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Heating & Energy Efficiency Report

Prepared for: -

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On behalf of CLPM Ltd by: -

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Property Reference: [redacted] Lissel Road, Simpson

Home Survey Brief.

CLPM were instructed by Jane Grindey on behalf of the Wolverton Community Energy Group to carry out heating and energy efficiency surveys to three differing properties in the Simpson area of Milton Keynes.

The specific requests were as follows: -

- To review the existing building with the aim of improving the efficiency levels of the property.
- To assess what future improvements might be appropriate and the feasibility of changing the heating source - potentially using renewable technologies.

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Please note the following document has been prepared from information which has been gathered from the site survey and information given by each individual house holder.

Please note; that we do not endorse any products or services, and any referred to are to be used as a suggestion.

The Property.

[redacted] Lissel Road is a mid-terraced property built in the 1970s and is fairly typical of the style at the time.
Buildings built in the period were generally well constructed but with no concessions to thermal efficiency.
They can quite often have light airy rooms, with vaulted ceilings and large areas of glazing which are attractive - all these points are good reasons for people to want to live in these types of houses.
But living in a property of this type can be a compromise in terms of what elements are retained verses efficiency measures.

The Structure

Properties built in the 1970s are generally constructed from cavity masonry typically 11" (280 mm) thick with an uninsulated cavity.
This early method of construction results in walls that have a poor thermal efficiency, (likely U value 1.5 compared to a minimum requirement of 0.25 today meaning they lose far more heat than of a newer building).

The ground floor construction to 1970s properties is usually solid concrete floors with no insulation. This can be checked easily by treading heavily on the floor and witnessing little sound.

The roofs to 1970s houses tend to be a simple but effective mono pitched structure and generally would have had little insulation.

High ceilings can often be found in the bedrooms, and sloping ceilings are also a common feature.
These sections of ceilings will be ventilated allowing cold air to pass by cooling the rooms significantly.

The windows of 1970s houses are most commonly timber casement types, which are often quite large, and are very effective for ventilation, but unfortunately are usually very draughty and are very poor thermally.
Timber sections of external walls are often found beneath the windows which would have had very little insulation.
The external doors can also be timber, and as it is a natural material, will swell and shrink over the seasons which usually leads to draughts.

The Heating

Even in the 1970s, very few houses had full gas fired central heating with many homes still having open fires.
The houses on Lissel Road may have been relatively early house with gas fired heating as there are no chimneys and fireplaces present.
There is a possibility that the houses may have had electric storage heaters originally on an Economy & tariff with an immersion heater for the hot water.
This was a popular option at the time, especially for developers as this was a cheaper installation.

Our Recommendations

The overall objective is to have a warm, comfortable and efficiently heated building. Older houses with poor thermal qualities, by their very nature of construction, are difficult buildings to heat. So, making improvements are a challenge, and will require elements of compromise.

Before we consider the heating, we must deal with the areas that affect the heat usage.

In an ideal world, all of these elements could be improved significantly, but practicalities and cost are usually the barrier. However, it still worth improving some elements as the efficiency of the building can be improved by the total sum of various small elements.

Houses of this period have often been modified and extended over the years, but it is quite common to find a number of the elements in existence.

The Building Envelope

As mentioned previously the thermal properties of the walls is poor, and the only way to improve this is by either injecting insulation into the cavity, or by adding insulation.
The cavity to the external walls will be quite narrow, so the amount of insulation fitted would be quite limited.
Also, it can be difficult to ensure that the insulation is evenly distributed throughout.
Fitting external rigid insulation boards can be an option, but this would need checking with the local planning authority.
If the walls are externally rendered, then there could be an option to do this.
The alternative would be to fit insulation boards to the internal skin, but this would reduce internal space.
An alternative would be to remove the existing internal render and replace with an insulative render. This can be much thinner than boarding and be approximately the same thickness as the existing.
This system will not be as effective as the boarding, but certainly will be an improvement over the existing. Re-rendering is not a cheap option but is worth considering if any alterations are being carried out in any rooms which will require works to the external walls, additional thermal improvements will be worth carrying out. Please see a link for more information.
https://bauwer.co.uk/

The existing concrete floor is unlikely to have any insulation fitted.

