Cork County Energy Agency

Energy Audit

Midleton Area Office

December 2009

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1. Introduction

Midleton area office and Midleton town council are located in Midleton Lodge, Midleton town, County Cork. The offices are used for administrative purposes by the county council area engineers and by Midleton town council. Both offices are in continuous use and are open to the public.

The purpose of this energy audit is to provide accurate information on energy use in the Midleton Lodge building. This will be achieved by an analysis of the building fabric and the end use of heat and electricity in the building. This information can then be used to improve energy awareness among the management, employees and patrons. In conclusion the audit will suggest measures that may be undertaken to improve the energy efficiency of the building including no cost, low cost and high cost measures.

2. Site description

Midleton Lodge is occupied by Midleton Area Engineers Office and Midleton Town Council. It houses the administrative office of Midleton Town Council and the Midleton area engineering division of Cork County Council. The town council offices are located on the ground floor and the area engineer's offices are located on the first floor. The offices are open five days a week during regular business hours from 9am to 5pm. Hours of occupancy do not vary throughout the year. The offices of both the town council and the area office are open to the public during office hours.

Photo

Figure 2.1 The Midleton Lodge building

The building footprint is approximately 305 sq/meters. The construction is of single leaf masonry wall measuring approximately 600mm. All internal walls are solid block with no dry lining. The building has a pitched roof and an un-insulated attic space.

The main entrance is on the north side of the building. There is substantial window area in both the south facing and north facing external walls. Most windows are wooden framed with single glazing except for one set of windows in the area engineer's office.

3. On site energy use

3.1 Energy management

The town clerk looks after the day to day running of the building including energy management. He is aware of all the major energy users on the site. Their operation and control is not well understood. There is some level of energy awareness among the staff. Heating is controlled by the town clerk while electrical loads such as lights and appliances are all manually controlled by staff. Private contractors provide technical and breakdown support for all building services.

3.2 Breakdown of energy use

Figure 3.1 and 3.2 shows the break down of energy cost and consumption in Midleton Lodge for the one year period form September 2008 to August 2009.

