Chapter 10: Energy efficiency and microgeneration

10. Energy Efficiency and Micro-generation in the Historic Environment

The aims of this chapter

- To inform building owners considering installation of microgeneration equipment of the potential for it to affect the historic environment.
- To identify ways in which heritage assets can be modified to improve their environmental performance without compromising their significance.
- To outline measures available for reducing energy consumption in traditionally constructed homes.
- To explain how conflicts between the conservation of the historic environment and the mitigation of climate change can be managed.
- To identify best practice in order to encourage improved standards.

This chapter should be read in conjunction with:

- Alterations to Historic Buildings – Chapter 8.
- Renewable and Low Carbon Energy SPD (DRAFT), (Harrogate Borough Council, September 2011).
- English Heritage guidance relating to renewable energy (for example, small scale solar and micro wind generation).
- English Heritage series of guidance documents relating to energy efficiency in historic buildings.
- 'Energy Efficiency and Historic Buildings – Application of Part L of the Building Regulations to historic and traditionally constructed buildings,' English Heritage or Historic England (2011).
- British Standard 7913 – 'Guide to the Conservation of Historic Buildings,' (2013).
- Department of Energy and Climate Change (DECC) Government Guidance – Letter to Local Authorities – Solar Energy (1st Nov 2013).

Introduction

10.1 Climate change is a key environmental challenge today. As pressure grows to reduce CO2 emissions, so does the need for owners and managers of traditionally built structures to improve energy efficiency and reduce fuel consumption. Whilst it has been proven that these buildings perform better thermally than is often assumed, there is still much that can be done to improve their performance. The council encourages all residents to take steps to use energy wisely and to consider the use of renewable energy technologies in their homes.

10.2 This guidance provides information on some basic ways to improve the thermal performance of a traditional building and its individual elements. Not all measures will be appropriate in all circumstances but it is important to be aware that there are ways to improve the performance of all traditional buildings which are sympathetic to their character and construction type. Living in a conservation area, or in a listed building, means that attention should be paid to the special character of the property when considering energy conservation and installing renewable energy systems.

10.3 The historic environment can play a positive role in delivering wider sustainability objectives. The retention and reuse of heritage assets avoids the material and energy costs of new development. Many older settlements reflect good practice in sustainable urban design. They have compact layouts; co-located employment, residential, retail and leisure uses; and, are usually near to transport nodes. The historic environment can inform and inspire the best modern, sustainable development.

10.4 By taking a narrow and rigid view of what makes a building or development sustainable, opportunities may well be missed to adapt and enhance what is already there. Rather, the embodied energy within existing buildings and the whole-life costs of any new scheme or proposed alterations should be considered. The creative adaptation of heritage assets can dramatically reduce the whole-life energy costs and waste impacts that would result from demolition and replacement, even where the proposed development would in itself be of an acceptable standard in terms of energy performance. The adaptation of heritage assets need not be more expensive or difficult than replacement. It is quite possible that the recycling of existing buildings at a site may cut the overall financial cost of development and even save time.

10.5 **Key Terms:**

- **Microgeneration – The production of heat and/or electricity on a small-scale from a low carbon source;**
- **Whole-life energy costs – An accounting method which aims to find the sum total of the energy necessary for an entire product life-cycle. Determining what constitutes this life-cycle includes assessing the relevance and extent of energy into raw material extraction, transport, manufacture, assembly, installation, dis-assembly, deconstruction and/or decomposition as well as human and secondary resources;**
- **Embodied energy – This is the sum of all the energy required to produce goods or services, considered as if that energy was incorporated or 'embodied' in the product itself. The concept can be useful in determining the effectiveness of energy-producing or energy-saving devices or buildings, and in deciding whether a product contributes to or mitigates global warming.**

The Council's Role

10.6 Harrogate Borough Council is committed to significantly reducing the borough's carbon emissions and to increasing the use of renewable and low carbon energy. Unlike fossil fuels (gas, coal and oil), energy from renewable sources – such as the sun – does not produce carbon emissions when used to generate power.

10.7 The council is also committed to conserving the borough's historic environment and preserving and enhancing the character, appearance and significance of its heritage assets. The council recognises that the historic environment is an irreplaceable resource which gives a 'sense of place' and promotes civic pride.

10.8 The council must therefore strike a balance between maximising the benefits of renewable and low carbon energy and conserving the district's historic environment. These two objectives need not be in conflict with each other, but where there is conflict, the council's role is to avoid, minimise and mitigate any potential harm to the historic environment and make pragmatic planning decisions.

