Energy Survey

Identifying heating, lighting and insulation improvements for community buildings

Introduction

This document is to guide you through an energy audit of your community building so that you can identify the most effective options for energy efficiency improvements. It's essentially a checklist combined with guidance notes. You can use it as the basis for a carbon reduction plan for the building (which could include a whole range of free, low cost and higher cost measures) and / or to decide what improvements you want to install and / or to identify measures you may be able to obtain funding for.

If you have any questions, or would like any help, when completing this survey please contact us on 0117 9341400 or communities@cse.org.uk.

Using the Energy Survey

Section 1
This is a checklist for carrying out a walkaround of the community building to help you identify possible areas for improvement. Try to answer each question on the list and for each item, consider whether there are free or costed improvements that would improve the building's energy efficiency. Note: Once you've carried out this walkaround, keep it and review it regularly. It is worth carrying out a walkaround regularly, in different weather and at different times of day.

Section 2
Summarise your comments / findings from the walkaround survey, noting key areas where you think improvements could be made.

Section 3
Look at the guidance on different energy efficiency improvements that you might consider, and the typical carbon savings associated with each.

Section 4
This section is to help you estimate CO_2 savings from energy efficiency improvements. It includes a form to record the building's total annual energy use and CO_2 emissions, and explains how to calculate the associated energy saving and carbon reduction for a range of improvements. You might choose to use this as the basis for writing a carbon reduction plan.

Section 5
Creating a carbon reduction plan. This provides some general guidance on putting together a plan for reducing carbon emissions from the building.

Section 1 **Walkaround checklist**

Community building and address:

Community group:

What fuel do you use for your space heating:

What fuel do you use for your water heating:

What fuel do you use for your lighting:

What fuel do you use for your electrical appliances:

Date of survey:

Survey completed by:

Weather (e.g. dry/wet, cold/mild/warm, windy/still, sunny/overcast)

NB Further information on the points in this checklist can be found in Section 3.

A) Insulation and draughtproofing	Comments
Are there any cold draughts from windows or doors?	
Are windows double glazed?	
Does the building have a flat roof or a pitched roof?	
Is the roof properly insulated? (The recommended depth for mineral wool insulation is 27cm)	
Does the building have solid walls or cavity walls? (The pattern of the brickwork will give you an idea)	
Are the walls insulated?	
Are there draughts from the floor? Could the flooring material be improved?	
B) Space and water heating	**Comments**
Is the temperature comfortable?	
Have there been complaints from building users?	

Is the heating working?	
Are portable heaters being used?	
Is the heating on, but windows/doors open?	
Are there timers? If so, do they work, and are they set for the right times?	
Are thermostats for the heating working and set to the right temperature (19-20°C)?	
Are there any obstructions in front of the radiators or heaters?	
Do the radiators have thermostatic radiator valves? Are they used effectively?	
Is all associated pipework insulated?	
Is heating and air conditioning on at the same time in the same area?	
Is heating or air conditioning on in unused spaces, such as cupboards and corridors?	
Have there been complaints that the building is too hot or cold?	
Are people in the building dressed appropriately for the time of year?	
Are blinds or curtains closed at the end of the day during winter to cut down on heat loss?	
Is air conditioning on, but windows/doors open?	
Is air conditioning turned off at the end of the day (as early as possible)?	
Are air conditioning thermostats working and set to the right temperature (23-25°C)?	
Are blinds closed during summer to help avoid over-heating?	

C) Lighting	Comments
Are lights on in empty rooms/unoccupied areas? (if so, where?)	
Are lights on when daylight is sufficient?	
Are the windows clean?	
Are light fittings clean?	
Are light switches clearly labelled?	
Is external lighting switched off during the day?	
Are low-energy (CFL) light bulbs being used?	
Are lights located in appropriate places?	
D) Appliances	**Comments**
Are computers left on overnight or at weekends?	
Are monitors switched off when not in use and screensavers disabled?	
Are photocopiers or printers left on overnight or at weekends?	
Are photocopiers in a well ventilated area – not where there is air conditioning?	
Are powersave facilities of equipment (e.g. fax machines, printers, photocopiers) activated during the day?	
Do users print/copy double-sided?	
Is a tray of used paper available for printing on the other side?	
Is equipment clearly labelled so that users know how to activate energy-saving features or switch it off?	
Are vending machines and water coolers left on all the time?	

Is the water cooler thermostat working and set to the right temperature (12-15°C)?	
Is the fridge/freezer defrosted regularly?	
Is the fridge/freezer door left open longer than necessary?	
Is the fridge thermostat working and set to the right temperature (2-4 °C)?	
What other electrical appliances (e.g. TV, radio, projector, kettle) are regularly used? Could they be used more efficiently?	
E) Water use	**Comments**
Is the water at the right temperature – not any hotter than it needs to be (60 °C)?	
Are there any signs of leaks, or dripping taps?	
Is associated pipework insulated?	
Are taps left running after use?	
Are flushes on toilets and urinals working properly?	

