1. Wedmore Village Hall Energy Audit

Audit date: 12 May 2022

Audit undertaken by: Mike Rippon

Weather conditions: Sunny

General

Check	Yes / No / Comments	Possible actions
How many hours in an average week is the hall in use?	30 to 40	
Can you hire different rooms at the same time?	Yes	
If yes, are these controlled as separate zones?	Yes	
How many hours per week is the heating on?	Exactly matched to use hours	

Insulation and draughtproofing

Check	Yes / No / Comments	Possible actions
Does the room temperature feel comfortable? How does this vary in different areas of the building?	Yes – controlled by separate thermostats and TRVs	
Are there any draughts and if so where from?	Very few	

Are windows single/ secondary or double glazed?	Single in Main Hall	NB Constrained by planning
Do external doors shut quickly / automatically?	No	
Do the main doors have a draught lobby?	Yes	
Does the building have a flat roof or a pitched roof?	Both	
Is the roof properly insulated? (NB The recommended depth for mineral wool insulation laid on loft floor is 27cm)	Yes	
Does the building have solid walls or cavity walls? (The pattern of the brickwork and width of the wall will give you an idea*)	Solid in Main Hall, cavity in rear extension	
Are the walls sufficiently insulated?	Yes in rear extension, but solid walls in Main Hall	Cladding in Main Hall not possible because of planning constraints.
Is the floor solid or suspended timber?	Suspended in Main Hall, solid in rear extension	
Are there draughts from the floor? Is the flooring material in good condition?	No draughts.	

*https://www.cse.org.uk/pdf/wpdcc_how_to_recognise_cavity_walls.pdf

Space and water heating, water usage

Check	Yes / No / Comments	Possible actions
Does the heating system work well?	Yes	
Have there been any complaints from building users?	No	
Are people in the building dressed appropriately for the time of year?	Yes	
Are portable heaters being used?	No	
Is the heating on, but windows/doors open?	No	
Are there timers for heating and hot water? Are they set to match occupancy times?	Yes for heating, which are set to match occupancy. Hot water is all instant heaters.	

Are heating thermostats working and set to the right temperature (19-20°C)?	Yes	
Who has access to the heating controls and does this lead to any problems?	Treasurer sets the timer using a key.	
Has your boiler been serviced regularly?	Yes, annually.	
Are there any obstructions in front of the radiators or heaters? (eg curtains)	No	
Do the radiators have thermostatic radiator valves? Are they used effectively?	In the toilets only. Other areas are fully controlled by room thermostats.	TRVs will be fitted in the Snug when it is refurbished.
Are the radiators in one room running at roughly the same temperature?	Yes	
Is heating on in unused spaces (eg cupboards, corridors)?	No	
Are blinds or curtains closed at the end of the day to cut down on heat loss?	Usually	
Is the hot water tank insulated and are all hot water pipes lagged?	No hot water tank – instant hot water system.	
Is water heated at point of use?	Yes	
Is the water at the right temperature – not any hotter than it needs to be (60 °C)?	Yes	
Are there any signs of leaks, dripping taps?	No	
Are taps left running after use?	No	
Are flushes on toilets and urinals working properly?	Yes	
Are there any signs of water constantly running into toilet pans or urinals?	No	
If you have urinals how do they flush? (eg mechanical or sensor?)	Mechanical	

Lighting

Check	Yes / No /Comments	Possible Actions
Are low-energy (LED or CFL) light bulbs being used?	Yes, everywhere.	
Are lights on in empty rooms/unoccupied areas? (if so, where?)	No	
Are there occupancy sensors in intermittently used areas?	Yes	
Are lights on when daylight is sufficient?	No	
Are the windows and skylights regularly cleaned?	No	
Are light fittings clean?	Yes	
Are light switches clearly labelled?	Yes	
Is external lighting switched off during the day or set on a timer?	Yes	
Are lights located in appropriate places?	Yes	

Appliances

Check	Comments	Possible Actions
Are there any appliances or chargers which are left on all the time?	No, except for fridges	
Are any appliances left on standby?	No	
Is the fridge/freezer defrosted regularly?	Yes	
Is the fridge/freezer door left open longer than necessary?	No	
Is the fridge thermostat working and set to the right temperature (2-4 °C)?	Yes	

