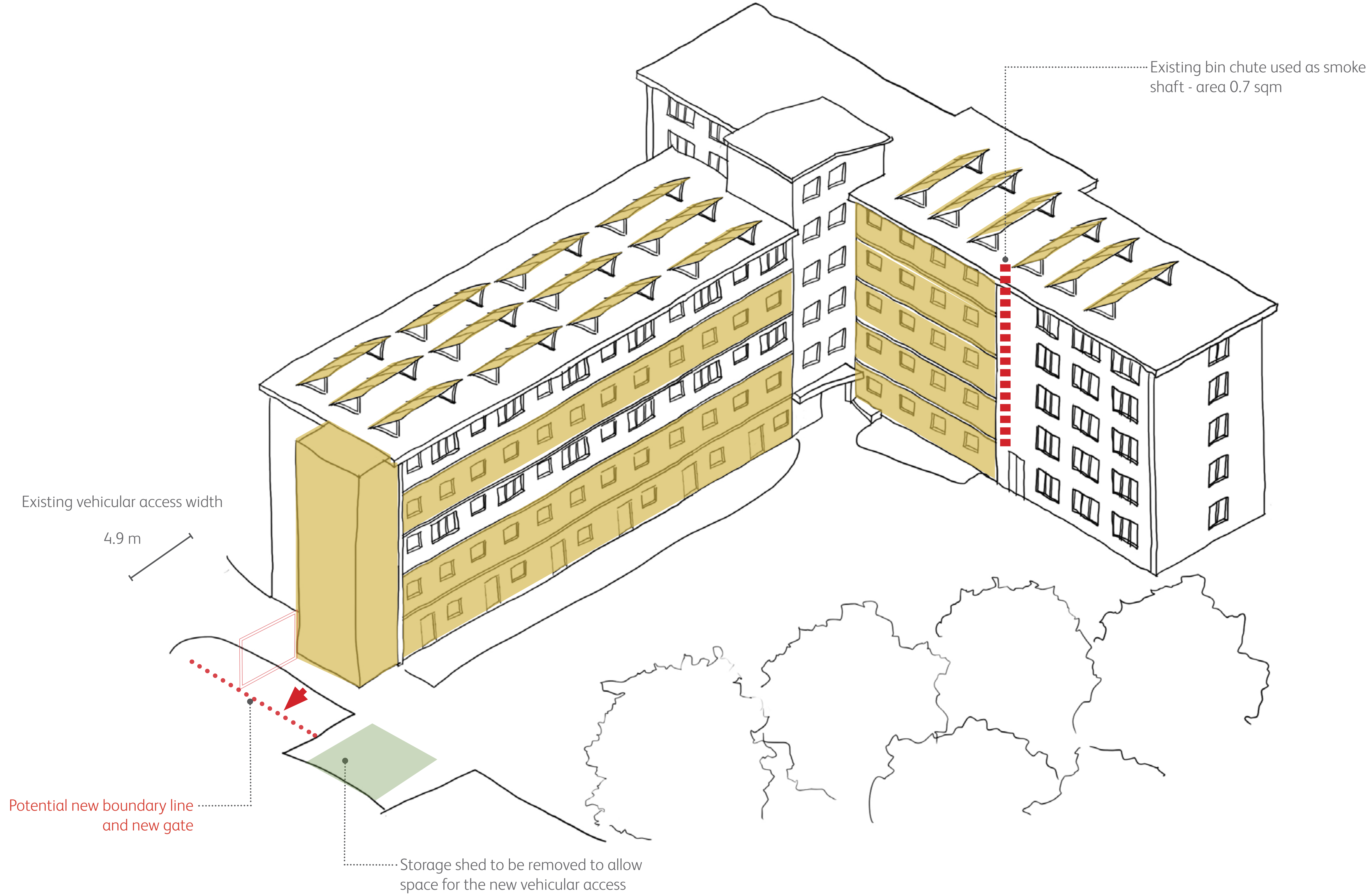
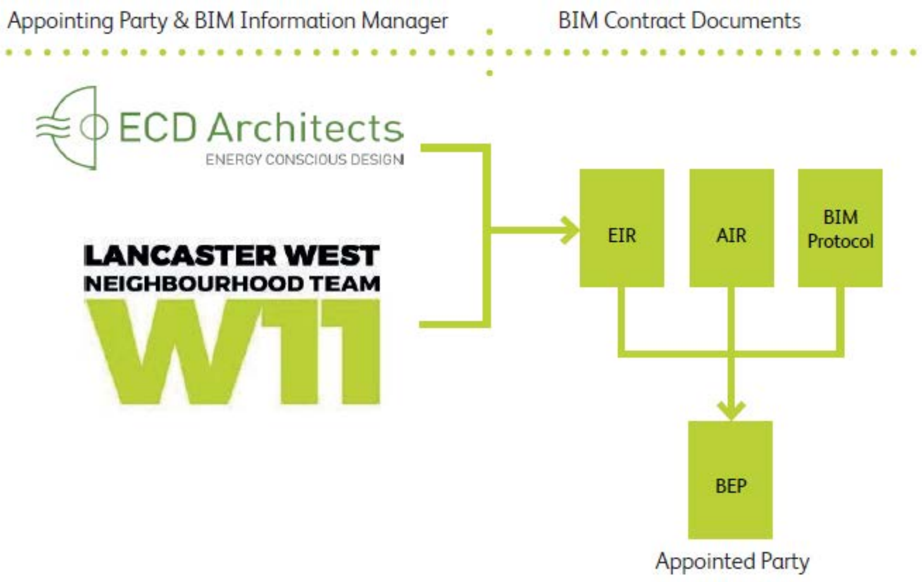


Figure 70 - Access decks enclosed


Existing bin chute used as smoke shaft - area 0.7 sqm
Existing vehicular access width
4.9 m
Potential new boundary line and new gate
Storage shed to be removed to allow space for the new vehicular access

In order to maintain a robust approach to data management and BIM information quality in line with industry standards the design team and wider consultant and contractor teams will work in a collaborative BIM environment. Details of this will be developed as the Employer's Information Requirements and Asset Information Requirements are defined with LWNT.



