LANCASTER WEST
LOT 6 - VERITY CLOSE

LONDON, W11 4HE

LANCASTER WEST NEIGHBOURHOOD TEAM

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RIBA STAGE 1
INITIAL IDEAS
FEASIBILITY REPORT

JANUARY 2020 (REVISED ISSUE)

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ENERGY CONSCIOUS DESIGN

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LANCASTER WEST NEIGHBOURHOOD TEAM W11

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

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RIBA Stage 1 Feasibility Report

Client: Lancaster West Neighbourhood Team

Signed by: Lizzy Westmacott

Date: 16th December 2020

Comments:

Author	Reviewer	Date	Rev.	Notes
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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 (PV) 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 53 homes at Verity Close that are owned by RBKC. 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. This report takes these needs and aspirations and looks at how feasible they are to achieve in the specific context of Verity Close. It reviews the existing buildings and earlier energy-use studies, as well as earlier co-design events and residents' priorities.

A range of possible retrofit measures are set out in terms of energy reduction, combustibility, disruption and other pros and cons. The earlier Retrofit Accelerator estate-wide energy use reduction review set out bronze, silver and gold standards for refurbishment, and the range of possible measures are then looked at as packages to meet these suggested standards.

The minimal-intervention bronze level is unlikely to achieve the energy use reduction required to make the introduction of heat pumps for heating and hot water effective, and will not create a zero carbon Verity Close.

To meet the silver standard it is proposed that buildings are externally insulated, minimising internal disruption. Additionally new windows, airtightness measures, and Mechanical Ventilation with Heat Recovery (MVHR) system and air source heat pump would be added. A range of implementation options are considered, from a largely site applied solution to more off-site construction. Further discussion with residents will be needed to understand their views on the balance between the heat demand reduction of these proposals and the disruption they would cause. Modelling suggests that these works would just miss the EnerPHit standard, though this might well be achievable for some units. Including ground floor insulation would allow further heat demand reduction, but the presence of freehold properties among those to be retrofitted will always limit this reduction. Regardless of the exact standard met, the silver proposals would lead to huge improvements in comfort and reduction in bills.

Adding renewable technologies to the silver standard works would achieve the gold standard, and might reach net zero operational carbon. In this scenario photovoltaic panels would be added to roofs and a study of how much electricity these might provide will be carried out at Stage 2.

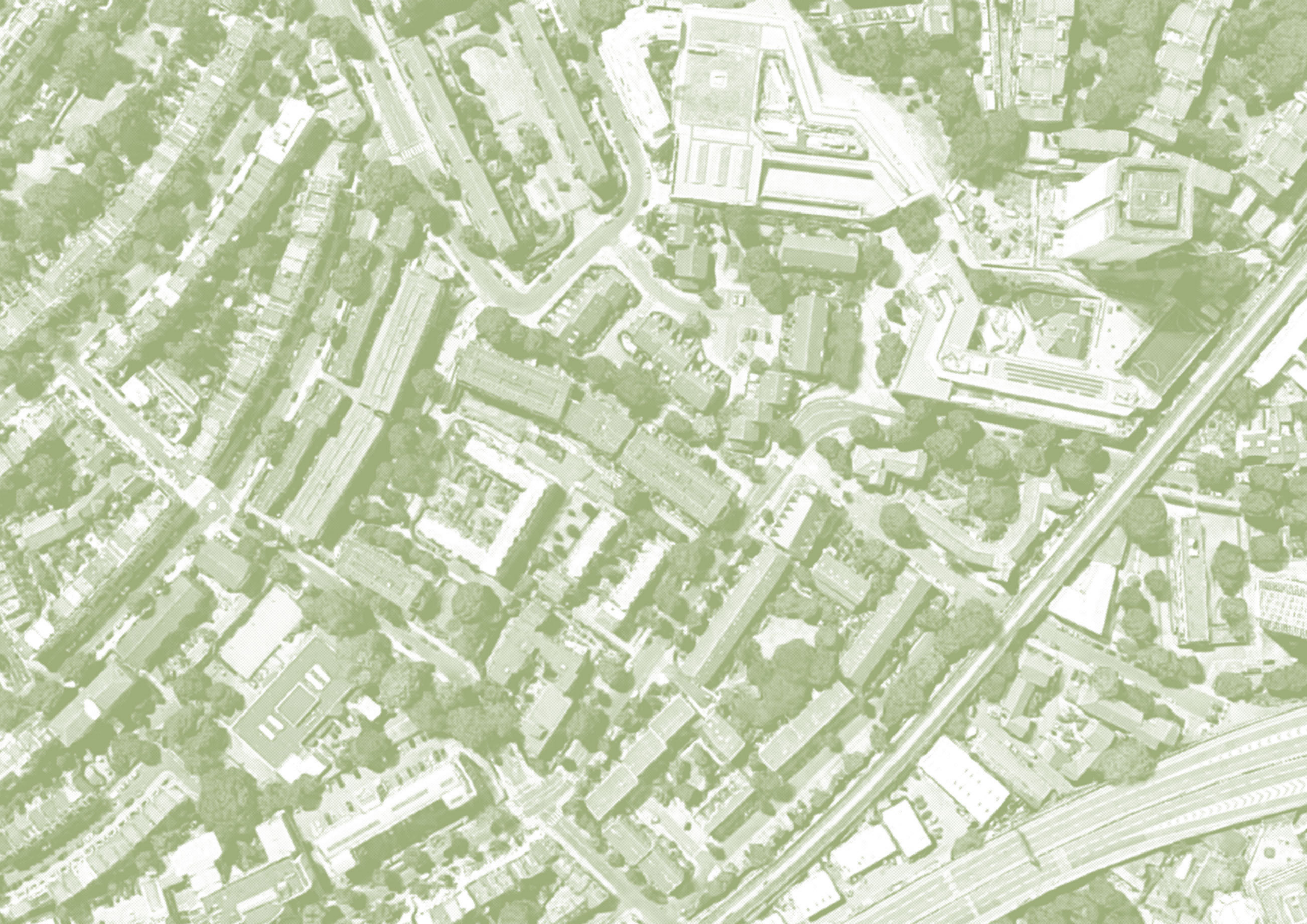
In our experience of delivering deep retrofit at scale with residents in-situ, one of the most challenging aspects of any retrofit are the internal alterations. This is why the proposals focus on external insulation. Internal works may then be limited to the installation of Mechanical Ventilation with Heat Recovery (MVHR) and associated ductwork which often requires lowered ceiling or bulkheads. Ductwork routing is explored in some detail in section 4.6 to ensure that this intrusiveness is understood and mitigated.

These works alone will not address all of the residents' priorities, and solutions are also presented to improve sound transfer between floors and the dominance of refuse stores by flat front doors. ECD will also work with LWNT to ensure the provision of new kitchens and bathrooms, landscape improvements and required maintenance is factored into these works, but specific proposals are outside the scope of this document.

Together these works will have a significant impact on the appearance of the Close, particularly given that nearly half of the houses are freehold, so will not be part of these works. Early ideas of how this challenge might be addressed are set out for discussion.

A proposed co-design strategy is set out, to be developed in more detail with LWNT. Next steps are then set out, highlighting further investigations and appointments needed to keep the project on programme.

With regards to procurement it is not yet clear which route will be pursued for the appointment of the main contractor. Similarly, it is not yet clear whether the scope of works will include the full range of proposals required to achieve net zero carbon as this will be dependent upon the availability of funding. An indicative programme is shown in Appendix 2, but given the uncertainties around funding and the wider procurement of the project this programme may be subject to further changes. Similarly, the cost plan shown in Appendix 1 is based upon the various options put forward, but this will be affected by the delivery timescale and procurement options yet to be confirmed. Finally, it is very important to note that this project is part of a wider co-design process with ongoing consultation as outlined in section 4.15, therefore any proposals in this report will be refined in discussion with residents over the coming months.



2.1 INTRODUCTION

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. RBKC 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 0-7, to refurbish the 52 homes that they own at Verity Close as part of this extensive programme of works within the Lancaster West Estate.

ECD Architects appointment includes the following disciplines:

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

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

- 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

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 is underway, but survey information was not available at the time of writing the report.

2.2 BRIEF

The Lancaster West Estate is to become a 21st Century Model social housing estate. As part of the estate, the homes at Verity Close and their surroundings need to be improved to achieve this. The top priority in this work is the residents of Verity Close 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. ECD's task is to work with LWNT, the residents and other consultants to develop a detailed design that builds on this previous work to create zero carbon homes that meet the residents' aspirations.

16 of the houses at Verity Close are freehold, so are outside the scope of this work. This will have an impact on the relative cost of works, overall heat demand reduction, and possibly on the appearance of the Close after the works. It is hoped however that when presented with a clear package of works that save money in the long run, some of these freeholders might chose to retrofit their homes as well.

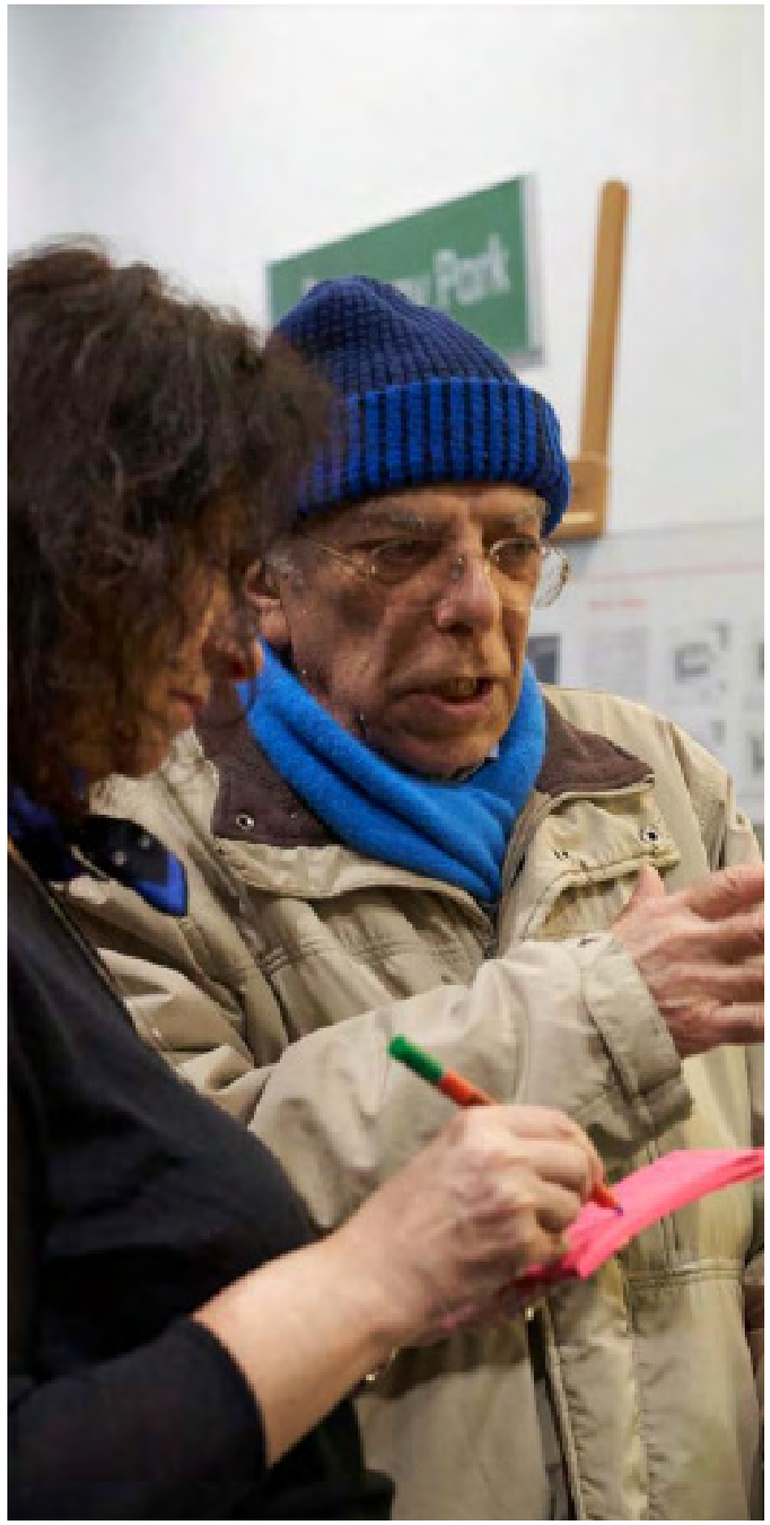
OUTCOMES OF CONSULTATION & CO-DESIGN

Co-design events were run across the estate in 2018, recorded in the 'Books of Ideas'. At Verity Close this revealed a number of problems with building fabric as well as with communal areas and overall appearance. This Book of Ideas effectively forms part of the brief, although some items have already been carried out. It is also noted that some of the issues raised relate to the wider estate and landscaping, and are accordingly outside the scope of ECD's appointment. While they will be examined briefly in this document, they will be developed and carried out as separate projects.

More recently LWNT established 'Top 10' priorities for residents of Verity Close, for residents of the flats and of the houses. These too feed into ECD's brief, as do feedback to more detailed pilots of various building elements and to Open House events.

This feasibility study is an initial design response to these issues. Once it has been discussed with the LWNT it will need to be discussed with residents to allow them an understanding of the reasons for the various proposals, and a choice in which are taken forwards.

Figure 1 - Venn diagram of inputs into the brief



RETROFIT ACCELERATOR OPTIONS

Retrofit Accelerator carried out a heat loss assessment for the whole Lancaster West Estate. While quite high level in terms of data input, it gives an idea of the estate's current heat demand. It goes on to propose two packages of building fabric improvements – package 1 is 'essential retrofit' and package 2 is 'good practice retrofit', both focusing on the buildings' fabric. A further package 3 adds photovoltaic panels and battery storage to package 2, reducing the CO_2 emissions.

The heat demand of these packages are being used to inform the design of estate-wide heating decisions, so these packages are what ECD understand that they are being asked to design for in terms of fabric improvements and renewable technologies. These will be assessed against the specifics of the buildings, as well as against the potential to create zero carbon homes.

Since this report the package 1, 2 and 3 measures have been re-branded as bronze, silver and gold. This terminology will be used throughout this report.

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. Where possible all elements of the refurbishments should be non-combustible. 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.

FUNDING

Significant funding is already in place, but this will not be enough to meet all the estate's aspirations. The design team will seek ways to gain further funding for the works and to integrate the procurement process into funding deadlines that are already set.

DELIVERY

Once agreed with residents and developed in more detail, 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.

	Heat demand (kWh/m²)	CO_2 emissions (tonnes)	Cost to tenants (£ - heating & elec)	Measures
Flats				
Current	68-112	2.2	820	-
Bronze	50-85	1.4	720	Draught proofing, 2x glazed windows, increase roof insulation, MEV, heat pumps
Silver	19-32	1.2	660	EWI, 3x glazed windows, roof insulation, MVHR, heat pumps
Gold	19-32	0.6	460	As 2, with PV & communal battery storage
Houses				
Current	89	5.3	1450	-
Bronze	69	1.9	790	Draught proofing, 2x glazed windows, increase roof insulation, MEV, heat pumps
Silver	27	1.4	680	EWI, 3x glazed windows, roof insulation, MVHR, heat pumps
Gold	27	0.6	460	As 2, with PV & communal battery storage

Figure 2 - Retrofit Accelerator - summary of existing & possible heat demand & energy reduction

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

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

Carbon cost effectiveness (£/tCO2)	
Pays for itself	☺☺☺☺☺
0-10 £/tCO2	☺☺☺☺
10-100 £/tCO2	☺☺☺
100-500 £/tCO2	☺☺
>500 £/tCO2	☺

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

Figure 3 - PAS2035 table for evaluating retrofits - information such as this can help in early stage decision making

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3.0 EXISTING BUILDINGS & CONTEXT

SITE 3.1

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 4 - Aerial view of Lancaster West Estate

Figure 5 - Aerial View

VERITY CLOSE - IMMEDIATE SURROUNDINGS

To the north west of Verity Close runs Lancaster Road, the northern boundary of the estate. To the north east Clarendon Walk Passage is a pathway that cuts through the estate with some trees, with the 6 storey flats of Clarendon walk beyond. Dulford Street runs along the south east and is a relatively quiet road with parking spaces along one side. Verity Close leads off Dulford Street. An alleyway runs between the south side of the Verity Close housing and the relatively modern Kensington Leisure Centre. This is gated off but would otherwise lead to a largely pedestrianised area between the leisure centre and the Kensington Aldridge Academy, a successful secondary school to the west of the site.

3.1 SITE

LANDSCAPE

The homes are arranged around the cul-de-sac of Verity Close itself and parking areas and a small play area. There is a vehicle gate at the entrance to Verity Close but this appears to be unused. Pedestrian routes run between the terraces of houses, linking the close into the surrounding network of streets and paths. 20 parking bays are provided in 4 areas off the Close and are for permit holders. The combination of the road, parking bays and wide pavements mean that the site is dominated by hardstanding, as well as bollards, signage, street lights etc from different eras that create a cluttered appearance. There are however a significant number of trees and each house has a private garden, many of which are generously planted. There are a range of trees and bushes of varying species, size and maturity. The garden walls are relatively high and some have been extended with fence or trellis, providing privacy to these gardens. At the rear many of the houses have lower, timber fences, appearing more open, but facing onto alleyways. The playground has railings around it and the communal gardens to the flats also have brick walls around them.

The close is relatively quiet and has a different atmosphere from other areas of the estate which are characterized by larger buildings. However residents have commented that people use the Close as a short cut, passing through too fast on bicycles. Additionally some of the alleyways are noted to lack clear visibility. Parking spaces are sometimes used by non-residents, and the playground is not well used. The significant permeability of the site possibly leads residents to want to maintain and extend the existing walls, which does not make the Close feel very 'open' to outsiders.

ORIENTATION & SHADING

The terraces and blocks of flats are at a range of orientations. The quantity and size of windows are similar to front and back, regardless of orientation, so that some homes will experience greater solar gain than others. The leisure centre to the south of the site will overshadow some of the flats' south facing windows as some times, but is also stepped so that it's impact is limited. Mature trees will also impact on solar gain to some homes.

Figure 6 - Site access & routes

1 *Trees partially obscuring flats*

2 *Car parking dominating*

3 *Playground reported to attract ASB*

4 *Closed off alley by leisure centre*

8 *6-storey Clarendon Walk beyond*

7 *Gable ends*

6 *Clarendon Walk alley*

5 *Estate boundary to the south*

3.2 BUILDING TYPES & TENURE

BUILDING TYPOLOGY

There are two small blocks of flats, each housing 18no. 1 bedroom flats, and 32 houses in staggered terraces. All buildings have pitched roofs.

These houses fall into four types:

a. 2 storey plus storey in roof with dormers front and back, (4 bedroom)
b. 2 storey plus storey in roof with front dormer (3 bedroom)
c. 2 storey with loft above (2 bedroom)
d. 2 storey with loft above with end-of-terrace lean to. (3 bedroom)

There are similarities across the house types, but also differences, as set out in the images below.

The blocks of flats are 3 storeys. Each has 3 communal entrances, with 2 flats per floor served by the communal stairs.

2 storey end of terrace with lean-to

2 storey terrace

2 - 2.5 storey terrace with front dormer

2.5 storey terrace with front & rear dormers

Figure 8 - Plan showing house types

2 storeys

Lean to entrances to ends of terraces

2 storeys to 'front'

1.7m high brick wall

2 storeys to 'rear'

Lean-to rear entrances

Lower fence to rear

2.5 storeys to 'front'

Dormer to front

1.7m high brick wall

2.5 storeys to 'rear'

Dormer to rear

Extended rear lobby & lean-to

Lower fence to rear

Figure 9 - Similarities & differences across house types

TENURE

The homes were originally all owned by RBKC. However some have since been sold as leasehold or freehold, so that the Close now has a range of ownership.

The flats are mostly socially rented, but 12 are leasehold. These are mixed among the six staircores. Under the leasehold agreements it should be possible to make changes to the blocks of flats as a whole, but ensuring that these leaseholders see the benefit of works and are enabled to seek financial support will be essential to the success of the proposals.

Among the houses there is an equal split of 16 freehold properties and 16 socially rented, as shown on the site plan. As noted, the freehold properties are outside the scope of this report. However it would benefit the estate as a whole and its energy use if these homes were upgraded in the same way. Further discussions are needed to understand how far LWNT have already engaged with freeholders and whether they might be encouraged to take up the opportunity for improvements at their own expense.

Figure 10 - Plan showing house ownership

SIZE OF HOMES

The flats are each 1 bedroom, with a bathroom and kitchen/living room.

The houses range in size from 2 bedrooms to 4 bedrooms. It is noted than a number of the freehold properties have been significantly extended.

Inevitably the larger homes tend to have a higher heat demand and use more energy. Further, those at ends of terraces and top floor flats lose more heat as they have a greater area exposed to the outside. These homes that lose the most heat are those that may benefit most from thermal improvements.

	Total	**1 bed**	**2 bed**	**3 bed**	**4 bed**
Flats 8-25	18	18			
Flats 26-43	18	18			
Houses	32		8	17	7
Total	**68**	36	8	17	7

Figure 11 - Number of bedrooms to homes at Verity Close

3.3 EXISTING LAYOUTS

The houses are all long and thin, and appear to follow a similar plan, with a central stair with a room to front and back of this. Other than the end of terrace homes with lean-tos, all houses have rear porches. These are larger to the homes with front and rear dormers, which also have an extended living room.

Bathrooms are stacked, adjacent to the stairs, with the kitchen also located on the same side of the stair, limiting plumbing distances.

At the second storey both bedrooms have areas of sloped ceilings, though those benefitting from a dormer have more useable area.