Traditionally Constructed Buildings

10.9 **Key Term:**

- **Traditional building – solid wall construction; no damp proof course; single glazing windows; likely to have been built before 1919.**

Traditional stone construction.

Traditional brick construction to left, note unusually steep roof.

10.10 It is often assumed that the older a building is, the less energy-efficient it must be, but this is not the case.

10.11 About a quarter of all existing buildings are 'traditionally constructed'. They are built using traditional materials and techniques, such as thick solid walls and with plenty of natural ventilation. Thick solid construction acts as an excellent thermal buffer, stopping the building either gaining or losing too much heat. Another important difference between modern and traditional buildings is that the modern buildings are designed to keep moisture out with layers of impervious materials (such as cement and plastic membranes), whereas traditional buildings work by using solid permeable materials that can absorb a great deal of moisture without damage, and release it slowly back into the environment, through evaporation, as conditions dry out.

10.12 Until the mid-19th century most buildings were designed to maximise passive solar gain with big, south facing windows and hardly any north-facing openings. Passive solar gain is now being promoted in new buildings as an effective way of making houses more comfortable and energy efficient.

10.13 Using modern materials and approaches on older buildings can cause severe damage and actually decrease energy efficiency. Ill-advised and inappropriate alterations risk harming the fabric of a building when prior to such alterations, it was functioning well. For example, adding external insulation to a thick solid wall may be costly and can also lead to problems relating to moisture in the fabric of the wall.

10.14 No changes should ever be made that risk long-term damage to the building. To reduce emissions we may need to improve efficiency in all buildings, modern and traditional. When doing this we need to be very sure that any proposed works take into account the unique composition of the building and do not harm its performance or historic character.

10.15 For these reasons, it is important when considering any work to a traditionally constructed building to understand how that building was designed to work. In simple terms, many such buildings were designed with passive ventilation which ensured air flow around building elements helping keep them free from excessive moisture and subsequent decay. The construction was further designed to allow an element of vapour movement within the structure. It is vital to ensure that when taking steps to improve the thermal performance of a traditional structure, these dynamics are not compromised to the detriment of the building. This is not to say that we should accept draughty conditions within houses, but it is important that sufficient air movement is maintained.

10.16 In considering improvements for energy consumption it is important to remember that many traditional (historic) buildings perform differently from modern buildings. Due consideration should be given to:

a) The construction of the building, to avoid causing damage;

b) The importance of moisture movement in historic buildings;

c) Minimising disturbance to existing fabric;

d) Reversing any changes without causing further damage;

e) Whether the building is of such significance that it should remain unaltered.

10.17 The fabric of a traditional (historic) building needs to 'breathe' – that is, to release and absorb moisture from sources such as driving rain, rising damp, defects and condensation. Moisture can move through traditional permeable building materials until it evaporates, internally and externally. Modern impermeable building materials obstruct this process; instead of keeping moisture out they usually trap it in, thereby accelerating the process of decay.

10.18 The main risks to traditional (historic) buildings associated with well-meaning 'improvements' are:

a) Moisture trapped within the building materials;

b) Condensation within unheated areas of the building such as the roof void or cellar;

c) Condensation at thermal bridges, especially corners;

d) Ventilation and heating which are insufficient to remove moisture. (In a permeable building it is important not to reduce ventilation rates too much to avoid trapping moisture within the building);

e) The indiscriminate removal of historic doors and windows and dry lining of interiors.

Improving energy performance

10.19 Where the ongoing energy performance of a building is unsatisfactory, there will almost always be some scope for suitable adaptations to be made without harm to the asset's significance. This will involve careful consideration of the most appropriate options for insulation, power use and power generation. Intrusive interventions, such as the external mounting of microgeneration technology, can harm the significance of a heritage asset. Where such interventions are proposed, a temporary, reversible installation will generally be preferable to one that causes irrevocable harm to an asset's significance. The council seeks to support home owners and developers to find solutions that avoid, or at least minimise harm to an asset's significance while delivering improved energy performance or generation. Detailed advice on how heritage assets can be adapted to new technologies or materials without harming their significance is available from English Heritage. Details of these guidance documents can be found in Appendix P – Bibliography.