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

1. Smart Asset Managment

2. Iterative Whole Life Carbon Design Optimization

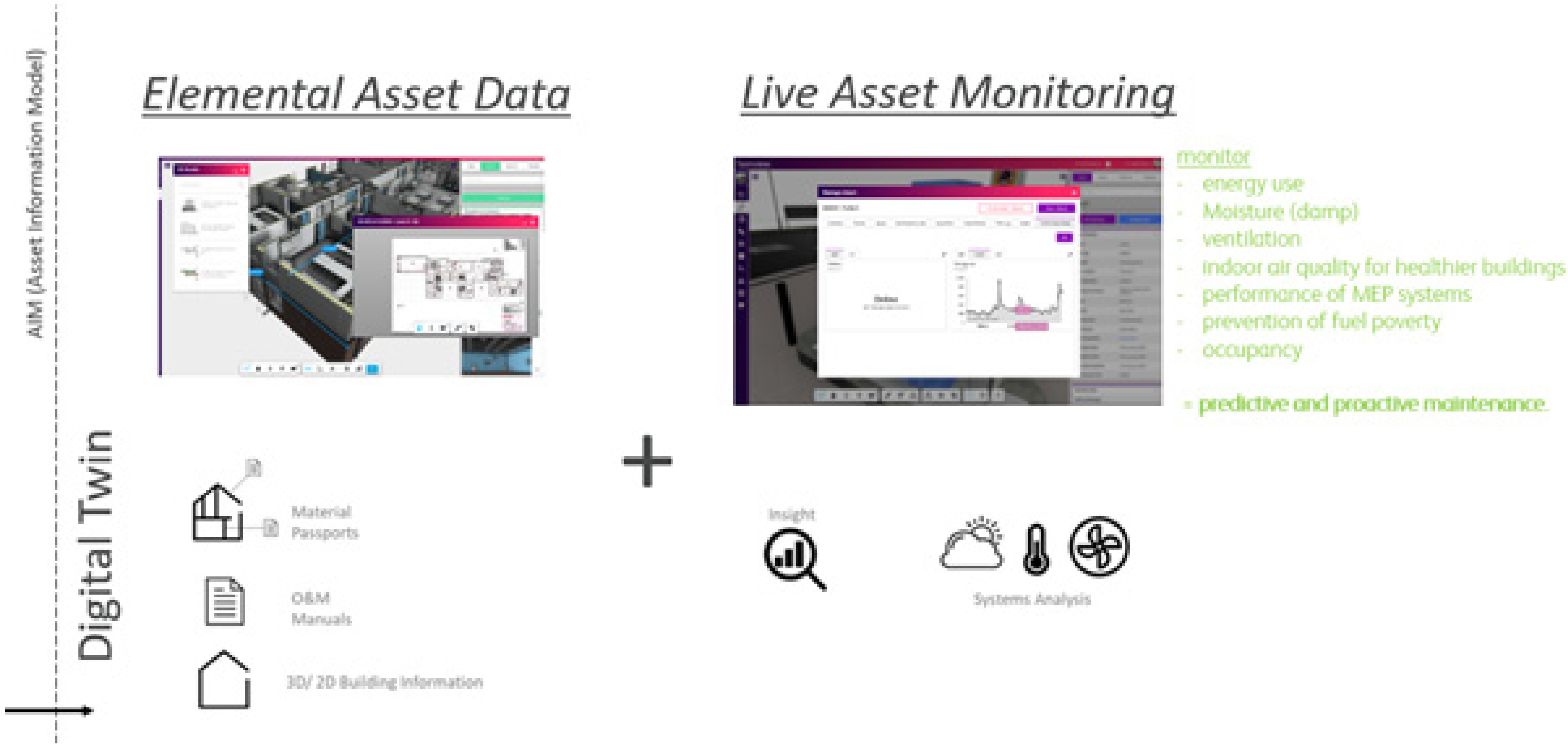
3. Visualization/ Resident Engagement

1. SMART ASSET MANAGEMENT

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 the client's sustainability agenda for a zero carbon estate this data based approach could provide the backbone for contributing to a Circular Economy. The accurate 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 so that they are repaired, reused or recycled, minimizing waste. This can be supported by active monitoring to give advanced insight for predictive maintenance.



Digital Twin

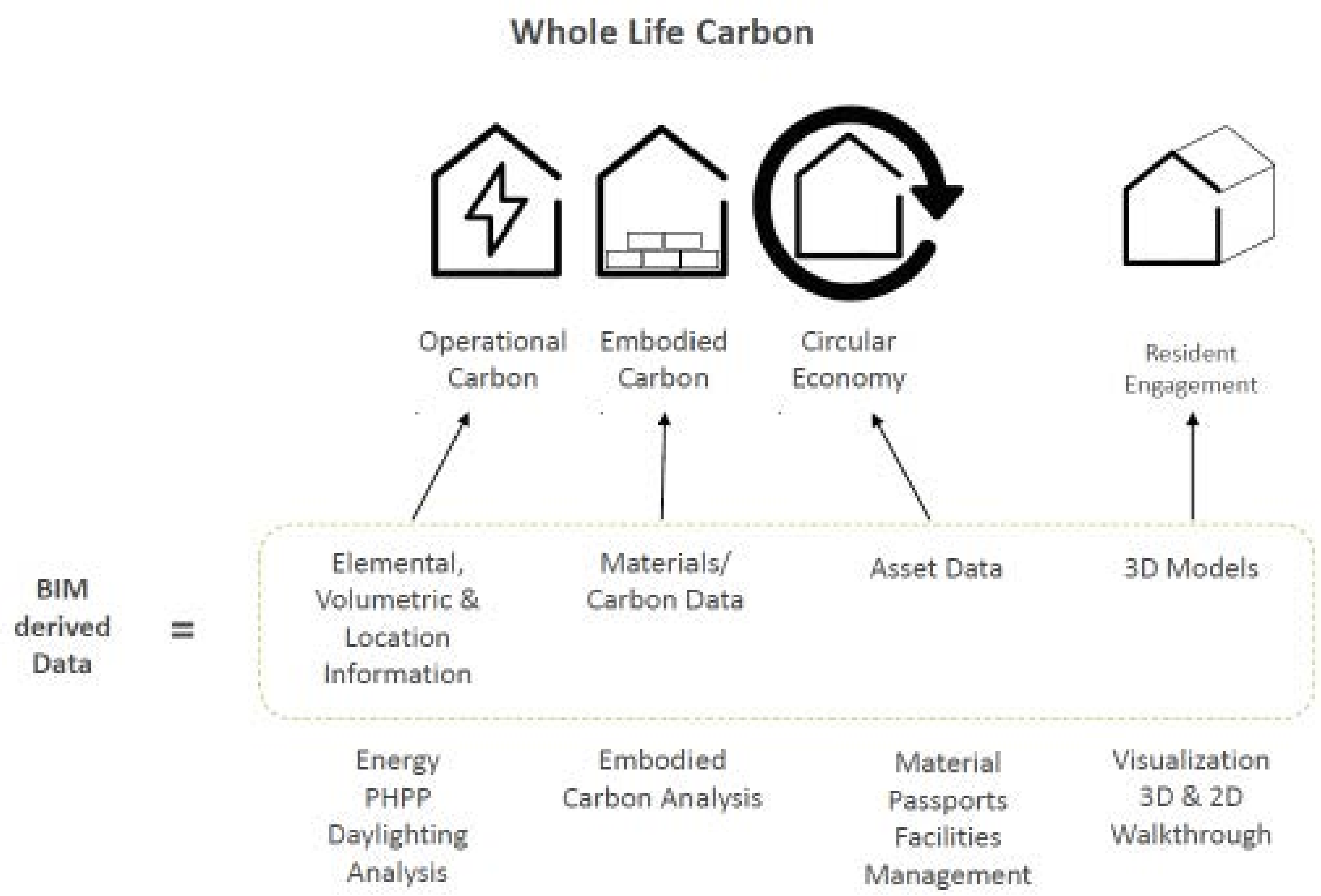
2. ITERATIVE WHOLE LIFE CARBON DESIGN OPTIMIZATION

A robust and accurate BIM design model with both geometric information and elemental data could prove particularly useful 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, appraising construction systems can help reduce core contributers. ECD have carried out high-level analysis of embodied carbon in the low energy refurbishment of a single house carried out elsewhere on the estate, using BIM software to simplify this process. Similar methods could be employed at Treadgold House to identify materials that are adding significantly to the refurbishment's embodied carbon and allow this to feed into the decision making process. This could help to meet one of Energisprong's additional requirements to '*select materials and designs that reduce the embodied energy of the solution*'

In respect of operational carbon/energy use reduction linked plug-ins between the Passivhaus Planning Package (PHPP) and BIM software could provide more accurate volumetric and geolocation data for analysis.

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



3. VISUALIZATION/ RESIDENT ENGAGEMENT

A 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 walkthroughs and design visualisations to illustrate design proposals to residents as the co-design collaboration evolves.

step by step engagement

Digital Vizualization

4.15 MONITORING & COMFORT PLAN

An essential part of the Energiesprong idea is that residents can see how much energy they are using, so that they know whether they are exceeding the comfort plan. It is also crucial that the building is monitored so that the success of the retrofit can be confirmed. Ensuring the building performs as designed means that it will be possible and reasonable for residents to use only the small amounts of energy covered by the comfort plan.

Current Energy Use

The first step is to establish energy use in the existing building. This allows more accurate modelling of the buildings and hence of what is necessary to achieve net zero carbon. It also ensures that the comfort plan will be set at a level that does not leave residents paying more than they currently do.

So far 24 homes have had their heat losses measured by Build Test Solutions. Over a 3 week period internal temperatures were monitored, and meters were read at the start and end of this period. This allows comparison of energy put into the home against the temperature achieved, so that heat losses can be calculated. Results of these measurements will be received shortly.

Additionally 9 of the residents have agreed to share heating bills with LWNT so that a picture of historic energy use and costs to residents can be built up. LWNT are hoping to add more households' bills to this over time.

Finally airtightness testing will be carried out using a Pulse testing machine. By emitting a quick pulse of high pressure air this machine can establish the current airtightness of the home. This will feed into the Passivhaus Planning Package model of the existing homes, as well as helping to establish the extent of measures needed to ensure future airtightness.

Testing of Building at Completion

At completion of the works the building will need to be tested to ensure it performs as designed. This will allow any necessary remediation works and ensure commissioning has been carried out correctly. This final testing must be included as part of the contractual requirements.