Two storey houses have a larger loft area, with no rooms with sloping ceilings

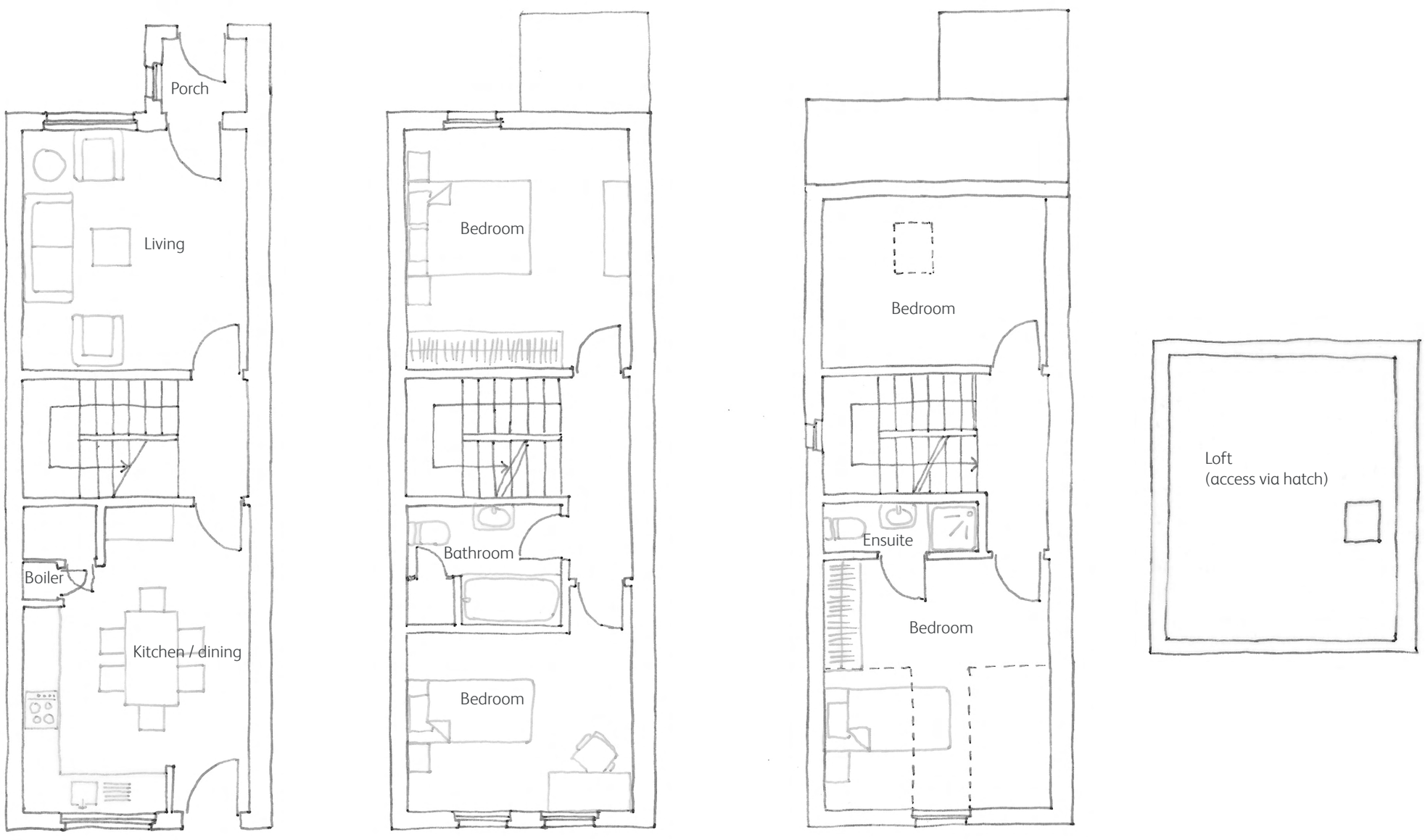


Figure 12 - Typical house floor plans - 2 - 2.5 storey terrace with front dormer type

The flats are all understood to have similar layouts, though there are variations in terms of fenestration across the different floors and relative front door location as the flats step in and out.

At around 46m² the flats are smaller than the London Plan would currently allow, but are reasonably well laid out. Upper floor flats have no private outdoor amenity space which would also not be acceptable for new build flats now. While the addition of balconies was suggested at the Block Representatives meeting on 3rd December, this has not been explored in this document as this does not form part of the budget allowed for Verity Close. It is however crucial that easy access is provided for all flat residents to the communal garden areas. Reinvigorating these could form part of a community engagement strategy. Should landscape works be carried out across the Close at a later date, a priority for these would be to create enjoyable outdoor space for all of the residents of the Close.

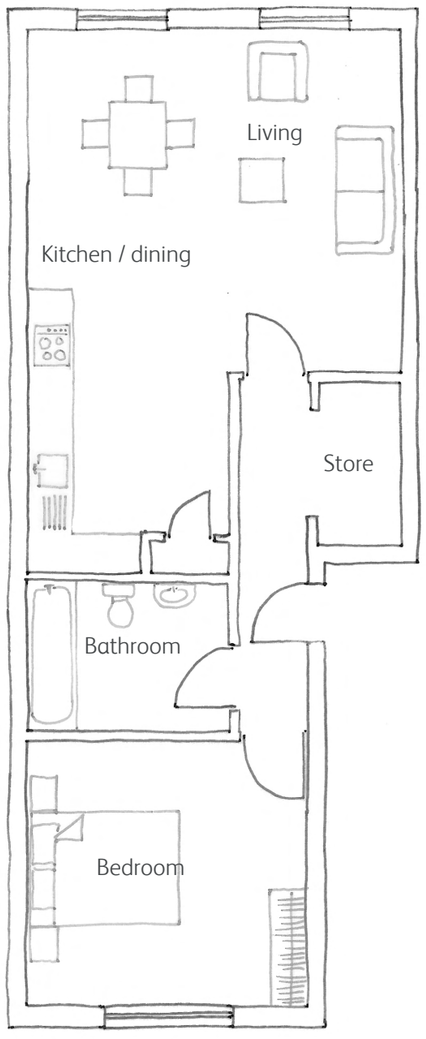


Figure 13 - Typical flat layout

3.4 EXISTING CONSTRUCTION

The Close was completed in 1979. Both flats and houses are each 3.84m wide, with blockwork party walls between. Much of the construction information is based on relatively intrusive investigations at 50 Verity Close, which has recently been refurbished. They are assumed to be relatively representative, although alterations have been made to some homes.

HOUSES

The buildings are brick cavity wall construction, appearing to have used red brick for both inner and outer leaves of the cavity walls to some areas, with an internal blockwork leaf in other areas. The cavity is understood to be around 100mm wide, and to have been filled with blown insulation at some point since construction. From the one property where a sample has been extracted (no. 50) this appears to be a mineral wool type insulation. It is not known whether this was applied to all homes, nor how well-filled cavities are. There is a soldier course detail to all window heads, and this extends all around the houses at ground floor window head level. Terracotta vents are visible externally in line with these soldier courses at ground and first floors. At 50 Verity Close these were also visible internally, and appeared to allow air to pass freely between inside and out. In conjunction with significant redundant ductwork in the roof void here, these vents are thought to have originally served open-vented gas fires.

Ground floors appear to be ground bearing concrete slab with a screed of around 70mm over this. Foundations are yet to be investigated. Houses appear to generally have a small step or slope up to doors. Upper floors are timber-joisted with joists on metal hangers running between the party walls. Residents have commented that they can hear noise clearly between floors, as well as between properties.

Roofs are supported on timber purlins, also on metal hangers spanning between party walls. These purlins support timber rafters, over which sit a breather membrane, tiling battens and concrete tiles. It is noted however that many properties have been re-roofed, so this build up varies around the Close.

At steps in the terraces ends are flat verges, while ends of terraces have a gable parapet wall protruding around 450mm above the roofline. This is capped by bricks-on-end, though in some instances waterproofing here has clearly failed, as the parapet has been sealed over.

Window openings are relatively consistent around the Close, but many windows have been replaced at various times, leading to some variation in opening type, window ages and material. Some homes still have original single glazed, aluminium framed windows, and condensation forms on the inside of these when it is cold. It is assumed that all more modern windows are double glazed and incorporate trickle vents, and it is noted that at no. 50 windows were poorly fitted, leading to gaps between frames and walls and between frames and opening panes.

All houses have small rooflights as a minimum, and in many instances these have been replaced and enlarged, or further rooflights added, suggesting that habitable rooms have been created in roof spaces. Two of the house types also feature dormer windows which are zinc covered and are one of the defining features of the Close. These dormers serve second storey rooms in the roof space. It is understood that these rooms sometimes overheat, and also that damp and mould have been observed around dormer windows.

All house types feature a rear or end 'porch' area of some kind, The 4 end of terrace houses with lean-tos have their front doors recessed in these lean-tos. The two storey properties and those with a single dormer have a small lean-to porch at the rear, featuring an entrance door and a small side window with a tiled pitched roof. The houses with dormers front and back have larger porch areas with zinc-clad sections of wall and flat roofs as well as a further lean-to section that protrudes at ground level, making these properties longer overall.

FLATS

The flats appear to be of similar construction to the houses, but with concrete floors. The two blocks of flats appear to be of identical plan, though minor alterations may have been made over time.

The plan of the blocks of flats is also staggered, but with a continuous ridge height, so that the eaves sit lower where the building steps forwards. In these locations there are dormer windows serving the top storeys, breaking the eaves line. These dormers therefore have a slightly different character, and those at the rear are almost square in format.

Lean-to structures to the front of each staircore house a refuse store, a services cupboard and the communal entrance door. These dominate the front of the blocks. Stairs are concrete and are lit by a window in the side of the entrance lean-to structure and a window at the top floor. Stairwells are unheated, and separated from flat front doors by a door and small lobby area. There have been instances of mould on the flat side of walls to the stairwell.

It is assumed that top floor flats have small areas of sloped ceilings and that there is some insulation in the loft area above, though this too is still to be verified.

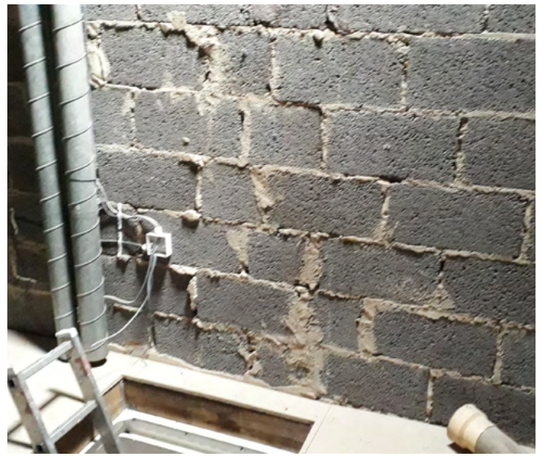


Figure 14 - Inner skin blockwork to 50 Verity Close gable wall

Figure 15 - Soldier course banding above ground floor window head level

Figure 16 - Vents through walls

Figure 17 - Ground floor screed over concrete

Figure 18 - First floor joists on metal hangers (here at eaves of lean-to roof)

Figure 19 - Poorly maintained parapet to gable end wall

Figure 20 - Metal lintel to window head

Figure 21 - Dormers to second floor of houses

Figure 22 - Staggered facade to flats with varied eaves height & lean-to entrances

Figure 23 - Larger rear dormers to flats, breaking the eaves line

Figure 24 - Windows to gable ends of flats

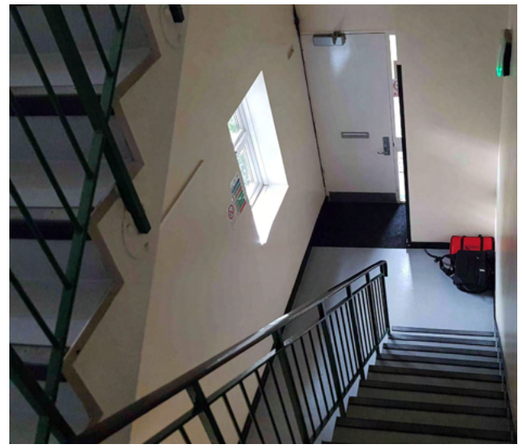


Figure 25 - Communal stairs, looking down to entrance door

3.5 EXISTING STRUCTURE & SERVICES

STRUCTURE

Verity close is a cul-de-sac with a number of residential properties on the road.

There are two basic types of property. Numbers 1-7 and 44 - 61 are more traditional three storey stepped terraced units. The construction is load bearing masonry supporting timber upper floors and roof.

The load bearing masonry is cavity wall construction with a blockwork inner skin and brickwork outer skin.

These units are generally quite narrow so the timber upper floors span from side to side. The roof structure is mono pitched sloping from front to back and incorporating the top level of the accommodation. The rafters are supported on timber purlins spanning from side to side. There are narrow dormer windows in then roofs.

At the front of each unit there is a single storey entrance lobby area with a mono-pitched timber roof.

Numbers 8 – 43 are located in 2 similar three storey blocks of flats. The construction is also load bearing masonry but supporting concrete upper floors and a timber pitched roof structure.

The load bearing masonry is cavity wall construction with a blockwork inner skin and brickwork outer skin.

Details of the internal load bearing walls are unknown. Either there is a spine wall or a series of cross walls between units.

At the front of the buildings there are single storey bin stores with mono-pitched roofs.

SERVICES

As a services consultant has not yet been appointed, this is a very high-level summary of the existing services.

All flats and houses are understood to be served by gas boilers, serving both heating and domestic hot water. Except for no. 50 Verity Close, where this system was recently replaced by an air source heat pump after extensive retrofit works.

Electric meter boxes to the flats appear to be housed below the communal stairs at ground floor.

Further investigations are required to establish existing gas routes to the houses and to and within the blocks of flats.

There are no lifts to the flats. Communal doors are access controlled with keypad / entryphone control, but this is only audio.

50 Verity Close recently had photovoltaic panels installed on its roof, but no other homes in the Close have these.

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.

RBKC are currently undertaking Type 4 Fire Safety Risk Assessments which include intrusive investigations to both common parts and individual flats and houses. The design team expect to receive the outcomes of these assessments imminently and these will inform design decisions. IFC (International Fire Consultants) are to be appointed from RIBA Stage 2 onwards to support the development of this work.

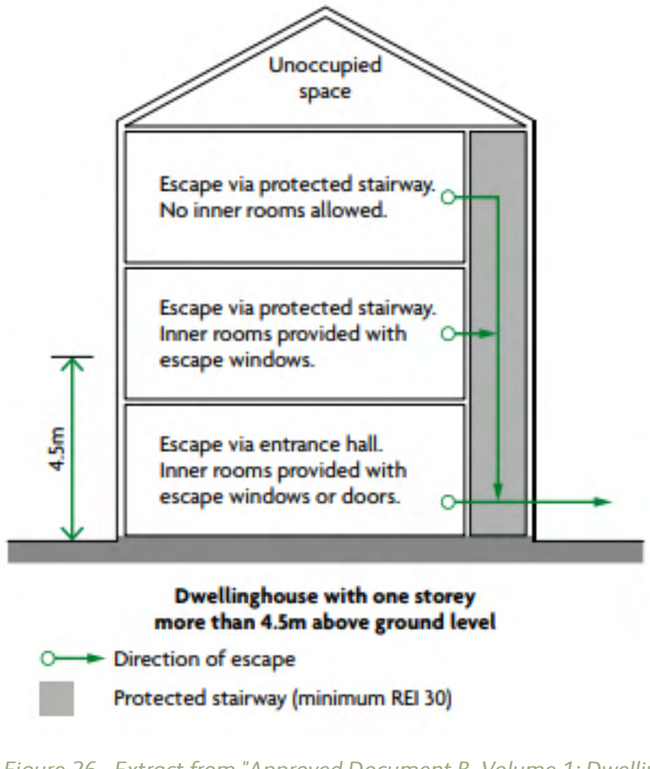


Figure 26 - Extract from "Approved Document B, Volume 1: Dwellings" Diagram 2.1 - Means of escape from dwellinghouses

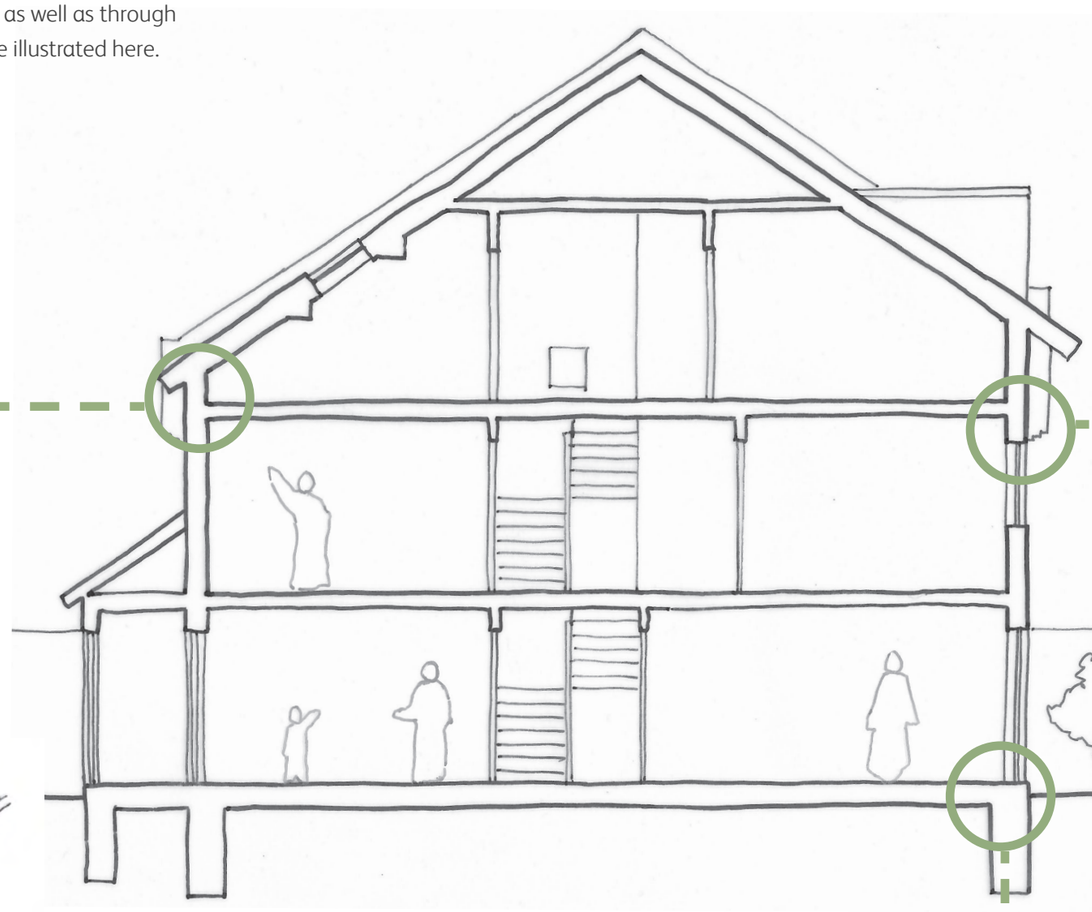
OVERVIEW OF EXISTING

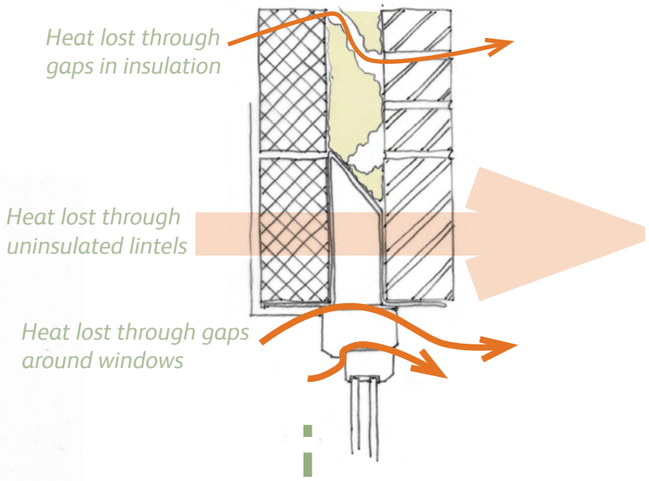
The existing houses are relatively low risk, being single family houses, below 11m of brick / block construction, with two entrance doors. However in many cases the top floor is more than 4.5m above ground level. Were they to be built now this would trigger the requirement for a protected stairway. It is yet to be confirmed whether this is in place in these homes. Any work to that might increase the speed of fire spread within the houses will need to be checked with building control to confirm that it is not making matters worse in any way.

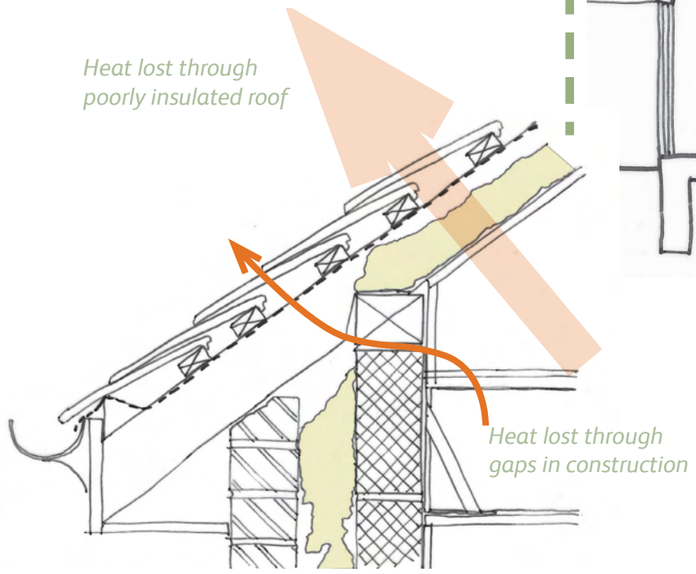
The flats are similarly below 11m and of brick / block construction, but as they house multiple dwellings, are somewhat more complex. It is yet to be confirmed that both internal layout of flats and the arrangements in the common parts are compliant with building regulations.