What other electrical appliances (e.g. TV, radio, projector, kettle) are regularly used? Could they be used more efficiently?	Only regularly used appliances are microwave and instant boiling water dispenser – this is on Eco setting.	
Do all appliances have high energy efficiency ratings?	Yes	

2. Guidance on energy efficiency improvements taken from CSE data[1]

Insulation and draughtproofing

Energy, in the form of heat, is lost from buildings through the fabric of the building (walls, floors, windows and roof), and through gaps, mainly around doors and windows. You should look over the whole of the building to establish the situation and pinpoint where insulation and/or draught proofing will help to reduce heat loss. It is important to assess this before considering heating, as the energy efficiency of the building fabric will influence choices around a heating system.

Roof insulation

If your roof has little or no insulation then this is perhaps the first measure you should consider as it can be one of the most cost- effective. Around a quarter of a building's space heating loss can be through an uninsulated roof and the most appropriate form of insulation will depend on the roof construction. Flat roofs can be insulated externally or internally using boards or slabs. Pitched roofs can be insulated using loose-fill or by laying rolls of insulation above ceilings where present or placing slabs between rafters where not. Insulated suspended ceilings are another option. With a timber roof, it is **crucial** to allow for adequate ventilation and/or vapour barriers for long term protection.

Typical savings: 10-20% of space heating energy

Wall insulation

Large amounts of heat can also be lost through the external walls of a building. Where cavity walls exist, specialist advice should be sought about filling the cavity with insulating material such as mineral or glass fibre. Solid walls tend to be harder to insulate. Like roofs, they can be insulated

[1] Centre for Sustainable Energy https://www.cse.org.uk/local-energy/download/an-energy-survey-pro-forma-76

either externally or internally, with the latter usually being the cheaper option. This typically involves insulated plasterboard applied to wooden batons fixed to the inside wall. An alternative involves sheets of foam-like material which can be glued to the wall. There's guidance on identifying solid/cavity walls on the EST website (www.est.org.uk).

Typical savings: 10-20% of space heating energy

Sealing gaps around windows, doors or floor skirting

Gaps around the floor, skirting boards, windows and doors can result in cold draughts and significant heat loss so they should be sealed wherever possible, whilst ensuring that adequate ventilation is maintained for spaces that need it.

Typical savings: 10-15% of space heating energy

Double glazing

Windows are generally areas of considerable heat loss and can cause down draughts of cold air. One way to cut down heat loss (and noise) is to install double glazing, either in the form of hermetically sealed units or by adding 'secondary' glazing such a second pane of glass or clear polycarbonate to create an air gap. Curtains and blinds can significantly reduce heat loss by acting as insulators and excluding draughts, particularly if they are made of a heavy fabric and have a thermal lining.

Typical savings: 5-25% of space heating energy

Floor insulation

Installing floor insulation can be disruptive and is not often undertaken as a retrofit measure unless there are significant additional works required such as floor replacement. However, insulation beneath a suspended timber floor is sometimes possible, and where underfloor heating is present insulation is vital to prevent heat being lost to the ground. A more simple and cost effective approach would be to eliminate draughts coming up through the floor, by sealing cracks and holes; or by laying some form of sheet material or carpeting together with an underlay.

Typical savings: 3-5% of space heating energy

Space and water heating

There are many different types of heating/cooling systems using different types of fuel. Many of those in community buildings are old, inefficient or not operated property, which results in higher bills, higher carbon emissions and ineffective heating or cooling. Take a look at the system in your building and find out what it comprises and how it is actually used.

New boiler/heating system

Your building's space and water heating may be provided by a central boiler or by stand-alone heaters, or a combination of both. You should seek advice on whether this arrangement is appropriate. If the heating system is 15 years old or more it is likely to be relatively inefficient, especially in the case of a non- condensing boiler, and you may want to consider a replacement. Your decision will be influenced by your water-heating needs i.e. will the boiler provide hot water for basins or kitchen, or will these use stand-alone 'instantaneous' units. If the main system uses an expensive heating fuel (oil, electricity LPG) you may want to consider switching to mains gas or wood, although this can incur significant capital costs.

