

**OUTLINE SUSTAINABILITY & ENERGY REDUCTION
PROPOSALS**

1-3 Porter Street, Bury, BL9 5DZ

01/08/2024

CLIENT: Sonalight Living Ltd



INTRODUCTION



Cathy Mocke Architecture & Design (CM A&D Limited) was approached by Sonalight Living Ltd to advise them on the measures which can be undertaken to improve the energy efficiency of the building at 1-5 Porter Street. A building of this type offers a unique opportunity to incorporate the ‘Fabric First’ energy efficiency improvement measures, given its age, state of dereliction and works required to convert it from its current state to multi-person co-living homes.

Cathy is a qualified chartered RIBA Architect, specialising in low carbon, net zero and energy efficient retrofit buildings. She has a level 5 Diploma in Retrofit Coordination and Risk Management and a Level 3 award in Energy Efficiency for Older and Traditional Buildings. She is a member of the AECB (Association for Environment Conscious Building) and the Passivhaus Trust Cathy is also the proud owner of an A EPC rated low energy net zero co-living home in Macclesfield. This was created by converting an old pub building, built in 1880, into a luxury co-living home in 2022. It was this project that inspired Solalight Living to create a similar project in Bury. It continues to perform very well, within the estimated energy usage parameters calculated an the beginning of the project.

At this initial stage of the project, we have made proposals for the strategy to improve the energy efficiency of the building. These proposals will be developed fully during the documentation stages, and tested against the project budgets to find the best suite of measures that will achieve the energy reduction targets and be affordable to the project. Proposals will also be made to future proof the building for future measures, which may not be part of the initial works, eg additional renewables, to ensure the initial build enables future improvements to occur.



REVISION NO	DATE	COMMENTS
A	05/08/2024	DRAFT ISSUE FOR COMMENTS
B	07/08/24	FINAL ISSUE

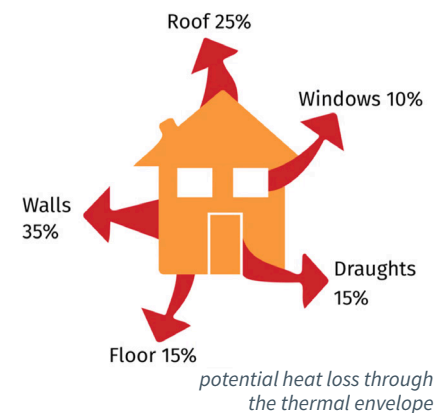


FABRIC FIRST:

The proposals centre around a 'Fabric First' approach to the refurbishment of the building. By doing this we reduce the amount of energy needed to heat and power the building in the first place.

The 'Fabric First' approach involves implementing measures which reduce the amount of heat lost through the building, or thermal envelope ie. through Walls, Floors, Roofs & Windows (transmission heat loss & thermal bridging) and uncontrolled Ventilation through the fabric and through gaps in the thermal envelope.

By reducing heat loss in the first instance, we reduce heating demand, then we look at how renewables in the form of Air Source Heat Pumps (ASHP) and Solar panels can be utilised to efficiently and effectively provide heating and power to the building.



Transmission heat loss

What we want to do is improve the thermal properties of the building envelope by improving the U-Values of the building's external envelope. U-Values are expressed in Watts per meter square Kelvin (temp diff between inside and outside) (Wm^2K) and represent the rate of transfer of heat through a structure or an assembly made up of several elements, eg brick+ insulation+render or glass+frame. The lower the U-value the lower the rate of heat transfer.



Thermal bridging

Thermal bridges, also known as cold bridges are 'weak points' in the building envelope which allow heat to pass through the component or assembly more easily than adjacent areas. These normally occur at junctions, interfaces and corners. Thermal bridges become more of a risk in well insulated buildings as any differential in surface temperature will be more prone to heat loss, condensation and possibly mould growth. Thermal bridges can account for significant heat loss as well as causing issues with condensation and, as a result, health and maintenance concerns.