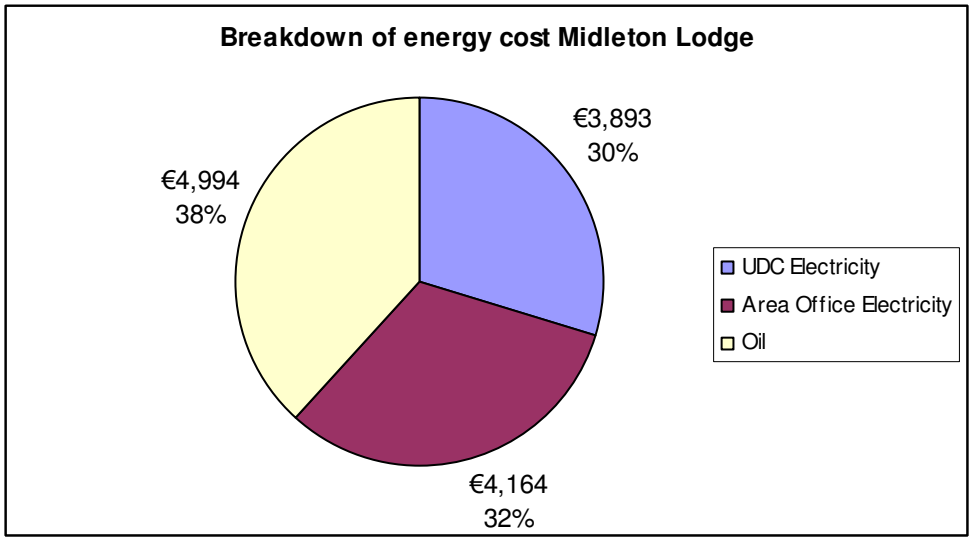


Figure 3.1 Breakdown of energy cost in Midleton Lodge

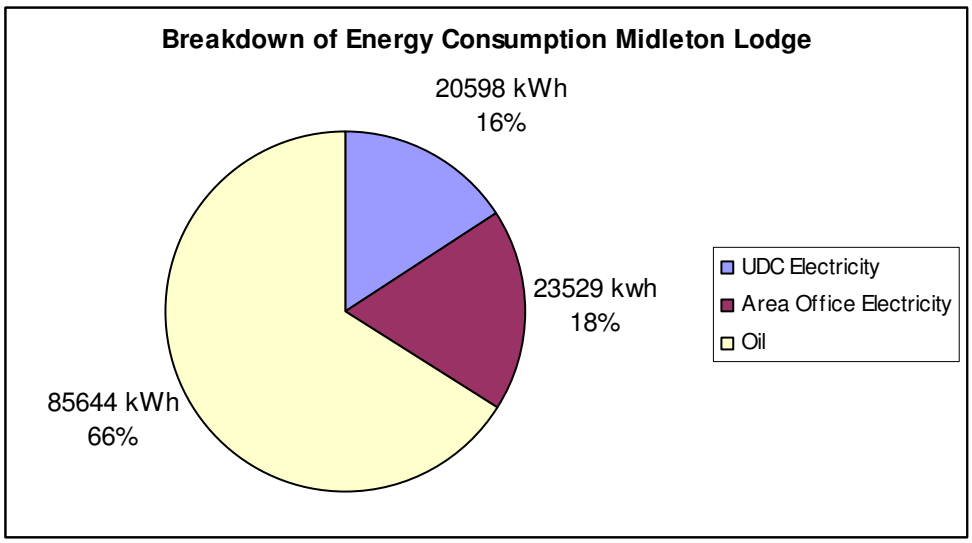


Figure 3.2 Breakdown of energy consumption in Midleton Lodge

3.3 Thermal energy use on site

Oil is used as the main heating fuel on site. This is supplemented in some offices by electric heaters. The main oil boiler which serves the two departments has a rated heat output of 68kW (figure 3.3).

Figure 3.3 Main oil boiler

The boiler is regularly serviced and is in good condition. The output of the boiler is controlled primarily by the boiler thermostat on the boiler output and then by a room thermostat placed in the hallway of the ground floor (figure 3.4).

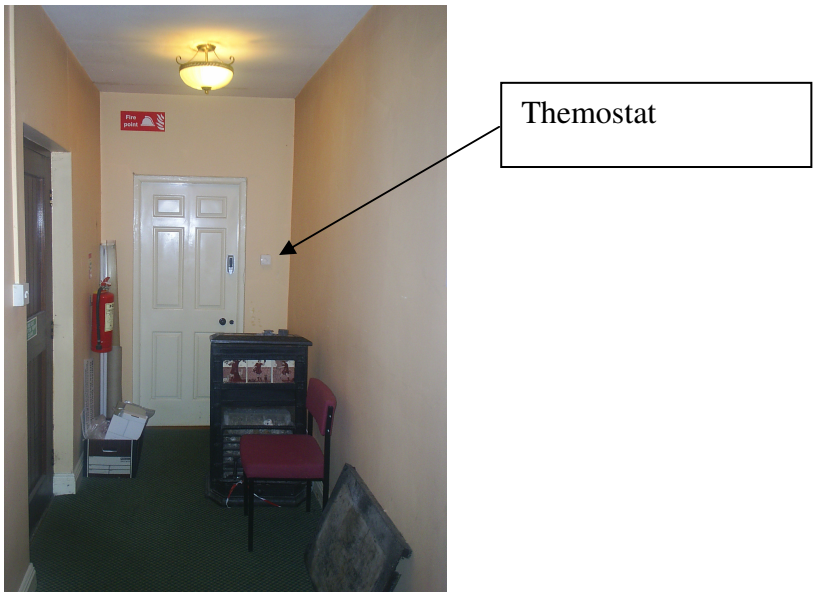


Figure 3.4 Themostat placed in hallway of office building

Time scheduling of the boiler is controlled by a seven day timer in the boiler house (figure 3.5).

Figure 3.5 Seven day timer to control boiler

The pipe work within the building is un-insulated black iron pipe.

Two radiators upstairs offices have recently been upgraded with thermostatically controlled radiator valves. All other radiators have flow control only.

