CLPM
CONSTRUCTION PROJECT CONSULTANCY

Heating System Strategy & Energy Efficiency Report

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of
Ivers Parish Council

Council Offices Survey

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You & Your Property:

CLPM were instructed by Ivers Parish Council to survey the property and report on its efficiency for future use.

The Existing Property:

This is a brick-built property built in the 1960's. Originally built as the local police station. A rectangular building containing a series of rooms located off a central corridor. The property has a front and rear entrance, opposite each other, on the north and south sides approximately a third of the way down the building from the western end. A flat room addition has been added to the eastern end at some point in the past which appears to be a timber frame structure, clad with a composite weather boarding.

Usage of the Property:

The property is mainly used by the Parish Council but also as a part-time police station. It is occupied most of the time (the police occupy it mainly at night).

Structure:

Traditional brick-built structure with cavity walls and a double pitched roof of common clay tiles. Solid concrete floors throughout the building.

Windows & Doors:

Windows are all double glazed UPVC with trickle venting and are in good order with little sign of wear or issues. The street side door is an aluminum framed double glazed door and is in fair condition, the seals are showing their age and becoming hardened. The original main door is a very heavy timber structure. It is in good order, but the weather sealing requires attention. Movement is present when the door is closed and locked, light can be seen between the door and the frame.

Heating/Hot Water:

Heating is provided by a Valiant Ecotech 624 system boiler (24kW – 88.9% efficiency rating) utilising Drayton controls and a generic room thermostat, centrally located. Heat delivery is via a mix of steel panel and convector radiators fitted with thermostatic radiator valves (TRVs). Hot water is stored in a vented tank approximately 130 litres with a cold storage tank in the loft space above.

Insulation:

The loft contains approximately 100 – 150mm of fibreglass insulation. It is unknown if cavity wall insulation is present, there are no marks on the outside to suggest that any has been injected. Commercial buildings of this era did not tend to have insulation incorporated during the construction process. The insulation of the extension is unknown, so it is worth checking, hopefully the plans are on record. The level of insulation in this area will depend on the time of the build and the building regulations at that point in time.

Power:

The property has a single-phase connection but looks to have a 3-phase supply and utilises a 3-phase grade consumer unit.

Heat calculation:

I calculate your current heating requirements of the property would be 20 to 25 kW (250m2 footprint). This is more than a single-phase air source pump can provide (see renewables section later in this document). It may be possible to reduce the heat requirement by improving the insulation levels.

Our Suggestions:

Insulation:

I suggest the first order of business is to improve the insulation levels in the loft. A minimum target of 300mm should be set, 400mm (two layer of 200mm rockwool loft roll) would be a better level. Ideally, multiple layers of insulation should be laid at 90 degrees to each other to improve efficiency. The central raised platform in the loft area has sufficient space underneath to allow for this additional insulation. The other boarded areas could simply be covered by the additional insulation material.

The amount of insulation in the ceiling of the flat roof section should be investigated, a minimum or 150mm of a PIR (300mm rock wool) would be a good target, failing that then do the best achievable. Whether this work is done from internally or externally will need to be decided. The roof is currently bitumen felt which usually requires replacement at periodic intervals so insulation improvement could be undertaken as part of the roof works if they are due reasonably soon. It is important that a minimum air gap of 25mm be maintained between the top of the insulation and the bottom of the roofing materials.

It may be prudent to have the outer wall structure checked for the presence of cavity insulation. If none is present, then it would be worth considering the injection of a suitable product by a specialist company. Various products are available including blown fibreglass, blown cellulose, polystyrene balls and expanding foam. Your specialist company should advise on the best product to use for the building.

Windows and Doors:

There is little improvement to be made to the windows as they appear to be in good order and working well. The doors, however, do need addressing. The front aluminum framed unit is looking tired, and the seals are hardening with age. It would be prudent to replace these units with a modern UPVC product to improve the efficiency in this area. It would be a shame to replace the original large wooden door as it is part of the building's history. It would be possible to improve the seals with the various products available on the market. The door is substantial enough to have professional level draught excluders fitted by a skilled carpenter or at least products like Copper Draught Strip which is readily available from the likes of Amazon and eBay.