Avoiding thermal bridging is key in ensuring a well-insulated and well performing thermal envelope. Typical design details will be developed to overcome these issues, but the installation and adherence to the details by the installers will be important in ensuring their success. We also find that this attention to detail results in a better built, better performing building over the longer term, reducing repair and maintenance costs significantly, which has an ongoing Carbon embodied efficiency benefit.

Uncontrolled ventilation

Uncontrolled ventilation, can account for upwards of 15% of the heat lost through the building envelope. Improving the building's airtightness can reduce the overall heating demand significantly. Uncontrolled ventilation will occur through gaps within the building envelope, eg. around windows and doors but also through penetrations for pipework, conduit, vents, etc. Improving the building's airtightness is key and again, the installation of measures to ensure this is done is an important aspect of the building installation works.

"BUILD TIGHT VENTILATE RIGHT"

The importance of Ventilation

Improving the insulation and air permeability cannot be looked at in isolation of ventilation. If ventilation is ignored this will inevitably result in unintended consequences, including poor air quality and the risk of condensation and mould occurring. Airtightness levels will dictate the ventilation strategy for the building in order to ensure there are no unintended consequences.

The intention for this building is to reduce uncontrolled ventilation heat loss by ensuring good levels of air-tightness, in excess of those required by the Building regulations, the target figure is $3\text{m}^3/\text{m}^2\text{h}@50\text{Pa}$ which also dictates a mechanical ventilation system must be installed.

Building Regulations

Approved Document L1: Conservation of Fuel & Power

- For existing buildings air-permeability is not defined (as long as its not worse than existing). For new build it is $8\text{m}^3/\text{m}^2\text{h}$.
- Good practice standard is $3\text{m}^3/\text{m}^2\text{h}$ and Enerphit is $<1\text{m}^3/\text{m}^2\text{h}$
- We are intending to achieve $3\text{m}^3/\text{m}^2\text{h}$ in order to ensure the MVHR system works as efficiently as possible.

Approved Document F: Means of Ventilation

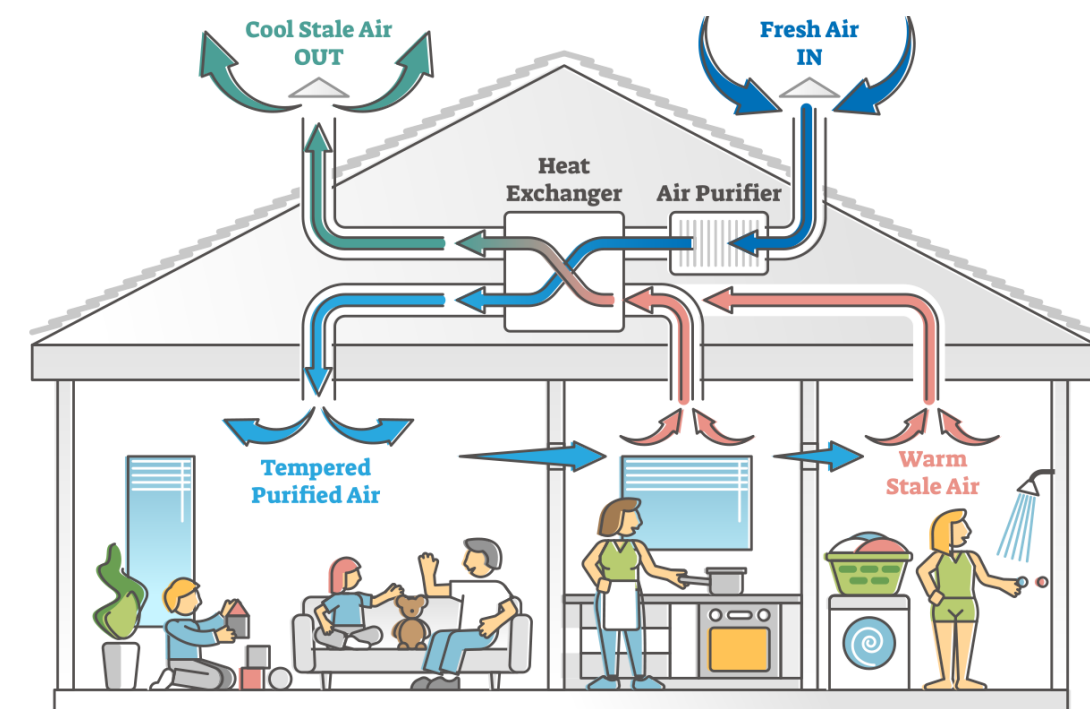
- Continuous extract ventilation must be installed where the air permeability is equal or less than $5\text{m}^3/\text{m}^2\text{h}@50\text{Pa}$. This would be MVHR, decentralised extract mechanical ventilation (dMEV) or centralised extract mechanical Ventilation (cMEV).
- MVHR extract ventilation must be installed where the air permeability is equal or less than $3\text{m}^3/\text{m}^2\text{h}@50\text{Pa}$