Hot water for sinks and the canteen is provided by electric under sink heaters (figure 3.6).

Figure 3.6 Electric under sink heater in kitchen

There is no mechanical ventilation in the building. The design of the new entrance door provides uncontrolled natural ventilation in the lobby area (figure 3.7).

Figure 3.7 Main entrance door

3.2.1 Thermal Energy Cost and Consumption

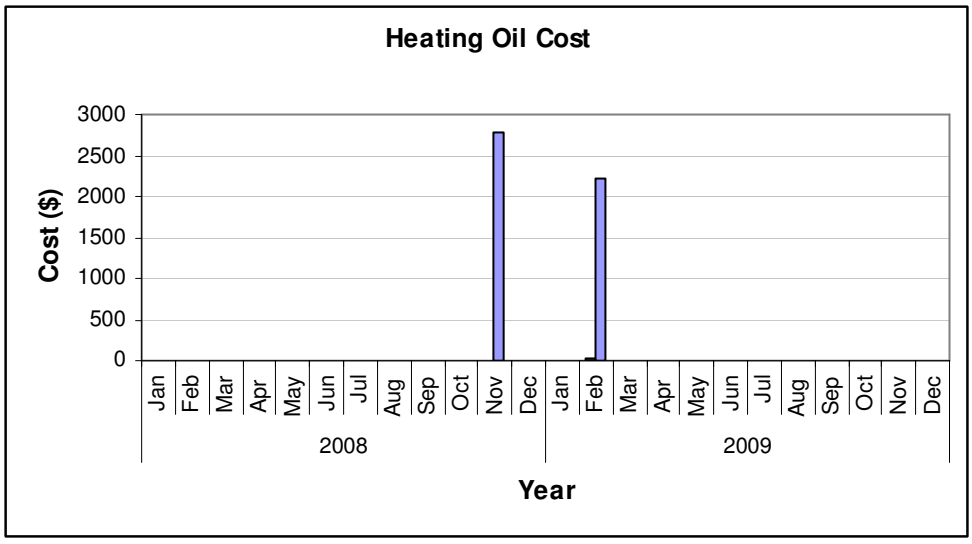


Figure 3.8 Heating oil cost Midleton area office and UDC

3.2.2 Cost

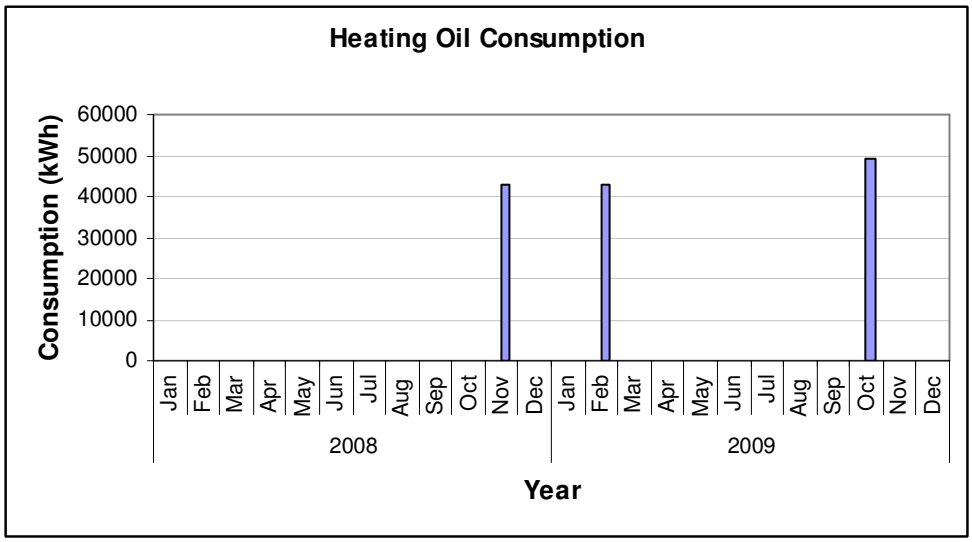


Figure 3.9 Heating oil consumption Midleton area office and UDC

3.3 Electrical energy use on site

3.3.1 Electrical loads

The major electricity use on site is lighting, hot water heating and ICT services.

