

# 6. sustainable design



*Underhill, underground house at Holme*

## Principles

**6.1** Principles of sustainable development should guide all stages of the design process from orientation of the building, its use of energy and water; to the selection of materials for construction and decoration. This section explores a range of principles for sustainable design and construction. The challenge is to embrace these principles whilst respecting local distinctiveness.

**6.2 Climate change** is the biggest global issue we face. The Government is committed to reducing the UK's carbon emissions by 60% by 2050. As buildings are responsible for over half of those emissions (with 27% being produced by our homes), sustainability here is crucial. The 'Energy Hierarchy' set out in Regional Planning Guidance recommends the following order of priority in relation to buildings:

- Reduce the need for energy.
- Use energy more efficiently.
- Use renewable energy.

**6.3** Sustainable design means the effective protection of the environment, both locally in terms of its special character and globally in terms of climate change. It also involves the prudent use of scarce natural resources. In other words, reconnecting buildings to place in a fundamental way.

**6.4** This is not a new idea. Its principles inform all traditional buildings and we can learn much that is relevant to solving today's problems by seeing how well the vernacular responded to its site and local context. Making best use of the traditional buildings we have is always the most sustainable option.



*Traditional south facing farmhouse, Alstonefield*

## New Homes and Buildings

**6.5** We should be planning for new development to have zero carbon emissions. A goal that is eminently achievable through a combination of sustainable design principles including the following:

### 6.6 Siting

- Ideally within a settlement with good access to public transport.
- Maximise solar gain by orientating the main glazed elevation to the south or within 30 degrees of south, and increasing the proportion of glazing on this elevation.
- Arrange dwellings so that main living areas and bedrooms are within 45 degrees of south.
- Minimise heat loss by limiting openings to the north.
- Avoid both exposed sites, frost hollows and flood risk areas.
- Maximise the use of trees for shelter; privacy and air cleaning, but avoid over-shading the south elevation.
- Align the building with the contours to avoid artificial mounding or wasteful under-building.



*The Moorland Centre, Edale using green roof technology*

## 6.7 Energy Efficiency

- Maximise the insulation value of the building's various elements, particularly roofs, walls and floors.
- Build with dense materials to give a high thermal mass that enables the building to absorb heat during the day and release it slowly at night.
- Seal the building to avoid heat loss through draughts.
- Avoid deep-plan layouts and use light reflecting surfaces to help reduce the need for artificial lighting.
- Locate the rooms used for living and working on the south side of the building and storage, bathrooms and stairs on the north.
- Specify energy efficient lighting, electrical appliances with intelligent controls and boilers.

## 6.8 Water Conservation

- Specify water saving devices such as spray taps and dual flush toilet cisterns.
- Use rainwater collection and grey water systems for flushing toilets and watering the garden.
- Employ sustainable drainage systems externally such as green roofs, ponds and permeable paving to minimise water run off and alleviate flood risk.

## 6.9 Waste Disposal

- Consider the effective use/disposal of both human and household waste in ways most beneficial to the environment.
- The provision and location of recycling bins should be considered as part of the design of new housing.

**6.10** In addition, sustainable values of **longevity and adaptability** should be encouraged by:

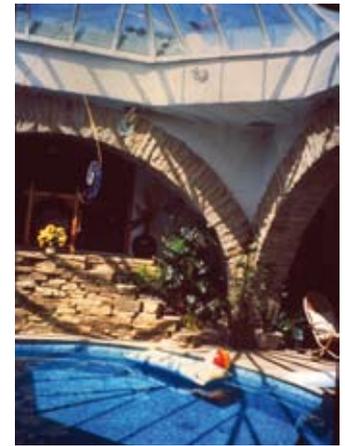
- Specifying durable materials and products.
- Detailing the building correctly to minimise weathering and repair.
- Designing well-proportioned, attractive buildings that will have a lasting appeal.
- Designing flexible internal spaces.
- Providing generous storage and built-in expansion areas (e.g. in the loft).
- Ensuring that services can be easily accessed and upgraded in the future.