Mechanical ventilation with heat recovery (MVHR)

It is the intention to install MVHR within each HMO. This will effectively reduce energy demand (through its heat recovery mechanism), improve air quality and guard against condensation and mould risk. MVHR provides fresh filtered air into the home, tempered (heated/cooled) by the heat extracted from the return air (via a heat exchanger) from the warmer areas of the property, essentially retaining a high percentage of the heat energy within the home. The higher the efficiency of the system, the less top up heating will be required to achieve the heating demand for the property.

The advantages include:

- Reduced heating costs
- Excellent air quality, especially effective against allergies
- Reduced sizing of heating devices (radiators, boilers, ASHP)
- Internal heat gains from people, appliance, lighting, etc. essentially heat the building



CO² emissions & energy usage

The current EPC's and estimated energy usage for the building are as follows (data is taken from the EPCs):

Unit	Rating	GIA (m²)	CO² emission kgCO²/m²/a	CO² emissions kg CO²	Primary energy use kWh/m²/a	Total Primary Energy Use kWh/a
Flat 1	G	54	148	8000	876	47,304
Flat 2	G (exp)	41	141	5800	802	32,882
Flat 3	F (exp)	69	159	11000	905	62,445
Flat 4	G	68	122	8300	729	49,572
1 Porter Street (Comm)	C	191	99.98	19096	591	112,881
3 Porter Street (Comm)	C	62	88.79	5505	525	32,550
Total		485m²	119kgCO²/m²a	57,701kg	696kWh/m²a	337,634

Retrofit Guidance

We refer to the guidelines set out in the **LETI** (Low Energy Transformation Initiative CIC) ‘Climate Emergency Retrofit Guide’ which can be downloaded from their website [here](#) . This is endorsed by several notable bodies including the RIBA, the AECB, and the Retrofit Academy.

This sets out guidance for different building Archetypes but the basic premise in achieving a nationwide reduction in carbon emissions is to encourage retrofit to a standard that is practical, affordable and achievable in more buildings than setting very high standards which will result in fewer building being retrofitted, which will be a barrier for most people to do anything at all. LETI have calculated targets which equate to an outcome where lower carbon emissions can be achieved by reducing heat loss and energy use, moving to all-electric solutions for heating and hot water through the use of heat pumps, without overwhelming the grid. It also assumes at some point the grid will be 100% run on renewables and net zero will be achieved.

The proposed measures will seek to meet these targets, unless it is technically and financially un-viable to do so. Nevertheless these will remain the targets and the aspiration will be to get as close to these figures as possible. Nevertheless, it will be a significant improvement on the existing Primary Energy Use and CO² emissions reflected in the current EPC’s.

We are really looking at consequential improvements whilst still bearing in mind the risks of over-achieving in some areas.