This is of less importance than the walls, and to take up the existing floor, would be very disruptive and costly.
If there is space at the thresholds to the external walls, it would be possible to lay a thin layer of insulation if a new floor finish was to be laid, for example if there was a wish to lay engineered wood flooring.

The roof to the house makes up a significant percentage of the external area of the house, so the thermal properties will have a significant adverse effect on the house.
The roofs to the houses in Lissel road are vaulted, except for the roof to the bathroom.
It is likely that there is some insulation when the roof was fitted fitted, but generally it will be of a poor material and not thick enough.
It would be very costly and disruptive to add insulation to the roof void.
The best option would be to fit rigid PIR insulation to the underneath of the existing ceiling, and then reboard and plaster.
Please note that it is likely that the wiring to the lighting would need extending.
I suggest that a minimum of 300mm of Rockwool type insulation is laid to the roof space above the bathroom. If storage is still required with boarding, then board lifters should be fitted so the insulation is not squashed.
Please see the link to a potential product.
https://www.loftleg.com/

The glazing may have been changed but if they are original, they can be improved.
Single glazed windows which would benefit from improvement.
Some early types of double-glazing use Aluminium frames. These metal frames suffer from cold bridging which allows condensation to form.
The best option would be to replace them, but this can be costly.
If they are to remain, I suggest that they are renovated by an experienced company.
Secondary glazing is an option to improve the thermal efficiency and draught proofing, which has improved recently and is far more effective and attractive than was. Please see links below to potential suppliers.
https://www.magneglaze.co.uk/
https://www.stormwindows.co.uk/

If the front door has a significant gap to the frame, this can be improved by fitting new draught seals.
Please see the link to a potential product.
https://www.amazon.co.uk/Pemko-Spring-Bronze-Weatherstrip-1-125/dp/B00002N73U

The letter box can also be a source of draughts, so it would be beneficial to fit an internal flap.

The Heating.

The heating requirements for a house are dependent on several factors.
One, how big the house is, and how draughty and well insulated it is.
As we are looking to reduce energy usage, the previously mentioned insulation improvements are critical to enable higher levels of sustainability.

It is likely that the heating system is fueled by gas and is regarded as having a relatively high carbon footprint. Recent gas boilers can be an efficient units and could get close to being 90% efficient if set correctly, but the likely hood is that the gas boiler would be running below this.
The two main gas options would be either a Combination, 'Combi' boiler, providing heating and hot water directly, or a heat only boiler providing heating and hot water via a hot water tank.
Combi boilers are generally rated at around 30 kW which is often oversized in terms of output for the heating system, depending on specific house details. The boiler requires a high output to enable in instantaneous heating of the hot water. Combi boiler efficiencies can be improved by fitting a water preheater.
Please see the link for more information.
https://www.molevalley.gov.uk/CausewayDocList/DocServlet?ref=MO/2015/1157&docid=647022

Heat only boilers can be sized according to the total heat load of the property which generally would make them a little more efficient.
If the boiler is oversized there is a risk of short cycling with the boiler turning on and off frequently which uses high levels of fuel.

If the boiler is older than 2005, it should be replaced as it will be very inefficient.
All post 2005 boilers are what is known as a 'Condensing' which improves efficiency and allows the boiler output to fluctuate somewhat depending on heating needs.
Regular servicing of the heating system is important to ensure all is working at the optimum and this includes ensuring the system is clean, Magnetite, commonly known as 'Sludge' can build up and reduces the general efficiency significantly.

Renewable Technologies

There may be a desire to come away from fossil fuels. Renewable technologies may be of interest and may be an attractive option but unfortunately, there are pros and cons to using renewable technology.

On a 'green' point of view, heat pumps are far more eco that fossil fuel boilers, but still require electricity which is as eco as the generation source. There are green energy suppliers which invest in renewables.

Using a heat pump can reduce your carbon usage for the heating and hot water by 60 to 70% which is a significant amount.

Though gas is still currently a cost-effective way of heating, with gas currently being around 3 times cheaper than electric at peak rate per kW.

We anticipate that in the near future government policy will begin to put pressure on reducing Gas use for heating in response to climate change targets by raising taxation, therefore reducing the cost differential between gas and electricity costs.
A Hydrogen mix may be an option in the future, but I would expect an increase in costs.