Ongoing Monitoring

The Mustbe0 funding requires that the homes provide resident real-time feedback covering a number of areas as a minimum.

These are

- Net energy consumption
- Energy generation
- Space heating
- Hot water
- Electricity 'allowance' use
- Energy used for services

In order to achieve this level of monitoring sensors and / or sub-metering of electrical circuits will need to be fitted around the home, feeding back to a unit or app that provides residents with this information. Setting up such a system will be part of the mechanical and electrical design solution. The tender will need to include any specific requirements that LWNT have for this monitoring that go beyond that required by Energiesprong. LWNT will also need to be clear to tenderers how information needs to be gathered centrally to allow billing of residents and to ensure coordination with Notting Dale Heat Network.

Figure 72 - Airtightness testing using a pulse machine

Co-design by residents is an essential part of LWNT's process for the retrofit of the estate, as has been evidenced by the engagement events that have already happened. The Mustbe0 funding also requires that residents are engaged in the process and understand the work being done to their homes. LWNT will provide a record of resident engagement prior to March 2021, and ECD will add to this as events progress, for submission to the Mustbe0 team.

The vote on the use of external wall insulation at Treadgold House has allowed LWNT to go ahead with the Mustbe0 retrofit of the building. The engagement carried out by Bowtiesrpong and LWNT to achieve this now needs to be built on to ensure that residents understand the process and the designs being proposed.

Bowtiesprong have since been working with part of their original design team, Mauer, to develop the external wall insulation system that they proposed in their competition entry. A sample of this has been delivered to LWNT and will soon be available for residents to view in the Baseline reception. LWNT, Bowtie and ECD will work together to ensure residents are aware of this and of the status of it - that it is a possible way of insulating their building, but not the only way. It is hoped that this will give residents a better understanding of how the insulation will change their building and give them confidence in this.

ECD will be holding a workshop in July 2021 to discuss the further ideas and understanding of the building. Aims of this workshop are likely to be

- Present options and ideas developed in this report and during Stage 3 design.
- Ensure residents understand ECD's involvement and that the Solution Provider will create the final design.
- Work with residents to establish any parameters that must go into the performance specification for the tender, such as constraints on external finishes etc.
- Discuss the Comfort Plan and how this will compare to current bills.

Clear and advanced advertising of the event will aim to maximise resident involvement. Attendees will be recorded so that those who are not involved can be contacted by other means to ensure they can be part of this discussion. It is intended that the outcomes of this workshop be fed back to residents, possibly in a further meeting, as well as informing the tender documentation.

After the workshop we intend to organise ongoing opportunities for residents to inform the design process: through sharing a dedicated email address for correspondence; placing a physical box in the vicinity for written comments and consultation. We will also continue our use of the LWNT Instagram to keep residents informed and spark discussion.

Figure 73 - ECD & LWNT online workshop for Verity Close

Figure 74 - ECD & LWNT 'pop-up' event at Talbot Grove House

The Mustbe0 funding requires that a detailed resident enegagement plan is set up and followed. (See '*National Net Zero Retrofit Accelerator - Resident Engagement plan Template, February 2021*') Along with monitoring of the homes before works begin, one to one meetings with residents will be arranged to explain the planned retrofit, as well as asking them about their current experience of their homes. The Solution Provider will have their own resident liaison officer who will continue this work during the contract, in conjunction with LWNT.

Residents will form part of the panel assessing the tender returns from potential contractors. This involvement will be made clear to tenderers, and if necessary the design team will seek to answer questions from the residents involved to ensure they have a full understanding of the Energiesprong aims and tender process.

The tender documents will require the contractor to continue talking to residents. This will need to cover aspects of the final design and how resident needs are being met; informing residents of the programme of works; working with residents to mininise disruption and with LWNT to find respite for residents at the most disruptive times. This will be in line with LWNT's 'Respite Facilities' booklet. Finally the contractor will need to provide a full hand-over to residents, ensuring that they understand the changes to their homes and how to operate heating and ventilation and how the Comfort Plan works.

PROCUREMENT OBJECTIVES

RBKC have provided Keegans with an outline business case for The Treadgold project. Keegans will complement their business case by producing a detailed procurement report justifying, explaining and recommending the various options available to RBKC on the various routes of procurement and how it best fits with RBKC's business.

Various factors, relating to the strategic fit of the project within RBKC's business and financial structure, will underpin the project. These include but are not limited to:

- Funding: both the total funds at the client's disposal for the project, and the availability or readiness of these funds as the project progresses, about contractual obligations to make payments
- Time: the required completion date, any important interim milestones when certain stages must be achieved, and any flexibility between the desired completion date and the absolute last delivery date
- Energiesprong Performance: the required functional performance of the final product and any indications of standards of quality
- Capital versus operational costs: whether a balance is to be struck between capital and running costs or whether initial capital cost is the primary factor
- Risk: the likely impact to the client organisation of risks inherent in the project processes associated with time, cost and function; and
- The nature of the project in this case retrofit may influence the procurement strategy. For example, the whole costs and performance guarantees associated with Energiesprong will require different considerations to a standard retrofit project.

Some of these factors may be in tension dependent upon the extent of their weighting: greater emphasis on speed or on the certainty of a completion date may influence project cost and may affect design development; emphasis on cost certainty or price level may have an impact on speed to completion or design quality; while an emphasis on project performance may affect both cost and project pace.

PROCUREMENT ROUTES

It is recommended, firstly, that all the factors influencing this project are identified and the project requirements analysed. The final procurement route for the design and construction of the Treadgold project can then be developed.

It is likely that there will be more than one route that can be adopted to achieve the aims of the client and the requirements of the project. It is advisable carefully to consider each option, as each will address the various influencing factors to a different extent.

Common routes can differ from each other in relation to:

- the client's exposure to financial uncertainty
- the degree of control that the client has over the design and construction processes
- the extent of design information at the time of tender
- the information required at the time that construction work can commence
- the extent of involvement by the contractor and the supply chain in the design stage, when these parties may be able to contribute to the design and planning of the project
- the organisational arrangements that distribute risk, responsibility and accountability; and
- the sequential character of the process.

SOFT MARKET TESTING

Keegans have commenced their SMT process in order to help establish the real-time interest in the market place for tendering this project. This process was driven by requesting contractors within the various frameworks to complete our questionnaire.

FRAMEWORK AGREEMENTS

As part of the SMT we have approached various Framework Providers to engage with them on the suitability of their Agreements.

Framework agreements puts in place the process to enable employers and contractors to enter into the individual contracts for the carrying out of the required works. They are often used to procure the construction of a new asset. Framework Agreements can be used to procure multiple projects or could be used on a single project basis where engendering a collaborative approach is desired.

It offers the provision of dealing with organisational structures and decision making, collaborative working, the supplier's supply chain, the sharing of information and know-how, early warning, performance indicators and a team approach to problem solving. Where a series of projects is procured on a framework basis, JCT and NEC3 contracts can be used.

We considered the following Framework Agreements:

- London Construction Programme Major Works FA
- Fusion 21 Retrofit Framework - Lot 1 Total Retrofit
- South East Consortium FA – Lot 1 Major Refurbishments
- Retrofit Accelerator Homes Innovation Partnership
- Pagabo - Refit and Refurbishment framework
- London Construction Programme Framework - LCP Major Works Framework

All of these are OJEU (Official Journal of the European Union) compliant, which is necessary as the project exceeds the OJEU cost threshold and by extension The Public Contracts Regulations 2015.

SUMMARY

Keegans will present an initial business case with an appended Procurement Report at Stage 1 and will develop the options during stage 2 and 3 of the project, we will continue to engage with Contractors and Framework Providers throughout the development of the project.

triple glazed windows (see window section). Where front doors have already been replaced with fire doors these are to remain and must retain guarantee. Where doors are still to be replaced, replace with new, insulated FD60 doors in line with RBKC fire door replacement programme.

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5.0 CONCLUSIONS

5.1 Conclusions

5.1 CONCLUSIONS

This report demonstrates that Treadgold House can be refurbished to meet the Energiesprong standard, offering warm, comfortable homes to residents, along with predictable energy bills. Further investigations are required, and there are many decisions still to be made. The following stages of work will set out the information needed to enable the design team, LWNT and residents to take these decisions. This will lead to a set of tender documents that require the selected solution provider to meet the Energiesprong requirements, while also meeting residents' aspirations.