10.20 An Energy Performance Certificate (EPC) shows the current and potential energy rating of a property. However EPC ratings used for buildings are based on estimates rather than actual measurements of the building and should therefore be treated with extreme caution. For example, the thickness and materials of solid masonry walls can give significantly different insulation compared to the estimate used by EPC. EPC estimates are disputed by the Society for the Protection of Ancient Buildings (SPAB) and English Heritage whose research (based on on-site measurements) is showing that most historic buildings in fact perform much better than their EPC ratings. When planning energy efficiency improvements, it is therefore important to work from a starting point based on actual measurements, rather than estimates; otherwise, the perceived benefits of any improvements will not have been correctly assessed which may lead to unnecessary works being carried out.

10.21 The following paragraphs provide guidance on the variety of ways in which energy efficiency can be improved in a traditional building, looking at energy use, heating regimes and equipment, reducing excess moisture, roofs and attics, floors, external doors and windows.

Energy Use

10.22 Before deciding to install a renewable energy system, consideration should be given to improving the energy efficiency of your property by employing simple measures such as:

a) Installing additional 'breatheable' loft insulation;

b) Installing additional 'breatheable' insulation underneath the floor boards;

c) Draught proofing windows and doors and where appropriate/possible installing secondary glazing, reinstating/restoring internal shutters;

d) Installing flue dampers in open chimney flues;

e) Upgrading existing rooflights;

f) Upgrading the boiler, heating controls and hot water cylinder;

g) Choosing the most effective types of heating for the space – 'wet' radiator systems, underfloor heating, passive heating etc.

10.23 The following measures can also make big reductions to your energy use and fuel bills:

a) Using energy efficient light bulbs;

b) Turning off all appliances that are not in use and not leaving them on standby settings;

c) Replacing inefficient or defective appliances and heaters with new energy efficient models;

d) Checking that your central heating is not programmed to heat the house while you're not there;

e) Using heavy curtains over single glazed windows and ensuring all curtains are closed at night – reinstating/using internal shutters where appropriate;

f) Switching to 'green' utilities suppliers;

g) Fitting individual heating controls to each radiator and heating only the rooms you use.

Heating Regimes and Equipment

10.24 Before considering any upgrade to building fabric, it is important to first ensure that space heating equipment such as boilers and radiators are being used efficiently. Effective use of such equipment can have a significant impact on reducing emissions and fuel consumption than fabric interventions. Where central heating is used this should be fitted with effective controls and these should be easily accessible and well understood by the building owner or occupier.

Reducing Excess Moisture

10.25 The more moisture there is inside a room and inside the walls/floor/ceiling, the colder it will be. Traditional construction was balanced by the use of open fires, presence of draughts, less water vapour being generated by cooking, bathing, drying clothes and the building being kept in good condition using appropriate, 'breathable' materials. Working rainwater goods, effective drainage, air movement up chimneys, breathable fabric and finishes, lime mortar to pointing and render – these all help to keep the fabric and interiors drier and warmer. Similarly, minimising water vapour from kitchens and bathrooms and aiding its escape from the building will help in reducing excess moisture vapour in a building.

Roofs and Attics

10.25 Around 25% of heat is lost through a typical roof, so suitable levels of loft insulation are a good starting point in improving the thermal performance of a traditional building. There are many types available, from natural materials such as hemp fibre or sheep's wool, to recycled products made from newspaper, and others made from glass and modern materials. In most circumstances natural materials are preferable in traditional buildings, as they are better able to disperse moisture and prevent condensation. It is important when installing any loft insulation to ensure valleys are effectively insulated whilst at the same time maintaining ventilation throughout the roof space. Recent guidance is that there should be a two inch gap between the top of the insulation and the underside of the sarking boards. In some properties, bats may be present in the loft space; should this be the case advice should be sought from the council's ecologist prior to the commencement of any works.

10.26 Roof timbers that have functioned perfectly well for decades or longer can decay rapidly if the roof is insulated in such a way that causes high levels of condensation to form on the timber. The cost of repairs could outweigh several times over the money saved by lower energy bills.

Floors

10.27 Where timber flooring is preserved on a ground floor it may be that there is sufficient crawl space to allow insulation to be installed on the underside without the need to lift the floor boards. If it proves necessary to lift the boards to install the insulation this should be done with care to avoid damage to the original fabric and may not be deemed worth the risk. Lifting floorboards invariably will result in damage, and often requires entirely new boards being laid. The cost (both financial and in terms of the potential loss of historic fabric) of this should be weighed with the benefit of improved insulation being installed. Whether installed from above or below, as with loft insulation, a material which allows some degree of moisture movement should be used. Laying non-permeable insulating board on top of a timber floor will inhibit water vapour movement and may give rise to timber decay, which would be very costly to remedy compared to the energy savings made.

