# Retrofit eco design

**GREEN 4 LIFE**

**Hess Kincaid Leach Architects**

# GREEN 4 LIFE

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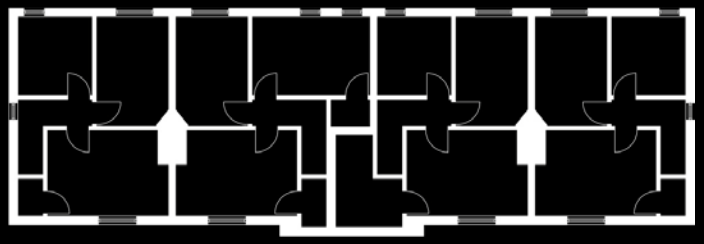
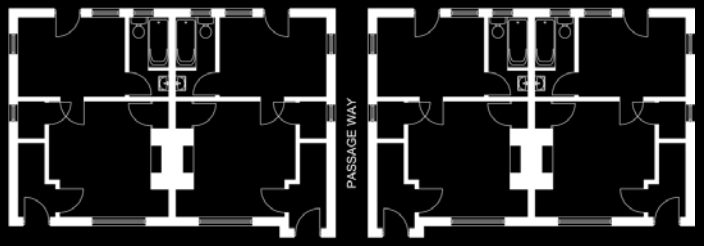
## ANALYSIS OF LAYOUT

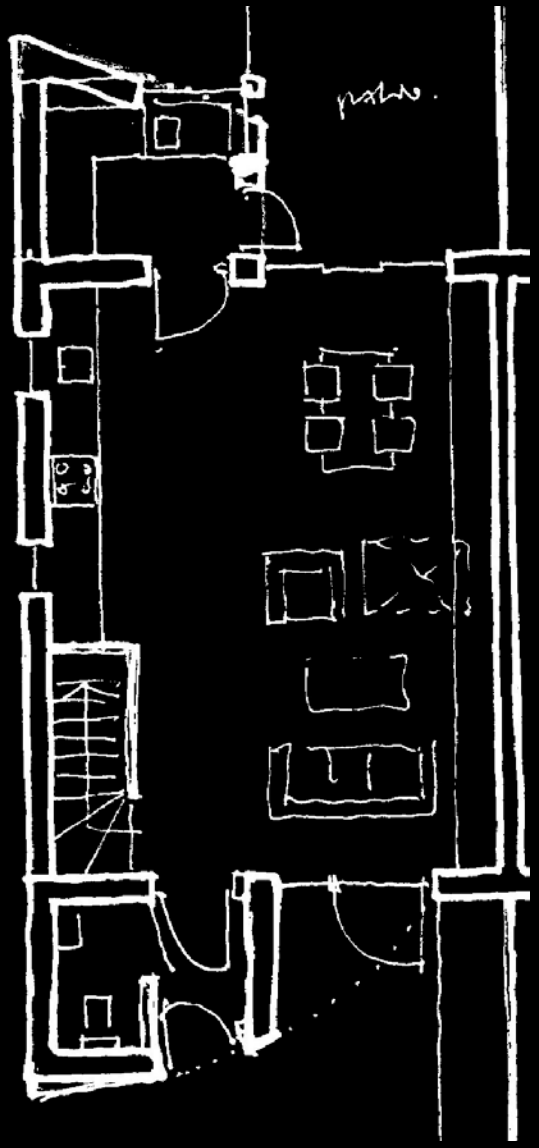
EXISTING EAST ELEVATION (FRONT)