While the interventions discussed in this report have largely been described in terms of technical detail, their potential impact on the lives of residents is far from abstract. Going forwards with this project has the potential to shape their quality of life in profound and lasting ways.

Improvements to ventilation promise to refresh and cleanse indoor spaces, contributing to the physical health of residents and mitigating against the stress caused by living in environments marred by damp and mould. The addition of external insulation will play a part in creating spaces that feel cosy and comfortable. As well as bringing about immediate comfort benefits, the Energisprong Comfort Plan will ensure residents can afford to have warm homes and lead to predictable billing, alleviatng the pressures that cause fuel poverty. The installation of brand new windows along with a new external finish to the building will refresh the building, marking places and those who dwell in them as cared for and valued. The aesthetic changes that some interventions entail – whether the addition of external wall insulation or the re-design of the entrance – are opportunities to enhance the appearance of the site, adding beauty and uplifting those who live at Treadgold House or pass by it. Ultimately, by taking seriously the energy efficiency of each home we work towards a future in which the welfare and livelihood of future generations is protected.

In these ways and more, the technical interventions discussed in this report have the potential to enrich the lives and well-being of those who live on the Lancaster West Estate for a long time to come.


25 BOMORE
ROAD

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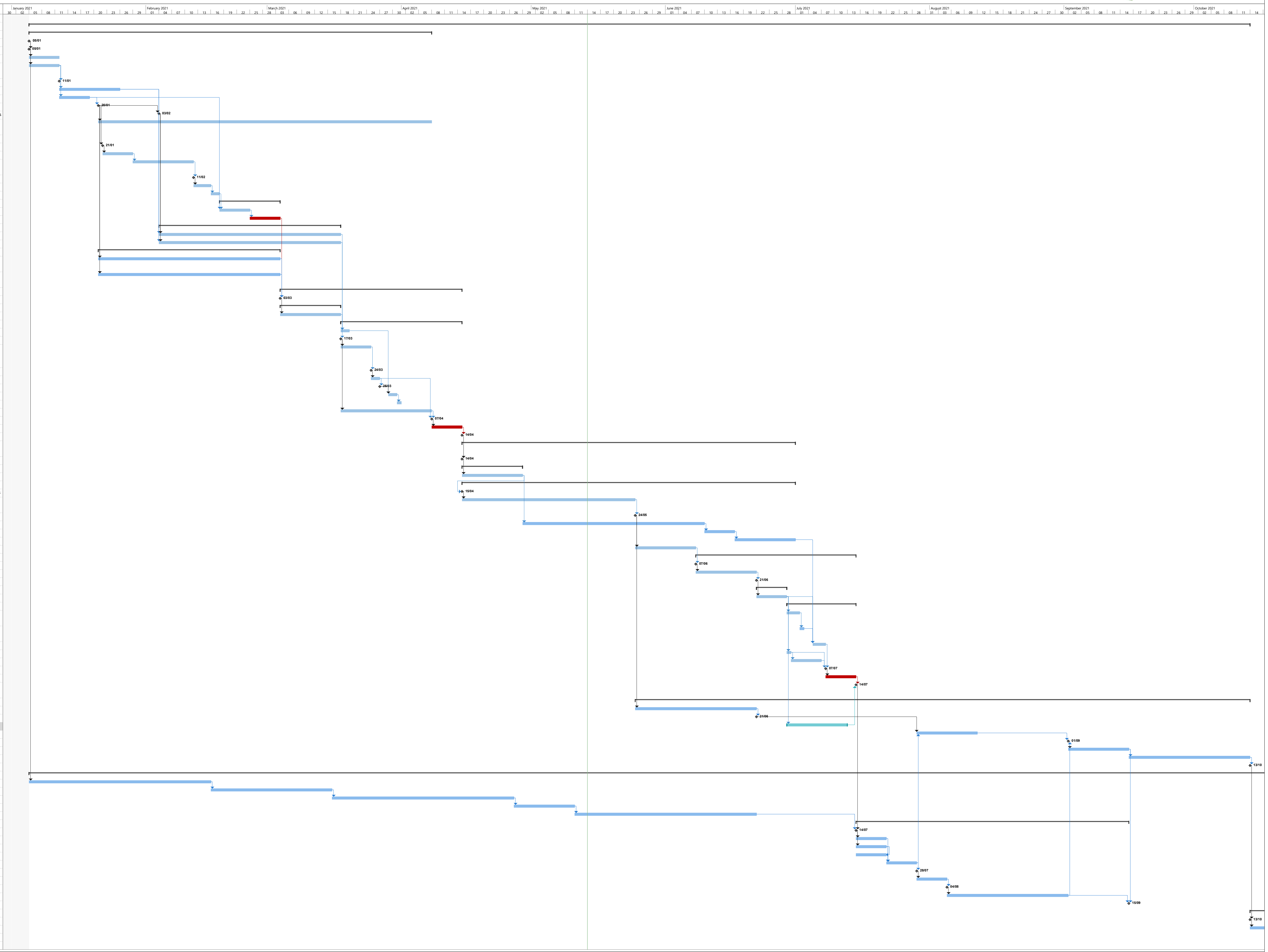
6.0 APPENDICES

THE ROYAL BOROUGH OF KENSINGTON AND CHELSEA

Royal Borough of Kensington & Chelsea
Lancaster West Estate
Treadgold House (Lot 4)