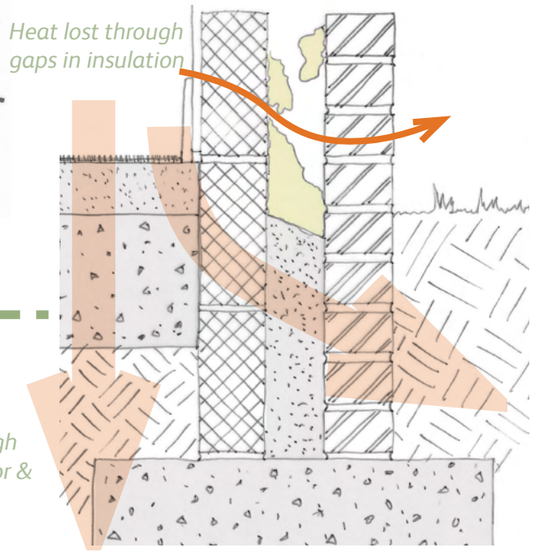
3.7 EXISTING ENERGY USE

Having been built in 1979 the homes at Verity Close are less energy efficient than a new home, though they are more efficient than many on the estate. Wall insulation is patchy at best, and thermographic imaging will establish how contiguous and dry this is. There are known gaps in construction around window frames and panes, as well as vents through walls. Eaves junctions are not well-sealed. The ground floor is understood to be uninsulated, so heat is lost to the ground here, making the floor feel cold. While some roofs are understood to have some insulation at rafter or loft level, it is not expected that this is consistent. A lot of heat is lost through gaps in construction, as well as through the main building elements. Some particularly poor areas are illustrated here.









ENERGY STUDIES

In addition to the Retrofit Accelerator report which covers the whole estate, and breaks Verity Close down into flats and houses, more detailed work has been carried out to establish existing and potential heat demand at 50 Verity Close. This culminated in retrofit works to this individual property. In what follows, these various pieces of work are examined in more detail and compared, to give an appraisal of current heat demand and of potential demand reduction. Once full dimensional surveys of all of Verity Close are available, as well as results of investigations being carried out on the existing fabric, more detailed modeling of the whole area will be carried out to refine the current models.

ENERGY PERFORMANCE CERTIFICATES (EPC) - SUMMARY

EPC certificates have been provided for 10 of the 68 properties at Verity Close. Further EPCs have been downloaded from the MHCLG website. All are Reduced Data Standard Assessment Procedure (RdSAP) assessments, produced over a range of time from 2010 to 2020. These suggest that the properties range from EPC band E to C and are presented here.

EVALUATION

The provenance of each of the EPCs is not known and hence accuracy cannot be confirmed. Additionally RdSAP is known to be an inaccurate tool for measuring actual energy use, and experience suggests that the reality is often worse than the assumptions that are fed into the SAP calculations.

All socially rented housing will need to achieve EPC band C, so RBKC will need to carry out some upgrades to at least some homes over the next ten years to meet this target. However LWNT's ambition exceeds this.

There are a few anomalies, such as a mid-floor flat with an EPC of E, where it has been assumed that this flat does not have cavity wall insulation, while surrounding flats are assumed to have this. However overall the homes appear to perform relatively well compared to the average UK home. However compared to the EnerPHit standard that LWNT have set out as part of their retrofit ambition, which calls for a space heating demand of 25 kWh/m2/year, there is clearly a lot of work to be done.

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

Property number	Type		EPC band	year	Floor area (m^2)	Primary energy use (kWh/m^2/yr)	CO_2 emissions (tonnes)	Space heating demand (kWh/yr)	Specific space heating demand (kWh/m^2/yr)
8	Flat	ground	C	2018	44	222	1.7	3831	87
9	Flat	ground	C	2017	46	167	1.3	2959	64
12	Flat	top	D	2012	73	224	3.1	7617	104
14	Flat	ground	C	2011	47	252	2		
17	Flat	mid	C	2020	43	143	1.1	1605	37
18	Flat	top	C	2016	46	191	1.6	3254	71
19	Flat	top	C	2017	45	170	1.3	2234	50
21	Flat	ground	C	2017	47	223	1.8	4274	91
24	Flat	top	C	2010	58	208	2		
25	Flat	top	C	2019	46	186	1.5	3339	73
27	Flat	ground	C	2010	47	257	2		
30	Flat	top	D	2013	47	246	2.2	5085	108
32	Flat	ground	C	2016	47	211	1.7	3573	76
34	Flat	mid	B	2010	45	179	1.3		
36	Flat	top	C	2012	48	200	1.8	4693	98
37	Flat	top	C	2013	46	169	1.5	4421	96
38	Flat	ground	C	2010	53	264	2.3		
40	Flat	top	C	2019	46	154	1.2	2321	50
41	Flat	mid	D	2012	38	251	1.8	3756	99
	Flat	**Average**							**79**
6	House	mid	E	2014	114	291	6.4	12072	106
7	House	end	D	2012	106	230	4.7	10686	101
44	House	end	D	2011	114	261	5		
47	House	mid	D	2016	120	192	4	10384	87
48	House	mid	E	2013	78	313	4.6	9705	124
57	House	mid	D	2015	126	192	4.3	12192	97
66	House	mid	C	2009	76	226	2.9		
	House	**Average**							**103**

Figure 27 - Available EPC information

3.7 EXISTING ENERGY USE

RETROFIT ACCELERATOR / CARBON TRUST SUMMARY

Prior to the appointment of ECD and other MDC teams RBKC 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 identifies a series of retrofit packages that could be applied to each of the building typologies as part of the route to net zero Carbon. These interventions are identified as Option 1 (Essentials); Option 2 (High performance envelope) and Option 3 (High performance envelope plus renewables and storage). These options were subsequently categorized by LWNT as Bronze (option 1), Silver (option 2) and Gold (option 3).

RESULTS

For Verity Close the proposed interventions are set out in the top table opposite and are applied to both flats and houses.

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 offered indicative energy performance results which are set out to the right. They are separated into houses and flats, as the scale and form of the homes is so different, so that their energy use and potential for reduction varies widely.

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

- Is the cavity wall insulation performing as expected?
- How can rooms in roof spaces be well insulated?
- Can thermal bridging be properly addressed, as well as ventilation?

EVALUATION

While this study is based on relatively limited information, it offers a really useful baseline to test ideas and outcomes against. As it is one of the inputs into the estate's overall heating strategy it needs to be considered in detail, and divergence from these proposals justified. As noted in the report further investigations into the existing construction, airtightness and insulation need to be carried out to inform the decision on the right strategy to take forwards. In particular it will be important to ensure that heat demand is significantly reduced before heat pumps are introduced, to avoid the risk of increasing residents' bills. The bronze, silver and gold standards are all investigated in more detail in the proposals section of this report.

Package	Walls	Thermal bridging	Air-tightness	Glazing	Roof	Ventilation	Heating	Solar
0 Current situation	Insulated cavity	None obvious	Reasonable for the building age	Double glazed, sash	Pitched, insulated. Potential issues around room in roof	Trickle vents, possibly extract fans in bathroom.	Gas boilers	None
1 Essentials			Basic draught proofing in addition to improved glazing.	High performance double / triple + new external doors	Increase loft insulation	Additional MEV	Individual heat pumps	
2 High performance envelope	High performance External insulation	New external envelope	Best practice	High performance double / triple + new external doors	Super-insulated	Additional MEV/MVHR	Individual heat pumps	
3 High performance + solar PV & storage	High performance External insulation	New external envelope	Best practice	High performance double / triple + new external doors	Super-insulated	Additional MEV/MVHR	Individual heat pumps	Solar PV + Communal storage

Figure 28 - Retrofit Accelerator - Proposed packages of works for houses and flats at Verity Close

Package	Annual CO_2 emissions (tonnes)	Heat demand (kWh/m²)	Annual tenant cost (heating and electricity)
0 Current situation	5.3*	89	£1,450
1 Essentials	1.9	69	£790
2 High performance envelope	1.4	27	£680
3 High performance + solar PV & storage	0.6	27	£460

Figure 29 - Retrofit Accelerator -Expected outcomes of packages of works for houses at Verity Close

Results in both cases assume:

Heating via individual heat pumps

MEEF carbon emissions factors used:

Gas: 0.184 kg/kWh

Electricity: 0.351 kg/kWh

Package	Annual CO_2 emissions (tonnes)	Heat demand (kWh/m²) Ground – Mid – Top Floor			Annual tenant cost (heating and electricity)
0 Current situation	2.2*	112	68	80	£820
1 Essentials	1.4	85	50	60	£720
2 High performance envelope	1.2	32	19	28	£660
3 High performance + solar PV & storage	0.6	32	19	28	£460

Figure 30 - Retrofit Accelerator -Expected outcomes of packages of works for flats at Verity Close

PASSIVHAUS OPTIONS REPORT - ECODESIGN CONSULTANTS (50 VERITY CLOSE)

SUMMARY

This report is based on more detailed survey drawings of this one house, though no opening up work nor fabric surveys were undertaken. The existing fabric is based on assumptions extrapolated from historic building regulations.

The report proposes a range of improvements which could be made to the building's fabric to reduce the heat demand and improve comfort, and packages these up to propose several standards which could be aimed for.

RESULTS

This report models the building in the Passivhaus Planning Package (PHPP) and indicates an existing space heat demand of 218kWh/m^2/year. This excludes the loft space from the useable floor area (which is appropriate given it's current condition), and acknowledges that some assumptions, such as quality of windows and current airtightness are very unknown.

It proposes upgrades to all building elements to reach AECB silver standard (40kWh/m^2/yr heat demand), EnerPHit (20kWh/m^2/yr heat demand) or Passivhaus (15kWh/m^2/yr heat demand). In all cases new windows would be required, along with significantly improved airtightness and an Mechanical Ventilation with Heat Recovery (MVHR) system. A variety of levels of additional insulation is proposed to meet the various standards, but in all cases significant new wall and roof insulation is needed.

EVALUATION

50 Verity Close was likely one of the worst performing properties on the Close, with a large form factor and relatively unmodernised. However its construction is likely largely representative of the rest of the close, so solutions are likely to be similar.

While the standards that the report seeks to achieve are appropriate for working towards a zero carbon estate, so me of the materials proposed are not A1 rated for non-combustibility, so would need to be substituted. Additionally the work required to achieve these standards is invasive, particularly the replacement of floor screed. As the property was vacant this was an appropriate proposal here but might be less so across the wider estate.

ECD / GREENGAUGE (50 VERITY CLOSE)

SUMMARY

ECD and M&E engineers Greengauge previously designed retrofit work for the house at 50 Verity Close. It should be noted none of the other reports were supplied to the design team prior to them undertaking their design work. The design was based on survey drawings of the house and some more detailed investigations of the fabric. Detailed design drawings and specification were provided to RBKC and their voids contractor (Vikfix) carried out the works on site. The property was void at the time of the works, which are almost complete as of mid-December 2020. Further details of the actual outcomes of these works will be available over the coming months.

The client stipulated that all components should be non-combustible where possible, and that external wall insulation would not be acceptable.

RESULTS

Greengauge's model of the existing building in the PHPP suggested an existing heat demand of 306 kWh/m^2/yr, treating the roof space as uninhabited. Through the application of internal wall insulation, significantly improved airtightness and introduction of Mechanical Ventilation with Heat Recovery (MVHR), new windows, new insulation between and below rafters it is hoped that the heat demand will be reduced to around 66 kWh/m^2/yr. The work also includes heating and hot water via a ground source heat pump and new photovoltaic panels, both of which further reduce carbon emissions.

EVALUATION

While this design work is based on the most detailed information of all the reports, full surveying of the existing condition were not carried out, so the work is based on assumptions around airtightness and efficacy of existing cavity wall insulation.

The heat demand at the end will be far lower than the existing heat demand, as will carbon emissions. The residents will have a warm and comfortable home. However the works were hugely invasive, involving the stripping of the roof, new rafters, access to floor joists, and the application of wet plaster to most internal walls. Carrying out work like this requires residents to move out, so may not be suitable for most homes on the estate. Additionally, the need to apply insulation and airtightness internally mean that thermal bridges and gaps in the airtightness layer remain, so the improvements are limited.

Figure 31 - 50 Verity Close - joist ends exposed & made airtight

Figure 32 - 50 Verity Close - Diathonite plaster applied to inside of walls (greenish hue is reinforcement mesh)

3.7 EXISTING ENERGY USE

ANALYSIS OF EXISTING REPORTS

The reports and information all set out to show different things and in different levels of detail.

Key points from the summary heat demand table to the right:

- Great **variation** in assumed existing heat demand
- **More detailed investigations suggest higher heat demand** (though noted that 50 Verity Close may have been worst performer on the Close)
- Really **significant heat demand reduction is possible**, but limitations on disruption, combustible materials and external insulation could all limit improvements

It is noted that limitations on construction work may limit the heat demand reduction. This is the challenging but crucial element of this project - finding a balance between what is technically possible and what is acceptable to and beneficial for residents.

	Heat demand (kWh/m²/yr)			
	Existing - houses	Existing - flats	Proposed - houses	Proposed - flats
EPCs	103	79	n/a	n/a
Retrofit Accelerator	89	68-112	27 (silver)	19-32 (silver)
EcoDesign	218	n/a	≤15	n/a
ECD / Greengauge	306	n/a	≈66	n/a

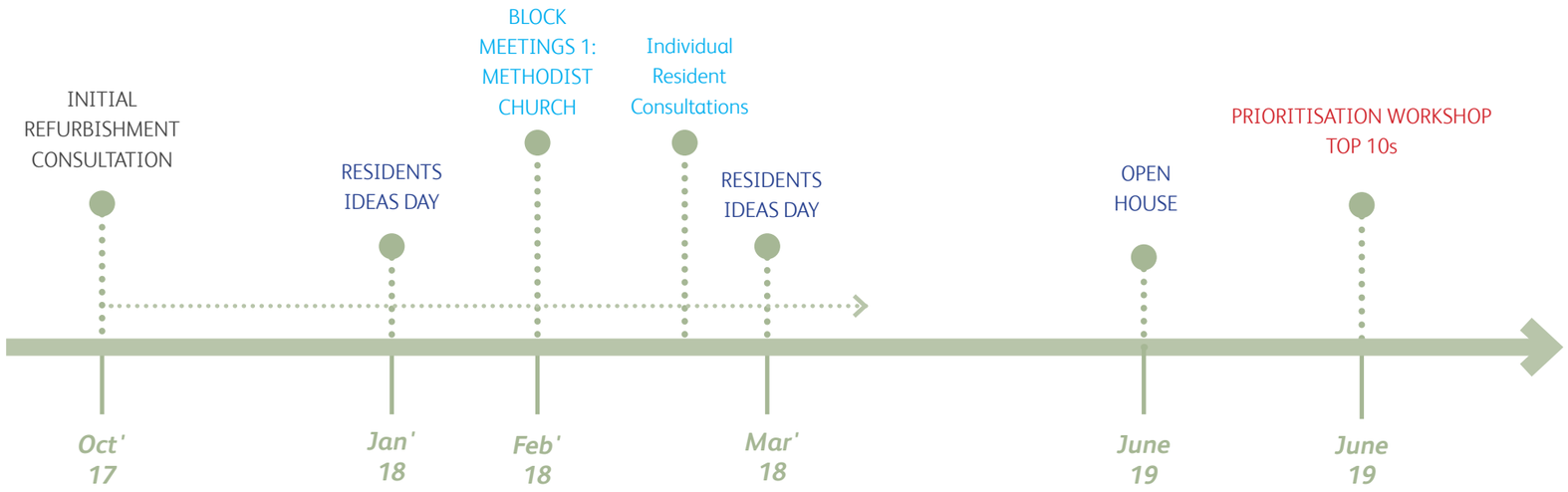


Figure 33 - Timeline of previous consultations

IDEAS DAY & CONSULTATIONS

At the Resident Ideas Day workshops, meetings and consultations residents from Verity Close had the opportunity to discuss their concerns and early design options for their homes and their buildings. Residents expressed concern about poor performance of windows, wanting upgrades to their kitchens and bathrooms, noise issues between floors and inadequate repairs and maintenance.

With respect to building and external space residents raised the issue of block entrances and bin stores being unattractive and insecure. In the Close, accessibility issues in relation to parking provision and communal gardens were raised. Furthermore issues around security and anti-social behaviour were noted. In terms of environment, they believe that the Close was dominated by vehicle space and could perhaps instead support better community use, as well as being better lit.

PRIORITISATION WORKSHOPS

The Prioritisation Workshop for Verity Close was held on 27th June 2020 and led by the Resident Engagement Team. This workshop helped residents prioritise their concerns raised in earlier Idea Day workshops and consultations. The outcome of this is shown opposite in a table of Top 10 items to address.

ECD's proposed response will focus as a priority on the works to the building fabric in order to improve its performance from both a thermal and acoustic point of view. The remaining Top 10 will also be addressed at a later point.

- Improve the thermal performance of the building by installing façade fabric by introducing new windows, roof insulation and new internal wall (IWI) or external wall (EWI) system.
- Improve the efficiency of heating, cooling and ventilation systems.
- Improve the sound proofing insulation between dwellings.
- Bring fire safety up to current standards.
- Improvements to the communal areas/ stair core: decorations, new flooring, LED lighting, etc. Include painting of all metalwork
- Improved security with new door entry systems.
- Improvements to internal doors and associated woodwork.

Top 10s

Flats	Houses
1. Kitchens	1. Sound proofing
2. Bathrooms	2. Kitchens
3. Entry-systems	3. Bathrooms
4. Drainage	4. Boiler
5. Sound-proofing	5. Electrics
6. Windows	6. Gate off the close
7. CCTV	7. Internal doors
8. Roofs	8. Plumbing
9. Boilers	9. Drainage
10. Re-design close	10. CCTV


Verity Close
Refurbishment programme – flats
Draft programme
Residents' top 10 priorities are:
1 Kitchens
2 Bathrooms
3 Block entry system
4 Drainage
5 Soundproofing
6 Windows
7 CCTV
8 Roofs
9 Boiler
10 Redesign the close
35% Resident participation
Co-design update


Verity Close
Refurbishment programme – houses
Draft programme
Residents' top 10 priorities are:
1 Soundproofing
2 Kitchens
3 Bathrooms
4 Boiler
5 Electrics
6 Gate off the close
7 Internal doors
8 Plumbing
9 Drainage
10 CCTV
28% Resident participation
Co-design update

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4.0 PROPOSALS

4.1 PROPOSALS OVERVIEW

THERMAL IMPROVEMENTS

The most significant works likely to be carried out at Verity Close are those to reduce heat demand and carbon emissions. On the following pages is a table of many of the possible retrofit interventions that could help to achieve this. Each is weighed up in terms of disruption, non-combustibility and pros and cons.

Combinations of these measures are then set out that respond to the Bronze, Silver and Gold aspirations presented in the Retrofit Accelerator report. Within these levels of retrofit there are further options around how various elements are implemented. This choice will have an impact on cost, disruption and overall effectiveness of the measures, and comment is provided on this.

Great reductions in heat demand and carbon emissions are possible, but the options that create the most improvement are the most disruptive, so discussion with residents of the relative benefits is crucial to establish the best way forwards.

OTHER WORKS

There are other issues raised by residents that ought to be addressed alongside these works. Some form part of this feasibility study, and are presented in more detail here. Others are outside 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:

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

By others, but integrated:

- Sprinklers
- Door entry systems
- Lighting
- CCTV
- Landscaping works
- Plumbing
- Below ground drainage

Commentary on how these works can be integrated and avoiding abortive work is provided at the end of this section of the report.

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 a proper 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

Preliminary energy modelling has been carried out in the Passivhaus Planning Package (PHPP) on the 3 bedroom house at 50 Verity Close, to show what kind of savings might be achieved by the various standards proposed.

As currently modelled none of the standards quite meet the EnerPHit standard, which requires a heat demand of ≤20 kWh/m²/year in London. While heat losses through most building elements reduce significantly under the silver scenario, the amount of heat lost through the floor remains high.

It is likely that more detailed energy modelling of other homes will show lower heat demand with the application of the same measures - the flats for example may well meet the EnerPHit standard, as well as mid-terrace houses. However the challenges of staggered houses and pepperpotting of freehold properties may limit the ability to apply external wall insulation.

Standard	Specific heat demand **kWh/m²/yr**	Total heat demand **kWh/yr**	Electricity needed to supply this via ASHP (COP3) **kWh/yr**	CO_2 emitted to do so **kgCO2/yr**
Existing	146	17082	5694	1999
Bronze	118	13806	4602	1615
Silver A	38	4446	1482	520
Silver B/C	25	2925	975	342

Figure 38 - Heat demand & CO_2 figures for the various thermal upgrades.
Note that figures do not cover all operational energy use

MODELLING ASSUMPTIONS

In this case 50 Verity Close has been modelled as if the roof space were habitable space, as this better reflects the situation across the Close as a whole. This explains significant variation from previously modeled versions.

The bronze scenario presented here assumes that airtightness measures manage to halve the air permeability, and that all windows are replace with triple glazed windows. This could form the first step in a step-by-step retrofit, but otherwise would represent a significant investment for what can be seen to be a relatively limited heat demand reduction.

Further investigations into the airtightness, energy use and element U values will help to provide more certainty around these numbers, and the dimensional survey will allow mo re of the properties to be modeled.

CO_2 figures assume carbon emission factor for electricity of 0.351 kg/kWh.