There are two separate electricity accounts as both departments are independently metered for their electricity use. Both accounts are on general purpose tariff. The town council electricity is supplied by ESB and the Area engineers offices is supplied by Energia.

Due to the design of the electrical supply panel it was not possible to sub meter different circuits within the building to determine the breakdown of electricity use on site. As this is a general purpose account there is no record of percentage electricity use by night.

The majority of the lighting in the building is compact fluorescent. Most indoor lighting is controlled by switches in the offices. All compact fluorescent lighting in the 1st floor area office has been replaced with modern luminaries with high frequency starters (figure 3.10). Most compact fluorescent lighting on the ground floor has old luminaires with magnetic starters. The outside floodlights are controlled by lux sensors and which turn the floodlights on automatically when it gets dark.

Figure 3.10 Old and new fluorescent lighting in main office

3.3.2 Consumption

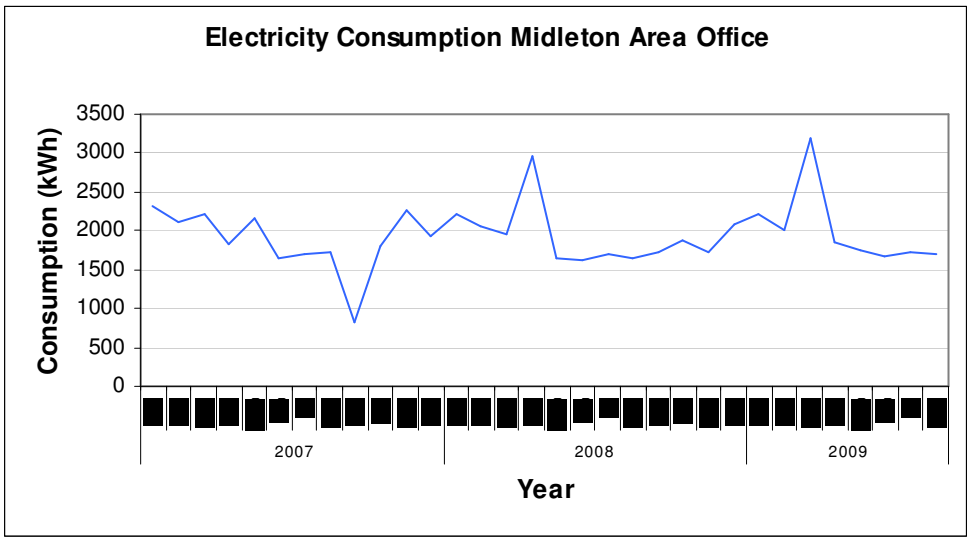


Figure 3.11 Electricity consumption Midleton area office

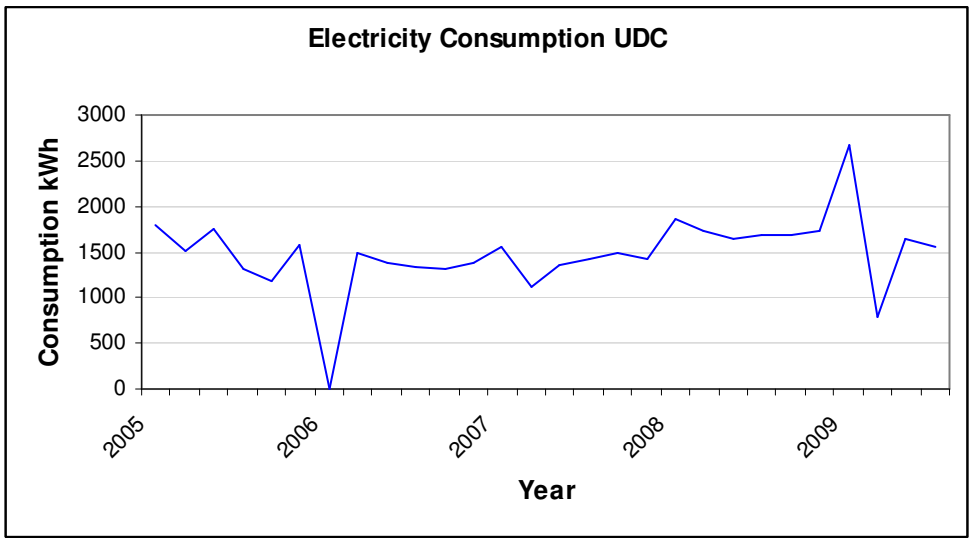


Figure 3.12 Electricity consumption Midleton UDC

3.3.3 Cost

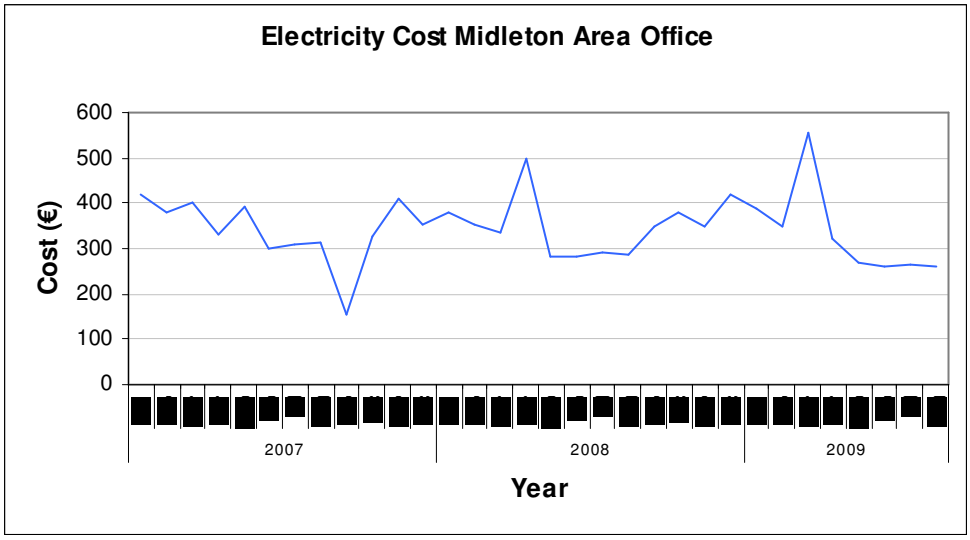


Figure 3.13 Electricity cost Midleton UDC

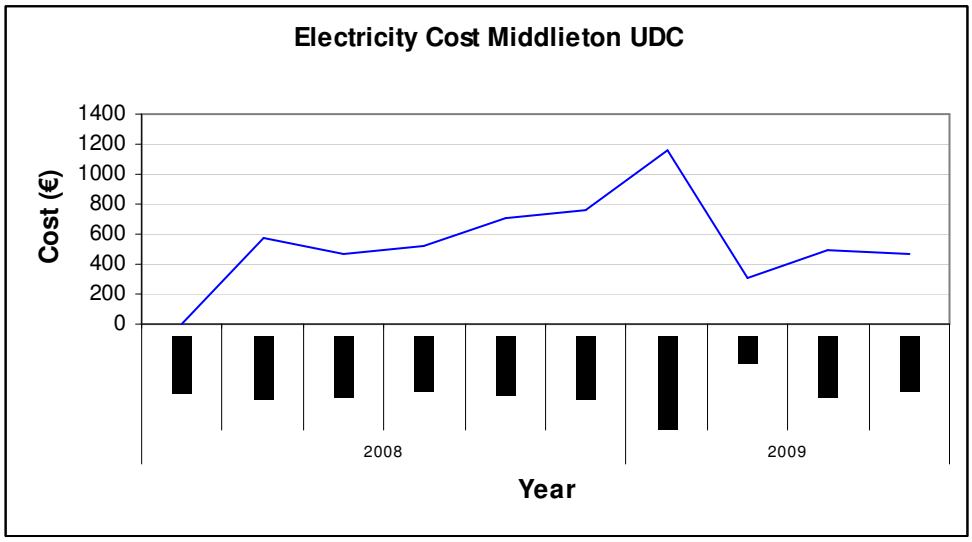


Figure 3.14 Electricity cost Midleton UDC

3.4 Performance indicators

Performance indicators are used to compare the energy performance of similar buildings. They are calculated by comparing the energy used in a building over a one year period against another common metric. This can be floor area, hours of opening or number of users. The performance indicator for Midleton area office was calculated using total floor area. This energy performance indicator was calculated using SEI's Display Energy Certificate tool. The office received a D1 rating. A copy of the DEC can be seen in Appendix A.