ECD Architects ENERGY CONSCIOUS DESIGN

ID	Task Name	Duration	Start	Finish	Predecessors
1					
2	**Lancaster West - Treadgold House**	**202 days**	**Tue 05/01/21**	**Wed 13/10/21**	
3	**RIBA Stage 0**	**67 days**	**Tue 05/01/21**	**Wed 07/04/21**	
4	Project inception	0 days	Tue 05/01/21	Tue 05/01/21	
5	Appointment Meeting	0 days	Tue 05/01/21	Tue 05/01/21	4
6	Programme review	5 days	Tue 05/01/21	Mon 11/01/21	5
7	Review any additional information supplied by RBKC	5 days	Tue 05/01/21	Mon 11/01/21	5
8	Obtain OS Maps if required	0 days	Mon 11/01/21	Mon 11/01/21	7
9	Obtain quotes for Surveys	10 days	Tue 12/01/21	Mon 25/01/21	7
10	Concept Review	5 days	Tue 12/01/21	Mon 18/01/21	7
11	Project Meeting	0 days	Wed 20/01/21	Wed 20/01/21	10FS+2 days
12	Instruct surveys	0 days	Wed 03/02/21	Wed 03/02/21	11FS+10 days
13	Agree stakeholder consultation strategy	55 days	Thu 21/01/21	Wed 07/04/21	11
14					
15	Site visit	0 days	Thu 21/01/21	Thu 21/01/21	11FS+1 day
16	Prepare site constraints information	5 days	Fri 22/01/21	Thu 28/01/21	15
17	Compile site information and identify opportunities	10 days	Fri 29/01/21	Thu 11/02/21	16
18	Refine Project Programme	0 days	Thu 11/02/21	Thu 11/02/21	17
19	Prepare Project Execution Plan	2 days	Fri 12/02/21	Mon 15/02/21	18
20	Prepare Project Risk Register	2 days	Tue 16/02/21	Wed 17/02/21	19
21	**Prepare Outline Studies**	**10 days**	**Thu 18/02/21**	**Wed 03/03/21**	
22	Retrofit Benchmarking	5 days	Thu 18/02/21	Wed 24/02/21	10,20
23	Client Approval Process	5 days	Thu 25/02/21	Wed 03/03/21	22
24	**Surveys**	**30 days**	**Thu 04/02/21**	**Wed 17/03/21**	
25	Topographical surveys	30 days	Thu 04/02/21	Wed 17/03/21	9,12
26	Measured building surveys	30 days	Thu 04/02/21	Wed 17/03/21	9,12
27	**Funding**	**30 days**	**Thu 21/01/21**	**Wed 03/03/21**	
28	Review Energiesprong funding requirements	30 days	Thu 21/01/21	Wed 03/03/21	11
29	Incorporate Energiesprong specification requirements	30 days	Thu 21/01/21	Wed 03/03/21	11
30	**RIBA Stage 1**	**30 days**	**Wed 03/03/21**	**Wed 14/04/21**	
31	Receive updated Stage 1 brief	0 days	Wed 03/03/21	Wed 03/03/21	23,28,29
32	**Prepare design options**	**10 days**	**Thu 04/03/21**	**Wed 17/03/21**	
33	Prepare Design Options	10 days	Thu 04/03/21	Wed 17/03/21	31
34	**Interim Design Review Process**	**20 days**	**Wed 17/03/21**	**Wed 14/04/21**	
35	Review Survey information	2 days	Thu 18/03/21	Fri 19/03/21	25,26
36	Project Meeting	0 days	Wed 17/03/21	Wed 17/03/21	33
37	Incorporate client feedback, funding results and refine design proposals	5 days	Thu 18/03/21	Wed 24/03/21	36
38	Client review Meeting	0 days	Wed 24/03/21	Wed 24/03/21	37
39	Finalise feasibility reports	2 days	Thu 25/03/21	Fri 26/03/21	38
40	Stakeholder review meeting	0 days	Fri 26/03/21	Fri 26/03/21	39
41	Incorporate recommendations	2 days	Mon 29/03/21	Tue 30/03/21	40,35
42	Update Risk Register	1 day	Wed 31/03/21	Wed 31/03/21	41
43	Prepare Feasibility Cost Plan	3 wks	Thu 18/03/21	Wed 07/04/21	36
44	Submit RIBA 1 Feasibility	0 days	Wed 07/04/21	Wed 07/04/21	43,39
45	Client approval process	5 days	Thu 08/04/21	Wed 14/04/21	44
46	Client sign off RIBA Stage 1	0 days	Wed 14/04/21	Wed 14/04/21	45
47	**RIBA Stage 2 - Based upon preferred Option**	**55 days**	**Wed 14/04/21**	**Wed 30/06/21**	
48	Receive instruction to proceed	0 days	Wed 14/04/21	Wed 14/04/21	46
49	**Prepare Stage 2 Design Proposals**	**10 days**	**Thu 15/04/21**	**Wed 28/04/21**	
50	Stage 02 Design Proposals	10 days	Thu 15/04/21	Wed 28/04/21	48
51	**Interim Design Review Process**	**55 days**	**Thu 15/04/21**	**Wed 30/06/21**	
52	Interim Meeting	0 days	Thu 15/04/21	Thu 15/04/21	50FS-10 days
53	Incorporate client feedback and refine design proposals	28 days	Thu 15/04/21	Mon 24/05/21	52
54	Pre-application meeting 01 with RBKC pla	0 days	Mon 24/05/21	Mon 24/05/21	53
55	Procure Opening up Works	6 wks	Thu 29/04/21	Wed 09/06/21	50
56	Undertake opening up Works	5 days	Thu 10/06/21	Wed 16/06/21	55
57	Reports from Opening Up Works	10 days	Thu 17/06/21	Wed 30/06/21	56
58	Incorporate recommendations	10 days	Tue 25/05/21	Mon 07/06/21	54
59	**RIBA Stage 3**	**27 days**	**Mon 07/06/21**	**Wed 14/07/21**	
60	Receive instruction to proceed	0 days	Mon 07/06/21	Mon 07/06/21	58
61	Prepare consultation materials	10 days	Tue 08/06/21	Mon 21/06/21	60
62	Client Meeting to sign-off on consultation m	0 days	Mon 21/06/21	Mon 21/06/21	61
63	**Prepare Stage 3 Design Proposals**	**5 days**	**Tue 22/06/21**	**Mon 28/06/21**	
64	Design Proposals	5 days	Tue 22/06/21	Mon 28/06/21	62
65	**Interim Design Review Process**	**12 days**	**Tue 29/06/21**	**Wed 14/07/21**	
66	Incorporate client feedback and refine design proposals	3 days	Tue 29/06/21	Thu 01/07/21	64
67	Community Consultation/ Presentation	1 day	Fri 02/07/21	Fri 02/07/21	66
68	Finalise Stage 3 reports	3 days	Mon 05/07/21	Wed 07/07/21	64,67,57
69	Update Project Risk Register	1 day	Tue 29/06/21	Tue 29/06/21	64
70	Update Stage 3 Cost Plan	5 days	Wed 30/06/21	Tue 06/07/21	69
71	Submit RIBA 3 Report	0 days	Wed 07/07/21	Wed 07/07/21	69,70,68
72	Client approval process	5 days	Thu 08/07/21	Wed 14/07/21	71
73	Approval to proceed (Planning & Tender)	0 days	Wed 14/07/21	Wed 14/07/21	72,77
74	**RBKC Sign off process**	**102 days**	**Tue 25/05/21**	**Wed 13/10/21**	
75	Include project details in RBKC forward plan	4 wks	Tue 25/05/21	Mon 21/06/21	54
76	Leaseholder process s20 (Note: No recharge	0 days	Mon 21/06/21	Mon 21/06/21	75
77	Fire Safety Review & Sign-off	10 days	Tue 29/06/21	Mon 12/07/21	64
78	Client sign off tender documents	2 wks	Thu 29/07/21	Wed 11/08/21	94,76
79	Tender Return	0 days	Wed 01/09/21	Wed 01/09/21	98,78
80	Tender Report	2 wks	Thu 02/09/21	Wed 15/09/21	79
81	RBKC Sign off Contract Award	4 wks	Thu 16/09/21	Wed 13/10/21	80
82	Contract Award	0 days	Wed 13/10/21	Wed 13/10/21	81
83	**Procurement**	**457 days**	**Tue 05/01/21**	**Wed 05/10/22**	
84	Consider procurement options	6 wks	Tue 05/01/21	Mon 15/02/21	4
85	Identify suitable frameworks	4 wks	Tue 16/02/21	Mon 15/03/21	84
86	Undertake Soft Market Testing	6 wks	Tue 16/03/21	Mon 26/04/21	85
87	Contractor feedback	2 wks	Tue 27/04/21	Mon 10/05/21	86
88	Incorporate feedback into tender documentati	6 wks	Tue 11/05/21	Mon 21/06/21	87
89	**Tender (Stage 3 Performance Spec)**	**45 days**	**Wed 14/07/21**	**Wed 15/09/21**	
90	Instruction to Proceed	0 days	Wed 14/07/21	Wed 14/07/21	73,88
91	Preperation of Design Drawings	1 wk	Thu 15/07/21	Wed 21/07/21	90
92	Preperation of Design Specification	1 wk	Thu 15/07/21	Wed 21/07/21	90
93	Preperation of Employers Requirements	1 wk	Thu 15/07/21	Wed 21/07/21	92FF
94	Tender Documentation	1 wk	Thu 22/07/21	Wed 28/07/21	91,92,93
95	Client Review Meeting	0 days	Wed 28/07/21	Wed 28/07/21	94
96	Client approval process	5 days	Thu 29/07/21	Wed 04/08/21	95
97	Client Approval to Proceed	0 days	Wed 04/08/21	Wed 04/08/21	96
98	Tender Period	4 wks	Thu 05/08/21	Wed 01/09/21	97
99	Contractor interviews	0 days	Wed 15/09/21	Wed 15/09/21	80,98
100	**RIBA Stage 5**	**255 days**	**Wed 13/10/21**	**Wed 05/10/22**	
101	Appoint Contractor	0 days	Wed 13/10/21	Wed 13/10/21	82
102	Mobilisation Period	12 wks	Thu 14/10/21	Wed 05/01/22	101
103	Start on site	0 days	Wed 05/01/22	Wed 05/01/22	102
104	Assumed construction period	39 wks	Thu 06/01/22	Wed 05/10/22	103



Project: 200910 -RBKC LWE TM&V - Programme
Date: Fri 14/05/21

Task | Split | Milestone | Summary | Project Summary | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | External Tasks | External Milestone | Deadline | Progress | Manual Progress

Page 1

Rev B

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EXTERNAL ENVELOPE - DECK ACCESS ENCLOSED

External wall insulation (EWI) - proposed U-value 0.14 W/m2K

Apply parge coat of plaster to outside face of existing external walls to improve airtightness. Ensure this is taken up to underside of roof slab and sealed to this and down to ground slab. Sequence with window & door installation to ensure airtightness at these junctions.