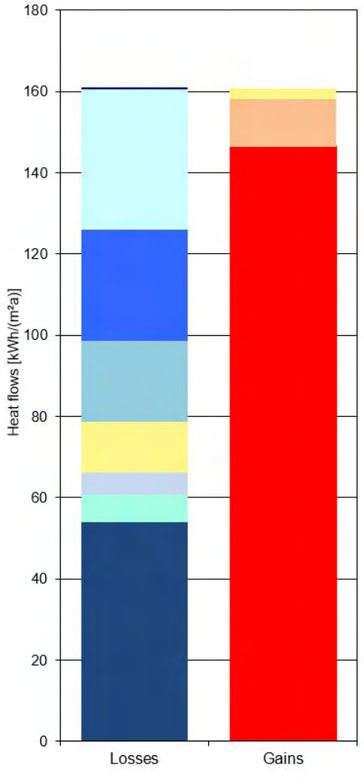


Figure 34 - Existing energy balance
Heat demand 146 kWh/m²/yr

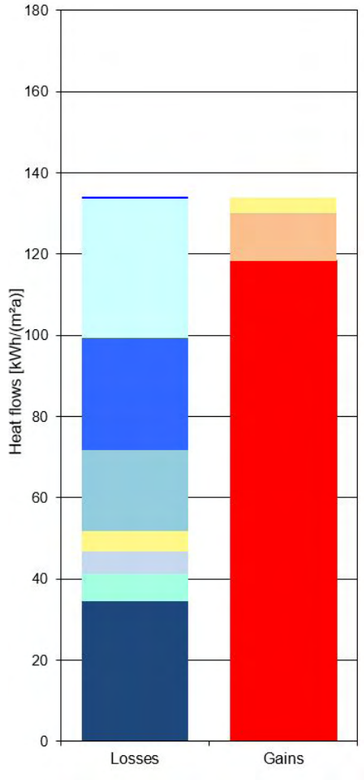


Figure 35 - Bronze energy balance
Heat demand 118 kWh/m²/yr

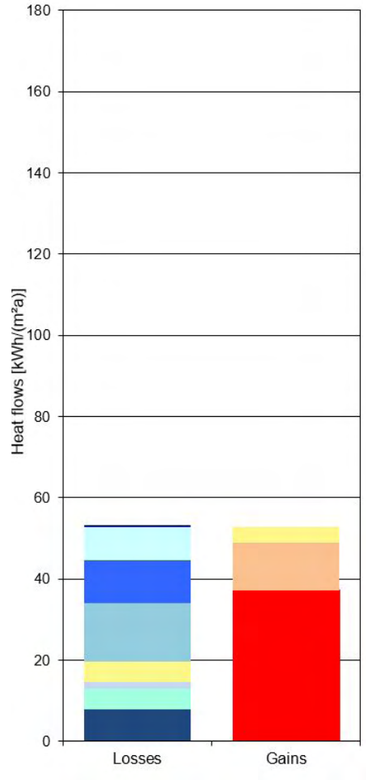


Figure 36 - Silver (A) energy balance
Heat demand 38 kWh/m²/yr

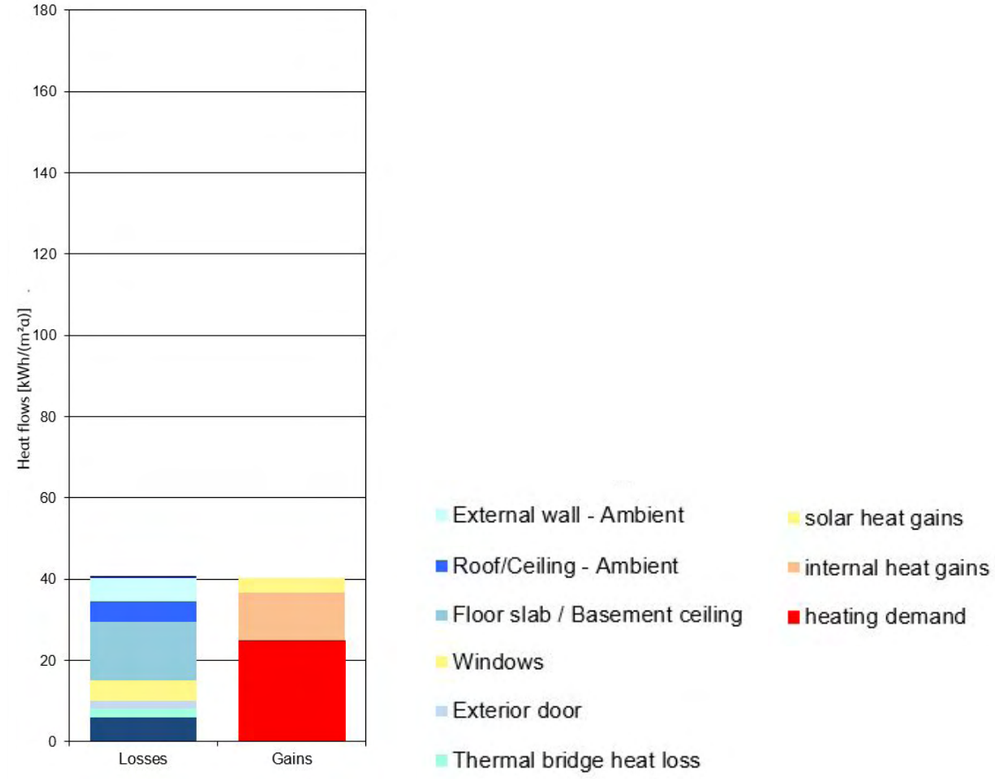


Figure 37 - Silver (B&C) energy balance
Heat demand 25 kWh/m²/yr

Measure	Image	Reason	Proposal	Safety
Insulate Ground Floor Break out existing screed/concrete & install insulation in this space		Floor is in contact with ground, so heat is lost through here and floor feels cold. Assumed current U-value = 0.7 W/m^{2}K	Remove existing screed & install Aerogel insulation board over existing slab. New floor finish over.	Spacetherm A2 Multi = A2,s1-d0
Insulate Ground Floor Add insulation above existing solid concrete ground floor		Floor is in contact with ground, so heat is lost through here and floor feels cold. Assumed current U-value = 0.7 W/m^{2}K	Add new Aerogel insulation over existing floor	Spacetherm A2 Multi = A2,s1-d0
Perimeter Insulation Dig down below ground level & install insulation to outside face of wall below ground		Create ‘skirt’ of insulation around the floor, so that the solid floor and ground below it are kept warmer.	Add new Foamglas insulation to outside face of external wall below ground level, up to 1m below external ground level	Foamglas = A1

Spatial Implications	Intrusiveness	Pros	Cons / Risks
None - specify new floor build up based on replicating depth of existing screed		- Reduce heat loss through floor - Warmer floor - more comfortable for residents - Potential for UFH, improving heat pump efficiency	- Work to remove screed - Caution needed at internal wall/floor junctions
Need to consider door thresholds & sizes throughout house and step or ramp up at front door.		- Reduce heat loss through floor - Warmer floor - more comfortable for residents	- Step up into house - Door sizes reduce - Floor to ceiling height reduced - Caution needed at internal wall/floor junctions - Bottom tread of stairs becomes shorter
No implications internally. Depth & shape of existing foundations unknown at present so depth of dig TBC. Existing planting at edge of building disrupted		- Reduce heat loss through floor - Warmer floor - more comfortable for residents - Less disruptive than internal floor insulation	- Less effective than insulating floor - Existing foundations to be investigated to determine design & hence efficacy - Confirm no moustre risk

4.2 POSSIBLE INTERVENTIONS

Measure	Image	Reason	Proposal	Safety
External wall insulation Add insulation to outside of external walls		Heat is lost through existing walls as there is little insulation in them. Assumed current U-value = 0.68 W/m^{2}K	Mineral wool insulation to outside of existing external walls with render or brick slip system to outer face	Mineral wool insulation = A1 Parge coat plaster = A1 Other elements depending on construction type
Internal wall insulation Add insulation to inside face of external walls		Heat is lost through existing walls as there is little insulation in them. Assumed current U-value = 0.68 W/m^{2}K	Diathonite insulated plaster applied to internal face of external walls	Diathonite insulated plaster = A1
Insulate Roof Add insulation between & below rafters		Heat is lost through roof Assumed current U-value = 3 W/m^{2}K	Mineral wool insulation between & below existing rafters. New ceiling required after works	Mineral wool insulation = A1 Airtightness membrane - Procheck A2 = A2-s1,d0

Spatial Implications	Intrusiveness	Pros	Cons / Risks
No implications to internal space Assume around 250mm extra thickness to walls externally		- Excellent reduction in heat loss through walls - Effective way to limit thermal bridges - Really warm comfortable home - Combine with parge coat below to improve airtightness	- Planning permission likely required - 'Pepperpotting' appearance as freehold properties untouched - Residents' concern about external insulation - Careful consideration of ground & eaves - Provision of new rainwater pipes & adjustments to gulleys - Heat still lost through party walls to un-retrofitted homes
Loss of space to all rooms along their external walls. Assume around 100mm extra build up internally		- Reduce heat loss through walls - No change to external appearance - Warmer more comfortable home than at present - Use same but thinner system along party wall to reduce heat loss here	- Care needed at internal wall/ external wall junctions - Loss of internal space - Smaller reduction in heat loss overall - Care needed where joists penetrate new insulation - Moisture risk
Reduction in height of sloped ceilings Roof pitch & height to be kept as existing, in line with adjoining roof.		- Reduce heat loss through roof - Include carefully installed airtightness layer - Opportunity to strengthen existing roof structure?	- Would require work to lean-to roof as well as main roof - Ensure new build up is appropriately ventilated - Loss of head room at sloped ceilings - Is roof structure strong enough? - Hard to ensure airtightness continuity with walls

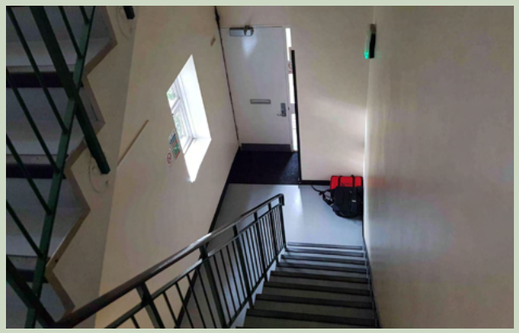
Measure	Image	Reason	Proposal	Safety
Insulate Roof Add insulation between & over rafters		Heat is lost through roof Assumed current U-value = 3 W/m^{2}K	Mineral wool insulation between & over existing rafters. New tiling battens & roof finish required over	Mineral wool insulation = A1 Airtightness membrane - Procheck A2 = A2-s1,d0
New insulated roof Add new insulated roof structure over existing		Heat is lost through roof Assumed current U-value = 3 W/m^{2}K	Remove existing roof finish. Add new off-site manufactured roof over, spanning between party walls	Mineral wool insulation = A1 New roof structure - timber as existing?
Insulate Roof Loft insulation		Heat is lost through roof Assumed current U-value = 3 W/m^{2}K	Mineral wool insulation between & above existing roof joists	Mineral wool insulation = A1

Spatial Implications	Intrusiveness	Pros	Cons / Risks
None internally Roof height raised - upstand needed at junction with un-retrofitted properties		- Reduce heat loss through roof - Include carefully installed airtightness layer - Opportunity to strengthen existing roof structure?	- Would require work to lean-to roof as well as main roof - Planning permission required? - Is roof structure strong enough? - Airtightness layer over rafters? Moisture risk? - Can it be achieved with existing ceilings in place?
None internally Roof height raised - upstand needed at junction with un-retrofitted properties		- Reduce heat loss through roof - Include carefully installed airtightness layer, detailed to meet wall airtightness layer - New stronger roof structure - Speed of installation	- Planning permission required? - Cranes required to lift roofs in - Confirm acceptability of new timber roof structure
None (but only applicable to uninhabited areas of roofs)		- Reduce heat loss through roof - Simple, cheap & uninvasive	- Limited impact on heat loss - Only applicable to uninhabited areas of roof - Some properties may already have this, so heat loss may not be reduced much further

Measure	Image	Reason	Proposal	Safety
New windows Replace all windows with airtight triple glazed windows		Heat is lost through existing windows - through uninsulated frames, glazing and at gaps around frames & opening window panes	New triple glazed windows, sealed to new airtightness layer on external wall / to existing wall	Glass is non-combustible. Choose frames for non-combustibility & thermal properties
New doors Replace all external doors with insulated doors		Heat is lost through and around existing doors	New insulated doors, with triple glazing if glazing still required. Sealed to airtightness layer on existing wall	Choose doors for non-combustibility & thermal properties Glass is non-combustible.
Full building airtightness Design & install airtight layer around inside of house's insulation. Aiming for less than 1 air change per hour		Warmed air is lost through gaps in existing building fabric, especially at window/door junctions & services penetrations	Dependent on insulation strategies adopted, but likely include use of parge coat airtightness membrane airtightness tapes airtightness paint	parge coat - A1 airtightness membrane - A2 airtightness tapes - B? airtightness paint - D?

Spatial Implications	Intrusiveness	Pros	Cons / Risks
None Avoidance of cold draughts near windows means that residents can enjoy full space within house		- Reduce heat loss through windows - No draughts near windows - more comfortable - Quieter internal environment	- Some existing windows not very old - Need to re-do plastering around windows - If done without other insulation works, expensive for limited gain
No implications for existing useable space		- Reduce heat loss through doors - No draughts near doors - New doors understood to be intended anyway	- Need to re-do plastering around doors - Add new external letterbox (to avoid opening in airtight door) - If done without other insulation works, expensive for limited gain
None		- Excellent reduction in heat loss - Excellent improvement in resident comfort - No draughts so more comfortable even at lower temperatures	- Must be combined with Mechanical Ventilation with Heat Recovery (MVHR) or Mechanical Extract Ventilation (MEV) to avoid mould risk - Must be completely & carefully implemented to be effective

4.2 POSSIBLE INTERVENTIONS

Measure	Image	Reason	Proposal	Safety
Bring stairwells into thermal envelope **(flats only)** Each block of flats has continuous layer of insulation & airtightness around it		Warm stairwells mean less heat loss through walls onto stairwells	Insulation, new doors & windows and airtightness to external stairwell walls as well as external flat walls.	As same measures elsewhere
Mechanical ventilation with heat recovery (MVHR) Install MVHR unit to each home with supply / extract to all rooms		Pre-heat incoming fresh air with warmth from outgoing stale air. Fresh air is supplied, but the heat in it is not lost	Install MVHR units with insulated intake & exhaust ducts to outside. Supply / extract ducts around house to serve all rooms	Use fire rated metal ductwork around homes
Mechanical Extract Ventilation (MEV) Install MEV unit with extract from wet rooms / kitchen		Ensure sufficient ventilation to all wet rooms	Consult with residents on problematic rooms. Add / replace extract ventilation as required	Use fire rated metal ductwork if / where ducts pass through other rooms

Spatial Implications	Intrusiveness	Pros	Cons / Risks
None. Though could be combined with improvements to communal entrances / bin stores		- Reduces effective form factor so flats lose less heat - Internal front doors do not need to be insulated	- May be complex around bin stores / communal lobby area if these are not altered.
MVHR unit around 978mm high x 792mm wide x 601mm deep. Access space additional. Insulated ductwork diameter around 200mm Uninsulated ductwork at least 75mm diameter		- Reduce heat loss through air while ensuring fresh air supply - Filters allow improved internal air quality - Engagement opportunity teaching residents about use of units - Through-wall units could reduce disruption to flats	- Uses electricity (though saves energy overall) - Need to run ductwork to all rooms - Only effective if building is airtight - Filters to be changed every 3-6 months - Need trained staff to maintain - Must get quality unit to avoid noise issues - Ensure controls are easy for residents to understand
Limited impact - ventilation units typically through walls		- Cheap & easy to install - Addresses specific damp issues	- Not energy efficient way to ventilate - Only appropriate if airtightness improvements are limited

4.2 POSSIBLE INTERVENTIONS

Measure	Image	Reason	Proposal	Safety
Air Source Heat Pump Heat in air used to heat water, via heat pump, to supply hot water for radiators & domestic hot water		Low carbon alternative to gas boiler	Install external unit to each property. New internal unit. Pair with hot water cylinder for domestic hot water supply	Lower fire risk than gas boiler. But as this is mechanical equipment ensure internal units are not on escape routes
District Heating Verity Close connected to estate-wide district heating. Heat interface units (HIU) in homes to provide sufficiently hot water	 	Estate-wide heat production may be more efficient than localised	New centralised district heating system supplies low temperature hot water to each home. HIU in each home uses this to provide hot water	Lower fire risk than gas boiler. But as this is mechanical equipment ensure internal units are not on escape routes
Photovoltaic Panels (PVs) Install panels on roof to turn sun's energy into electricity to add into home's power supply		Reduce amount of electricity needed from grid, reducing energy bills	Install PV panels to all but north-facing roofs. Install inverter internally (turns DC current from panels into AC current for use in building)	Install such that no risk of PVs creating fire risk to roof

Spatial Implications	Intrusiveness	Pros	Cons / Risks
Varies with unit size External unit eg. 840mm high x 980mm wide x 408mm deep Internal unit eg. 500mm high x 360mm wide x 250mm deep Cylinder likely 575mm diameter, 1485mm high		- Low carbon heat source, supporting zero carbon aspiration - Avoids having gas in home - In conjunction with hot water cylinder can supply all heating & hot water requirements - May be opportunity for resident engagement	- Check whether planning permission required - Noise of fan externally - RBKC will need to maintain this - do they have appropriately trained staff? - Ensure controls are easy for residents to understand - Ensure model chosen has good coefficient of performance - Only implement if home retrofitted to good standard to avoid high electricity bills
Varies with unit size eg. 700mm high x 440mm wide x 270mm deep		- Low carbon heat source, supporting zero carbon aspiration - Avoids having gas in home - Supplies all heating & hot water requirements	- Check whether planning permission required - Noise of fan externally - RBKC will need to maintain this - do they have appropriately trained staff? - Ensure controls are easy for residents to understand
Inverter required internally		- Reduce electricity bills - Export electricity to grid at some times & make money - Low carbon energy source	- Occasional cleaning & maintenance required - Confirm possible output, considering surrounding trees etc - How best to split electricity among flats? - Ensure roofs can support panels

4.2 POSSIBLE INTERVENTIONS

Measure	Image	Reason	Proposal	Safety
Solar Thermal Panels Install panels on roof to use sun's energy to heat water		Top up hot water to serve space heating & domestic hot water supply	Install panels to both west and east roofs. Pipework runs to twin coil hot water cylinder, combining with hot water from heat pump	Install panels to both west and east roofs. Pipework runs to twin coil hot water cylinder, combining with hot water from heat pump

Spatial Implications	Intrusiveness	Pros	Cons / Risks
Insulated pipework runs from roof to cylinder		- Reduce use of heat pump, so reduce electricity use - Low carbon energy source	- More complex system than PVs - Need more complex controls to integrate with heat pump output - Less simple to install to flats - could hot water be shared between flats?

4.3 PROPOSALS - BRONZE STANDARD

Walls: Close up cracks & openings

Roof: Increase Loft Insulation

Windows: High performance double glazed windows & new external doors where existing is particularly poor or draught proofing at frames

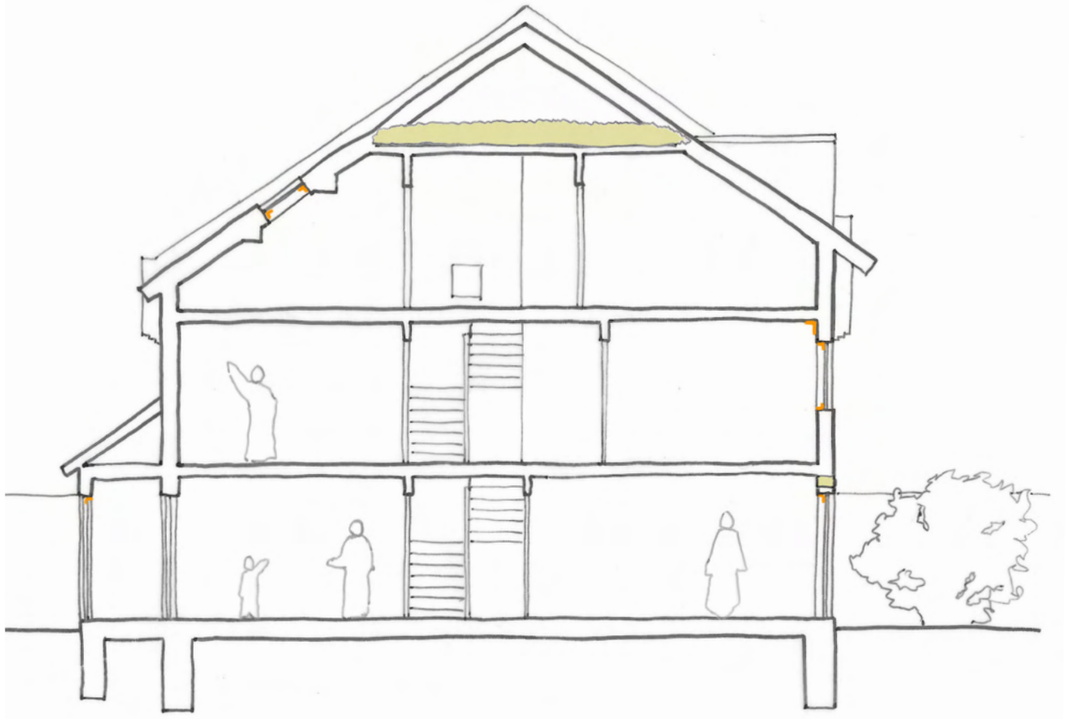


Figure 39 - Diagrammatic Section

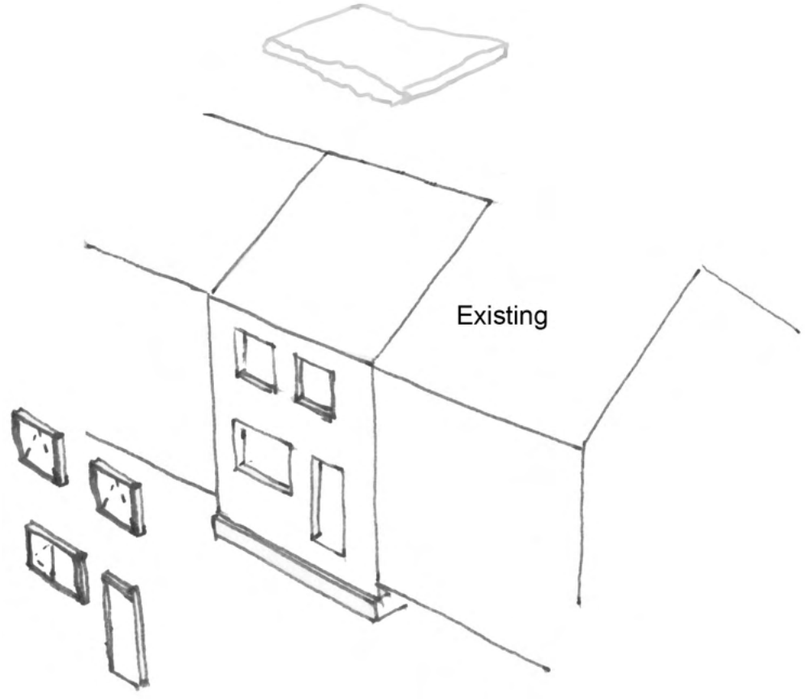


Figure 40 - Installation illustration

Measure	Description	Outcome
Increase loft insulation	Review existing insulation at loft level. Increase to 400mm mineral wool insulation between and above joists	Limited as few properties have significant lofts & some already insulated
High performance double / triple glazed windows & new external doors	Check existing window heat loss. Replacement windows & doors, sealed to existing walls, replastering reveals	Improve airtightness, up to twice as good. Less heat loss through windows & doors
Basic draught proofing	Close up evident openings in walls, draught stopping to doors etc	Improve airtightness
Addition of mechanical extract ventilation as needed	Add / replace extract fans to bathrooms & kitchens where necessary	Mitigate risk of mould
Individual air source heat pumps	Replace boilers with heat pumps for heating & hot water	Heat demand may still be too high to make this efficient

ENVIRONMENTAL IMPACT

Heat demand reduction 146 kWh/m²/yr down to **118 kWh/m²/yr**

Minimal reduction in carbon emissions

SOCIAL IMPACT

Homes less draughty

Limited disruption to residents

ECONOMIC IMPACT

Homes marginally cheaper to heat

Fewer long term maintenance issues

Miss opportunity for larger scale investment

Significant spending on new windows but many issues remain

FIRE RISK MITIGATION

Mineral wool insulation proposed to lofts is A1 rated.