Airtightness/Breathability:

Insulating a property is not enough in itself, controlled air movement is very important. A well-insulated and sealed property needs to breathe. Obvious areas such as kitchen and bathroom areas should have appropriate extraction systems. The more you insulate and seal a structure the more important it becomes to ventilate it in a controlled manner. Trickle vents in windows are an effective tool for the controlled ventilation of a property. These can be retrofitted into existing windows.

Heating system:

The current boiler is a good quality product with a good service and parts support network. Comparable running costs to other systems available to you include renewable systems such as Air Source heat pumps. Your current single phase connection limits the output of an Air Source unit to 12kW which is far less than you require. With insulation improvements you could reduce your needs down to a point that may be serviceable by such a unit. However, if you upgrade the connection to 3-phase, then the building

requirements can easily be satisfied by an air source unit. Given that the running costs of gas and air source are currently very similar the capital investment (approx. £18 – £20k) would be difficult to justify on purely fiscal grounds. However, if you are looking to reduce your carbon footprint then this move to a renewable energy in conjunction with an aggressive insulation project will go a long way to that achieving that target.

Hot water:

There is not a large requirement for hot water in the property, the current gas system or a replacement renewable system would be very capable of providing the property's needs.

Control systems:

I would suggest that you use a modern digital system like Honeywell's Evo home control system. This type of system allows greater control of the heating at room level and makes the boiler work far more efficiently. It also offers remote monitoring and control functionality.

Renewable Heating Systems:

Renewable heating systems come in two forms:

Ground Source:

Ground source comes in two forms: a pipe buried in loops underground which will need roughly 100m2 for each kilowatt of heat required, so you need a large area of land. The other option is drilling boreholes to extract the heat from the ground. Although more efficient than air source (4:1 as opposed to 3.2:1, heat kilowatts for electric kilowatts used) the initial setup costs and disturbance is far higher than a comparative air source system.

Air Source:

Air source is a far easier and cheaper installation process although less efficient (see above). The difference in relative costs makes it a better option. There is a small noise issue, but correct placing of the unit(s) may well mean you will not notice it. Air source units do vary in what noise they produce.

Renewable systems differ to traditional fossil boilers in several ways, but the key difference is the working temperature of the system. Fossil fuel boilers have a working temperature of 75 to 80 degrees whereas renewable systems such as ground source and air source have a working temperature of between 35 and 50 degrees. This difference affects the size of radiators required to deliver heat into any given room. The size differential can be up to a 40% increase in radiator output/size. Another component that is different in the systems is the hot water tank. Tanks used for renewable heating systems are specifically designed to get the most out of the lower working temperatures and keep it. A buffer tank is usually installed as part of the system which will need to be housed somewhere locally in the building.

PV:

The modern approach to the use of Photovoltaic panels is to have sufficient to service the building's needs, rather than the old way of trying to produce the maximum and selling it back to the National Grid. A reasonable array will go a long way to offset the daytime needs of an average building. Your roof is ideally oriented for the use of PV panels. It may be possible to install up to 7kW of panels.

Arrays larger than 4kW on properties with only single-phase (12kW for three phase connections) supplies will need approval from your local electricity supplier, this is to ensure the local infrastructure can cope with the loadings involved.

This power could be used to run the building during the day, charge official cars and to charge batteries to provide the power for the night shift.

Water Softener/scale inhibitor:

If the property is supplied directly from the mains water supply, it will have a high level of limescale. Limescale will coat the surfaces of heat exchangers which will reduce efficiency and reduce the longevity of taps. Two millimetres of scale will reduce the hot water production efficiency by around 10%. When fitting a water softener careful consideration should be given to the location of an untreated (fresh) supply such as kitchens.

An alternative to a softener is the use of a scale reducer or filter system which is not as effective in removing scale but does slow the buildup process.

Summary:

The building is in generally good order and would not require any major works to improve the efficiency. There are opportunities to utilise renewable products to improve the environmental credentials of the council if the capital is available to do so. Improvements to the insulation etc. will reduce the day to day running costs if nothing else.

I hope you find this report of use.

Kind regards
Marcus Moulson
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