4. Analysis

4.1 Energy management on site

The building manager has a reasonable level of energy awareness but this could be improved. A number of steps can be taken to improve energy awareness among management and staff including

- Display the Display Energy Certificate (DEC) in a prominent place.
- Set up of an energy-team led by a designated 'energy champion' to take responsibility for the energy management of the building.
- Take regular electricity meter readings and oil stock levels to benchmark monthly energy use and use as energy performance indicators to quantify savings made though energy efficiency.

4.2 Thermal energy use on site

- The heating system is generally poorly managed. At the time of the site visit the boiler was programmed to come on outside of office hours thus heating the building needlessly.
- Boiler controls are outside in the boiler room. Modern wireless room thermostats allow control of the boiler from inside the building including seven day programming. If the boiler controls are easily accessible by the building manager there is more likelihood that the heating system will be use efficiently.
- The boiler thermostat was set at 40℃. The radiators are designed for a flow temperature of 60℃. Using the boiler at this lower temperature output reduces the effectiveness of the heating system.
- The office thermostat was set to 21.5℃. It is generally recommended that this could be reduced to 20℃ without any reduction in comfort. The thermostat is also placed in the hall. This is one of the least occupied areas. If possible it should be placed in a north facing office wall. Wireless room thermostats are available that would make the building users more aware of room temperature and would make the boiler easier to control, see Appendix B.
- Occupants have no control of the heat in their office which generally means opening a window when it gets too hot. This temperature control would be better achieved though thermostatic radiator valves on the radiators allowing occupants greater control over temperature in their offices without unnecessary heat loss though the opening of windows.
- Hot water heating is poorly regulated with different temperature set points on each heater and no clear control when not in use out of office hours. Switching off these heaters outside of occupied hours would reduce the electricity used for heating water by 70%. The heat output of the heaters should be set to the minimum required for effective washing and all should be set to the same temperature.

- Given the age of the building there is little that can be done to reduce heat loss though the walls and windows. There is opportunity to reduce heat loss though the building fabric by insulating the attic space with 300mm of cellulose insulation or rock wool.

4.3 Electrical energy use on site

- At present the area office is on the correct electricity tariff and this cannot be changed. As there is very little night usage it would be not cost effective to switch from general purpose to general purpose night saver tariff.
- The town council account should be switched to an alternative supplier such as Energia. This will save 10% on the cost of electricity.
- Most of the lighting and luminaries in the town council office are old and inefficient (see figure 3.10). The discoloration of the luminaries is evidence of their age. This discoloration significantly reduces the light output. Some may contain PCB's if installed prior to 1978. Modern day alternatives such as T5 fluorescent lamps with high frequency starters can improve the quality of light in the offices at three quarters running cost of the existing lights and fittings. The most cost effective way to approach this changeover is to replace the old lights and luminaries upon failure with new T5 fluorescent lamps and more effective luminaires.
- Some consideration was given to the use of occupancy sensors. This is most cost effective when a switch controls a bank of lights in an infrequently occupied room. This situation does not present itself in the Midleton Lodge as most of the offices are fully occupied from nine to five and the infrequently occupied areas such as the canteen and corridor only have minimal lighting.
- Launch an energy awareness campaign aimed at staff to ensure good housekeeping and that all appliances switched off out of hours.

5. Recommendations

There is good scope to significantly reduce energy use at Midleton Lodge at minimal cost. These opportunities for energy and cost savings can be seen in the table below divided into low cost, medium cost and high cost measures. Low cost measures are inexpensive and will not require professional trades or labour. It is recommended that they are carried out immediately. Medium cost measures require some capital expenditure and professional trades to install. High cost measures require substantial capital investment but should result in significant long term savings.