EXISTING 1st FLOOR PLAN




EXISTING GROUND FLOOR PLAN



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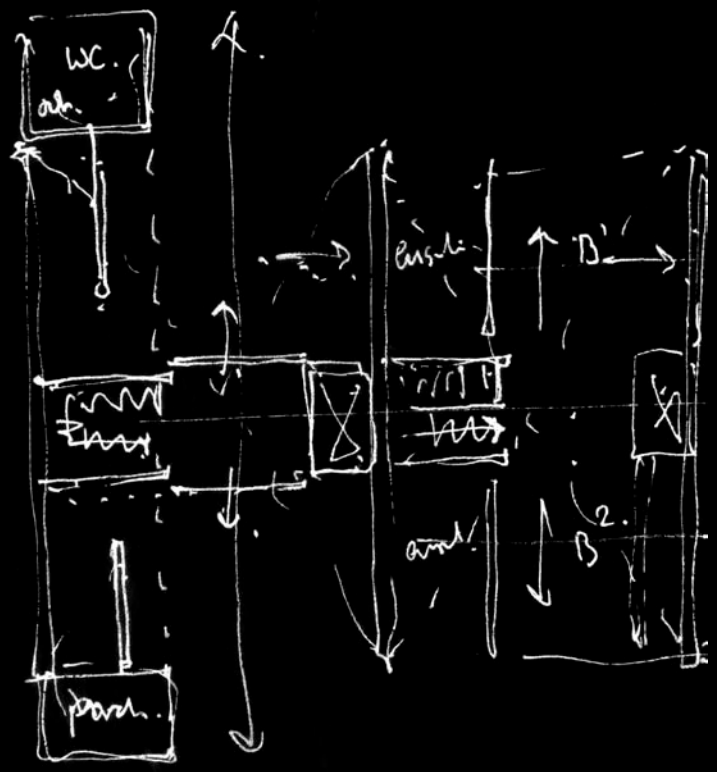
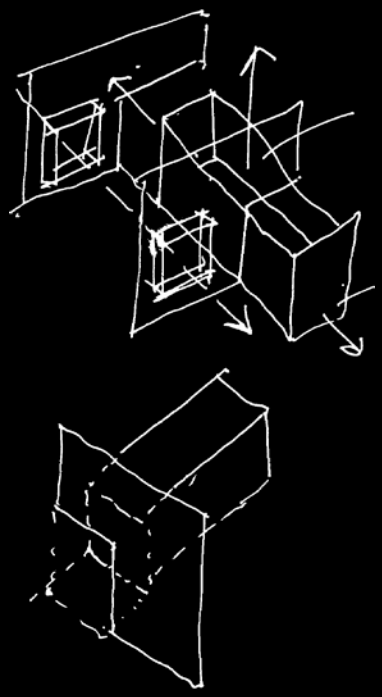
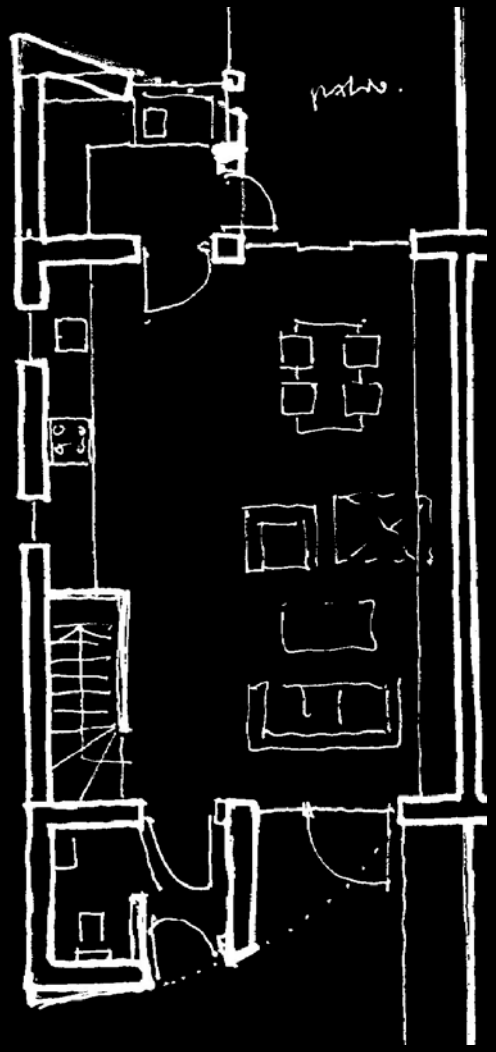
## DESIGN STRATEGY





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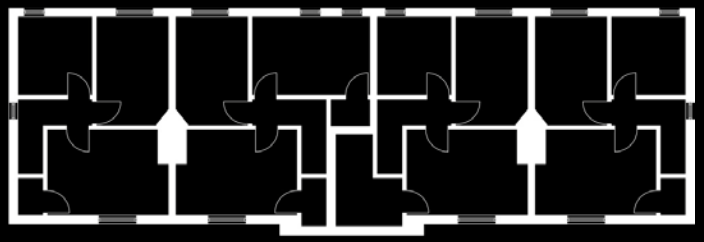
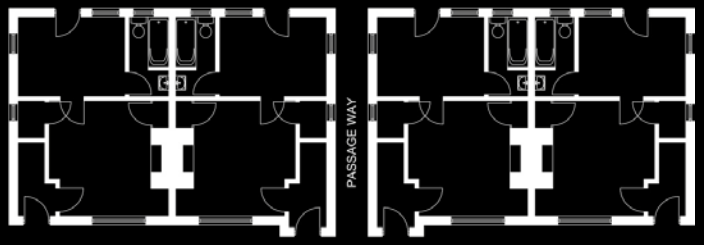
## EXISTING

