Energy & Water Use Survey

Introduction

This proforma combines guidance and a checklist to carry out an energy audit of your building and to assess the effectiveness of different improvements. You can use it to put together a carbon reduction plan for the building (which could include a whole range of free, low cost and higher cost measures). Read through all four sections of the proforma before you start.

Using the Energy Survey Proforma

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.

Section 1: Walkaround Checklist

Community building and address:				
Community group:				
Date of survey:			Survey completed by:	
Weather – e.g.	Dry/Wet	Cold/Mild/Warm	Windy/Still	Sunny/Overcast

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 270mm – the length of a piece of A4 paper.)	
Does the building have solid walls or cavity walls? (The pattern of the brickwork will give you an idea – see the EST and CSE websites for more information.)	
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 any 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 installed? 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, corridors?	
Have there been complaints from users that it is too hot /cold?	
Are users dressed appropriately for the time of year?	
Are blinds 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 thermostats for air conditioning 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 –task lighting?	
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)?	
Are microwaves switched off at the plug after use?	

What other electrical appliances regularly used in the building (e.g. TV, radio, projector, kettle)? 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

Section 3: Guidance on energy efficiency improvements

A. Insulation and draughtproofing

Energy, in the form of heat, is lost from buildings by conduction through the walls, floors, windows and roof (building fabric losses). Warmed air escapes through gaps, mainly around doors and windows and is replaced by cold air from outside (ventilation losses).

Look over the whole of the building to establish the existing situation and pinpoint where insulation is needed to reduce building fabric heat loss and where draught proofing will help to reduce ventilation heat loss. It is important to assess this before considering heating as building fabric energy efficiency will influence choices around a heating system.

1. Roof insulation

If your roof has little or no insulation then this is perhaps the first measure you should consider implementing 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. Typical methods are as follows:

- Flat roofs – external or internal insulation using boards or slabs
- Pitched roofs – loose-fill or rolls of insulation above ceilings where present or slabs between rafters where not. Insulated suspended ceilings can also be an 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

2. 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. Like roofs, solid wall insulation can be applied either externally or internally, with the latter usually being the cheaper option. Internal insulation or 'dry lining' typically involves insulated plasterboard applied to wooden batons fixed to the inside wall. An alternative form of internal wall insulation involves sheets of foam-like material which can be glued to the wall. There's more guidance on identifying solid / cavity walls on the EST website (http://tinyurl.com/2waormw). As a very general guideline, properties built after the 1920s tend to have cavity walls. Buildings with solid walls tend to be harder to insulate.

Typical savings: 10-20% of space heating energy

3. 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

4. Double glazing

Windows are generally areas of considerable heat loss and can cause severe down draughts of cold air.

One way to cut down heat loss (and noise from outside or inside the building) is to install double glazing, whether in the form of hermetically sealed units or by adding 'secondary' glazing in the form of a second pane of transparent material such as glass or clear

polycarbonate to create an air gap. Curtains and blinds can have a significant effect on reducing 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

5. 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 and several types of fuels. Many systems in community buildings are old, inefficient or are not controlled in the most appropriate way, which results in higher bills, higher carbon emissions and often ineffective heating or cooling of the building. Take a look at the system used in your building and find out what it comprises and how it is actually used.

1. New boiler/heating system

Your building and domestic hot water may be heated by a centralised boiler or by stand-alone heaters, or by a combination of both. You should seek expert advice on whether the heating arrangement is the most appropriate and effective for the building concerned. If the heating system is 10-15 yrs 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 domestic water heating requirements will also influence the type of heating system i.e. whether water heating will be integrated with the boiler or operated as stand-alone 'instantaneous' units. If the main system uses expensive heating fuels such as electricity , LPG or oil you may also want to consider options for switching fuel to mains gas or wood*, although this can incur significant capital costs.

Typical measures and savings:

New condensing boiler: 15-20% of (boiler) heating energy

2. New heating controls

Before thinking about the different types of control available it is important to decide who will be in charge of the heating system, as correct operation is essential for the system to work effectively. Community buildings are often used intermittently, which can be challenging in setting up heating controls to operate efficiently. Difficulties in allowing for suitable warm-up times and in ensuring timely switch-off often means the heating is left on for much longer than needed. Use of advanced controls such as timers, programmers and zoning (individual control of more than one area) can lead to significant savings and more effective and comfortable heating. Basic controls such as Thermostatic Radiator Valves (TRVs) for radiators and room thermostats should be regularly monitored as building users may change these from their optimum settings.

The heating system and the control system need to be chosen together as different

forms of heating lend themselves to different forms of control.