Typical savings for a new condensing boiler: 15-20% of (boiler) heating energy

New heating controls

Community buildings are normally used intermittently, leading to difficulties in allowing suitable warm-up times and timely switch- off. This can mean that the heating is often left on for much longer than needed. Advanced controls such as timers, programmers and zoning (individual control of more than one area) can lead to significant savings and more comfortable temperatures. The heating system and the control system need to be chosen together as different forms of heating lend themselves to different forms of control. It is also important to decide who will be in charge of the heating system, as operating it properly is essential if it is to work effectively. And thermostatic radiator valves (TRVs) and room thermostats should be regularly checked as people may fiddle with them and change their optimum settings.

Typical measures and savings:

- Time controls on electric hot water tanks: 20-50% of water heating energy
- Presence detector controls on electrically heated rooms: 10- 40% of space heating energy
- TRVs: 5-10% of space heating energy
- General upgrade of heating controls: 5-25% of total heating energy

Point-of-use water heaters

The demand for hot water can vary greatly over the week in a community building and it makes little sense to heat a whole tank of water just to use a small amount. Some form of local instantaneous appliance, usually powered by electricity or gas, may therefore be the best option for water heating. This also avoids long pipe runs where a hot tap needs to be run for some time before hot water is obtained.

Typical savings: 10-30% of water heating energy (where replacing centralised supply)

Insulation of hot water pipework

Hot water pipework which is uninsulated will result in heat being lost to the surroundings and where the pipe runs through unheated spaces, it will not usefully contribute to the heating of the building. Insulation of hot water pipes and valves can therefore be a simple, cost-effective measure.

Typical savings: 5-10% of space/water heating energy (depending on length of pipes)

Lighting

The majority of community centres are lit by fluorescent lights. These are relatively energy efficient but most can be upgraded to higher efficiency slim-line ‘T5’ tubes or better still LED fittings. In most situations simply replacing fluorescent tubes with LEDs is not possible because of the load and the starter motors (ballast) which can compromise the result. It is more costly but far more effective to replace the whole light fitting with an LED unit which can generally be found in a similar size to reduce the need for redecoration. New fittings require more of a capital outlay but result in better savings in the long run. Standard light bulbs or compact fluorescent lamps’ (CFLs) should be replaced with LED bulbs which are now widely available. These give substantial energy savings, last 15 years or more and are now available in virtually all shapes and sizes.
Few community buildings have anything other than manual on/off switches for lighting control, meaning that lights are often left on unnecessarily for long periods. Timers and motion sensors can be an effective way of making significant savings, providing they are installed and set-up correctly taking into account the room or area’s occupancy patterns.

Typical measures and savings:

- Replacement of T12 or T8 tubes with T5: 40-50% of lighting energy
- Replacement of T% with LED fittings: 45-65% of lighting energy
- Replacement of tungsten filament bulbs with LED: 80-95% of lighting energy
- Automatic lighting controls: 20-50% of lighting energy

Electrical appliances

Community buildings usually contain a range of appliances such as kettles or water boilers, fridges, microwave ovens and office equipment. Most new devices are now supplied with an energy efficiency rating, so by replacing old appliances with new ones (e.g. rated A++) substantial savings can be made. Simple programmable on/off timers can also be highly effective on a range of equipment including instantaneous water boilers, photocopiers and printers.

Typical measures and savings:

- Time controls on office equipment: 20-60% of associated electricity use
- Replacement of an old fridge/freezer with an A++ unit: 50- 80% of associated electricity use

Water use

There are a number of simple, low-cost measures that can be taken to reduce water use. If this is hot water, then there will be savings in energy, but even by saving cold water used in basins, sinks and toilets you will be saving energy because of the energy and carbon emissions associated with the water's supply and treatment.

Typical measures and savings:

- Spray taps: 0.04 tonnes CO2 per year (for a typical wash basin in use 6 days per week)
- Volume control in toilet cisterns: 0.01 tonnes CO2 per year (based on 12 flushes per day, saving 2.5 litres per flush)

3. Calculation of annual energy use and associated CO^2 emissions

The Centre for Sustainable Energy[2] set out the following method for calculating your CO^2 emissions and for estimating the reduction in CO^2 emissions resulting from the improvement measures you have identified.