EXISTING EAST ELEVATION (FRONT)

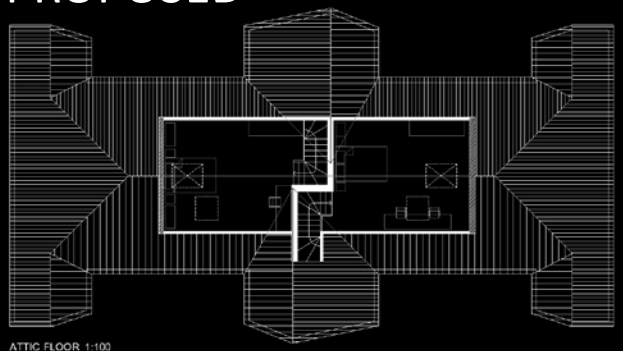


EXISTING 1st FLOOR PLAN

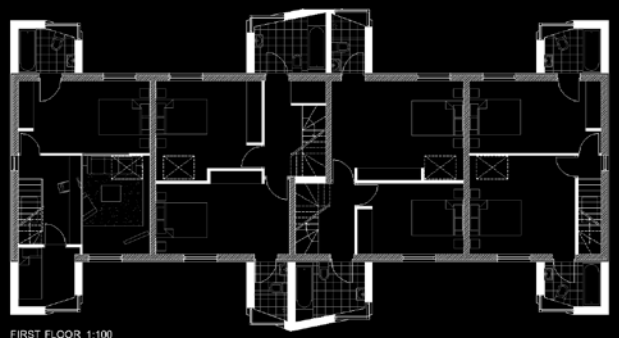



EXISTING GROUND FLOOR PLAN

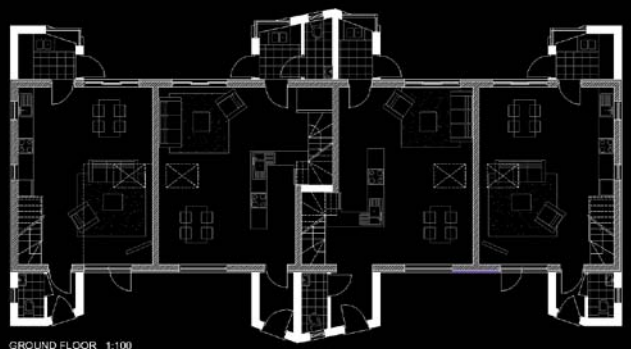
## PROPOSED



ATTIC FLOOR 1:100



FIRST FLOOR 1:100



GROUND FLOOR 1:100

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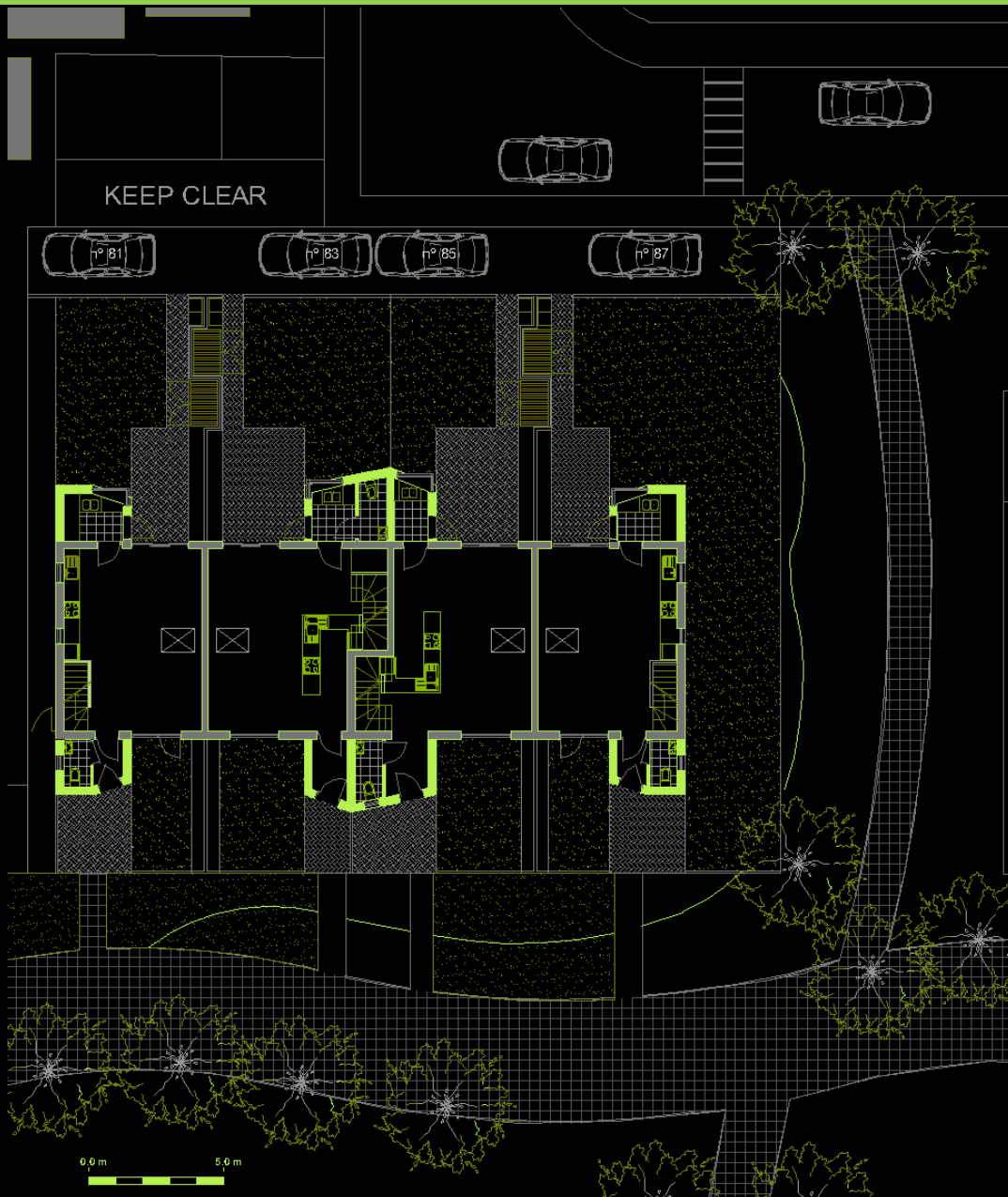
## SITE CONTEXT



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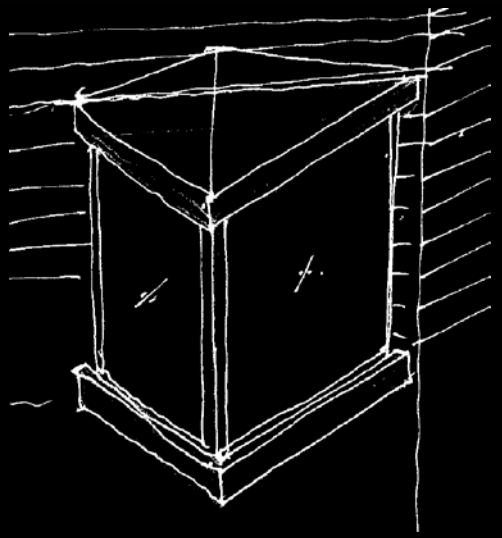
Front aerial view

EYES ON THE STREET



Rear aerial view

# GREEN 4 LIFE

## Hess Kincaid Leach Architects

**No 81 Shakespeare Street**

It is the year 2010 and Mr & Mrs Greene have just moved into their new house which they purchased after being impressed with a number of innovative features - such as lifetime adaptability, innovative materials and sustainable design into a holistic composition. Another key feature is the double height lightwell over the lounge which has a home office at the first floor landing that is utilised on a daily basis by these busy professionals.

**No 83 Shakespeare Street**

It is now the year 2025 and Mr & Mrs Greene have two children named Romeo and Juliet - after all this is Shakespeare Street. The attic has been converted into a third bedroom with minimal disturbance and the logic of the two zones has created an efficient use of circulation space.

The ability of the layout to incorporate this third bedroom for their family needs has meant that the Greenes can stay and continue to foster a strong relationship and identity with their local community.

**No 85 Shakespeare Street**

It is now the year 2050 and Mr & Mrs Greene's children **have** moved out to start their university education. The attic room has now been rented out to a lodger to supplement their income.