Low Cost Measures

		Capital Cost (€)	Savings	Payback
1	Energy awareness aimed at staff	None	None	n/a
2	Switch electricity supplier to Energia (Midleton town council office)	None	10% on electricity bill	n/a
3	Turn down room thermostat from 21.5℃ to 20℃	None	10% on heating bill	n/a
4	Change boiler time-clock to reflect occupancy hours and adjust according to comfort	None	20% on current settings	n/a
5	Change boiler thermostat from 40℃ to 60℃	None	Make boiler more efficient	n/a
6	Energy awareness campaign aimed at staff	None	Up to 10% on energy bills	n/a
7	Brush piles on door frame	None	Reduce heat loss though front door	n/a

Medium Cost Measures

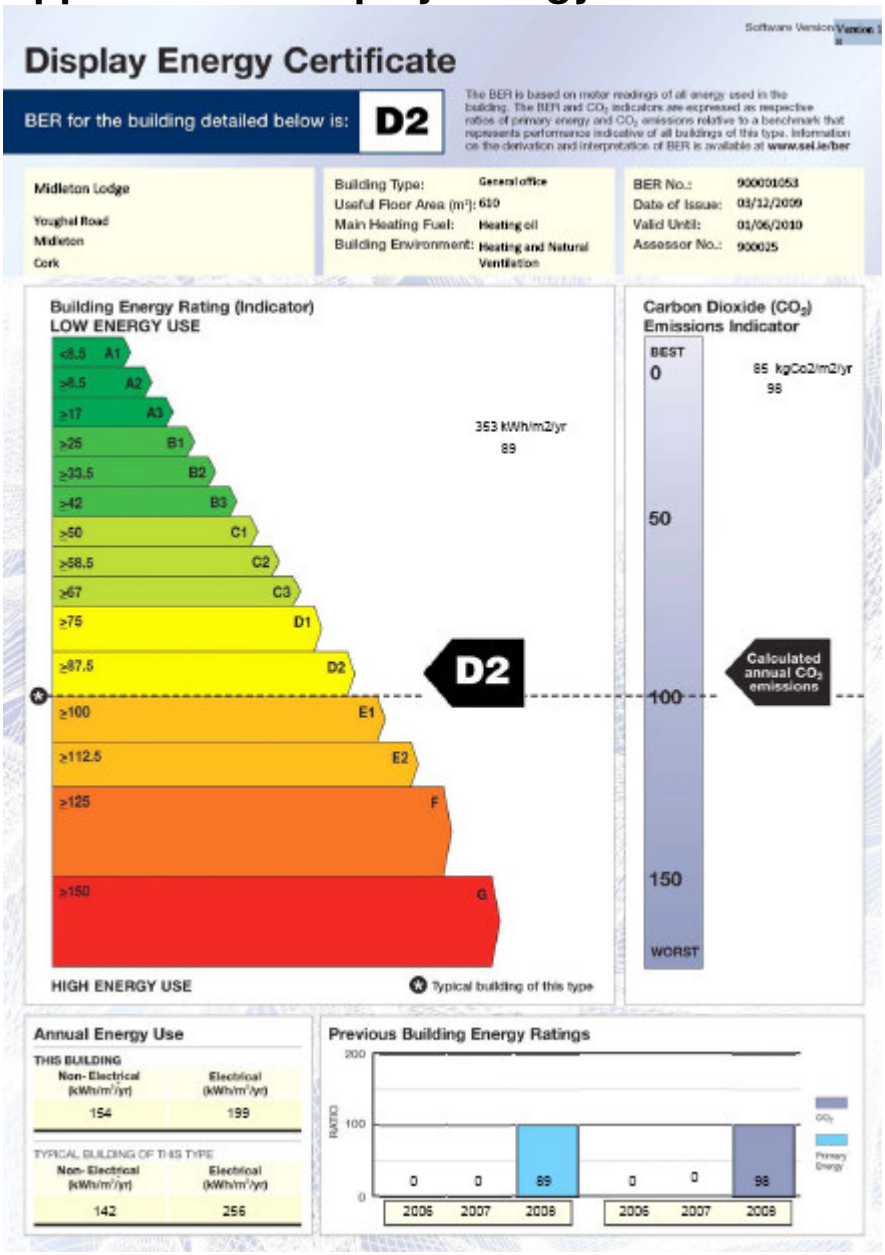
		Capital Cost (€)	Savings/anum	Payback
1	Place (4) seven day timers on all under sink heaters	€500	€520[1]	1 year
2	Remove existing boiler thermostat from corridor and install wireless room thermostat in Town Clerks office	€350[2]	Not estimated	n/a
3	Replace old twin fluorescent lights with energy efficient T5 alternatives upon failure.	€100/fitting	€4.40/fitting/year[3]	n/a
4	Replace boiler thermostat with digital seven day timer for more accurate control, this can incorporated in the	€[4]	Not estimated	n/a