Heat pumps are around 3 to 4 times more efficient than gas boilers, so similar running costs would be expected.

One of the drawbacks with heat pump technologies is the limit of output of the units. The maximum output of a single heat pump on a standard power supply, which most properties have, would be around 12 to 17 kW depending on the model.
This could rule out heat pumps for many properties if the total heat load is not reduced by improving the insulation.
If the heat requirements are too high after the insulation levels have been done, it is possible to have a heat pump working in conjunction with the existing boiler as a hybrid system. This allows the heat pump to run the majority of the time with the gas boiler joining in when required, for example during the coldest weather.

Please note that the district power network operator must be informed if you plan on fitting a heat pump.

Please note that heat pumps are not able to heat the water directly as a combi, so hot water tank will need to be fitted.

The two main heat pump options would be a ground source or an air source heat pump.

Ground source heat pumps are not fitted frequently as they either require a large area of ground or bore holes and are not often an option due to costs and complications of carrying out suitable ground works.

Air source heat pumps derive the energy from the surrounding atmosphere and are far more cost effective to fit. The drawback is that they are not particularly attractive.

The units do produce noise, but it is minimal if the unit is located sympathetically and will not be heard in the house.
I suggest that if you are interested in having one that you listen to one running so you will be able to decide if you are happy with the noise level. Also, the heat pump runs more in the winter than the summer, so should be less of an issue.

Please note that Air Source Heat Pumps require to be located in free air space and cannot be covered.

Please see the link below for more information.

https://linkprotect.cudasvc.com/url?a=https%3a%2f%2fwww.panasonicproclub.com%2fuploads%2fGB%2fcatalogues%2f2021%2fPUK%208P%20AQ%20TCAP%20MONOBLOC.pdf&c=E,1,JXC0b61_3ZXw2yv0V2-VZEtJeYjP5y4C3V4jeasa4W-Uw0yRZvnykLeQey9mM4wBBnGhrONKFVQsjUHWuVoLQv_BvusfBUpk_6rp9ycu_Smtiw,,&typo=1

Heat pumps deliver hot water at around 35 to 50 degrees C which is cooler than a conventional boiler which means that the current radiators may not be effective and may need upgrading. This will need checking once the insulation improvements have been carried out.

Heat pumps do not heat water directly and a hot water tank will be required.

If the current boiler is a Combi. Space for a tank would need to be found, or the Combi could remain to provide the hot water, and the heating covered by the heat pump.

It is likely that an existing standard hot water tank would not be suitable, and a heat pump compatible unit would be required.

The Renewable Heat Incentive is currently in effect till Spring 2022 which is a Government run incentive which gives payments for 7 years to offset the increased costs of fitting renewable technologies.

We are expecting that a grant will be available to replace the RHI.

Please see below for more information.

https://linkprotect.cudasvc.com/url?a=https%3a%2f%2fwww.edie.net%2fnews%2f11%2fGovernment-planning-to-replace-RHI-with-Clean-Heat-Grant%2f&c=E,1,lLHZnfE37L1gXBGcE9Om9bZUlto2F5HJV1hdjq3qISsZsjSJYQmIGuYY4gssRtbBfAfHyjhVNWeX35Lq5NCezdmOp0M9vZouEAho6VHi&typo=1

Electric panel or storage heaters may have been fitted, and can be cost effective to fit, as the installation tends to be cheaper than a standard wet heating system.

The main issue is that at current energy costs, direct electric heating and water heating systems will be in the region of three times the cost to run.

Controls

Most properties have only one thermostat which has limited effectiveness as it cannot sense the temperature of other rooms.

Multi-zoned systems are available which can control each room depending on their requirements, and also allow rooms that do not need heating to be shut down saving energy. This is often the case when bedrooms do not need heating during the day. Please see the link to a potential product.

https://getconnected.honeywellhome.com/en/evohome

Ventilation.

Older properties suffer from uncontrolled ventilation which allows the building to breathe, but also make the house cold and draughty.

Insulating a property is not enough in itself, controlled air movement is very important. A well-insulated and sealed house needs to breathe. The more you insulate and seal a structure the more important it becomes to ventilate it in a controlled manor.