**No 87 Shakespeare Street**

It is now the year 2080 and Mr & Mrs Greene are retired from professional life. The house has had many interventions over the years to meet the families evolving needs and the latest intervention has been the incorporation of the platform lift for Mr Greene which gives him access to the first floor including a wet room en-suite. These features were designed into the layout as part of the original design and lifetime strategies, so there has been minimal disturbance. Reflecting back on their initial purchase, Mr & Mrs Greene have had the good fortune to be part of a truly sustainable community, fostered by a holistic approach to lifetime design integrated with innovative technologies and a true sense of place

# GREEN 4 LIFE

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No.81 section

No.83 section

No.85 section

No.87 section

# GREEN 4 LIFE

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House no 81 Shakespeare Street

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House no 81 Shakespeare Street

# GREEN 4 LIFE

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House no 85 Shakespeare Street

# GREEN 4 LIFE

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The houses have a recycled tile roof covering over counter- battens and a taped sealed vapour permeable membrane - This is the external air tightness layer. The target for air tightness is 3m³/hour/m² @ 50 Pascals. Thorough detailing and attention to detail on site are essential

South facing and some east-west roof slopes are to have evacuated tube solar thermal collectors and photovoltaic arrays.

The roof windows are Velux triple glazed argon filled k glass in white prefinished moulded frames. The manufacturer's U value is 1.0 w/m²/k

Roof insulation layer. 120mm Phenolic foam overlayer, and sprayed in-situ Polyurethane foam between the existing rafters. U value 0.12.

Foil backed plasterboard with taped joints and a plaster finish provides a vapour barrier and the internal airtightness layer to the underside of the mid terrace attic rooms. A twin air tightness layer is necessary to prevent 'thermal bypass'.

The end terrace loft floors have 120 mm phenolic foam loft insulation, storage decking and draught sealed insulated hatches. The internal gable walls are insulated, because the mid terrace attic rooms are adjoining an unheated space.
Mains pressure hot water storage systems mean that there are no tanks or plumbing in lofts except pipes to the solar collectors.

The new extensions housing the service rooms bathrooms and entrance lobbies are off-site manufactured structural insulated panels. They are 220 mm thick overall with polyurethane foam core, bonded to oriented strand board sheathing. Their finish is two coat textured polymer render with vapour permeable membrane. U Value 0.15.

The existing brick fabric is insulated externally with 120 mm phenolic foam fixed by adhesive and mechanical fixings. Vertical stainless steel rails hold the vapour permeable membrane in place and carry treated timber battens and glazed vertical tiling. U value 0.16.

The windows are hybrid wood/foam aluminum-clad frames. The glazing is triple with warm edge separating spacers, K glass and argon gas fill. U value 0.9w/m²/k .

The doors are 54mm thick foam cored with multi point locking, u value 1.1w/m²/k.

The floor decks are ply web I-joists which span between party walls to enable adaptable non load bearing partitions.
The finishes to the inside of the external walls (where they are replaced), are all wet plastered, not dry lined, to promote airtightness.

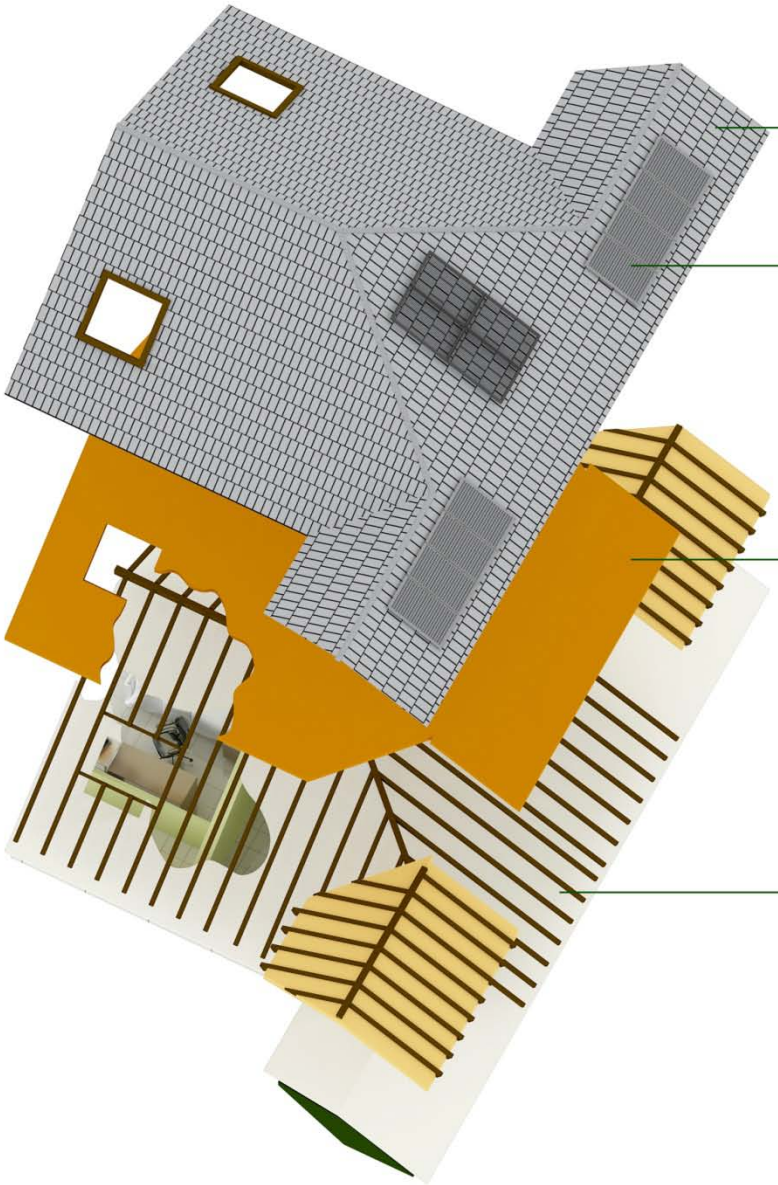
The existing ground floor concrete slab is made up with a 65mm deep layer comprising: Engineered wood finish flooring with aluminium spreader-plate underfloor heating, over 40mm battens. The insulation is 40mm Aerogel, conductivity 0.013W/mK. The same make up but with expanded polystyrene underlay provides sound insulation and heating to the upper floors.