*Composting toilets, White Lodge*



*Secondary glazing, Newholme Hospital, Bakewell*



*Central space to Underhill, Holme: the underground design gives the building high insulation values*

## Existing Homes

**6.11** As these will still make up two thirds of the housing stock by 2050, the energy efficiency of these buildings will need to be improved. Draught-stripping, loft and cavity insulation and more efficient boilers are the obvious first measures. Loft insulation in particular should be increased in thickness. The double glazing of windows, either by double glazed sealed units or by secondary windows (or both) is also required. This can be at odds with historic buildings or within Conservation Areas, and is certainly the case in terms of listed buildings.

**6.12** Here, one solution is to retain traditional single glazed windows as the outer barrier but to add a double glazed inner window internally (as traditionally occurs on the continent where the inner window usually opens inwards).

**6.13** Increasing the insulation value of existing external walls is particularly beneficial for 20th century buildings. Historic buildings with their thick solid walls are at an advantage in this respect, though even here the addition of internal or external porches, rear lean-tos, or even where appropriate conservatories, can act as a buffer zone to the house improving its thermal performance. Even where the solid stone walls of historic buildings are very thick, a layer of material can increase their insulation value but this may not be appropriate for listed buildings or ancient monuments



*Local needs bungalows, Pilsley: gritstone in the walls have been reused up to five times in the last 250 years*

## Renewable Energy

**6.14** The National Park Authority supports the positive role that renewable energy can play in reducing our dependence on unsustainable forms of energy production.



*Photovoltaic tiles*

Although the conservation of the valued characteristics of the area must always remain the priority, there is scope for small-scale renewable energy schemes appropriate to local need. These can take a variety of forms including:

- small-scale wind and water turbines.
- heat pumps.
- solar photovoltaic systems and thermal collectors.

**6.15** The National Park Authority's Supplementary Planning Guidance for Energy Renewables and Conservation<sup>15</sup> sets out in more detail the various options and where they can be used appropriately in connection with buildings. See also Meeting the 10% target for renewable energy in housing – a guide for developers and planners<sup>16</sup> published by Energy Savings Trust (2006)

## Sustainable Use of Materials

**6.16** It is possible to source materials and products from all over the world. The extent to which this is damaging to the environment is becoming increasingly apparent. By exercising choice we can have a direct influence on the situation.

**6.17** Some general principles to bear in mind:

- Repair rather than renew.
- Use salvaged or recycled products/materials, including aggregates.
- Buy locally.
- Minimise the use of non-renewable resources.
- Avoid products whose manufacture, use or disposal causes harmful by-products.
- Choose materials with low embodied energy (the energy needed for extraction, processing, manufacture and transportation).

**6.18** Specifically in terms of specification:

**Paint:** The vast majority of paint is synthetic and often highly toxic. Oil-based paints give off high levels of VOCs (volatile organic compounds) which are harmful to health. A safer alternative is plant or water-based paint. In general look for paints with a low VOC rating.

**Plastics and Upvc:** Oil, a non-renewable resource, is the main raw material for the plastics industry. The manufacturing process uses more energy than is needed to produce metal. Plastic products emit a variety of toxic chemicals as well as toxic fumes such as nitrogen oxide and cyanide when incinerated. Many European countries have restricted the use of upvc in buildings on environmental grounds.



*Stone slates at the base of a now demolished cottage with heather thatch roof, Monyash*



*Patent glazing at ridge level on a former workshop, Bakewell*

*Two examples offering clues on how to add photovoltaic tiles or solar panels in an unfussy way*

Consider alternatives such as linoleum, cork sisal or coir to upvc flooring. Timber is the better option for windows and doors. As well as being a 'greener' product and looking more in keeping, it is repairable and more cost-effective (even allowing for decoration costs). Cast metal or timber guttering is more appropriate than upvc and avoids the need for fascia boards.

**Stone and slate:** The importation of stone and slate from the other side of the world is questionable on sustainability grounds but is often open to aesthetic objections in terms of its different appearance to local materials.

**Timber:** Source new timber from independently certified, well managed forests and ensure that it bears the Forest Stewardship Council (FSC) logo.



*Moorlands Discovery Centre, Longshaw  
Designed to maximise solar gain and minimise heat loss, with a ground source heat pump to provide heating. The woodland setting makes the use of timber here more appropriate.*