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

Thermostatic radiator valves: 5-10% of space heating energy

General upgrade of heating controls: 5-25% of total heating energy

3. Point of use water heaters

The demand for hot water can vary greatly over the week in a community building and often 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 energy is more likely to be wasted and where hot taps need to be run for some time before hot water is obtained.

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

4. 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, which are relatively energy efficient but most can be upgraded to higher efficiency slim-line 'T5' tubes. Standard light bulbs can be changed to low energy 'compact fluorescent lamps' (CFLs) giving substantial energy savings and lasting up to fifteen years and beyond. They are now available in virtually all shapes and sizes to suit almost every given situation.

Few community buildings have anything other than manual on/off control of lighting and, due to the range of activities that typically occur within the building, lights are often left on unnecessarily for long periods. Timers and motion sensors can therefore be an effective form of control resulting in significant savings, providing they are installed and set-up correctly for the area of concern and its 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 may contain a range of appliances including kettles or water boilers, white goods and office equipment. Many new devices such as fridges, cookers, etc. are now supplied with an energy efficiency rating, so by replacing old appliances with efficient units (e.g. 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

Reducing the quantity of water used in a building will not only save energy and carbon emissions in the supply and treatment processes of the water industry, but also by reducing the amount of water that needs to be heated in domestic hot water systems. There are a number of simple, low cost measures to reduce water use which will have minimal impact on appliance performance but will make notable savings in the long term.

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

Annual energy use and emissions

What is your annual energy use and associated CO_2 emissions?

			Conversion Factor [tonnes CO_2 per kWh]			
Gas:		kWh x	0.000185	=		tonnes CO_2
Oil:		kWh x	0.000246	=		tonnes CO_2
LPG:		kWh x	0.000214	=		tonnes CO_2
Electricity:		kWh x	0.000542	=		tonnes CO_2

Note – for gas and electricity, you should be able to get kilowatt-hour (kWh) figures straight off your utility bills. However oil and LPG are usually billed for in litres, so for oil multiply no. of litres by **10.3** to get kWh; for LPG multiply no. of litres by **6.96** to get kWh.

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 particular energy efficiency measures you are planning. Please complete the table in Part C below using the following guidance:

1. **Measure**: the measure which you are planning e.g. roof insulation

2. **Approx. saving**: the estimated CO_2 saving (%) given in Section 3; e.g. for roof insulation, this is 10-20% (of space heating energy). The ranges given are approximate only as savings can vary considerably depending on the specific circumstances of the measure, so you will need to estimate an appropriate value using common sense. (For example insulating a very short piece of pipework will result in a low energy saving compared to cladding several long sections of piping.)

3. **Applicable energy use**: 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 your space heating is done by a fuel which is billed for separately, as you can then take the relevant kWh figures you supplied for your annual energy use above. However, if your space heating system uses electricity then you need to estimate the proportion that is actually used for space heating. Similarly, your water heating system may use the same fuel as that for space heating.

   What fuel(s) do you use for your:

   - Space heating _____
   - Water heating _____
   - Lighting _____
   - Electrical appliances _____

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%.

4. **Approx. energy saved**: 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.

5. **Conversion factor**: 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 0.000246 tCO_2/kWh.

6. **Approx. CO_2 saving**: 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 0.000246 = 1.48 tonnes CO_2 per year.

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

Improvements

C. CO_2 savings from energy efficiency measures					
1. Measure	**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	0.000246	1.48
CO_2 savings from water efficiency measures					
	n/a				
	n/a				
	n/a				
				Total	

Using the survey to draw up an action plan

From your list of improvements above, decide which will have the greatest impact on energy saving, and obtain quotes for these measures. (The Energy Saving Trust website is a good starting point if you don't know where to look.) N.B. no cost / behavioural measures should also be included in this list.

If you flag up a number of areas that need addressing you may want to prioritise actions, or identify options based on their cost, ease of implementation and effectiveness.

More information

To find out more about the measures outlined above, look at the Carbon Trust website: www.carbontrust.co.uk and the Energy Saving Trust website: www.energysavingtrust.org.uk.

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

The Energy Saving Trust Green Communities programme may be able to help you with specific questions and with identifying further sources of support / funding. The Green Communities web address is www.energysavingtrust.org.uk/cafe, or call 0844 848 0077.

The CO_2 conversion factors used in this proforma are taken from: *2010 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting* which is available online: www.defra.gov.uk/environment/business/reporting/conversion-factors.htm

Creating A CLIMATE FOR CHANGE **TOOLKIT**

This toolkit has been developed as part of the **Creating A Climate For Change Programme** by Friends of St Nicholas Fields and Creating Space For You.

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