Where the external wall insulation and the SIPS panels give way to the ground level walls below damp proof course, there is a 60 mm thick vertical edge insulation layer 400mm deep against the foundation wall, protected by 50mm thick concrete paving slabs on edge. This is made of waterproof foamed glass, acting also as a damp barrier, and it completes the insulated envelope enclosing the building fabric from top to bottom.

To minimise the overall $CO_2$ emissions, the whole house strategy is complemented by heat recovery ventilation working with gas boiler or air source heat pump; LED lighting; enhanced smart metering; infra red sensor spray pattern taps; low flush WCs, and AA rated appliances including Induction hobs and natural gas ovens.

**The improved building has the following SAP Ratings:**
**Mid-terrace 3 storey : 91 B $CO_2/m^2/p.a.$ : 17.4kg**
**End-terrace 2 Storey: 87 B $CO_2/m^2/p.a.$ : 16.2kg**

# **ANATOMY of the Retrofit** The elements of construction



The houses have a recycled tile roof covering over counter battens and a taped sealed vapour permeable ("breather") membrane - this is the external air tightness layer. The target for air tightness is 3m2/hour/m2 at 50 Pascals. (In other words in one hour 3 cubic metres of air will permeate through a square metre of the building fabric when the air pressure is 50 Pascals. An Air tightness of 10 or 12 is typical for the average British home)

South facing and some East-West facing roof slopes are to have evacuated-tube solar thermal (hot water) collectors and photovoltaic (solar electric) panels.

The roof insulation overlay on the existing roof will be 120 mm phenolic foam, with polyurethane foam sprayed in-situ between the existing rafters. U Value 1.2.
Foil backed plasterboard with taped joints and a plaster finish provides a vapour barrier and the internal air tightness layer to the underside of the mid terrace attic rooms. A twin air tightness layer is necessary to prevent 'thermal bypass' (draughts blowing through and around the insulation).

The same make up applies to the end terrace loft floors which are boarded out and have draught sealed insulated hatches. The internal gable walls are insulated because the mid terrace attic rooms are next to unheated spaces.

Mains pressure hot water storage means there are no tanks or plumbing in lofts, except for pipes to the solar collectors.