10.28 In most cases flagged floors should be left in situ as lifting them may cause damage. However, where a flagstone floor requires to be lifted for other reasons it may be worth considering laying an insulated limecrete floor under the flags.

10.29 Where original floor finishes have been lost and a more recent concrete floor laid there are considerable benefits in insulating this using a proprietary insulated board.

External Doors

10.30 Whilst the frame of a traditional timber door generally performs well thermally, improvement can be made to the panels which are typically made of thinner wood. This can be done by adding a layer of appropriate insulation material on the interior side whilst maintaining the character of the door from the outside (though this may not be appropriate for some doors, such as those in listed buildings). In all cases the finished insulation should be kept flush with the door framework, new beads may be required to finish the edge. Draught or weather stripping around the edge of the door and the letter box can also help. There is little need to insulate internal doors, unless there are significant heat differences between rooms.

Windows

10.31 Whilst a single pane of glass has a fairly poor thermal performance (with a U-value for most traditional glass of around 5.2), there are many improvements which can be made to the thermal performance of a window without intervening in its fabric, such as hanging heavy curtains, using shutters or installing secondary glazing. Secondary glazing is the most effective option and can reduce heat loss through the window by 60%. Secondary glazing in a removable inner frame is an acceptable option for some windows. Listed building consent may be required depending on the nature of the existing windows, the grading of the building and the architectural features that exist within the building, which could be affected by the insertion of secondary glazing. Using timber shutters is the most effective traditional method, reducing heat loss by 50%. However the greatest reduction in heat loss can be achieved using a combination of measures. Using secondary glazing, or combinations of blind and shutters, can significantly reduce the U-value of the window. Whilst some options, such as closing shutters or drawing heavy curtains, shut out natural light, the period of lowest temperature (and therefore greatest heat loss), is at night when this is not so much of an issue.

Secondary glazing installed on the inner face of a traditional vertical sliding sash window. Note that the secondary glazing lines through with the meeting rail of the sash window and is not therefore visible externally.

10.32 Draught stripping sash windows can reduce air leakage by 80%, as well as allowing the full use of the window in terms of opening and closing, although it will not improve the U-value. Many companies provide this service, which combines the upgrading work with a general overhaul of the window and the sash cords. Draught-proofing your house is a simple measure to improve energy efficiency – but remember that solid walled buildings need circulation of air to allow evaporation of moisture. Without correct ventilation, an airtight room will often suffer from condensation (which is often mistaken for damp) and mould growth. This can also contribute to health problems.

10.33 A common misconception is that traditional windows are not capable of being energy-efficient and that they should be replaced with window made with modern materials such as PVCu. As set out above, there are numerous alternatives to replacing windows, all of which can make a substantial difference to the energy efficiency of your property. Before replacing existing timber windows and doors there are several environmental issues to consider:

a) Repairing an existing window is likely to be more sustainable than removing it and making a new one;

b) The manufacturing process of PVCu is long, highly energy intensive and produces toxic by-products;

c) Other chemicals are added to PVCu to improve stability and other qualities. This makes PVCu very difficult to recycle;

d) PVCu does not biodegrade when it becomes waste. Additives are susceptible to leaching in landfill sites;

e) PVCu is also hazardous when it burns because of toxic gases produced.

f) PVCu window replacements change the character and appearance of historic properties, particularly once they begin to discolour;

g) Replacing traditional windows may result in the loss of historic fabric (timber and glass) which is to the detriment of the building's significance;

h) If one element of a PVCu window fails, the whole unit usually needs replacing;

i) PVCu windows are likely to need to be replaced every twenty years;

j) Timber window frames have comparable thermal characteristics to PVCu frames – it is the traditional use of single glazing and lack of draught proofing which can reduce their efficiency;

k) Timber in old windows is usually of a much higher quality than modern timber and therefore less likely to need wholesale replacement;

l) Timber windows can be patch repaired with rotten timber cut out and new timber spliced in, which requires much less material and is cheaper than wholesale replacement;

m) Timber needed for repair is a renewable resource with low embodied energy;

n) Retention and repair of an existing window retains the original character and appearance of an old building;

o) Properly maintained timber windows can last for hundreds of years.

Slim double glazing units held in place with putty.

10.34 It is usually impossible to install double-glazed units in existing frames or to replicate existing frames with new sealed units without making noticeable changes to the profiles of glazing bars, styles and rails. The new glass in such units may also significantly alter the appearance of the window.
Such changes are rarely acceptable in listed buildings.