- Multiply your annual energy use in kWh by the conversion facture for that fuel (gas, oil etc) to calculate the tonnes of CO2 (see table below). For gas and electricity, you can get kilowatt-hour (kWh) figures from your utility bills. Oil and LPG are usually billed in litres, so for oil multiply number of litres by 10.3 to get kWh, and for LPG multiply number of litres by 6.96 to get kWh.

[2] Centre for Sustainable Energy https://www.cse.org.uk/local-energy/download/an-energy-survey-pro-forma-76

Fuel	Annual use		Conversion factor (tonnes CO_2 per kWh)		Tonnes CO_2
Gas	18,000 kWh	x	0.000184	=	3.31
Oil	kWh	x	0.000253	=	
LPG	kWh	x	0.000217	=	
Electricity	1,200 kWh	x	0.000462	=	0.55

- Estimate the CO^2 savings from the measures you have identified. By applying the percentage savings figures given in the previous section to your annual energy use as noted above, you can estimate the CO^2 savings that are likely to result from the energy efficiency improvements you are considering.

CO^2 savings from energy efficiency measures

Improvement eg Insulation	Approx. CO^2 saving	Applicable energy use [kWh/yr]	Approx. energy saved [kWh/yr]	Conversion factor [tCO^2/kWh]	Approx. CO^2 saving [tonnes/yr]
TRVs in Snug			40	0.000462	0.12

Column 1: This is the measure you are considering eg roof insulation

Column 2: Approx. saving (%)
This is the estimated CO^2 saving (%) given earlier, e.g. for roof insulation this is 10-20% (of space heating energy). As savings can vary depending on the specific circumstances of the measure, the ranges given are approximate and you will need to estimate a figure using common sense (e.g. insulating a very short piece of pipework will result in a low energy saving compared to cladding several long sections of piping.)

Column 3: Applicable energy use
This is the proportion of your total energy use that the saving refers. This is fairly straightforward if you heat your space using a fuel for which you are billed separately (it will be the relevant kWh figures you supplied for your annual energy use above). But, say your space is heated by

electricity. Then it's not so simple because you'll also be using electricty for lighting, appliances etc, so you need to estimate the proportion of electricity that space heating accounts for. Similarly, your water heating system may use the same fuel as that for space heating.
As an approximate guide, total energy use in a typical village hall may be split as follows: space heating 70%; water heating 5%; lighting 15%; electrical appliances 10%.

Column 4: Approx. energy saved
This is the actual amount of energy (kWh) that is likely to be saved from the measure; e.g. for roof insulation and an annual space heating requirement of 40,000 kWh, this figure would be 15% of 40,000 = 6,000 kWh.

Column 5: Conversion factor
This is the value used to estimate CO2 savings resulting from the quantity of energy expected to be saved. The conversion factor is dependent on fuel type and can be taken from the figures at the beginning of this section above; e.g. where oil is the fuel of interest, the conversion factor will be 0.000253 tCO2/kWh.

Column 6: Approx. CO2 saving
This is the estimated CO2 savings resulting from the quantity of energy expected to be saved; e.g. for an annual space heating saving of 6,000 kWh where oil is the fuel used, the saving will be 6,000 kWh x 0.000253 = 1.52 tonnes CO2 per year.
Note – for water efficiency measures, you can estimate CO2 savings directly from the figures given.

4. Developing a carbon reduction action plan

Once you have a list of possible improvements you can develop a carbon reduction action plan setting out priorities for action, costs, timescales and responsibilities. Identify areas where fundraising will be needed and agree who will review this plan and how often.

Action	Responsible person	Time frame	Costs	Comments (eg fundraising requirements, obtaining three quotes, need for planning permission)
Short Term	MR	2024	£2000	
Water saving in flushes				
Improved energy rated fridges	MR	2023	£600	As and when fridges need replacing
Mid term				
Replace main hall overhead fluorescents with LED	MR	2025	£3000	When current T5 fittings reach end of life
Long term				
Double glazing in Main Hall	MR	2027	£8000	Would depend on planning consent as we are in a conservation area.