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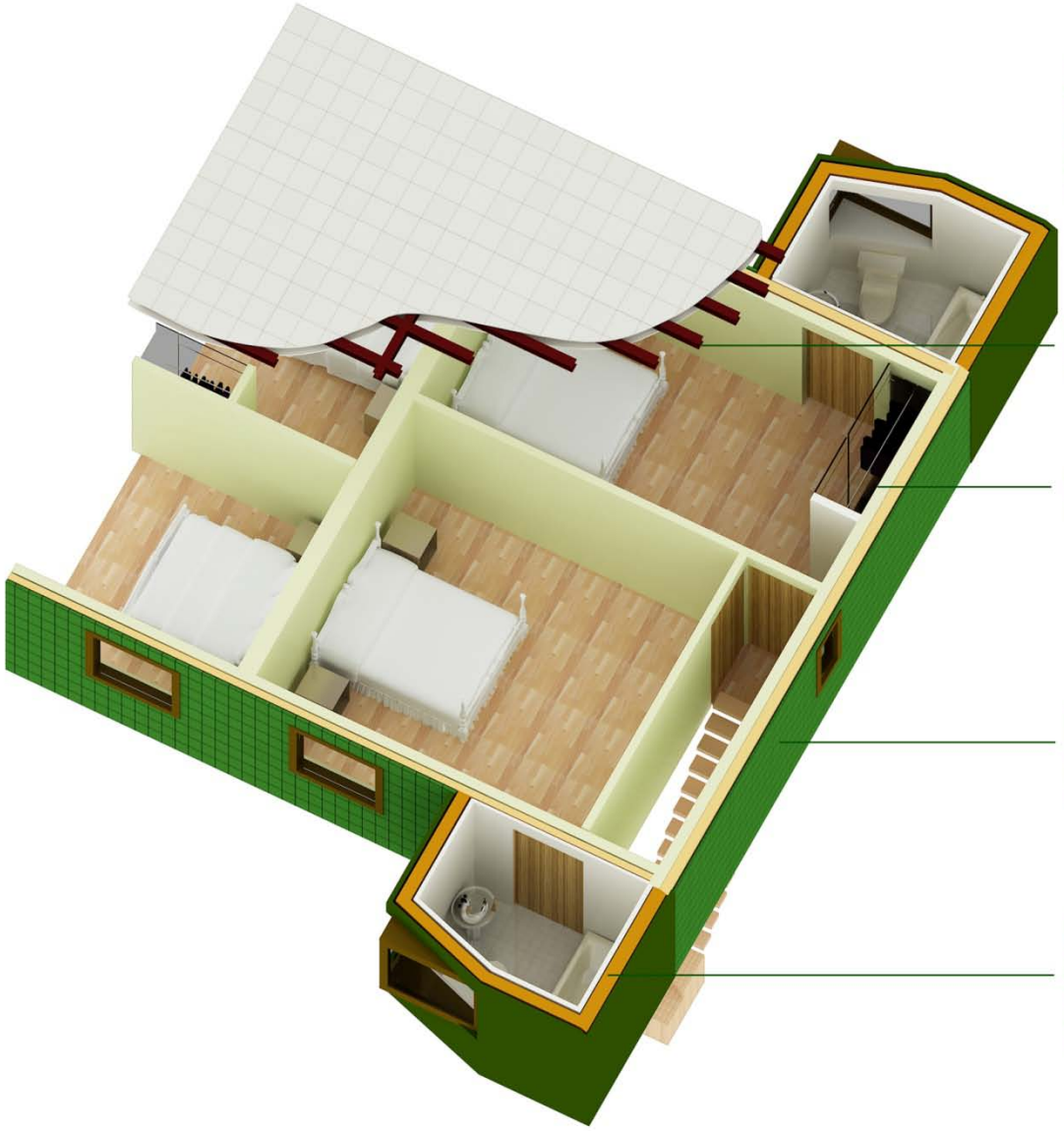

To minimise the overall CO2 emissions the whole house strategy is complemented by heat recovery ventilation working with gas boiler or air source heat pump; LED lighting; enhanced smart metering; infra red sensor spray pattern taps; low flush WCs, and AA rated appliances including induction hobs and natural gas ovens

The floor decks are ply web I-joists which span between party walls to enable adaptable non load bearing partitions.

The finishes to the inside of the outside walls (where they are replaced) are wet plastered, not dry lined, to promote air tightness.

The existing brick fabric is insulated on the outside with 120 mm phenolic foam fixed by adhesive and mechanical fixings. Vertical stainless steel rails hold the breather membrane in place, and carry treated timber battens and glazed vertical tiling. U-value 0.16.

The new extensions housing the service rooms, bathrooms and entrance lobbies are “SIPS”: structural insulated panels, manufactured off-site. They are 220mm thick overall with a polyurethane foam core bonded to strand board sheathing. Their finish is two coat textured polymer render with vapour permeable (“breather”) membrane, U value 0.15.