Pushing the U-Values in existing buildings, resulting in an inconsistent heat loss through the building fabric, can sometimes lead to unintended consequences. Improving insulation values in some areas can cause issues in those areas which are unable to be improved as the heat loss will be concentrated in the areas of least resistance which can lead to condensation and mould despite the efforts made in other areas. To a certain extent, a good ventilation strategy can mitigate these factors. There is a school of thought that consequential improvements in existing buildings should be conservative in their approach to insulation to avoid extreme differences in heat loss within the dwelling.

Table 4.2 Limiting U-values for new fabric elements in existing dwellings		
Element type	Maximum U-value ⁽¹⁾ W/(m².K)	
Roof ⁽²⁾⁽⁴⁾	0.15	
Wall ⁽²⁾⁽⁵⁾	0.18	
Floor ⁽⁴⁾⁽⁵⁾	0.18	
Swimming pool basin ⁽⁴⁾	0.25	
Window ⁽⁷⁾⁽⁸⁾⁽⁹⁾	1.4 or Window Energy Rating ⁽¹⁰⁾ Band B minimum	
Rooflight ⁽¹¹⁾⁽¹²⁾	2.2	
Doors with >60% of internal face glazed ⁽¹³⁾	1.4 or Doorset Energy Rating ⁽¹⁰⁾ Band C minimum	
Other doors ⁽¹³⁾⁽¹⁴⁾	1.4 or Doorset Energy Rating ⁽¹⁰⁾ Band B minimum	

Table 4.3 Limiting U-values for existing elements in existing dwellings		
Element	U-value ⁽¹⁾ W/(m².K)	
	(a) Threshold	(b) Improved
Roof ⁽²⁾⁽⁴⁾	0.35	0.16
Wall – cavity insulation ⁽²⁾⁽⁵⁾	0.70	0.55
Wall – internal or external insulation ⁽²⁾⁽⁶⁾	0.70	0.30
Floor ⁽⁷⁾⁽⁸⁾	0.70	0.25

For these reasons the U-Values of the thermal envelope will either meet or exceed those set out in **Part L of the building regulations**.

For improvement to existing buildings, the Regulations state that “The U-Value of an existing thermal element that is being renovated should both:

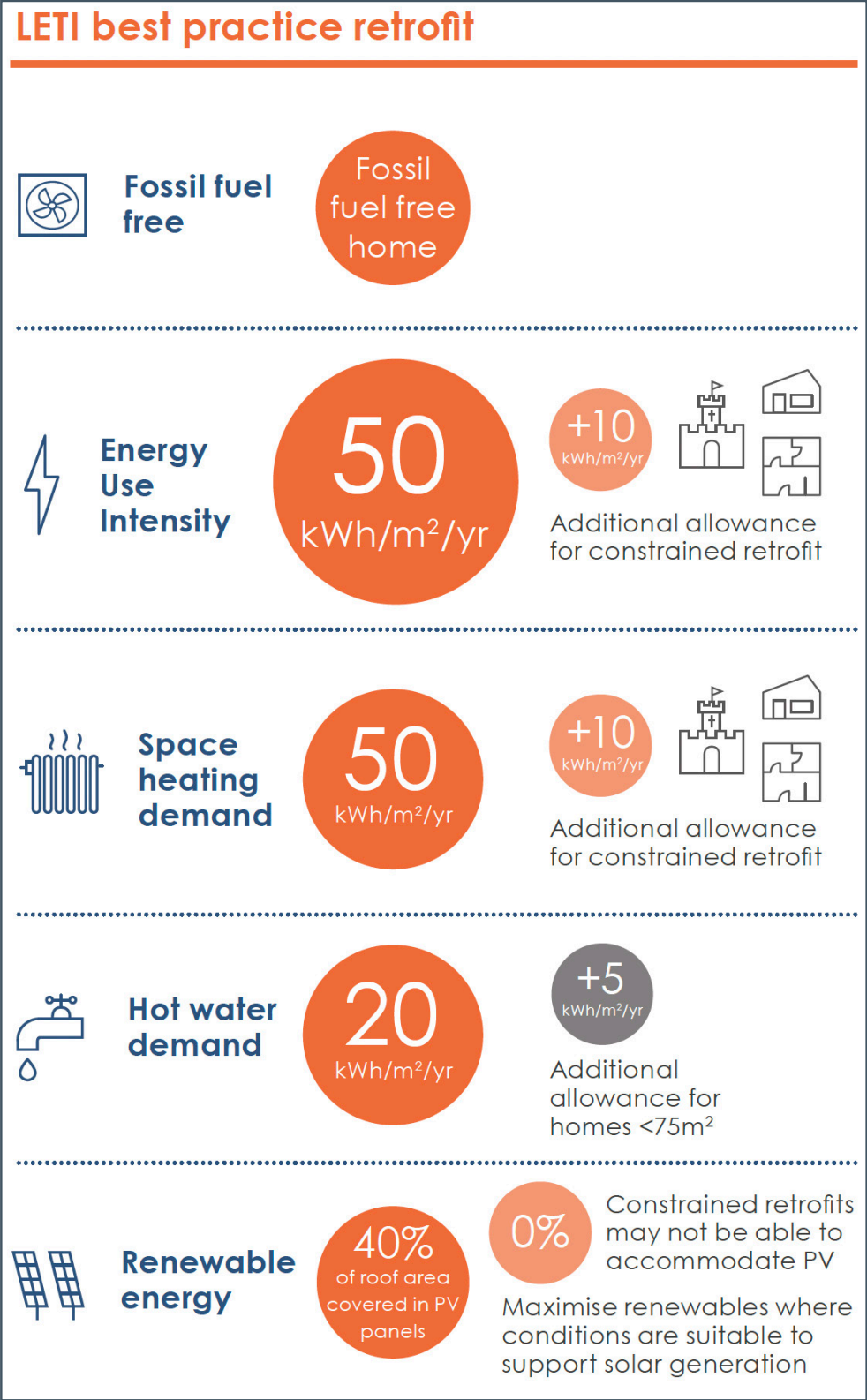
- be no worse than that of the element before it was renovated
- meet the limiting standards in Table 4.3.”