10.35 More information on window replacement, in terms of how it impacts on the character, appearance and significance of an historic building, can be found within Chapter 8 – 'Alterations to Historic Buildings.'

Renewable Energy Sources

10.37 Increasingly, owners are investigating the possibilities of adopting renewable energy sources in their home, such as solar panels, photovoltaic cells or wind-powered generators. The government has revised permitted development in this area in order to facilitate installation of micro-generation equipment by householders. However, all types of installation which could affect a listed building, or its setting, will still require listed building consent. Consideration must be given not only to the appearance and setting of the listed building but also the damage that could be caused to the fabric of the building.

10.38 The following paragraphs include a brief description of different types of renewable energy sources, including solar energy systems, (solar hot water systems and photovoltaic cells) and heat pumps (ground source heat pumps and air source heat pumps) and discusses how their installation may impact upon historic buildings.

Solar Energy Systems

10.39 There are two main types of solar energy systems:

- Solar systems for heating water;
- Photovoltaic cells that convert light energy into electricity.

10.40 **Solar Hot Water Systems (Solar Panels)** – Solar hot water systems work by using the sun's energy to preheat water entering a conventional hot water system. To maximise solar exposure, solar panels should ideally be placed on south-facing roofs, or be able to be angled to face due south.

10.41 When visible from the front of the property, solar panels are likely to have a negative impact upon the character and appearance of the historic building and the streetscene. Therefore consideration should be given to an alternative roof slope where the solar system will not be visible from the public realm. If the property is a designated heritage asset, it is likely to be preferable for the solar system to be ground mounted in the curtilage of the building or on an ancillary outbuilding, where the roof is likely to be lower. The council advises property owners who are considering installing a solar system to enter into pre-application discussion with officers at the earliest stage in the process.


Ground mounted solar panels.


Visually prominent roof mounted solar panels, Main Street, Great Ouseburn.


Solar panels on St Wilfrid's Catholic Primary School, Ripon.

10.42 **Photovoltaic (PV) Cells** – These use the sun's energy to generate electricity, and require only daylight, not sunshine, to work. This means that the positioning of PV cells is more flexible than for solar hot water panels, which usually require a south-facing location to absorb adequate heat. Whilst PV cells will generate more electricity if positioned facing the sun, they may still be a worthwhile investment for non-south-facing roofs, subject to the manufacturer's guidelines.

10.43 Additionally, there are photovoltaic 'tiles' and 'slates' on the market which are less visually intrusive than older-style photovoltaic systems and solar hot water panels. They can be designed to blend in with the existing roof tiles and may therefore provide a renewable energy system which has a minimal impact on the aesthetic significance of the heritage asset. The council advises property owners who are considering installing photovoltaic cells to enter into pre-application discussion with officers at the earliest stage in the process.

Heat Pumps

10.44 There are two main types of heat pump system:

- Ground source heat pumps;
- Air source heat pumps.

10.45 **Ground Source Heat Pumps** – Heat from the ground is absorbed at low temperatures into a fluid inside a loop of pipe (a ground loop) buried underground. The fluid then passes through a compressor that raises it to a higher temperature, which can then heat water for the heating and hot water circuits of the house. The cooled ground-loop fluid passes back into the ground where it absorbs further energy from the ground in a continuous process as long as heating is required.

10.46 Normally the loop is laid flat or coiled in trenches about two metres deep, but if there is not enough space in your garden you can install a vertical loop down into the ground to a depth of up to 100 metres for a typical domestic home.

10.47 Heat pumps have some impact on the environment as they need electricity to run, but the heat they extract from the ground, the air, or water is constantly being renewed naturally.

10.48 **Air Source Heat Pumps** – Air source heat pumps absorb heat from the outside air. This heat can then be used to heat radiators, under floor heating systems, or warm air convectors and hot water in your home. Heat from the air is absorbed at low temperature into a fluid. This fluid then passes through a compressor where its temperature is increased, and transfers its higher temperature heat to the heating and hot water circuits of the house. An air source heat pump extracts heat from the outside air in the same way that a fridge extracts heat from its inside. It can get heat from the air even when the temperature is as low as –15° C. Heat pumps have some impact on the environment as they need electricity to run, but typically the heat they extract from the ground, air or water is constantly being renewed naturally.

10.49 There are two main types of air source heat pump systems:

- An air-to-water system distributes heat via the wet central heating system. Heat pumps work much more efficiently at a lower temperature than a standard boiler system would. They are therefore more suitable for underfloor heating systems or larger radiators, which give out heat at lower temperatures over longer periods of time;
- An air-to-air system produces warm air which is circulated by fans to heat a home. They are unlikely to also provide hot water.