Choose windows for non-combustibility of frames. Ensure any that currently act as fire escape windows continue to allow this.

Other measures so limited that these make negligible difference.

IMAGES

Figure 41 - Installing draught stopping

Figure 42 - Installing loft insulation

SCENARIO A - TRADITIONAL ON-SITE

Walls: Site Applied External Wall Insulation (EWI)

Roof: Insulation between & over rafters (if possible)*

*disruption to tenants

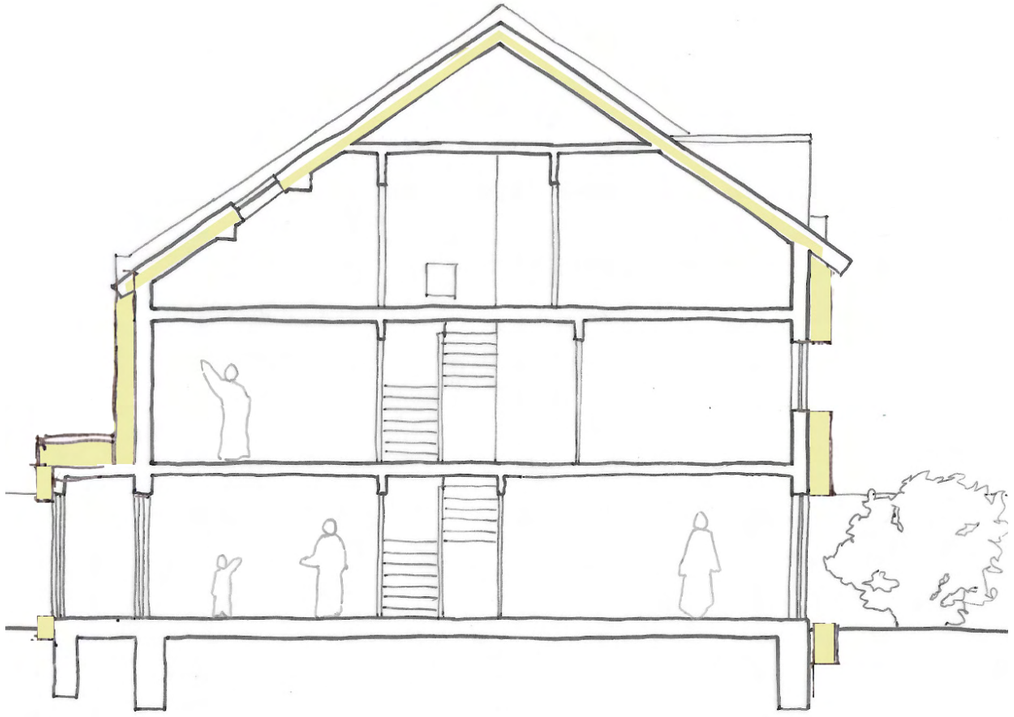


Figure 43 - Diagrammatic Section

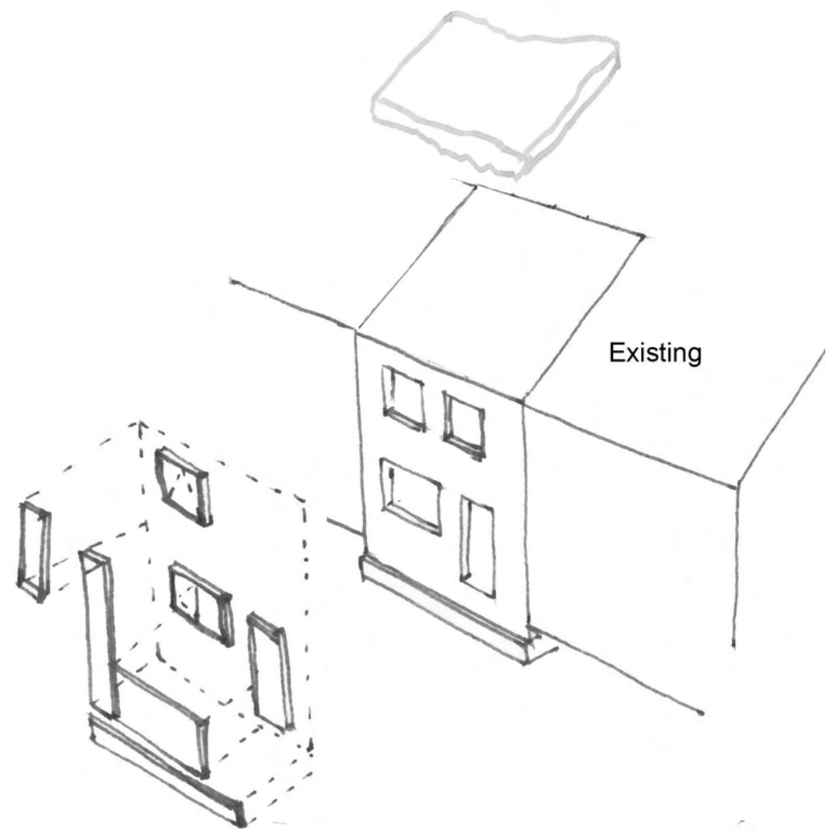


Figure 44 - Installation illustration

Measure	Description	Outcome
External Wall Insulation	250mm mineral fixed to outside of walls Extend insulation below ground	Significant as reduces heat loss & improves airtightness
Triple glazed windows & new external doors	Check existing window heat loss. Replacement windows & doors, sealed to existing walls, replastering reveals	Less heat loss through windows & doors Improves airtightness,
Roof insulation	Strip existing roof finish. New mineral wool insulation between & above rafters. New roof finish.	Significant reduction in heat loss. Some improvement in airtightness but hard to make continuous
Floor insulation	None - too invasive. Consider if void available	None
Mechanical ventilation with heat recovery (MVHR)	Install MVHR unit & ductwork to all rooms	Significant
Individual air source heat pumps	Replace boilers with heat pumps for heating & hot water	No gas on site (assuming new cooker) Carbon emissions reduction

ENVIRONMENTAL IMPACT

Heat demand reduction 146 kWh/m²/yr down to **38 kWh/m²/yr**

ASHP further reduces carbon emissions

Cleaner air

SOCIAL IMPACT

Homes less draught y & warmer

Significant disruption to residents over several weeks

Residents likely need to vacate for few days / longer where living space in roof

ECONOMIC IMPACT

Homes much cheaper to heat

Far fewer long term maintenance issues

Major works but limitations to airtightness strategy

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.

SYSTEM IMAGES

Figure 45 - Rendered EWI completed retrofit scheme Note: other finishes, including brick slips to replicate existing are possible

Figure 48 - Brick slips being installed over EWI

Figure 46 - EWI construction process

Figure 47 - Airtight window installation

SCENARIO B - 'KIT OF PARTS'

Walls: System (Beatie Passiv-style EWI)

Roof: System (Beatie Passiv-style Roof over existing*)

*depends on strength of existing roof, may need additional goalpost structure.

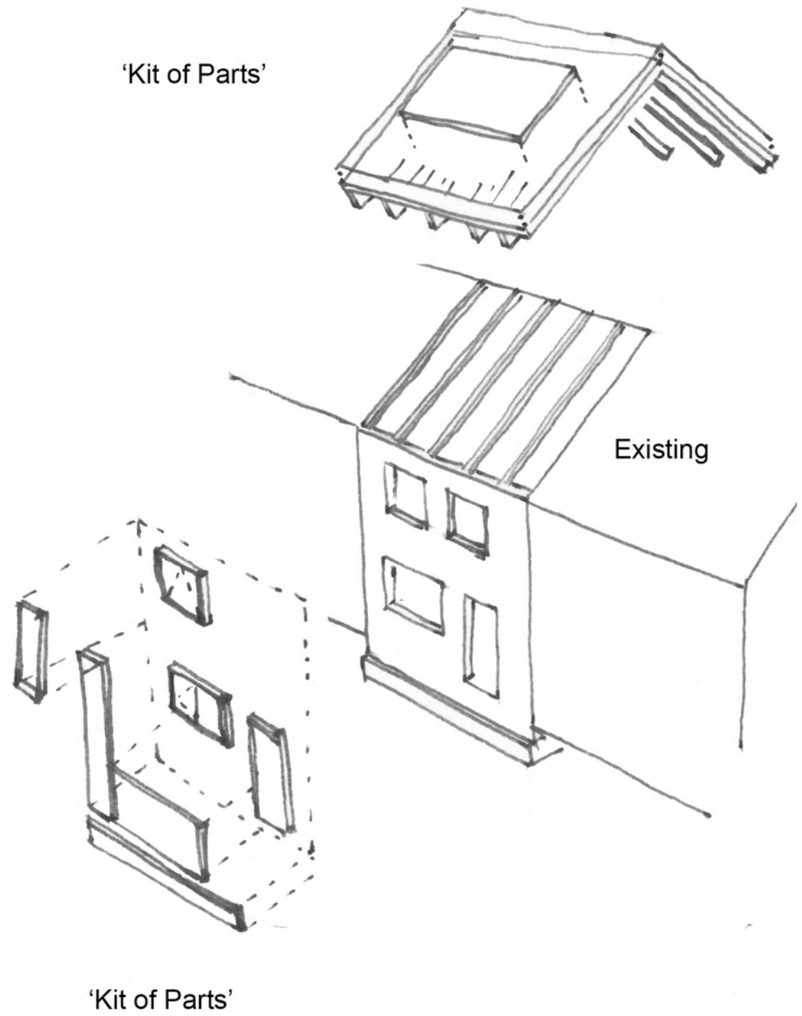


Figure 49 - Beattie Passive system installation illustration

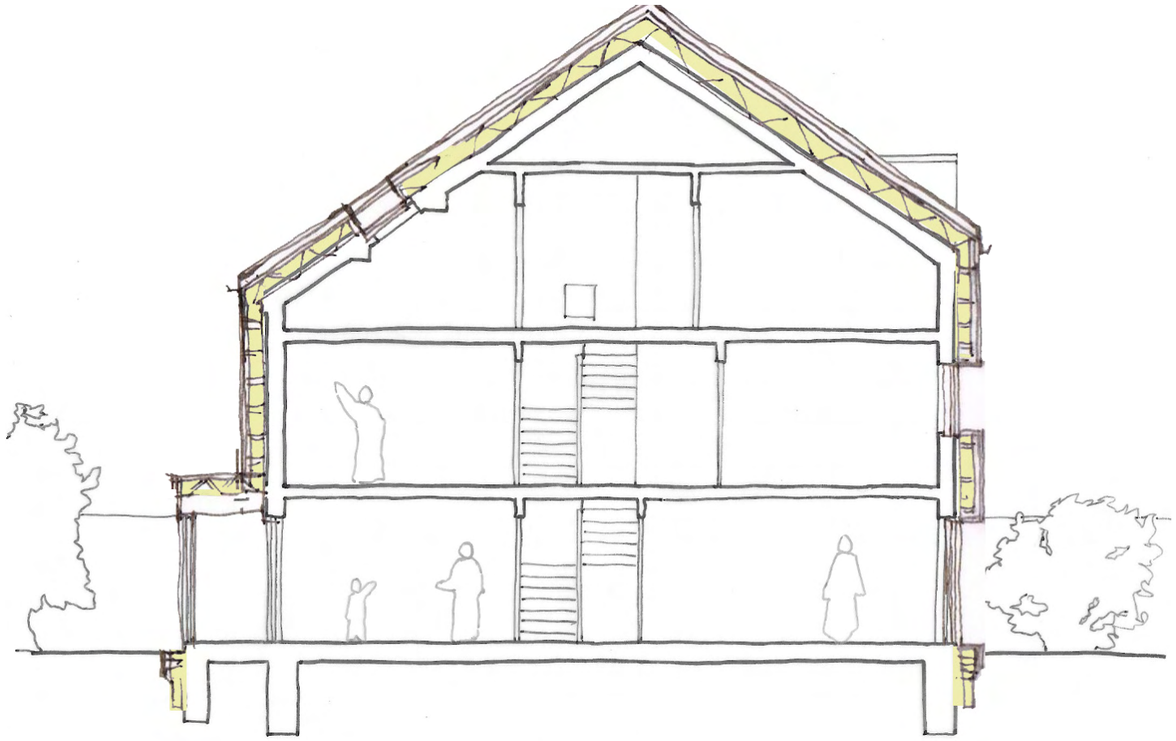


Figure 50 - Diagrammatic Section

Measure	Description	Outcome
External Wall Insulation	Complete new insulated facades (incl. finishes - materials tbc.) using Beattie Passiv T-Cosy System Extend insulation below ground	Significant reduction in heat loss. Significant improvement in airtightness.
Triple glazed windows & new external doors	New Passive Certified Windows and Doors, installed on-site, sealed to existing walls, replastering reveals	Significant reduction in heat loss through windows & doors. Part of improvement in airtightness.
Roof insulation	Complete new insulated roof (incl. tiles) using Beattie Passiv T-Cosy System	Significant reduction in heat loss. Significant improvement in airtightness.
Floor insulation	None - too invasive. Consider if void available	None, but heat loss balanced by envelope.
Mechanical ventilation with heat recovery (MVHR)	Install MVHR unit & ductwork to all rooms	Well-ventilated but warm home, affordable to heat
Individual air source heat pumps	Replace boilers with heat pumps for heating & hot water	Carbon emissions reduction

ENVIRONMENTAL IMPACT

Heat demand reduction 146kWh/m2/yr down to **25kWh/m2/yr**

Increased health benefits, through healthier air quality, less mould and damp within properties.

Sound pollution dramatically reduced

SOCIAL IMPACT

Homes healthier, less draughty & warmer

Less disruption to residents compared to on-site applied EWI.

Residents can stay in situ during retrofit. Access is only needed at the start to do a site survey, Installation of Mechanical Ventilation with Heat Recovery (MVHR) ducting and Installation of windows.

Residents likely need to vacate for few days where living space in roof.

ECONOMIC IMPACT

Homes much cheaper to heat

Far fewer long term maintenance issues

Refer to Cost Plan in Appendix 1

FIRE RISK MITIGATION

The main products within the system are all class A non-combustible, ie GRP Bracket, Knauf Insulation, Magply, Brickslips

SYSTEM IMAGES

Figure 51 - Beattie Passive system completed / in-progress retrofit schemes

Figure 52 - Beattie Passive system construction process

SCENARIO C - MODULAR

Walls: Modular Off-Site

Roof: Modular Off-Site*

*depends on strength of existing roof, may need additional goalpost structure.

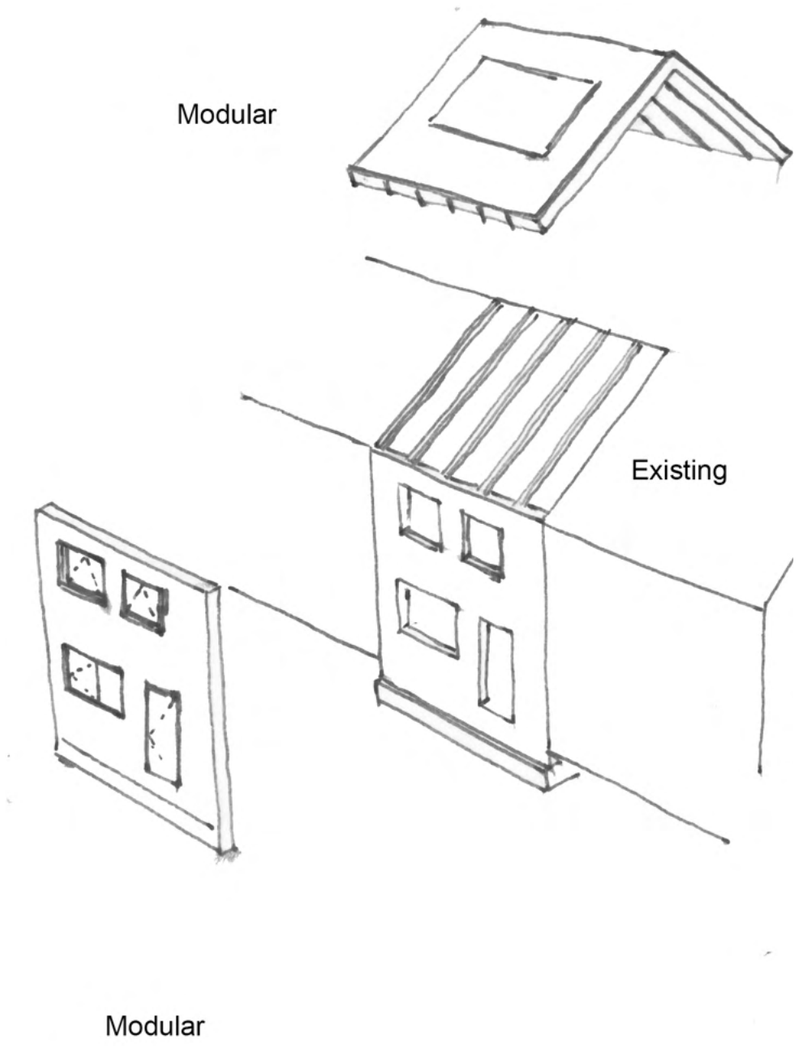


Figure 53 - System installation illustration

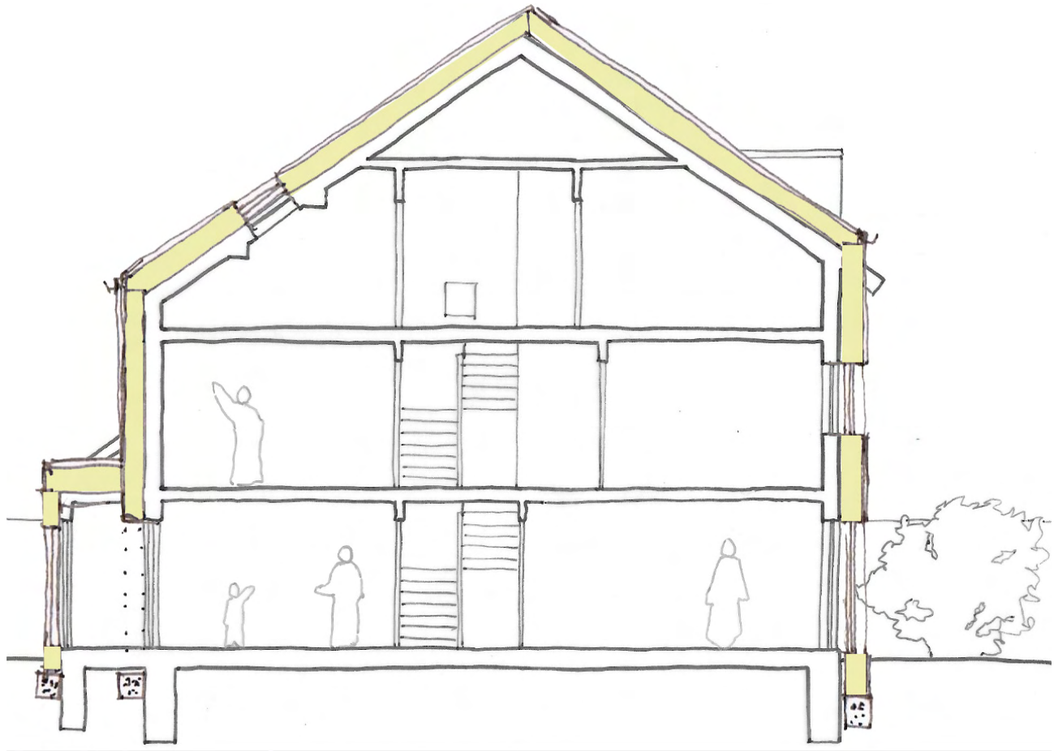


Figure 54 - Diagrammatic Section

Measure	Description	Outcome
External Wall Insulation	Complete new modular insulated facades (incl. finishes - materials tbc.) using Melius Homes Modular Off-Site System	Significant as reduces heat loss & improves airtightness
Triple glazed windows & new external doors	New Passive Certified Windows and Doors, installed off-site, sealed to existing walls, replastering reveals	Less heat loss through windows & doors Improves airtightness,
Roof insulation	Complete new insulated roof (incl. tiles) using Melius Homes Modular off-site System	Significant reduction in heat loss. Significant improvement in airtightness.
Floor insulation	None - too invasive. Consider if void available	None, but heat loss balanced by envelope.
Mechanical ventilation with heat recovery (MVHR)	Install MVHR unit & ductwork to all rooms	Well-ventilated but warm home, affordable to heat
Individual air source heat pumps	Replace boilers with heat pumps for heating & hot water	Carbon emissions reduction

ENVIRONMENTAL IMPACT

Heat demand reduction 146kWh/m2/yr down to **25kWh/m2/yr**

Increased health benefits, through healthier air quality, less mould and damp within properties.