Fix new frame structure between floors & columns to deck access areas & to span between ground & first floor below deck areas. Form new window openings onto deck areas within this structure.

200mm of mineral wool added to the outside of existing walls / new frame. This could either be in the form or slabs of mineral wool fixed to the existing wall, or using a system that creates a void which is filled with mineral wool insulation. This would then be finished with a layer of brick slips or render. Assume brick slip finish on non-combustible rail system.-

Replace existing deck-facing windows with new fixed, fire rated windows, of good acoustic quality.

Remove existing deck waterproofing finish and replace with new internal corridor flooring.

Allow for sprinkler system to all flats and mechanical smoke ventilation of newly-created corridors.

EXTERNAL ENVELOPE - DECK ACCESS REMAINS OPEN

Apply parge coat of plaster to outside face of existing external walls to improve airtightness. Sequence with window & door installation to ensure airtightness at these junctions.

200mm mineral wool of insulation added to external walls other than those facing onto deck access areas. Add 40mm Aerogel A2 insulation to walls facing onto deck areas, and to soffit above. Finish with render board or similar.

Remove existing deck waterproofing finish back to concrete slab. Add 40mm Aerogel A2 insulation with magnesium oxide board or similar over. Add new waterproofing layer over, draining into existing rainwater downpipes. Possible alterations to existing door thresholds.

Replace existing kitchen & bathroom windows facing onto decks with new triple glazed windows (see window section). Where front doors have already been replaced with fire doors these are to remain and must retain guarantee. Where doors are still to be replaced, replace with new, insulated FD60 doors in line with RBKC fire door replacement programme.

GROUND FLOOR

No insulation, but continue wall insulation below ground – proposed U value, as existing 2.5 W/m2K

It might be possible to remove the existing screed and replace this with insulation, reducing heat loss through the floor. Though this would reduce heat loss through the floor. It would be hugely invasive to residents and thermal bridges at external walls and party walls would remain.

Therefore it is proposed to leave the ground floors as they are and extend external wall insulation down below ground level. This creates a thermal 'skirt' around the earth below the slab, so that this earth will not lose heat as fast as normal, reducing heat loss through the floor slab. The extent of this will depend on the depth and form of existing foundations, but ideally this would extend 600mm – 1m below external ground level. This is proposed to be of 200mm thick Foamglas insulation.

The combination of installing external wall insulation and the below ground insulation will be disruptive, leading to planting, paving etc. needing to be replaced. Scaffolding will likely be required, impacting further on garden areas. Additionally any items fixed to external walls, such as awnings and satellite dishes will need to be removed and replaced. Where services pass through existing walls these will need to be sealed to the new parge coat to create an airtight junction.

ROOF

Insulation over existing concrete slab – proposed U value 0.102 W/m2K

Remove existing services from the roof. Temporarily remove existing safety railings. Cut down existing chimneys to slab level and close up head. Create new opening in roof for new stair into rooftop room and close up existing roof access opening. Remove roof finishes & insulation and replace with 370mm new mineral wool insulation with new waterproofing over. Ensure edge detailing allows insulation continuity with wall insulation. Include for new insulation to plant room roof.

Allow for new biosolar roof except to areas with other plant on, achieving as many south-facing angled PV units as possible. Allow for new inverters and electical system to share supply among homes. Allow for relocation of watertanks and rearrangement of existing cold water pipework. Allow for installation of new roof-mounted air source heat pump units

BALCONIES

Cut back existing projecting balconies. Build new structurally separate balcony frame, providing balconies of at least 8m2 to maisonettes. Include for shading at intermediate floors where balconies are not required.

Allow for new glazed screens to convert existing west-facing balconies into winter gardens. Provide new structurally separate balcony frame, providing balconies of at least 8m2 balconies to three bedroom flats and at least 5m2 to one bedroom flats.

Allow for new external rainwater downpipes in place of those at back of existing west-facing balconies. Allow for alterations to below ground drainage to pick these up.

WINDOWS & DOORS

New triple glazed windows – Proposed installed Uw value < 0.86 W/m2K

All existing windows to be replaced with new triple glazed, ideally Passivhaus certified windows. If not certified it will be necessary to be confident about how airtight the windows seal when closed. For example Rationel AURAplus windows.

If deck access is enclosed, then refer to this section for window requirements to deck-facing windows.

New windows to sit in line with insulation layer if possible and frames to be sealed to new parge coat. Ideally detail such that insulation wraps around front of frames.

Windows will also need to be Secured by Design certified in some areas, as well as ensuring safe opening heights, and possibly opening areas where they act as fire escape windows.

VENTILATION

At present homes are ventilated via trickle vents in window frames, with additional mechanical extract ventilation to kitchens and bathrooms. Some residents have noted mould growth in some areas, which may in part be caused by insufficient ventilation.

Once the homes have been made more airtight it will be crucial to ventilate them properly.

Assume new Paul Climos 200F to three bedroom properties and Zehnder Comfoair 160 to 1 bed flats and studios. All with associated non-combustible ductwork, Armacell insulation to intake & exhausts.

All pipes & conduits passing through external walls to be sealed with airtight grommets.

HEAT SOURCE

Remove all existing boilers and associated flues and gas supply pipework.

Assume new communal air source heat pump supplying low temperature hot water to new insulated pipework serving each flat. New heat interface units to each home link into existing heating and hot water system (M&E consultant to confirm whether this will be possible)

OTHER WORKS

As set out in table in section 4.8 and plans on following pages.

Lancaster West - Lot 4 - Treadgold House

Outline Scope of work

Revision P01	11/02/2021
Revision P02	17/02/2021
Revision P03	24/02/2021
Revision P04	01/03/2021

Item	**Energiesprong** Develop performance specification to Stage 3 - overall energy performance specification in line with Energiesprong criteria, with additional LWNT / resident parameters	**Non-energiesprong** Develop full drawings / details to Stage 4	Comments	Additional parameters to be controlled in tender docs	Information needed to confirm parameters and provide information needed
External wall insulation	y		Impact on residents & other elements may depend on whether deck access is enclosed	What's acceptable to residents in terms of appearance & disruption, eg: - Limit duration of installation? - External finishes precluded / preferred - non-combustiblity of products - if solution includes enclosure of deck access, requirements around openings in this - Preclude IWI on basis of disruption	therefore need to establish parameters in consultation with residents
Airtightness	y		Likely as part of insulation layer	Contractor to demonstrate how intended airtightness allows building to meet overall energy performance. Tell us how this will be achieved - testing during works, details, site photos, toolbox talks, plan for testing with residents in situ, (who will carry out testing?) remediation plan for failing areas etc. - Preclude acheiving this internally on basis of disruption Make KPI?	enclosure of deck access - significant impact for residents, though already part of initial propsal voted on. Ensure residents understand impact of final airtightness test.
Ground floor insulation	y		May not be included	include existing information & describe what's acceptable and ask for proposals. - Screed / floor removal not allowed - internal insulation over ground floor likely not acceptable due to disruption	need to find out existing floor construction & foundation details
Roof insulation/renewal	y		Include improving roof access if adding PVs / other roof-mounted plant	drawings, performance spec. - limit on overall height - preference on pitch? - Access requirements relative to plant required on roof - Limits around what can be done to existing chimneys?	Consult with planners & residents to set parameters Require roof access to survey chimneys (also any issue with leaseholders 'owning' flues?)
MVHR inc. ductwork	y		Level of internal disruption dependent on system design	parameters around maintenace, noise, disruption, combustibility, size of ducts. Advisory design to prove that parameters are not over-constraining design so that energy performance is not achieveable	Help residents understand spatial impact of MVHR & disruption during installation. Require internal layouts of flat types to allow us (& contractor) to do outline design. (ECD to request from Maccreanor Lavington)
ASHP	y		Possibly compact unit combining MVHR with this. Possibly district heating instead	If district heating then tender to include details of this. If not district heating consider setting limits on acoustics, location / prominence of units	Ensure residents understand there will not be gas on site after works
New windows	y		Including to deck access if decks enclosed	colour, material, opening, security parameters	Work with residents on these items