Whenever the washing machine or dishwasher is opened after a wash, a considerable amount of moisture is released into the building which needs to be dealt with.

If the existing glazing does have trickle vents for ventilation, and these should be opened and closed to ensure adequate air flow.

If they are not present, then windows should be opened periodically to allow some ventilation.

If the glazing is to be replaced, I suggest that trickle vents are considered.

Other Renewable Technologies.

Photo Voltaic panels may be of interest. Unfortunately, the financial incentive to fit and generate electricity has gone since the feed in tariff was dropped. But it can still be viable proposition. The Smart Export Guarantee is now in place which will give some return.

Most houses have a general background usage of 600 to 800w of power when the power consumption of the fridge, freezer, Wifi hub and other units on standby are taken into consideration. Unfortunately roofs to the houses on Lissel Road orientation are not suitable as they generally face East and West.

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Conclusions

The general objective is to reduce the energy usage of our properties, therefore reducing our carbon footprint.
The ultimate aim is to move towards using renewable technologies and to come away from running on fossil fuels.
Fitting a heat pump could cost in the region of £12k depending on what involved works are required, and this can be beyond the budget of many people.
The most important thing is to carry out insulation improvements which can allow the fitting of a heat pump a more viable option in the future and reducing your energy bills in the short term.
Also, by improving the insulation, the total heat load of the property will be reduced meaning that a smaller heat pump would be required, than if no extra insulation was fitted, therefore reducing the cost of the heat pump installation and ongoing energy costs, and further carbon reduction.
As heat pumps become more popular, we would expect that the unit costs will reduce.

Older properties are a compromise, and I fully understand that the budget is important, so what the level of improvements are, will be dependent on what you wish to do, but even if some of the improvements are carried out, there will be a noticeable change.

The order of carrying out the works in terms of cheapest and easiest to the more costly are as follows but would depend a little on specification and volumes.

- Fit an internal flap to the letter box
- Fit new/ replacement draught seals to all doors and windows.
- Insulate the loft space with 300mm of high performance rockwool.
- Fit rigid high performance insulation (e.g. 'Celotex' of 150mm thickness) to the vaulted ceilings.
- Fit comprehensive heating controls with main timer, time of day temperature control and at least room-by-room control using trvs.
- Insulate the external wall cavities. The combined cavity and external insulation should achieve a U value of 0.2 or better.
- Fit new glazing; at least double glazing with a U value of 1.4 but potentially triple glazing with a U value of 1.0 or less.
- If all the above are done, we believe it will be practical to fit an air source heat pump.

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The next steps are to draw up a wish list and ask contractors to price the elements so that specific decisions can be made based on costs. The matrix below indicates the general cost/benefit ratio for this type of house. Neither the low and medium cost items combined nor the high cost items alone may reduce energy consumption enough to make a heat pump practical, consequently we believe all measures will be required.

Savings:	**Low £ few if DIY, few hundred if contracted**	**Medium £ hundreds to thousands**	**High £many thousands**
Limited	Letter box flap	Loft insulation	
Fair	Draught seals to all doors and windows, Heating controls	Vaulted ceiling insulation, Cavity wall insulation, Double glazing	
Fair	Draught seals to all doors and windows, Heating controls	Vaulted ceiling insulation, Cavity wall insulation, Double glazing	
Significant			External wall insulation, Triple glazing

[redacted] Lissel Road Specifics.

[redacted] is a fairly typical 1970s property with some of the previously mentioned issues.
The house has had cavity wall insulation fitted, but not to all the external walls.
Older types of insulation can slump and may need topping up. I suggest that this is checked with a thermal imaging camera.
The house also has a small conservatory extension that requires thermal upgrades primarily to the roof to allow all year round usage.
The house has a Combi boiler which is oversized for the property.

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An air source heat pump would be an option, with space in garden, by the perimeter fence.
The house has a fan flued gas fire which has been isolated as it does not conform to current regulations.
This fire could be removed and replaced with a Bioethanol fire.
There is also a wish for underfloor heating to some of the ground floor, primarily the hallway, cloakrooms and the kitchen. An overlay system can be fitted which would be suitable. Please see the link to a potential product.
https://www.wundagroup.com/underfloor-heating/wundatherm/

Kind Regards,

Rob Bohm
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