Sound pollution dramatically reduced.

Lower Embodied carbon

SOCIAL IMPACT

Homes healthier, less draughty & warmer

Mininal disruption to residents.

Residents can stay in situ during retrofit. Access is only needed for site survey, and for installation of Mechanical Ventilation with Heat Recovery (MVHR) ducting and of windows.

Residents likely need to vacate for few days where living space in roof.

ECONOMIC IMPACT

Homes much cheaper to heat

Far fewer long term maintenance issues

Major works but limitations to airtightness strategy

FIRE RISK MITIGATION

The void between the new panel and the existing wall is sealed with proprietary fire-socks around all openings and the perimeter of the panel itself. The window openings in the panel are lined with Fermacell cement particle board. The fire performance of the whole construction is assessed by Melius Homes' partnered LABC body, Hertfordshire, and the site installation is overseen by the Local Authority building control team. This holistic approach is critical as the performance of the existing home is as important as the performance of the new panels. Whilst we will be led by the client on the façade choice, we will only use non-combustible façade materials.

SYSTEM IMAGES

Figure 55 - Melius Homes Modular completed retrofit schemes

Figure 56 - Melius Homes Modular construction process

4.5 OUTLINE SCOPE OF WORKS

BRONZE STANDARD

The measures proposed in the Retrofit Accelerator report essential retrofit package for Verity Close's flat and houses are:

- Increase loft insulation
- High performance double glazed windows & new external doors where existing is particularly poor
- Basic draught proofing
- Addition of MEV as needed
- Individual heat pumps

In practice the flats and houses perform quite differently, and even among the houses different levels of refurbishment over time will mean that they perform differently. In particular it is understood that amounts of roof and loft insulation are likely to vary and that cavity wall insulation may not be installed to all properties.

This package of works seeks to be low impact in terms of disturbance to residents. Therefore in practice this would consist of:

- Review existing loft insulation. Increase to 400mm mineral wool insulation between & over ceiling joists
- Use visual inspection & thermographic survey to determine which windows need replacement.
- Replace existing windows & doors with new triple glazed windows, sealed to existing walls by replastering reveals
- Close up evident openings in walls, draft stopping to doors etc
- Issues – might increase mould risk, no idea what airtightness we'll reach, a lot of money on windows while still having some big issues.
- Unlikely to reach low enough heat demand for heat pump to be economical. Therefore retain gas boilers.

SILVER STANDARD

A higher performance outcome will require more change to the existing fabric, and this will necessarily have a greater impact on residents. However we have looked at ways to minimise this impact and discounted options that appear to have too great an impact. The scope set out here is for the 'scenario A' on site solution.

WALLS

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. Sequence with window & door installation to ensure airtightness at these junctions.

250mm of mineral wool added to the outside of this. 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. The pros and cons of various systems are set out below and ideas of the new appearance are set out at the end of this section.

GROUND FLOOR

No insulation, but continue wall insulation below ground – proposed U value, as existing 3.0 W/m2K

It might be possible to remove the existing screed and replace this with insulation, reducing heat loss throug h 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 Foamglas insulation.

The combination of installing external wall insulation and the below ground insulation will be disruptive, leading to planting, paving etc. being destroyed and 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. Rainwater goods will need to be removed and replaced outside the new insulation. It may be possible for these to run into existing gullies, or new / moved gullies may need to be created. It will be necessary to check locations of meter boxes and other incoming services. These will need to be moved away from the face of the existing walls to allow for a continuous layer of insulation behind them. Where services pass through existing walls these will need to be sealed to the new parge coat to create an airtight junction.

ROOF

Insulation between & over rafters – proposed U value 0.23 W/m2K

The current roofs are understood to have rafters that are only 95mm deep. These rest on a number of purlins running between party walls. In some houses this roof void may be entirely unhabited. In these cases it will be simplest and most effective to install a significant amount of loft insulation – say 400mm mineral wool roll.

In most houses and in the flats, at least some of the roof space has living accommodation in it. In these areas insulation will need to run at rafter level. Assuming the existing roof structure remains in place, it is suggested that 90mm Rockwool Flexi is installed between the rafters with 85mm Hardrock over. New counter battens to be installed over, with breather membrane over with tiling battens over. Replace existing roof tiles (subject to condition).

Additionally, a new taped and sealed VCL needs to be installed below the rafters, which will necessitate the replacement of internal finishes, which will again be intrusive. If going this far it may be worth considering replacing the rafters with deeper ones, allowing a greater insulation build up overall. Assume Proctor Group Procheck A2 as VCL. Also new breather membrane below replaced existing roof finish - assume Illbruck ME010.

The rafters may also need to be extended at the eaves to ensure continuity of insulation with the walls. Additionally, a question remains about how best to ensure continuity of airtightness at the eaves.

Where there are habitable rooms in the roofs this work will be extremely disruptive as it will require access from inside as well as outside. Scaffolding will be required and a 'tent' over the roof, and even so residents will need to move out of rooms in the roof temporarily. The interior of these rooms will then need to be made good.

DORMERS

Insulation between & outside new studs – proposed U value 0.24 W/m2K

The existing dormers will require insulation to avoid these being cold points. Additionally, shading of the glazing here needs to be considered as rooms in roofs are where most overheating complaints pertained to.

Further investigation into the existing structures will be needed, but either these will need to be stripped back to their structure and insulation be added between and over studs, with a new finish applied over. Or the entire dormer structure might be replaced, possibly by a pre-fabricated element, which could help to ensure airtightness and insulation continuity in an area that can be tricky to detail.

WINDOWS & DOORS

New triple glazed windows – Proposed Uw value < 0.80 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 IdealCombi Futura + and Velux GGU 008230 for rooflights

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.

This will present a good opportunity to have similar widows throughout Verity Close – over time replacements have led to significant variation.

New insulated doors will also be required throughout.

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 houses and Zehnder Comfoair 160 to flats. All with associated fire rated ductwork, Armacell insulation to intake & exhausts.

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

HEAT SOURCE

Assume new air source heat pump per unit to supply heating and hot water. Include new insulated hot water tank.

AIR SOURCE HEAT PUMP

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.

GOLD STANDARD

This is as the silver standard, but with the addition of photovoltaic panels where possible.

Once a services consultant is appointed further options for the inclusion of renewable technologies will be investigated. This will include looking at battery storage and electric vehicle car charging. Understanding the way residents use their homes will help to work out simple strategies that can optimise the use of energy that is generated, bringing Verity Close nearer to the zero carbon target.

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 forms part of the silver and gold standards proposed.

In a typical house 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 those at Verity Close, 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 get to.

Figure 58 - Through-wall unit, suitable for small properties

Figure 57 - Through-wall unit installed (the box above the radiator

DECENTRALISED SYSTEM

Air needs to be supplied or extracted to all habitable rooms in the home. This can be done in two main ways. In smaller properties, such as the flats, small MVHR units can sit within the walls of the home, meaning that only small ducts need to run from the outside wall to the kitchen and bathroom.

CENTRALISED SYSTEM

In larger homes it is more efficient to have one central MVHR unit and run ducts from this around the home. This is more likely to be suitable for the houses at Verity Close, though may also be best in flats.

Many of the houses in Verity Close have pipework running vertically through cupboards in the middle of the house, and we will explore these as a possible route for some of the ducts needed. There would still be some ductwork that needs to run under ceilings and be boxed out, so that installing would involve some disruption. It also needs to be done it a way that does not add to fire risk, using non-combustible ductwork where necessary. Intake and exhaust ducts which run from outside to the MVHR unit may be around 250mm diameter, so keeping these short is crucial, as is finding an appropriate route. Extract and supply air ductwork, which need to run to every room will likely be between 90 and 150mm diameter. The units themselves usually require a drain connection as well as access for filter changing and maintenance.

An alternative is to run ductwork within new external wall insulation if this option is taken up. Some ducts can then feed into rooms around new windows. This may cause less disruption during installation, although due to the layout of the houses some internal ductwork would still be needed.

Each duct either supplies or extracts air from a room and ends in a valve that allows the air to gently move into or from the room. These may be mounted on ceilings or walls.

Consideration needs to be given to cost, disruption and ease of maintenance and we will work with residents and LWNT to develop the right solutions for each home. As these designs develop we will be able to produce more detailed visualisations showing the impact of new boxing out around ducts. We will also work with residents to chose the right control system and ensure that everyone knows how to control this new element in their home.

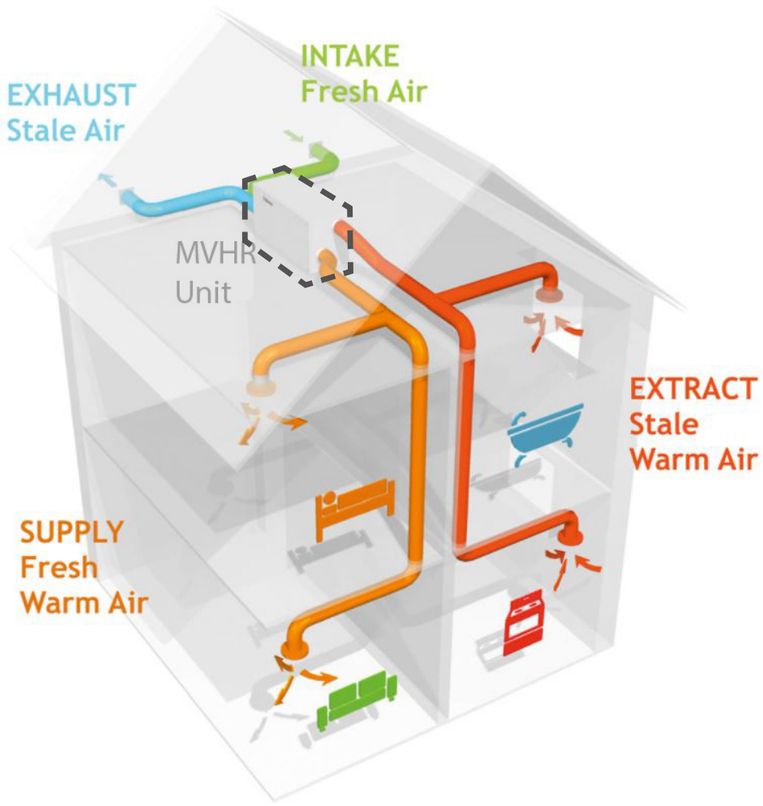


Figure 59 - View of typical house (not Verity Close) showing ductwork with MVHR unit in loft

Figure 60 - Ceiling mounted air supply and extract valves

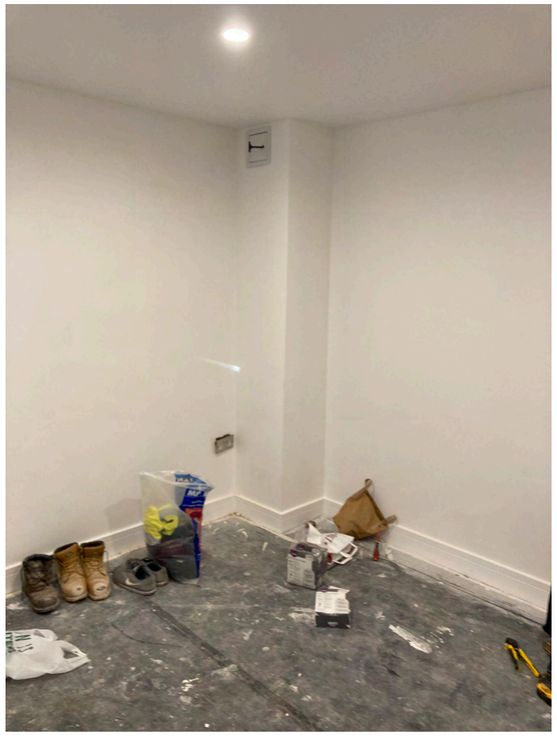


Figure 61 - Boxing out around MVHR ductwork in the corner of a room

Figure 62 - Typical control unit for MVHR

Figure 63 - MVHR unit with insulated exhaust & intake ducts and uninsulated, metal extract & supply ducts

4.7 NEW WINDOWS & DOORS

Windows were raised as a priority by residents of the flats at Verity Close, and windows in the houses have been observed to be poorly fitted. In all options new windows and external doors are proposed to reduce heat loss through window, and allow a more airtight seal to the existing walls.

At present there are a range of single and double glazed windows around Verity Close, so there is already variation in appearance. Single glazed windows, and older double glazed windows tend to be cold on the inside surface of the glass, the frame and the surroundings when it is cold outside. This can mean that condensation forms, sometimes leading to mould. This can also cause drafts to move around rooms, making the home feel less comfortable. Additionally heat is conducted through the glass, and can also be lost as warm air travels out through gaps around the window edges.

NEW WINDOWS

New windows will change the appearance of the homes, but can still be kept relatively similar to the existing appearance.

As part of the bronze standard windows might be double glazed, but in all other scenarios triple glazed windows are proposed. The external appearance in either case would be similar. Triple glazing will lose about 5 times less heat than single 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 or top hung, mimicking those that are installed at present. 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.

Most of the newer windows around the Close are uPVC framed (a type of plastic). It would be possible to use a similar type of frame for new double or triple glazed windows. At 50 Verity Close windows have been replaced with timber framed windows with a polyester powder coated aluminum external layer. This protects the outside of the window, while having a more traditional timber appearance inside (though this is often painted). Overall these windows should require no more maintenance than a uPVC window.

The colour of the outside of window frames will also have an impact on the overall appearance, and it is suggested that this is developed with residents. if an external wall insulation solution is chosen the appearance of the rest of the walls to some homes will also change, so the windows should be considered in relation to this.

Figure 64 - New triple glazed windows at 50 Verity Close

Figure 65 - New side hung triple glazed casement window at 50 Verity Close. The frame is deep, but appears slender from inside & out

Figure 66 - New triple glazed rooflights at 50 Verity Close. These examples are made by Velux, and can function like other Velux rooflights

NEW DOORS TO HOUSES

New insulated doors, with good seals, and double or triple glazing are also proposed to reduce heat loss from the houses. How large the area of glazing is could vary between houses, according to residents' preferences, as this is noted to vary around the Close at present.

In the silver options, in order to maintain an airtight layer around the home it is best to avoid having letterboxes through these new doors. Therefore it is suggested that residents would have new letterboxes next to their front door. These would be Secured by Design approved, to avoid any risk of 'fishing' of post. A range of styles and colours are available, so these could reflect residents' individuality.

NEW COMMUNAL DOORS TO FLATS

In the flats the main communal front doors would need to be improved thermally, as the communal stair area would be treated as part of the 'warm' space. The style of door can be chosen with residents, though will of course need to be suitably robust for communal use, and its opening be connected to the door entry system.

Additionally doors at the rear of the flats at ground level would also need to be upgraded. Front doors to flats within the building would not need to be upgraded as part of thermal upgrade works. It is proposed that postal delivery to flats continues as at present, through these individual flat front doors.

All new windows and doors would be Secured by Design certified where necessary, which in many cases would improve security in the homes

Figure 67 - New insulated triple glazed door at 50 Verity Close

Figure 68 - A variety of styles of outdoor letterbox are available

4.8 APPEARANCE

While the bronze standard retrofit would leave the buildings looking much as they are, either gold or silver standards would have a significant impact on the appearance of the existing buildings. As a minimum external walls would be thicker, there would be new windows, and roofs and dormer cheeks would be thicker. While the whole of each block of flats can be over-insulated in this way, half the houses around the terrace are freehold so are not expected to be retrofitted. Therefore there will be steps in and out where insulation starts and stops. How this insulation is finished will therefore have a significant impact on the appearance of the terrace overall.

As explained in section 4.5 of this report, the existing houses share many similarities, but they also vary It is hoped that this variation can be played on, to allow the partially retrofitted Close to retain a coherent appearance.

It would be possible to cover external wall insulation with brick slips, creating a similar appearance to the existing buildings. Similar tiles could be used on the roofs (or existing tiles reused where possible). Alternatively the change could be emphasised and celebrated. Different coloured brick slips could be used, or insulation could be rendered, allowing a mix of colours. Openings could be grouped or emphasised to enhance the proportions and thus the appearance. Precedents to right illustrate examples of facade treatments which could possibly be applied to the retrofitted properties.

It is proposed that if external insulation is to be applied the design team work with the residents to develop a palette of materials that everyone is happy with and then use these to create facades that maintain the idea of similarities but with variation. Overleaf is a brief exercise undertaken by us to illustrate possibilities.

Figure 69 - Sketch view of Verity Close flats & houses looking north from centre of Close Flats & RBKC-owned houses externally insulated illustrating variety in materiality

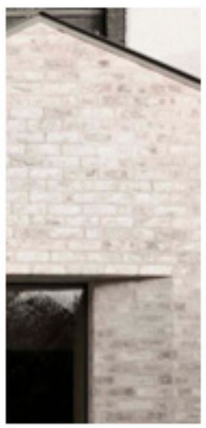


Figure 70 - Precedent Images of other projects illustrating possible facade treatments

Existing Elevation

Proposals

Proposals

Figure 71 - Sketches of possible architectural treatment

4.9 PHOTOVOLTAIC PANELS

The gold standard of retrofit calls for the addition of photovoltaic (PV) panels to roofs. These would supply electricity to the houses and flats below. In combination with the fabric upgrade measures and the use of air source heat pumps and energy efficient fittings, these could enable the upgraded houses to become net zero operational carbon. These homes would still require electricity from the grid at some times, but at others could export electricity.

As the silver standard proposes installing new electrically powered mechanical ventilation with heat recovery units and air source heat pumps, this additional electricity will be of benefit to residents.

The image below shows where PV panels might be added, the areas being based on:

- south, east or west facing roofs
- properties that aren't privately owned
- avoidance of dormers & rooflights

Further work will be needed to establish how much energy these panels could produce and the best way to divide electricity for use in the flats. This will also be part of establishing whether the homes can reach the net zero carbon goal.

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.

Figure 72 - Suggested locations for photovoltaic panels

Photovoltaic panels have already been installed at 50 Verity Close. In this case they have been installed over new roofing. It is also possible to have more integrated photovoltaic panels, that sit in line with the roof, making them less obtrusive. New ways of integrating photovoltaics into roofs are becoming available all the time, including Tesla photovoltaic tiles. However any system will have to be weighed up in terms of aesthetics, cost and ensuring that it does not create any fire risk.

Figure 73 - Photovoltaic panels installed at Verity Close

Figure 74 - Photovoltaic panels installed in line with roof covering

Figure 75 - Photovoltaic tiles among existing tiles

Figure 76 - Tesla photovoltaic tiles

Photovoltaic panels have been pursued here as an option rather than green roofs, which would cover the roof's surface with vegetation. While green roofs foster biodiversity and contribute a striking appearance to a building, they tend not to work well on pitched roofs, like those present at Verity Close. It can also be difficult to ensure that insects thriving in the vegetation don't infiltrate the building and compromise comfort inside the home. For these reasons, photovoltaic panels have been prioritized as an option more suitable to the site and for the estate's zero carbon agenda.

4.10 ACOUSTIC UPGRADES

Sound can be heard be heard between the floors of the houses and flats at Verity Close and was the top priority for residents of the houses. This is understood to be particularly impact noise e.g. footsteps above, and creaky floorboards rather than airborne noise. Where there are single glazed windows, noises can be heard from adjacent homes.

If the silver or gold standard are adopted, new higher quality windows, sealed to the building's walls will stop noise getting into the homes from outside. New insulation on the outside of the existing walls will also stop noise getting into the homes, so they should be very quiet inside.

NOISE BETWEEN FLOORS

Noise transfer between the floors in the houses and flats will need to be addressed separately from the thermal upgrades, and will need to be applied across whole floors in order to really be effective. This would be quite disruptive, as floor and/or ceiling finishes would need to be replaced. Further investigations of the existing floor structure in a few homes is needed, as so far only one has been viewed in detail, and this had some variations within the one home. A proposal is made here to reduce sound transfer between floors in the houses. An alternative solution will be proposed for the floors of the flats once the problem there has been discussed in more detail with residents and the existing build up confirmed. It will also be important to understand to what extent noise travels between houses, as this has been raised as a concern.

The houses have timber floor joists, around 200mm deep at around 450mm centres on metal joist hangers. These span between party walls, with an MDF board over forming the floor. There is some strutting between joists to add rigidity. Typically this likely has plasterboard fixed to the underside of joists to form the ceiling.

In order to reduce noise transfer between floors it is proposed to:

- Temporarily remove existing floor finishes
- Temporarily remove existing flooring board
- Install mineral wool acoustic insulation between joists (e.g. Rockwool RWA45)
- Screw new layer of plywood to joists, adding to floor's rigidity
- Install new resilient layer (e.g. CMS Danskin 10mm Acoustilay)
- Refit existing floor finishes where possible / new where necessary or in line with internal refurbishment works)

This solution is invasive and not all tenants and leaseholders may wish to take this up. The specification will also need to be confirmed with suppliers, and the combustibility of the elements considered (although it is noted that this is to be applied to an existing timber floor).

Figure 77 - Existing first floor joists and strutting at 50 Verity Close

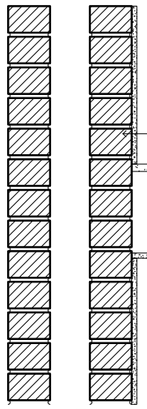


Figure 78 - Existing floor section - houses

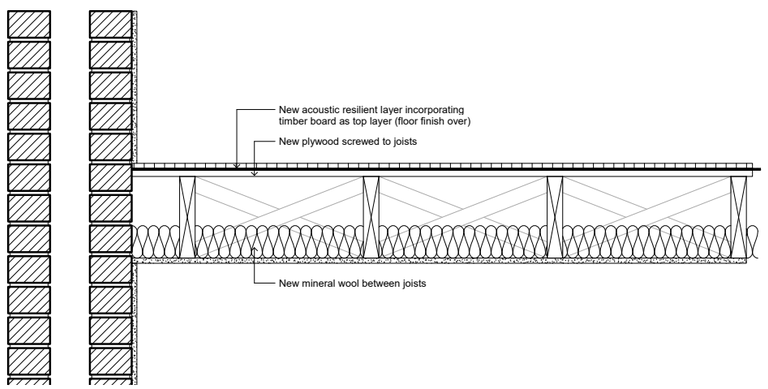


Figure 79 - Proposed floor section - houses

Figure 80 - Floorboard temporarily removed to allow insulation to be fitted between joists and for better fixing of floorboards to reduce squeakiness

Figure 81 - New resilient mat being fitted over floorboards

Further investigation into the floors in the flats is needed to understand how these can be improved, as well as discussion with residents to ensure that their specific issues are addressed.