New doors	y		Consider new FDS have just been installed so check for need from energy performance perspective	colour, material, opening, security parameters If existing new front doors to be retained include informaiton on these. If retention is preferable state this	Confirm airtigtness of existing new front doors - then include this in tender info.
Photovoltaic panels	y			Parameters around how electricity is distributed to residents? How will this feed into billing?	LWNT to work out how resident billing will work and interaction with Comfort Plan Raise with planners (though unlikely to be controversial in themselves)
Other renewable energy generation	?		Possibly - don't want to commit to one particular type of energy generation	Are there any types of renewables we'd preclude? Eg. Wind turbines?	
Energy meters & monitoring	y				LWNT to work out how resident billing will work and interaction with Comfort Plan
New lift in existing shaft		n	Chapmans		
Fire escape stair	y		Likely required if enclose deck access		
New balconies	y		Not directly required by energiesprong, but necessary to achieve like-for-like, as existing balconies cannot easily form part of Energiesprong design	Is provision/retention of balconies a necessity? If yes, state this in tender. Parameters around size, colour, style, non-combustibility	Discuss concept and likely size with planners (meet London Plan sizes?)
Landscape works		n	Not officially part of scope at present, but potential addition to project, particularly with engagement happening with Social Landscapes	Not to be in scope of tender	
Car park works		n	Some alternations likely needed if new fire escape stair added		
Pram shed upgrade		n	Not yet known whether this will be possible		
Communal Electrics	?	?	Depends on how we package this considering the site-wide M&E project		
signage	?	?	We may get another contractor to do this		
Communal entrance		y			
Communal entry		n			
Communal area redecoration		y			
Refuse chutes - consider replacing with external bin stores		y	As part of site wide refuse plan to encourage recycling and composting. If new fire escape stairs needed then eastern chute needs replacing		
Kitchens & bathrooms		y	Presume detailed design by LWNT direct contractor, rather than part of ECD design		
Existing drainage issues?		y			
RWP alterations / repair	y		Likely changed along with EWI anyway		
Communal lighting	?	?			
CCTV		n			

	Performance Criteria	Requirement	Comment	References
Energy	space heating energy	<40 kWh/m2/yr While the modelling is based on standard heating regimes the system must be able to achieve 21°C in living room when outside temperature is -5°C. Use SAP 2012 defaults: • Appendix U for local climate data. • All the rooms of a house are heated • A demand temperature of 21°C in the living area and 18°C elsewhere • A weekday heating pattern of 2 hr on, 7hr off, 7hr on, 8hr off – • A weekend heating pattern of 16 hr on, 8 hr off Use gross internal floor area for this metric.	<30 kWh/m2/yr should be an achievable average at roll out which will help future proof Energiesprong solutions and keep down the risk of high energy prices, policy changes and high-use tenants. Projects should aim for 30 kWh/m2/yr, but we accept that some situations will make this difficult, so up to 40 kWh will be accepted for the pilot projects. This is the useful thermal output power of the heating system, not the electrical input power or primary fuel power.	NL range is 0 – 50 kWh/m2/yr, Passivhaus is 15 kWh/m2/yr. EnerPHit 25 kWh/m2/yr. BREDEM SAP 2012. It is worth revisiting this, and considering lowering to 18°C. See: http://www.demand.ac.uk/05/11/2014/why-room-temperature-needed-to-be-taken-down-a-notch-the-conversation-4-november-2014/ and more recently here: http://www.tandfonline.com/doi/full/10.1080/09613218.2017.1307647
	kWh per annum allowance for lighting, cooking and sockets	2,300 kWh/yr. Solution provider to update lighting and standard appliances at installation so it is reasonable that tenants can achieve 2,300 kWh/yr. Gas appliances will need to be replaced where they are fitted.	2,300 kWh/yr achievable with low-energy lighting and replacement fridge. This is not a limit or maximum but a central figure that will be used in modelling usage and net consumption in a typical home - need for careful/messaging engagement with tenants around the tariff. Tenant responsible for replacing lighting and appliances on failure. Consider 'fair use' policy to manage risks around irregular consumption. Potential tenant value uplift and engagement opportunities exist around enhancing the specification of appliances, e.g. induction hobs.	NEED suggests 3,500 kWh & 10,250 kWh as mean gas & electricity consumptions in 2012/2013 in social housing. ofgem TDCV is 3,100 kWh. Electricity figures will include some heating and social housing is smaller than average $67m^3$ vs $94m^3$. Annual allowance of approx. 2,500 kWh has been achievable in NL with some new appliances and lighting. Willmott Dixon have shared paper on consumption in ES properties.
	hot water	System has the capacity to deliver 200 litres at greater than 45°C (or equivalent at	It is best to measure temperature at the tap and this should be checked on commissioning. Scaling	British Standard recommends 35-45l/person @ 60°C. Also SAP 2012 Table

		higher temperatures) in one hour. Hot water consumption to be scaled by typical number of occupants (N) 64+26N, in litres. Housing provider sets typical number of occupants so for N=3, 142 litres per day at a tap temperature not less than 45°C. Legionella risks must be addressed by the contractor in the design of their solution and the proposals for how this will be dealt with must be acceptable to housing provider.	consumption for typical number of occupants (N) 64+26N provides ~95% confidence water will meet demand.	1b. 55°C at tap point is spec in NL. Measuring Hot Water Consumption in Dwellings found N(umber) of occupants was only significant key factor and suggested 64+26N. Delivery temp of 51.9°C ±1.3°C. New build regs require bath outlet temperatures to be <48°C. HSE Legionella Guidance.
	net energy consumption	Net zero over the year should be achievable on certain well orientated house types, allow <1,500 kWh/yr for others. Net consumption is import (kWh) minus export (kWh) over the year.	Reasonably ambitious target which will help future proof Energiesprong solutions and mitigate risk of high energy prices, policy and high-use tenants. Allow flexibility in demonstrator procurement given different house types, orientation and shading. Consider yearly variations in generation. Gas supplies would normally need to be removed to deliver the net consumption target and reduce energy supply costs to the home.	SAP 2012 Appendix U. PVGIS or Microgen Database for PV. Solar PV degrades by up to 0.5%/year.
	feedback	Provide feedback to tenants against each of the allowances for heat, hot water and appliances energy use. Provide real-time and historical feedback to make comparisons.	Example specification: - Daily appliances energy use, lights energy real time and v daily targets - Daily hot water consumed v daily target - Internal temperature(s) – real time	Further information in the monitoring protocol.
	payments from housing provider	State upfront payment, any ongoing (maintenance/other) payments, and how much the property stands to earn from generating energy.	Will need to cost maintenance plan if done by another party, see maintenance. Average cost of capital rate to be provided by housing provider so solution provider can optimise NPV.	
	tenant payments	Outline the energy service plan, cost, provisions and additional charges. Illustrate impact against pre-retrofit spending for the	Central case as per heating, hot water and kWh allowances. Low and high cases to be identified by housing provider. Consider setting maximum	Consumer profiles being developed to consider minimum energy budgets, JRF research and impact on fuel poverty.

		low, central and high-use case.	tenant cost, which could be based on imported electricity costs.	
Comfort & Health	temperature in living room	21°C achievable when outside temperature is -5°C.	There may advantages to using a single time/temperature zone or multiple zones depending on heating technology. Model to demonstrate that solution will achieve target internal temperatures when external temperature is -5°C and use commissioning tests to demonstrate that the system performance is adequate to deliver this.	RdSAP standard (average) heating pattern of 9/16 hours weekday/ weekend. See pages 219-221. Research has found hardly any difference between weekday/weekend heating regimes, and 10 hours' heating/day is the norm. New-build and system replacement regulations for up to 150m2 require two zones with independent temperature control.
	temperature elsewhere	18°C.		
	control	Provide options around heating pattern and whether zoning would be appropriate. Provide an override or 'boost' function.		
	summer overheating	Designed so that less than 11 days a year are over a comfort temperature of 26°C in all rooms, and minimum window opening of 1/20th the floor area or equivalent mechanical ventilation. Assume median climate conditions for 2050.	Some (non-Energiesprong) low-carbon solutions have suffered from overheating. Household behaviour has significant impact on overheating so make sure advice is offered. 108 hours is 1% of summer hours. Consider additional summer shading and secure night-ventilation to meet targets. DCLG regulation work in progress. Add 3°C onto summer monthly mean maximum, use closest Met Office weather station data for last 5 years.	NHBC Foundation, NF 46, Overheating in new homes, 2012, use 1% of occupied hours. NL use 300 hours rather than 1% of occupied. NCM parameters: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/7762/1016185.pdf % occupied hours over 27°C. CIBSE use 3% hours. ZCH report and CIBSE TM52. UKCP09 - typical increase in average summer maximum temperatures of between 2 and 4˚C by 2050, so use 3°C as median. Met Office Weather Stations. CIBSE TM59.
	max air velocity (drafts)	<0.2m/s in heating season where people can be reasonably be expected to sit or sleep.	High air velocities can lead to occupants feeling draughts/cold. Check on commissioning of demonstrators.	Dutch regs/guidelines suggest < 0.15m/s. No Passivhaus guidance found. CIBSE < 0.1m/s. 0.2 m/s < ASHRAE/ISO thermal comfort.
	indoor air quality	Retrofit solution to comply with Part F of the Building Regulations as if the retrofitted home was a new dwelling.	For the demos it can be assumed that air-change rates will resolve humidity and CO2 levels, but consider monitoring these in demonstrators.	REMI suggests 40 – 60%. Building Regs Part F set moving average maximums of 65, 75 & 85% for periods of 1m, 1w & 1d respectively. CO2 may be proxy for other contaminents which might be easier to