Installing Renewable Energy Systems – Key Considerations

10.50 Proposals for installing microgeneration equipment on, attached to, or within the setting of heritage assets should duly consider the following:

a) Will the installation result in any loss of significance (value)?

b) Can the equipment be accommodated without loss of significance?

c) Is the visual impact of the equipment minimal?

d) Has it been designed specifically and sensitively to the building and its setting?

e) In fixing the equipment to the building, will it harm or damage the historic integrity and/or fabric of the building?

f) Can the associated pipework, cabling, fuse boxes or other related equipment be accommodated without loss of, or damage to, significant historic fabric?

g) Is the installation reversible without significant long-term impact on historic fabric?

h) Have all other energy-saving measures or alternative locations with less impact on the historic fabric and significance been considered and are not viable?

i) Will it harm or compromise the setting of the building?

j) Is the building structurally capable of withstanding the imposed and dynamic loads?

k) Does the proposal have a net environmental benefit?

l) Will the equipment, including cabling, pipework, fuse boxes etc. be removed and the historic fabric made good as soon as it becomes redundant?

m) For ground-mounted installations, will the equipment cause ground disturbance? If so, can this be minimised to avoid harming the significance of the site?

Positioning a Renewable Energy System

10.51 It is important to make sure that the system works effectively but it is also vital to consider its visual effect on neighbouring properties, the public and the environment. Any alteration to the roof will affect the external appearance of a building. The impact of any system could be lessened by installing the system on a less visually prominent roof slope, or preferably, installing ground mounted equipment. For solar systems, consideration should be given to making use of roof slopes that face away from roads and paths at the front of a property, or using parts of the roof obscured by parapet walls.

Recently installed air source heat pump at Chapel of the Hospital of St Mary Magdalene, Ripon, a grade I listed building.

Solar panels partially hidden behind a parapet wall, Hotel de Ville, Ripley.

Large-scale Energy Generation and Other Infrastructure

10.52 Proposals for large-scale schemes, such as wind farms, that have a positive role to play in the mitigation of climate change and the delivery of energy, but which may impact on the significance of a heritage asset, such as a historic landscape, should be carefully considered by the developer and planning authority with a view to minimising or eliminating the impact on the asset. Ideally, the proposals should be discussed with the council at the pre-application stage to establish an acceptable balance between the necessity for measures that meet the challenge of climate change and the importance of conserving the significance of the asset.

Wind Turbines

10.53 To work efficiently, wind turbines require a smooth, steady air flow. This means that the performance of a turbine is dramatically affected by the local terrain. Any trees or buildings in the path of the wind will dramatically

reduce the available energy and create turbulent conditions, which increase wear and tear on the turbine. For these reasons wind energy potential can be low in most urban areas. Furthermore wind turbines can be detrimental to the aesthetic significance of heritage assets and the character and appearance of the streetscene or historic landscape and setting of heritage assets. However, a balance must be struck and resultant harm minimised and/or mitigated.

Energy Efficiency and the Requirements of Buildings Regulations

10.54 Part L of the building regulations requires improved standards of energy efficiency to be adopted into any major alteration to an existing building. For example, if single-glazed windows are to be renewed double-glazed units will usually be required as replacements. These regulations are relaxed if the building is:

- Listed, or;
- In a conservation area, or;
- Shown to be of local historic interest.

10.55 Other means of conserving energy, for example, through the use of secondary glazing, or through increased insulation in other areas of the building, can usually be incorporated into the design to compensate for measures which conserve the character or appearance of an old building.

Energy Efficiency and Planning Consents

10.56 Some alterations to improve energy efficiency require planning permission. In addition, if a building is listed, listed building consent is required for any alterations that affect the character or appearance of the building, such as replacement of original windows. Before making any changes to your building it is always a good idea to check whether you need permission by contacting the council.

Further Reading:

- See Appendix P – Bibliography

Appendices: (held in a separate volume)

A Action plan

B Policy context

C Designation types

D Planning legislation

E Recording heritage assets – how to compile a record

F Advertisement control

G Conservation areas

H Conservation Area Appraisals

I Article 4 Directions

J Village Design Statements

K Validation Criteria

L Examples of best practice

M Screening options

N Archaeological interest in the Harrogate district

O Glossary of terms

P Bibliography

Q Consultation on draft SPD