[1] Assuming (0.5kW*8750hrs)*70% = 24542kWh @ 17c/kWh = €520
[2] Estimate
[3] Based on 1750hrs running 74W T8 replaced by 58W T5.
[4] Can be done as part of measure 2

	one wall mounted unit as per measure 2			
6	Block up open chimneys with a chimney balloon	€30/chimney	Not estimated	n/a

High Cost Measures				
		Capital Cost (€)	**Savings**	**Payback**
1	Insulate the attic space with 300mm of cellulose	€3,000	Not estimated	none
2	Replace radiator valves with thermostatically controlled radiator valves	€2,500	Not estimated	none

Appendix A – Display Energy Certificate



Appendix B – Display Energy Certificate

Datasheet

TP7000, TP7000-RF and TP7000M Programmable Room Thermostats

Features

The TP7000 combines the functions of a time clock and room thermostat into a stylish, simple to use controller that allows the user to programme different temperatures for different times to match lifestyle demands. The TP7000 offers true 7-day programming, allowing each day to be set differently if so required. In addition, the unit can be set to 5/2-day mode allowing one set of programmes to be used for weekdays with a different set being available for the weekends.

TP7000 is available in hard wired versions and in labour saving RF versions. Both hard wired and RF models offer up to six temperature changes each day and include the option of programming an "Off".

TP7000 offers several advanced features which can be selected by the installer at the time of installation, these include:

- Optimum start control : This feature uses internal temperature to calculate the time in advance of programmed time that the system must switch on in order to ensure that programmed temperature is achieved by the programmed time.
- Chrono-proportional control: This feature defines the boiler cycle rate and the on/off times of the boiler within the cycle. This adds to comfort and improves boiler efficiency, particularly with condensing type boilers.

RF models incorporate a digital FM radio transmitter which transmits a unique thermostat identity code which is learnt by the RX receiver during commissioning. Receivers, which are available in 1, 2 & 3 zone versions, can be mounted up to 30 metres from the thermostat and can be used to switch boilers, pumps or control valves.

The range includes battery and mains powered versions in both built-in and remote sensor types, please refer to the data table for details and ordering codes.

- 7-day or 5/2 day programming options
- Up to 6 time and temperature events per day
- Available in hard wired and RF versions
- Hard wired versions available for battery and mains operation
- Holiday programming mode and thermostat mode
- Many user overrides including programme extension

Installer Settings - DIL Switches

	All models		
Sw[1]	5/2 day programming		7 day programming
Sw[2]	Optimum start contoller enabled		Optimum start contoller disabled
Sw[3]	Chrono-proportional control		On/Off control
	TP7000, A, B, AB, M, M, MA, RF & A-RF models with 3/6 cycles per hour option		
Sw[4]	Chrono-proportional, 6 cycles / hour		Chrono-proportional, 3 cycles / hour
	TP7000C, CA, CM, CMA, C-RF & CA-RF models with 6/12 cycles per hour option		
Sw[4]	Chrono-proportional, 12 cycles / hour		Chrono-proportional, 6 cycles / hour

Note: Sw[4] is only active if Sw[3] is set to chrono-proportional mode

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