Target Energy usage and CO2 emissions

Unit	Rating	GIA (m²)	CO² emission kgCO²/m²/a	CO² emissions kg CO²	Total Energy use kWh/m²/a	Total Energy Use kWh/a
ALL	B	485	20-34	9,864-16,440	120-200	58,200-97,000
Improvement (up to)		485m²	71-83%			

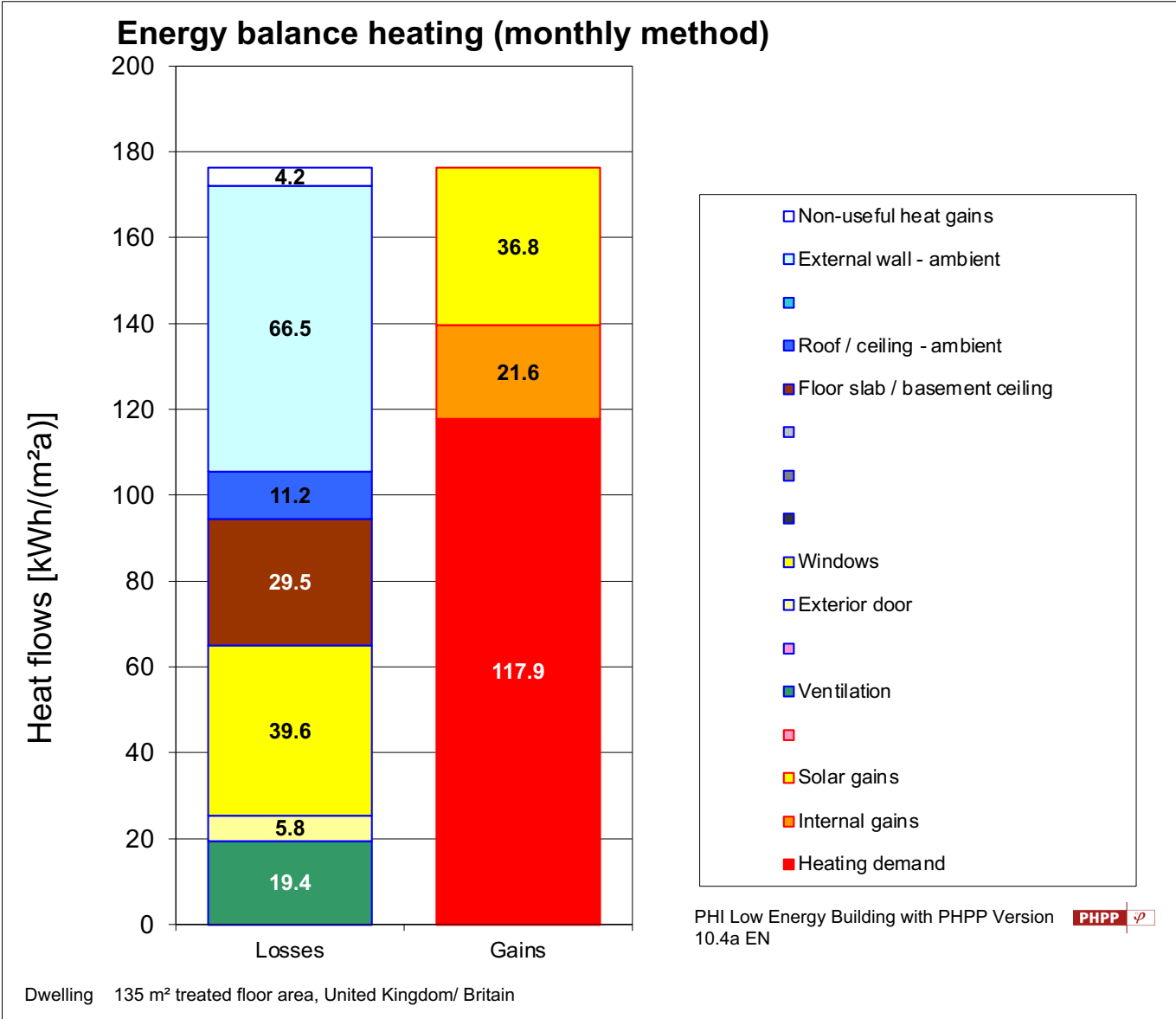
Note: the above figures are estimates at this stage, a more detailed design will be needed to ascertain actual calculated energy usage



THERMAL MODELLING METHODOLOGY

The building will be modelled to accurately calculate its heat loss and subsequent heating demand.

In the example below, the column on the left reflects the heat loss through the building fabric and the column on the right reflects the heat gains and the difference between the two shows the required heating demand for the building (in red).



This is used as a tool to assess improvement and aid design decisions. It is a very accurate reflection of the building performance and does take into account other factors such as hot water, electrics and renewables.



SUMMARY OF MEASURES

The following measures will be applied as a given (to meet or exceed building regulations):

- External Wall Insulation - To be applied to all external walls this will be internally (IWI) and/or externally. IWI will be used where the facade is fronting the public highways, on other facades externally applied insulation (EWI) may be used instead of IWI to maximise floor areas and improve overall energy efficiency.
- New windows and doors to meet or exceed the Building Regulations - these will also improve the acoustic environment internally, insulating the internal spaces from the external traffic noise.
- Roof/loft insulation
- Floor insulation
- Improved airtightness (as discussed previously in the document) to limit air permeability to 3m³/m²/h
- Ventilation to be via Mechanical Ventilation with Heat Recovery (MVHR) this will ensure excellent air quality providing in the region of 1 air change per 2 hours. The heat recovery element will reduce the space heating demand by a significant amount as the heat energy within the building is retained and re-used. Internal heat gains are factored in.
- Hot water and heating to be provided via Air Source Heat Pumps (ASHP). The ASHP's will have an average Coefficient of Performance (COP) of 3.5, which means for every 1kW of energy they draw from the grid, they will produce 3.5kW of heat energy.
- All new appliances to be A or B rated.