				design out, e.g. vent intake near road. CO2 can reach 4000ppm in Winter, 1500ppm or more might be typical. Also see CISBE Guide B, 2005
	daylighting	Daylight is not reduced by more than 10% without agreement.	Potential reduction of day lighting as new windows likely to have: thicker frames, lower G-value and greater shading. Glazing is occasionally over provided. Housing providers might prefer to state a maximum Daylight Factor reduction.	Daylight factor between 2 and 5 - CIBSE Lighting Guide 10. ES NL use no reduction in net glazed area.
	noise from ES services inside	30 dBA (equivalent to someone whispering a few feet away) absolute limit in living rooms/ bedrooms or where background noise is higher use relative limit of <2 dB.	Consider use of attenuators to reduce fan noise and prevent cross talk between rooms.	BS 8233 no adverse issues < 30 dB. Passivhaus requires sound level exposure through ventilation system less than 25 dB(A). Dutch building regs (since 2012) < 30 dBA. Building regs Part F suggest < 35 dB.
	noise attenuation from outside and neighbours	Noise attenuation from outside and between dwellings is the same or greater than existing.	In quieter houses occupants notice noise from neighbours, so may need to explain that noise from neighbours may seem louder.	
	noise from ES services outside	Noise from Energiesprong equipment will not exceed 42dBA (like bird-song outside) at 1m from window of habitable room.	The most likely source of noise would be an air-source heat pump.	MCS020 provides method for calculating noise levels.
Installation	installation time	Installation time with occupants in-situ < 15 active working days per home. Maximum active time onsite two calendar months	For the demonstrators consider installation day as an active day onsite, on dwell days there should be no scaffolding and homes should be fully functional and safe. Consider managing works before/after and tenants who may be in all day. Consider whether speed is being driven over disruption.	
	occupant satisfaction	As part of the overall engagement and feedback strategy obtain feedback before, during and after the installation.	Sample occupant satisfaction questionnaire available from Energiesprong UK.	

Warranty, Maintenance & Monitoring	performance warranty	Aim is to provide guarantee of energy, comfort and health factors so long as maintenance and occupant protocol has been met.	Consider special warranty arrangements for the demonstrators, given that a first of a kind solution will provide insight and feedback, e.g. could include an initial monitoring and improvement period. Consider liability caps. Longer term arrangements may be required to release capital funding.	
	design life	Optimise design to satisfy performance warranty period but state which components are likely to last significantly longer and the advantages this may bring.	Client to consider the expected design life of each component with the solution provider supplying a lifecycle cost which is less than a client specified amount (over the design life based on today's replacement costs) Typical design life: Walls and roof – 60 years Windows and doors – 20 years Battery 10 years PV – 25 years Air source heat pump – 12 years MVHR - 12 years with regular filter changes	
	maintenance	Provide a fully costed planned and preventative maintenance protocol for the lifecycle plan. Identify cost and resource requirements for each activity so that they can be costed by a third party.		
	monitoring	Provide sufficient monitoring and logging to be able to exercise performance warranty. Make suitable data privacy and security arrangements.	Additional funding streams may be available to cover additional requirements. See monitoring protocol.	See Monitoring and Reporting protocol.
Design	Kerb appeal, highly attractive design uplift, customer satisfaction	Demonstrate how the solution meets the design brief.		

ADDITIONAL REQUIREMENTS TO BE CONFIRMED IN PROCUREMENT

Performance Criteria	Requirement	Comment	References
Fire risk	Outline how the design of the retrofit complies with fire building regulations, does not increase fire risks and highlight the new features that will reduce the risk	It seems unlikely that single storey dwellings will be affected by regulation changes following Grenfell, but perceived risks around cladding and impact on fire risks will require management.	
CO2	There may be a requirement to set a CO2 reduction goal for the property or project.	Future electricity grid intensities should be considered in the calculation.	
Construction site management and waste	Some customer might look to set more stringent targets above CDM requirements.		
Local economic benefits	Requiring local supply chain engagement may deliver economic benefits.	It will be difficult to drive the anticipated benefits for the pilots.	
Security	Solution providers to consider PAS24 (for doors and windows) and security improvements by design.		Dutch use Police Mark standard, REMI suggested PAS24 in UK
Water use and butts	Allow very low water use in homes: as little as 80 l per person per day	Use low-flush, dual flush WCs (4/2.6 l flush) with delayed inlet valves, and low-flow taps and showers. Install low-water use washing machine and dishwasher. Use a central rainwater collection system to feed WCs where possible – rainwater collection for garden irrigation elsewhere. Suggested tank size at least 150 l.	Again, simplified version of the Code, and the Water Calculator used to support the Code and Building Regs Part G : http://www.thewatercalculator.org.uk/calculator.asp
Drying space/ clothes	EITHER: Heated space with min 30l/s ventilation, intermittent and controlled OR An unheated outbuilding with adequate ventilation to avoid mould OR A secure external space, with restricted access, and accessible directly from an outside door.	Any fixtures and fittings must be permanent features of the room or space	Straight out of the old Code for Sustainable Homes: CLG (2010) Code for Sustainable Homes: Technical Guide. London: CLG. https://www.gov.uk/government/publications/code-for-sustainable-homes-technical-guidance

Recycling	Provide sufficient internal and external space for three recyclable materials and non-recyclable waste.	At least 100 l of external storage space for a 1-bed home, plus 70 l per bedroom, to store non-recyclable waste OR the size of local authority containers if this is larger; AND external storage space for 3 recycling bins, minimum capacity of 180 l; AND dedicated internal storage space for 3 recyclable materials, at least 30 l in total.	Simplified version of the Code Requirements (same reference)
Composting	Provide sufficient internal and external space for home composting if there is a garden		Simplified version of the Code Requirements (same reference)
Cycling	There should be secure cycle parking for each resident near to the front door	At least one cycle stand (allowing locking for two bikes) for every two residents externally, or space for one bike per person internally, near the entrance. 'Sheffield' type racks are preferred, plastic-coated, with 2m x 1m allowed for each stand, ideally covered and ideally lit at night. They should be set at right-angles to any slope. Any doors cyclists need to pass through must be at least 1m wide.	Guidelines on cycle parking is available here: http://www.makingspaceforcycling.org/#cycleparking And: https://www.cambridge.gov.uk/sites/default/files/docs/CycleParkingGuide_std.pdf [Code for Sustainable Homes had nothing on transport or cycle parking]
Growing food	Consider providing outdoor space with topsoil and storage for gardening tools, and/or planting fruit trees	Not every resident wants to grow fruit and vegetables, and having access to shared allotment space may be better than provision for every unit. Maintenance can be difficult, and this requires some thought.	Only limited guidance is available: https://www.sustainweb.org/pdf/food_growing_&_social_housing.pdf And: http://sustainablefoodcities.org/Portals/4/Documents/Planning%20Food%20Cities%20Webinar%20Summary%20Developer%20perspective,%20why%20include%20food%20growing%20space%20in%20new%20development.pdf [Code for Sustainable Homes had nothing on growing food]
Embodied energy	Selecting materials and designs that reduce the embodied energy of the solution might be considered.	Methodologies in this are still being proven.	

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