NOISE BETWEEN HOUSES & BETWEEN FLATS

Reducing noise between properties generally requires an extra layer of soundproofing on one side of the wall. This could typically be an acoustically absorbent layer, laminated to heavy-weight plasterboard, making the wall around 30mm thicker. In order to make even greater improvements a similar board can be supported off the existing wall on acoustically isolating studs. This would make the wall around 85mm thicker, losing more floor area from the existing rooms.

As these solutions are both disruptive and impact on existing floor area it is suggested again that they are offered to residents if they wish.

Figure 82 - Example of wall soundproofing system - acoustic insulation, battens and boarding can all be used to stop sound moving through walls

4.11 REFUSE STORAGE & ENTRANCES TO FLATS

Currently the refuse stores dominate the front of flats, sitting forward of the actual entrance doors. Residents do not like this as it feels unwelcoming. Should a silver or gold thermal upgrade standard be chosen, it will also be necessary to either bring these refuse stores inside the thermal envelope and airtightness line, bring this line between the bin stores and the main building, or accept some heat loss through here.

There is also a gas intake cupboard between the bin stores and the main building.

Additionally the current arrangements only allow for a single refuse bin per stairwell, which does not provide any opportunity for recycling or food waste composting. A single 'loose' recycling bin has been observed near the flats, but it is not clear who is expected to use this, or whether residents do make use of it.

Figure 83 - Currently bin stores (green double doors) dominate front of flats. Loose recycling bin sitting by gable end of house

Figure 84 - Inside existing bin store

Figure 85 - Inside existing gas meter room

Figure 88 - Journey to communal front door of flats with refuse stores dominating the approach

We have considered three options which address some or all of these issues:

1. Make bin stores prettier

    Doors could be changed, but is the issue really the appearance, or is it about smells and the overall dominance of the lean-to structures?

    This will not address lack of recycling facilities

2. Move doors to bin stores to side

    But this would put them near windows to a flat, and leave a blank frontage next to front doors

    This will not address lack of recycling facilities

3. Move bin stores to 1 or 2 communal stores

    opportunity to improve entrances & facades overall

    easier to achieve contiguous thermal envelope to flats

    larger front gardens

    chance to ensure proper recycling & food waste facilities

    If gold or silver option taken up gas meter room no longer needed

    New refuse stores need to be within 30m of all front doors - may still dominate

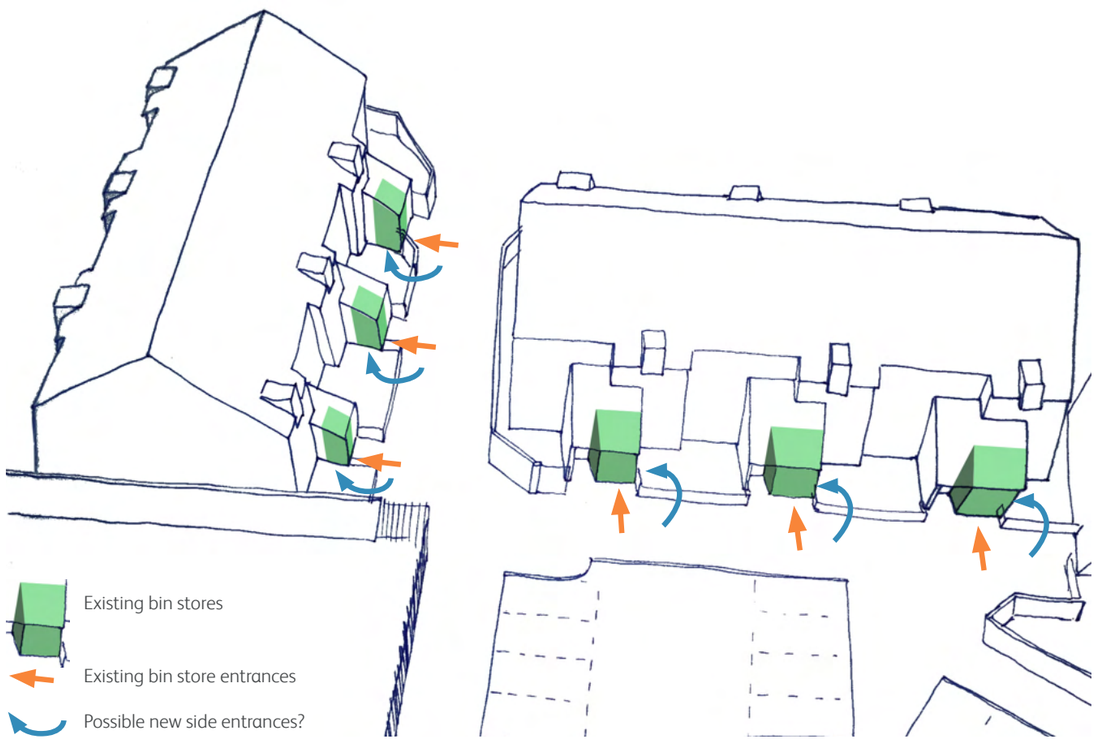


Figure 86 - Diagram of current refuse stores

Figure 87 - Option 1 - can refuse store doors be made pretty enough to be acceptable?

4.11 REFUSE STORAGE & ENTRANCES TO FLATS

Looking at option 3 in more details, if refuse storage is moved new stores should be within 30m of residents' front doors, as well as being easily accessible for refuse operatives.

The council's requirements around amount of storage for different types of waste will need to be met, while avoiding the new stores becoming equally dominating.

Type of waste	Per bedroom	Total	Number of bins
General refuse	30 litres	1080 litres	2no. 660 litre Eurobins
Recycling	3x20 litres	3x720 litres	3no. 1100 litre Eurobins
Food waste	10 litres	360 litres	4no. 140 litre 'wheelie' bins

The plan adjacent shows 30m from the front doors of the most distant flats, and hence approximate limits for possible locations of new waste stores. It is suggested that the main stores are integrated into the existing fence line between playground and pavement. There is already a range of fence types along here, so new refuse store openings could be integrated into this line to limit how obtrusive they appear. Planting would help to soften their appearance, though it is noted that design will need to respect the tree's roots.

A separate store is proposed to the gable end of number 44, where a loose recycling bin often sits at present. This would house general refuse and food waste bins for residents of flats 28-43. This reduces the size of any one store, but would need to be carefully acoustically separated from the house beyond,

Locations and ideas for appearance need to be discussed with LWNT and with residents, to understand how this might sit within wider improvements to recycling facilities across the estate, as well as understanding residents' feelings about the impact on different spaces.

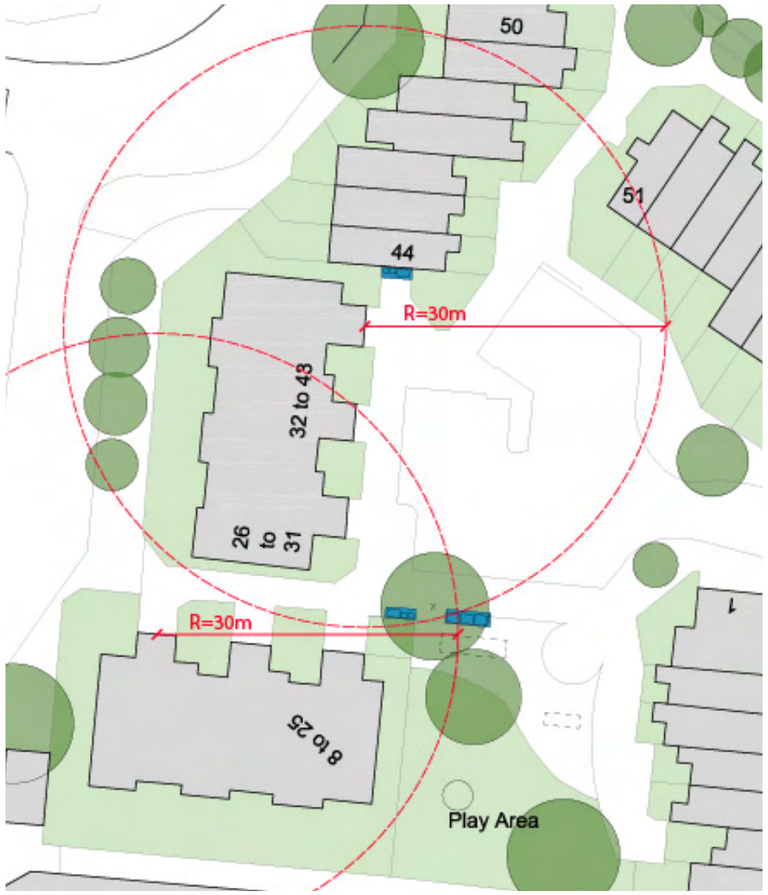


Figure 92 - Plan showing 30m distances from front doors of most distant flat. Proposed refuse & recycling stores marked in red

Figure 89 - View of playground fencing where some refuse stores are suggested

Figure 90 - View of playground fencing & hedge where some refuse stores are suggested

Figure 91 - Precedent images of refuse stores

The replacement of the existing refuse stores and gas supplies no longer being needed (under a silver or gold retrofit) would be an opportunity to create new, more welcoming communal entrances.

The design of these would need to be developed in detail with residents and would be affected by other decisions around the external appearance of the flats once they have been retrofitted. These would be smaller than the existing structure, while allowing more generous internal space at the base of the stairs. They could get rid of the dominating sloped roof and allow new first floor windows to the stairwells, bringing in more natural light. In conjunction with slightly larger front gardens, and new external paving, the entrances would focus the eye on the front doors, creating a more welcoming route to the homes.

Figure 93 - 3d section of flats with existing entrance, refuse store & gas meter room

Figure 94 - 3d section of flats with sketch proposal for new entrance

Figure 95 - Existing entrance area to one stairwell of the flats

4.12 STRUCTURAL COMMENTARY

It is proposed to significantly improve the insulation on these buildings. In the houses the scale of these buildings is smaller and also the form of construction lighter so there is less capacity to increase the loadings on these buildings. The flats have a heavier form of construction enabling more flexibility for adding additional loads form insulation or photovoltaics.

ROOF

In the houses the existing 120x44 @ 350mm c.c. rafters can support the proposed additional loading from the new insulation. It doesn't really matter from a loading viewpoint if the insulation goes above below or in the same plane as the rafters.

If there are instances where the rafters are less than the size noted above then the load bearing capacity of the roof can be improved by providing additional purlins across the units.

The existing details of the roofs to the flats are unknown. It is anticipated that if the timber structure is unable to support the additional loads some strengthening would be possible.

WALLS

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

FRONT ENTRANCE BIN STORES

The structure forming the bin stores at the front of the flats look to be independent structures that could be expected to be relatively easily replaced or altered.

A significant amount of other maintenance and refurbishment work is planned for the estate as a whole including Verity Close, to meet some of the residents top 10 priorities. This will be carried out by RBKC's sub-contractors, but it is crucial that this is integrated with the main works outlined in this report to ensure money is not wasted and resident disruption is minimised. The table here sets out important considerations for integrating these works, should any take place at a different time from the main works. Design work for these must be progressed alongside the main works.

ENTRANCE DOORS & ENTRY SYSTEMS

Entrance doors are integral to the external envelope of the buildings and must achieve specific u-values and airtightness values. The doors must not have letterboxes. Letterboxes should be wall mounted on the wall adjacent to the door, in a way that the wall airtightness is not compromised with the fixings. It is best that these be replaced as part of the main works.

The replacement of door entry systems can be carried out fairly independently of the main works, but if bin store / communal door areas are to be altered it would of course be wise to implement this at the same time as those works.

INTERNAL DOORS

The flats and houses will probably have a whole-house mechanical ventilation with heat recovery (MVHR) system. This system will require internal ductwork to all bedrooms, living rooms, kitchens and bathrooms at high level, most probably the main route will be underneath the internal hallway ceiling (within a lower suspended ceiling). This means that internal door dimensions may vary from those existing. New doors must also have specific background ventilation requirements (under-cut of 10mm clear above floor finishes), to allow the MVHR to work.

WINDOWS

It will be best that windows be replaced as part of the main works as set out in the proposals.

VENTILATION

As explained above, a whole-house Mechanical Ventilation with Heat Recovery (MVHR) system may be required, which will involve new ductwork and suspended ceilings on the internal hallways, as well as potential bulkheads on some rooms, and/or wall mounted ceiling valves on top of doors or adjacent to them. If decorations around these areas are to be done, some of this work may need to be re-done at a later date.

Similarly, if existing traditional extract fans on kitchens and bathrooms are to be replaced within the internal refurbishment programme, they will need to be discarded as they will become redundant if a whole-house MVHR system is in place.

PLUMBING

If new plumbing is to be installed careful consideration must be made at its design stage, to be able to account for all internal heat gains and losses, which must be included within the energy modelling of the whole building. Pipes must be insulated, and their lengths should be minimised. This information must be fed to the energy model, in order to understand its implications, especially if an energy standard target, such as EnerPHit, is adopted.

HEATING & RADIATORS

If new radiators are fitted in, it is likely that they may become redundant if the blocks achieve very low heat demand. Such low heating demand may make traditional wet-system radiators redundant; and other heating systems such as an ASHP, or even direct electric systems in some instances, may be more suitable if there is a very low heating demand. ASHPs also work with a wet heating system, albeit radiators must be sized according to a low-temperature flow to suit the system's requirements.

APPLIANCES & LIGHTING

Same as with plumbing above, the EnerPHit energy model will need to include the electricity usage of all main appliances, white goods and lighting, and may inform the final Primary Energy Demand value, which must be below a certain target.

CUPBOARDS & STORAGES

If the internal refurbishment works include the provision of improved cupboards this must also take into account possible new space requirements for the installation of new hot water cylinders, new MVHRs and/or ASHP (air source heat pumps) if required in a non-district heating scenario.

FLOORING

If new flooring is to be installed on GF flats or houses, this would be the perfect opportunity to also include floor insulation. Floor insulation may affect the whole floor-to-ceiling height, as well as the need to raise kitchen and bathrooms accordingly. Again, if new kitchens and bathrooms are installed, this would be the perfect time to install floor insulation.

Internal decoration to roofs in roofs / top floor flats

The existing roofs will probably need added insulation to achieve the set energy and comfort targets, and this may need to be installed from the inside of the properties (TBC on option selected), in that case, any decoration works will need to be redone if applied in advance of the thermal improvements.

AIRTIGHTNESS

It is noted on site that there are some external wall's vents. It is unclear what is currently included within RBKC's Internal Refurb programme to finish these elements from the inside, however, it is likely that these holes in the external fabric will need to be insulated and filled appropriately, to achieve the targeted airtightness and u-value levels.

BELOW GROUND DRAINAGE

Residents have noted issues with this. While largely independent of other works, it should be noted that any pipwork passing through the external envelope of the building should be sealed to the new airtightness layer.

4.14 CONSTRUCTION (DESIGN AND MANAGEMENT)

Derisk are the CDM Princpal Deisgner across the estate. Having visited the site with ECD architects, and reviewed this report they have provided the following commentary, which will inform further work.

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

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

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

CDM 2015 requirements (the Construction Design & Management Regulations) are being monitored by the Principal Designer (Derisk) and the Lot 6 works are considered by Derisk to be in full compliance with the Regulations at present. ECDA are legally required to communicate design risk information to the Project Team and all persons affected by the refurbishment works, this is being demonstrated partly in the form of written CDM Risk Registers. These are developed with Derisk and are reviewed frequently, with revised versions issued at a minimum of each RIBA work stage. The risk register is retained within the Site-Wide Refurbishment Risk Register and is in the process of being revised for Lot 6 specific works.

The refurbishment works planned are of lesser complexity than works at other Lots, particularly Lot 1 (Walkways), however are still considered to constitute extensive construction works. All construction works will present health and safety hazards to the residents of Verity Close. It is the utmost priority of the Project Team to identify what these hazards are at the earliest possible stage and work with the team, the contractors, and of course the residents to reduce the associated risks to as low as reasonably possible to ensure the safety of all persons within Verity Close and adjacent properties. As stated, the design proposals and construction methodology are still at a very early stage, however Derisk and ECDA anticipate the following hazards to be addressed as a minimum.

- Maximising Fire Safety – is at the foremost of all works on the Estate. Separate Fire Engineers are in the process of being procured by ECDA to review the existing buildings and will be embedded within the design team. Of significant risk is the need for a collaborative approach between respective organisations and Lots, as several separate packages of work are being planned that must all tie in together to ensure fire safety not only meets but exceeds current standards. Once a Fire Engineer is appointed, regular fire safety meetings will be diarized within the design team meetings, and this will be agenda item on all team meetings. Fire Safety during construction is also a priority and the Fire Engineers will support the contractors to develop fire plans that keep all persons within the close safe during the refurbishment works. It is of note that discussions are taking place between the lead consultants for all of the Lots, the LWE team, and internal RBKC Fire Team to review and prepare a standard 'estate-wide' approach to fire design safety. An initial kick-off meeting was chaired by KCA (Lot 1 consultant) w/c 25th January 2021 and a further meeting with the RBKC Fire Safety Manager is diarized for w/c 1st February 2021.

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

- Interface with other projects (particularly the Internal refurbishment and void works) – all planned works that may impact upon these works (such as the refurbishment of voids within the Close) are closely managed to prevent any clashes or interference. Derisk are involved with the separate Internal refurbishment programme and will assist the LWE Team to develop programmes and specifications that cause minimum disruption to the Lot 6 works and ultimately to the residents.

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

- Freehold properties – nearly half of the properties in the Close are freehold and may not undergo the same degree of refurbishment. Given their locations, this may prevent construction works from being undertaken to a row of properties concurrently. This may impact upon the construction programme but also increase the complexity of falsework such as scaffold because this may be required to be effectively capped off at one boundary and resume at another around a freehold property.

- Asbestos containing materials are noted to be present within the buildings. Though currently being managed by the Estate team these are proposed to be removed during the refurbishment works unless it is deemed acceptable to retain (encapsulate) it through the process of risk assessment. Asbestos is an extremely hazardous material and for the safety of all persons on the estate all works will be carried out in strict accordance with the Control of Asbestos Regulations 2012. Historical asbestos information is available to the team and is in the process of being reviewed by the team and Derisk. A number of more detailed asbestos refurbishment surveys have been undertaken to the communal areas of the small blocks which have identified the presence of asbestos containing materials. Further surveys are likely to be required to identify gaps in asbestos information over the coming weeks.

- All works where possible will be undertaken without the need for site operatives to work at height to reduce the risk of falling materials and tools around residents. However there are many elements of the works that cannot be undertaken from ground level and so suitable access platforms will be used. These are likely to include scaffold and tower scaffold systems, and traditional ladders and step ladders. All present different risks to residents and site staff, however construction methodologies will be considered during the design phases to ensure that the hazards and risks are outlined and controlled. Derisk have proposed the undertaking of Construction Hazard workshops with ECDA over the coming weeks to review work at height and general construction requirements for all proposed designs.

- RBKC as the Client (for the purposes of CDM 2015) are required to ensure that the contractors put in place suitable welfare (toilets, hand washing facilities, changing areas, water supply, etc.) during their works. Due to the numbers of persons proposed to be undertaking these works it is unlikely that use of void

properties will be suitable, and defined welfare areas or cabins will be required. These will need to be sited close to the Close and so parking spaces or small areas of the landscape may need to be temporarily closed to accommodate these. All proposals will be considered by the Project Team and developed in consultation with residents.

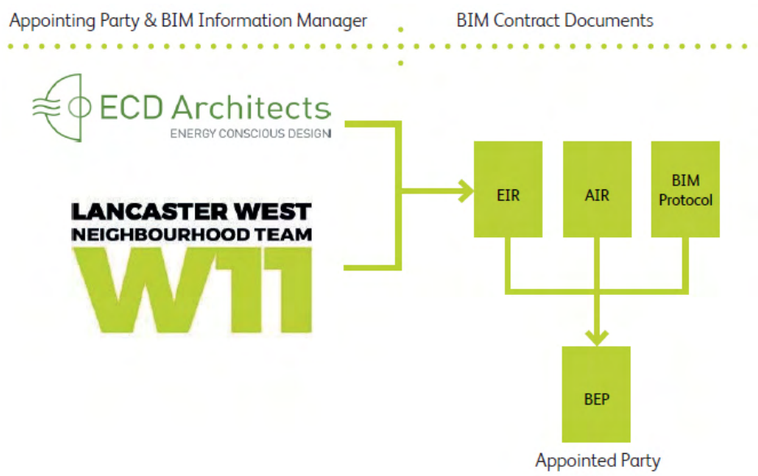
- Larger construction works will require an area or compound to house offices, cabins, material storage, tools and plant etc. Due to the limited space available around the estate this may impact upon existing parking areas or the landscaping as discussed above.