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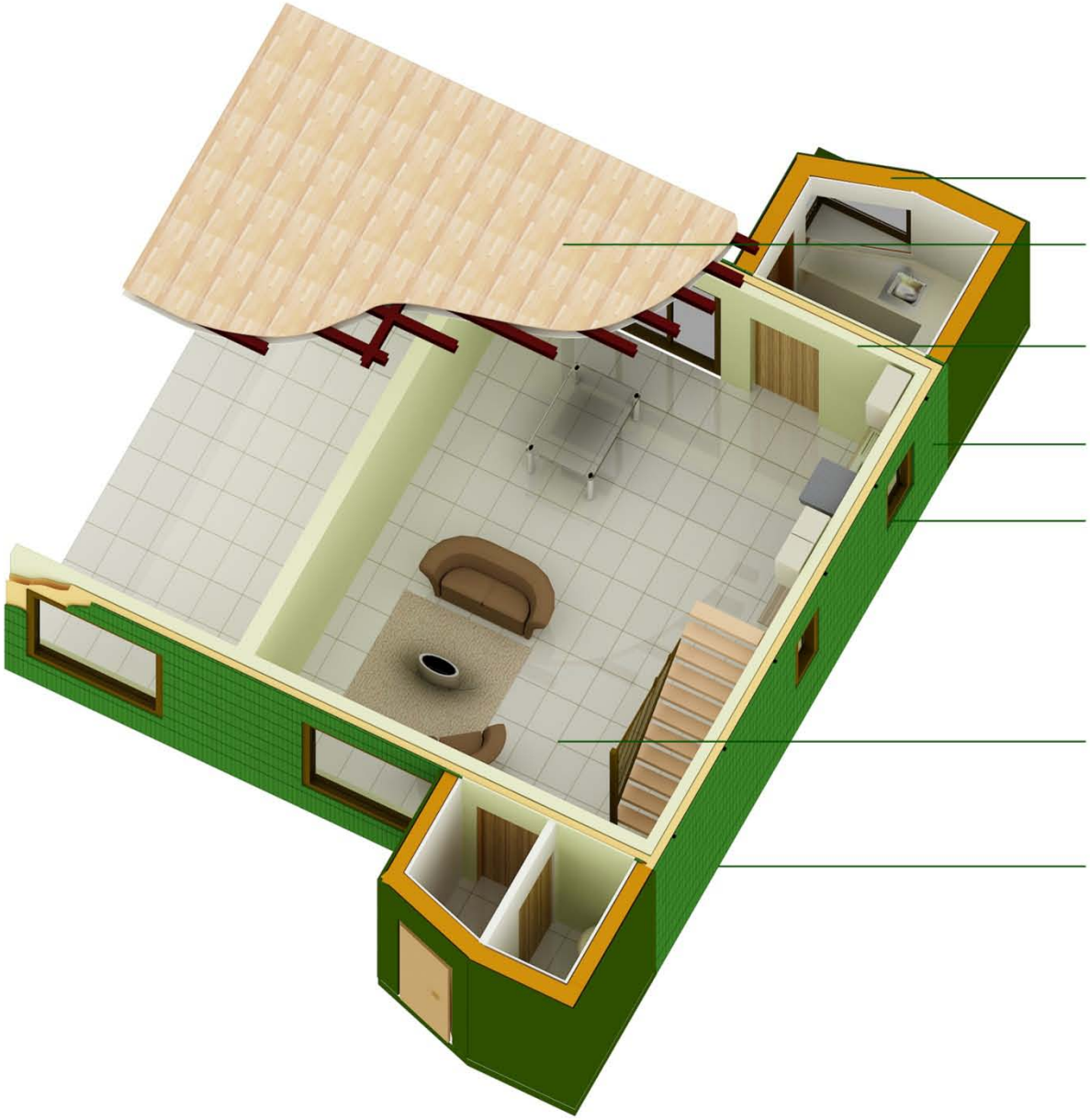

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The windows are hybrid wood/foam aluminium clad frames. The glazing is triple with warm-edge spacers, K-glass and argon gas fill. U-value 0.9. The doors are 54mm thick foam cored with multi point locking, U-value 1.1.

The existing ground floor concrete slab is made up with a 65mm deep layer comprising: Ceramic tiling on subfloor with aluminium spreader-plate under floor heating over 40mm battens. The insulation is 40mm super-thin Aerogel foam, conductivity 0.013W/mK.
The same make up but with expanded polystyrene underlay provides sound insulation and heating to the upper floors.

Where the external walls and SIPS panels give way to the ground level walls below the damp proof course, there is a 60 mm thick vertical insulation layer 400mm deep against the foundation wall, protected by 50 mm thick concrete paving slabs on edge. This is made of waterproof foamed glass, acting also as a damp barrier, and it completes the “tea cosy” insulated envelope enclosing the building fabric from top to bottom.

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Front aerial view