Section 2: **Actions to improve energy efficiency**

Refer to your comments from the walkaround (above) and to the guidance in section 3 (below) and outline the actions that you've identified under each section that could improve the building's energy efficiency.

A) Insulation and draughtproofing

B) Space and water heating

C) Lighting

D) Appliances

E) Water use

A) 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 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

B) 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, but may benefit from the Renewable Heat Incentive payments.

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

New heating controls

Community buildings are often 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)

C) 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. Standard light bulbs should be replaced by low-energy 'compact fluorescent lamps' (CFLs). 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 tungsten filament bulbs with CFLs: 70-80% of lighting energy
- Automatic lighting controls: 20-50% of lighting energy

D) 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

E) 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 CO_2 per year (for a typical wash basin in use 6 days per week)
- Volume control in toilet cisterns: 0.01 tonnes CO_2 per year (based on 12 flushes per day, saving 2.5 litres per flush)

Section 4: **Calculating energy use and predicted savings**

You can use this section to work out your current energy use and set realistic targets if you write a carbon reduction plan for the building. If you would like any help with the calculations please get in touch.

Calculating your annual energy use and associated CO_2 emissions

Simply multiply your annual use in kWh by the conversion facture for that fuel (gas, oil etc) to find out the tonnes of CO_2. For gas and electricity, you should be able to get kilowatt-hour (kWh) figures straight off 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.

Fuel	Annual use		Conversion factor (tonnes CO_2 per kWh)		Tonnes CO_2
Gas	kWh	x	0.000184	=	
Oil	kWh	x	0.000253	=	
LPG	kWh	x	0.000217	=	
Electricity	kWh	x	0.000462	=	

Estimating CO_2 savings from measures

By applying the percentage savings figures given in Section 3 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. This will help you prioritise actions. The headings in the form below are explained here:

Column 1: Improvement
The measure which you are considering; e.g. roof insulation

Column 2: Approx. saving (%)
This is the estimated CO_2 saving (%) given in Section 3, 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 an 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 to; e.g. for roof insulation, the 10-20% refers to 'space heating energy'. 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 CO_2 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 tCO_2/kWh.

Column 5: Approx. CO_2 saving
This is the estimated CO_2 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 CO_2 per year.

Note – for water efficiency measures, you can estimate CO_2 savings directly from the figures given in Section 3.

CO_2 savings from energy efficiency measures					
1. Improvement	2. Approx saving [%]	3. Applicable energy use [kWh/yr]	4. Approx. energy saved [kWh/yr]	5. Conversion factor [tCO_2/kWh]	6. Approx. CO_2 saving [tonnes/yr]
e.g. Roof insulation	15%	40,000	6,000	0.000253	1.47

Section 5: **Using the survey to write a carbon reduction plan**

From your list of improvements, decide which will have the greatest impact on energy saving, and obtain quotes for these measures. If you're applying for funding, many grant scheme applications will ask you for a breakdown of expected costs. Please contact us if you want advice about how to find local suppliers or installers. Note that you should also include no cost / low cost / behavioural measures in this list. If you flag up a number of areas that need addressing you may want to prioritise actions, or identify key options to start with based on their cost, ease of implementation and effectiveness.

Your plan will have a set of actions or targets, resources needed (i.e. cost in £ and time in days), dates and responsibilities.

Other factors that you may want to consider in your plan:

- Will you carry out any marketing and publicity to promote what you're doing?
- Behavioural changes and no cost measures that can have a big impact on energy use. Are you planning an energy awareness campaign (e.g. with building users / owners as part of your work?
- Have you explored options for raising money for improvements?
- Do you have permission from any relevant individuals / bodies to go ahead with the measures you've proposed (e.g. building owner / co-users / statutory planning permission)
- Who will review the plan - and how often?

More information

You can find out more about improving the energy performance of community buildings and how to finance this on the PlanLoCaL website - **www.planlocal.org.uk** – as well as on the Source – **www.cse.org.uk/thesource**

The Carbon Trust website has a range of publications and good practice guides that are available to download if you sign up as a member - **www.carbontrust.co.uk**

You may also find the information sheets available on the CSE website useful. See **www.cse.org.uk/advice**. These include guidance on loft and cavity wall insulation and how to read your meter.

The CO_2 conversion factors used in this proforma are taken from the Defra 2015 Greenhouse Gas Conversion Factor website here: **www.ukconversionfactorscarbonsmart.co.uk**