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

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

4.15 BUILDING INFORMATION MODELING/ DIGITAL DESIGN OPPORTUNITIES

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



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

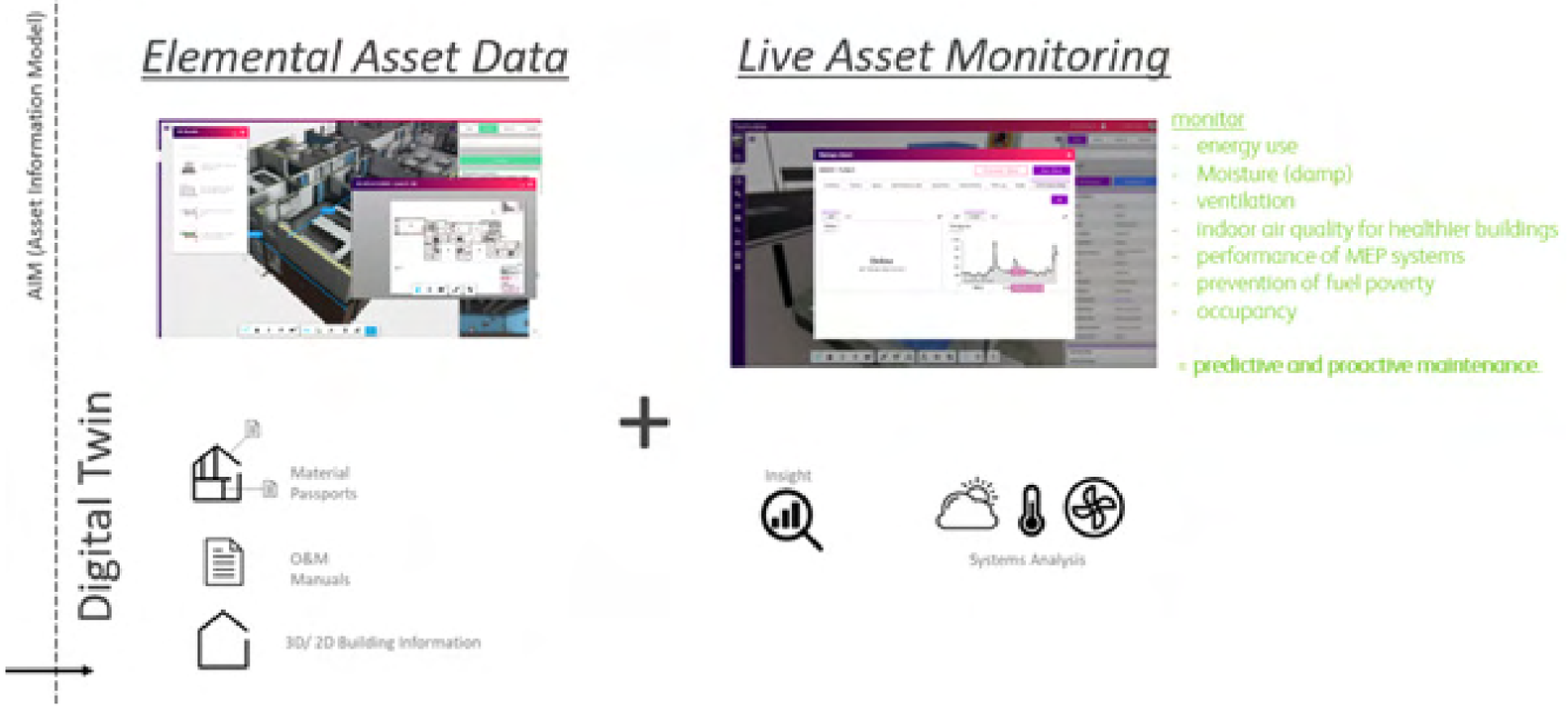
3. Visualization/ Resident Enagement

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. In so far as 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 and are repaired, reused or recycled, minimizing waste, from an built asset point of view. This can be supported by active monitoring to give advanced insight for predictive maintenance.



Digital Twin

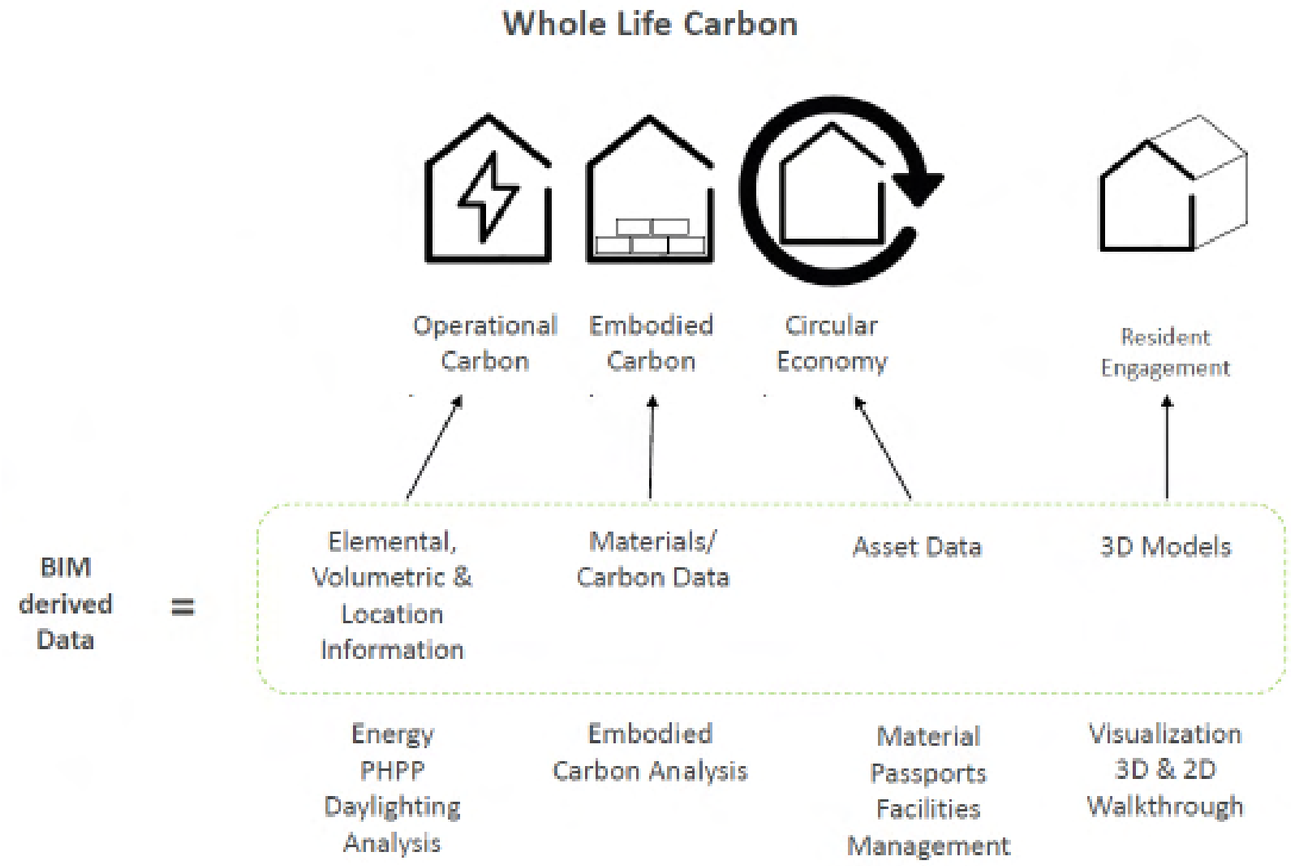
2. ITERATIVE WHOLE LIFE CARBON DESIGN OPTIMIZATION

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

From an embodied carbon perspective, appraising construction systems can help reduce core contributers.

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 possiblities of BIM based design processes



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.

Digital Vizualization

4.16 MONITORING

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

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

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

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

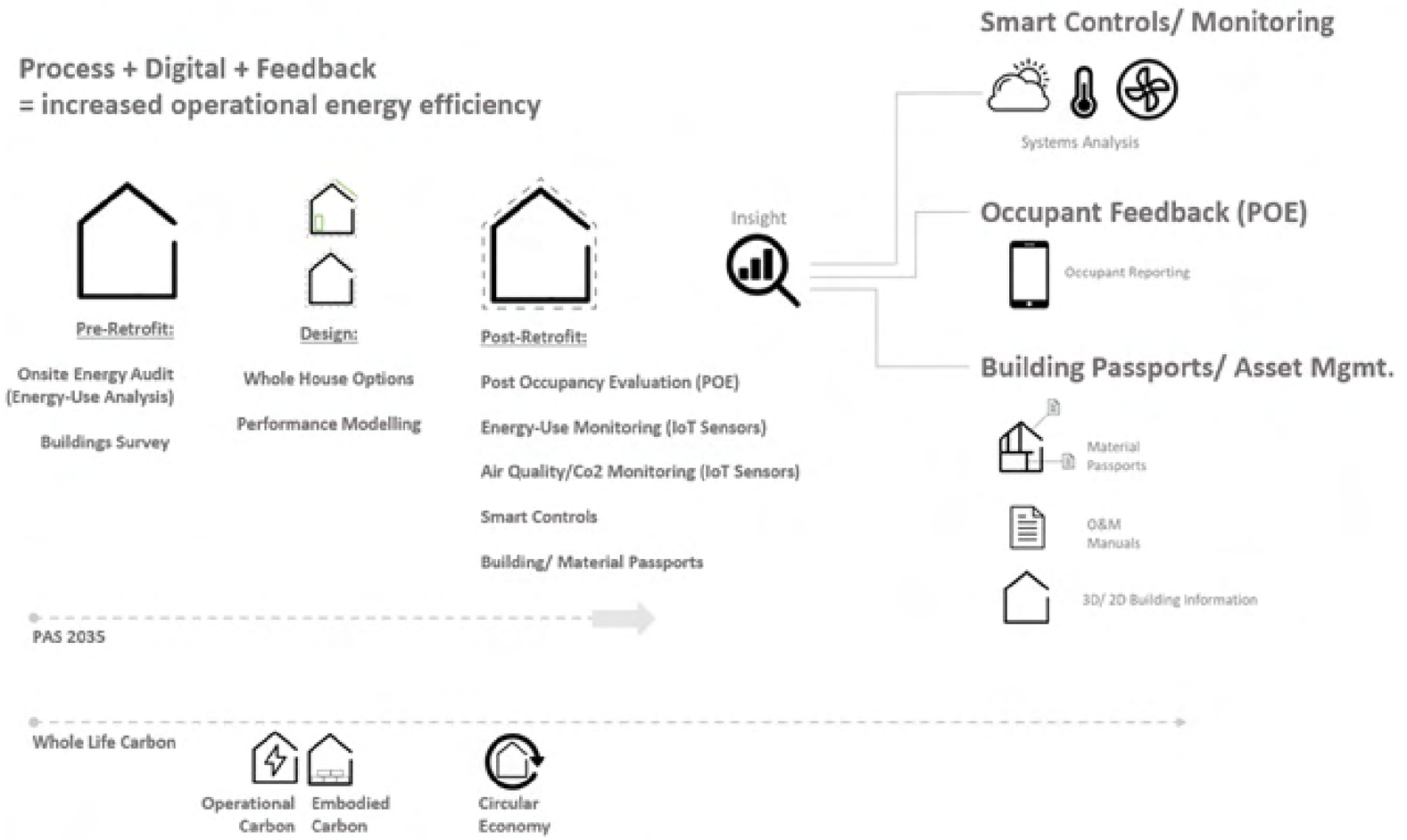
Pre/Post Retrofit: The methodology for pre- and post-installation is to use innovative non-invasive methods including Smart HTC to measure whole building thermal performance and Pulse air tightness testing. We will use Build Test Solutions' Smart HTC technique: which enables whole building heat loss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

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

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

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

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



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

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

Figure 96 - The process of testing air tightness (left) and U-Values (right)

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

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

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

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

Figure 97 - 'Open House' engagement events organised by LWNT

4.17 RESIDENT CO-DESIGN

The approach by ECD will focus both on the collaborative design process and also education, engaging residents in why retrofit is being done and how their behaviour and knowledge can help in regards to energy conservation and the benefits to their wellbeing. We will endeavor to undertake the collaborative design process in the following manner:

1. Listen to residents' experience of living on the Lancaster West Estate, to gather a feel for the place, unlocking local knowledge. Identify and harness the skill and resources of residents, assisting them in expressing their own creativity and capacity to play a part in the design process, building personal confidence and unearthing new skills.

2. Establish the value of their input. From the outset make it clear to participants what influence their contribution will make to the decision making process. This will set out which elements of design are already fixed and why, and which are open to be shaped by residents.

3. We will take the residents on an iterative design journey, informed at each stage by residents' contribution, reflective of a range of voices and interests. ECD will outline a clear strategy from day one with defined outcomes and methods of collaboration.

Regarding methods of collaboration we will harness a predominately graphic output, utilizing 3D and interactive design environments to support an inclusive approach to design development communication and engagement. Distribution will be via LWNT on-line communication platforms and a printed newsletter including the use of Instagram and WhatsApp.

Practically speaking, our approach will take the form of three workshops, to take place between February and April. These workshops will build on one another, and conclude in outlined designs to be implemented at Verity Close.

The arc of these workshops can be thought of as follows: Workshop 1 will establish what the problems residents experience in their homes are, and what solutions exist; Workshop 2 will delve into how these solutions can be implemented, and how their implementation would affect residents in the short and long term. Following a decision as to which solutions will be taken forward, Workshop 3 will explore the detail of these solutions in context, enabling residents to decide on the particulars of their chosen solutions.

Owing to the ongoing pandemic, these workshops will likely take place on-line, using a platform that enables residents to annotate and interact with graphics and images we will share. Paper copies of the workshop content will be distributed ahead of time to ensure that engagement never relies on on-line access.

In between each 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; and sending residents resources in the post to spark their own design contributions.

Our initial phase of 'soft' engagement is already underway. As a primer to our first workshop, we are in the process of producing three videos which will explain the function and potential problems associated with windows, walls/insulation, and ventilation. The content of these videos has also been written up in the form a leaflet to be posted to residents. It is hoped that these materials will enable residents to feel they can get the most out of the workshops to follow.

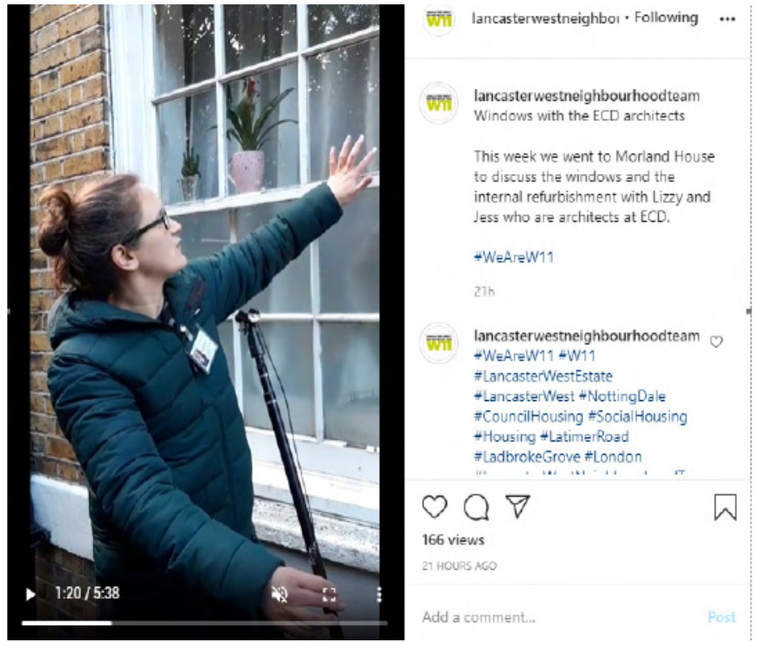


Figure 98 - A still from our first video focusing on windows

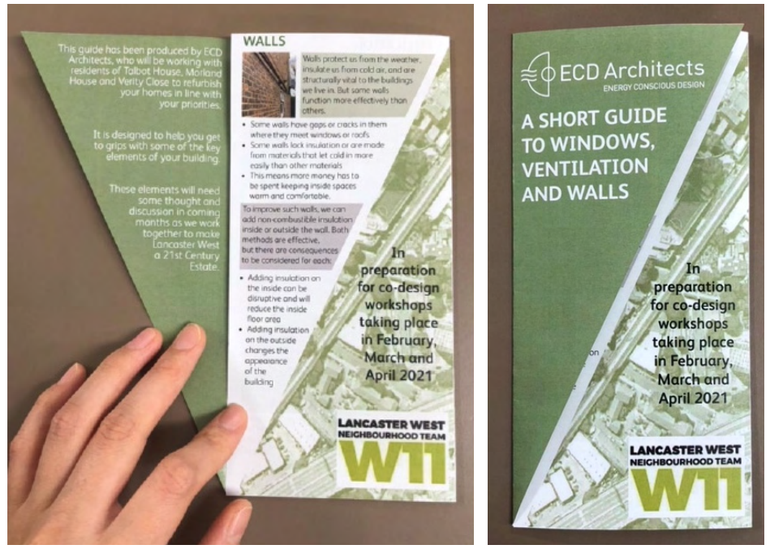


Figure 99 - A proposed leaflet to explain key building elements to residents

GREEN HOMES GRANT

Many of the works proposed in this report could be eligible for government funding under the green homes grant. Under this scheme vouchers are supplied to cover two thirds of the cost of eligible improvement works, up to a maximum contribution of £5,000 (or £10,000 in certain circumstances). Local authority homes owners can apply for this grant.

One of a list of primary measures must form part of the works being funded, after which secondary measures can also be paid for by the grant. This could be applied to the standards proposed in the following ways:

BRONZE

Primary measure -

- Loft insulation (may not be applicable to some properties that already have this installed or have no loft)

Secondary measure (cannot exceed value of primary measure)-

- Draught proofing
- Replacing single glazing with double or triple glazing
- Energy efficient replacement doors (if existing is pre-2002)
- Smart heating controls

SILVER / GOLD

Primary measures -

- External wall insulation
- Pitched roof insulation
- Room in roof insulation
- Air source heat pump

Secondary measures -

- Draught proofing
- Replacing single glazing with double or triple glazing
- Energy efficient replacement doors (if existing is pre-2002)
- Smart heating controls

Freehold homes owners are also eligible for this funding, so it would benefit the estate's overall bid to become net zero operational carbon to encourage and enable freeholders to access this funding.

SOCIAL HOUSING DECARBONISATION DEMONSTRATOR FUND

While some areas of the estate have applied for funding from the Social Housing Decarbonisation Demonstrator fund (SHDF), it was decided that an application for this for Verity Close was unlikely to be successful. This is because of the high proportion of freehold homes and because the homes currently have relatively good EPCs (funding sought homes with EPCs worse than C).

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5.0 CONCLUSIONS

5.1 CONCLUSIONS

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

This study is also affected by ongoing investigations into the local district heating system and whether this will be extended to include Verity Close, therefore any conclusions must be compared against recommendations from this parallel study by others. Of the three options put forward only the 'Gold' standard can deliver a net zero Carbon outcome in a single project. However, all three options offer a trajectory towards net zero Carbon at a variety of timescales. The 'Bronze' option is the cheapest solution however this does not adequately address the main sources of heat loss and would require further extensive work to achieve net zero Carbon. The 'Silver' option offers perhaps the most desirable outcome as this tackles the main sources of heat loss through most building elements and reduces heating demand to a minimum. This option also includes an air source heat pump, providing low carbon energy, bringing the Close nearer to net zero. The provision of further low carbon energy sources, such as photovoltaic panels can then be provided as costs reduce.

Verity Close represents a common house typology across the UK with numerous similar cavity wall properties across which this solution could be delivered. The existing buildings offer good quality homes which are generally popular with residents. However resident feedback has also identified a number of issues related to the poor energy efficiency of the homes, especially the existing windows. By tackling these issues and addressing other sources of heat loss we can improve the energy efficiency of each home and address Carbon emissions whilst maintaining the character and qualities of the existing buildings.

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. The changes that residents decide to pursue each have 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 insulation, whether internal or external, will play a part in creating spaces that feel cosy and comfortable. As well as bringing about immediate comfort benefits, such insulation has the potential to reduce the amount residents spend heating their homes and, in this way, can alleviate the pressures that cause fuel poverty. Taking the time to investigate and solve acoustic issues can make for homes where peace and quiet can be found more readily. The installation of brand new windows, whether of a new or traditional style, can refresh a 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 bin storage – are opportunities to enhance the appearance of the site, adding beauty and uplifting those who live at Verity Close or pass through 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.

CO-DESIGN

The most critical next step is to agree the co-design programme so that workshops can be planned, and notice be given to residents. The co-design process is critical to the success of the scheme, but needs to keep moving if residents are to feel that they have sufficient time to understand proposals and make decisions, but allow the project's tight programme to stay on track.

FIRE CONSULTANT

IFC fire consultancy have been appointed to ensure compliance in all aspects of the work, as well as to recommend best-practice solutions where these exceed statutory compliance. This should reassure residents that maximising fire safety is the top priority in the design and implementation of the works.

SERVICES CONSULTANT

TACE have been appointed not only to address estate-wide services, but also to offer consultancy on Verity Close in particular. ECD's multidisciplinary team will draw on the expertise of TACE both to ensure the existing services are fully understood, and that residents understand all the systems available for their homes and how this can improve their quality of life and reduce carbon emissions.

BUILDING INVESTIGATIONS

Further investigations are needed as follows:

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

A price is being put together for items 3-5 across several properties by Build Test Solutions, who are already carrying out some work at Verity Close.

PLANNING

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

The similarities and variety of the existing buildings at Verity Close was explained, along with the number of freehold houses. ECD set out the idea of playing on the similarity and differences around the Close, to allow some homes to be retrofitted and others left as they are, while still maintaining a coherent whole. The intent then being to work with residents to choose a suitable palette of materials and arrangements of these for their individual homes. Some concern was raised about the change in appearance and loss of a consistent materiality.

ECD will work with LWNT to establish the best approach for ongoing liaison with the planning department to ensure that all works that require planning permission are granted this in a smooth and timely manner.

BUILDING REGULATIONS

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

PARTY WALL MATTERS

If the silver or gold standard are adopted it will be necessary to agree party wall matters with the freeholders neighbouring the RBKC owned properties, as the works will impact on the party walls between properties, adding additional load here, and altering the way rainwater is shed.

CDM

Derisk, who are the Principle Designers for works across the estate, have continuing oversight over all works. They attend meetings with ECD's multidisciplinary design team in order to ensure safety and compliance at every stage.

RETROFIT COORDINATOR

While the works are being planned and designed in line with the recommendations of PAS 2035, it is recommended that a retrofit coordinator be appointed as soon as possible. This will ensure that there is an over-arching view of the retrofit strategy taken across the disciplines and in relation to the other works that RBKC intend to carry out.

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ENERGY CONSCIOUS DESIGN