

Swindon Sustainable Building Design and Construction SPD

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Executive summary

Swindon Borough Council is committed to making Swindon the UK's no.1 sustainable place. This Supplementary Planning Document sets out the Council's aspirations in relation to the sustainable design and construction of all new major development within the Borough.

New development which is designed to minimise water and energy use (and secure sustainable sources of water and energy), utilise renewable materials and make efforts to reduce wastage can contribute to reducing environmental pollution and preserve natural resources while also benefiting homeowners and businesses by reducing bills. Sustainable design and construction therefore not only makes sense in environmental terms, addressing the root causes and impacts of climate change, but also stacks up financially.

The **Swindon Standard** is the benchmark for future major development in Swindon. The Swindon Standard is a sustainability standard which uses as its basis the "Code for Sustainable Homes" for residential development and the "BREEAM" standard for non-residential development. In addition the Swindon standard includes a 20% zero/low carbon energy requirement and consideration of solar passive design. For residential development the standard also includes a commitment to "Lifetime Homes", helping to ensure that what we build now is fit for purpose in future.

PART ONE

Introduction

“If everyone in the world lived as most Europeans do, we would need three planets to support us.” One Planet Living (Bio Regional/WWF, 2004)

This is a sobering statement. Buildings provide for the basic human need for shelter and a host of other activities essential to everyday life. However, the impact posed by buildings is perhaps one of the most significant environmental challenges of today.

The construction and operation of buildings contributes over 50% of total CO₂ emissions in the UK. The manufacture of construction materials and the demolition of buildings generates vast quantities of waste, the majority of which could be reused or recycled. The construction process can also impact on key natural resources through emissions to air, land and water which can also affect biodiversity.

Swindon Borough Council recognises that more sustainable ways of designing and operating buildings are necessary to achieve greater sustainability within a high quality environment. The sustainable design and construction of Swindon’s new buildings will play a major role in meeting targets to reduce carbon dioxide emissions, a major contributor to climate change, and help utilise natural resources more effectively.

The wider benefits of sustainable design and construction

In addition to the key environmental benefits, sustainable design and construction will also deliver social and economic benefits. Designing and constructing buildings in a more sustainable way will have a major positive impact. It is also something that everyone involved in building design and construction can get involved in – from designing a house extension to masterplanning a new urban extension.

For developers the advantages include:

- **Reduced construction costs** - minimising wastage of construction materials, energy, water use etc, will help to improve profits.
- **Increased returns** - developments that are of a high quality are more likely to be in demand from perspective buyers or tenants, helping to boost development values.
- **Improved reputation** - local people are more likely to welcome development by those developers who show a track record of caring about the environment.

For local communities the benefits can be significant. High quality developments can instil a sense of purpose and place, produce healthier environments that uplift people’s spirits, and help to reduce crime and improve safety.

Policy Context

This SPD supplements policies within Swindon Borough Local Plan and Wiltshire and Swindon Waste Local Plan. It builds on relevant national and regional guidance, and provides clear and practical advice on sustainable building design and construction. **Broader sustainability concerns – including the location of development, re-use of existing buildings, mixed-use development, density and biodiversity are addressed by other policies in the existing Swindon Local Plan and emerging planning policies.**

In particular, this guide amplifies policy DS6 of the Swindon Local Plan (Design and Amenity) which requires that development proposals shall:

“Address environmental sustainability throughout, including the use of recycled and/or traditional materials in construction and energy efficiency in design and layout, where this is not covered by building regulations...”

The guide will also help achieve corporate priorities contained within the following documents:

- Swindon’s Local Area Agreement 2006 – 2009
- Our Swindon Our Community Our Future: A Community Strategy for Swindon 2004 – 2010
- Wiltshire and Swindon Renewable Energy Action Plan, Autumn 2005 (WREAP)
- A Climate Change Action Plan for Swindon Borough 2006 – 2010
- Swindon Renewable Energy Task Group Report (June 2007)

A comprehensive policy context matrix can be found in **Appendix 2**.

Purpose and status

The purpose of this supplementary planning document is to set out clearly Swindon Borough Council’s commitment to achieving sustainable development and to raise awareness of how the development of land within Swindon can contribute towards sustainability through encouraging a holistic approach to construction and by reducing the impact of a development during its lifetime. This guidance provides practical advice on how to design and construct more sustainable buildings, large or small, in Swindon.

Consideration of sustainable building design and construction in respect of submission of planning applications should not be seen in isolation from the requirements of building regulations, particularly in respect of energy efficiency. Under the Building Act 1984, Building Regulations set standards for

the design and construction of buildings to ensure the safety and health for people in or about those buildings. They also include requirements to ensure that fuel and power is conserved and facilities are provided for people, including those with disabilities, to access and move around inside buildings.

As an adopted supplementary planning document, the advice in this guidance is a material consideration in the determination of planning applications.

Early use of this document in the design process is encouraged.

PART TWO:

The SWINDON STANDARD

The “**Swindon Standard**” is the benchmark for all new major development¹ in Swindon.

The “**Swindon Standard**” uses as its basis the **Code for Sustainable Homes (CSH)** for residential development and the **British Research Establishment Environmental Research Method (BREEAM standard)** for non-residential development.

Also, the “**Swindon Standard**” sets additional requirements which all new major development should address. The following tables highlight the various requirements of the Swindon Standard by development scale and type.

It is important to note that the elements of the Swindon Standard should be addressed sequentially in designing for sustainable energy use. Emphasis should be laid on addressing robust energy efficiency in layout, design and construction **before** considering for zero/low carbon energy sources

Residential Development

Scale	Requirements
10 dwellings or more	<ul style="list-style-type: none">• ENERGY EFFICIENT DESIGN AND LAYOUT: Consideration of passive solar design principles• SUSTAINABLE CONSTRUCTION: Code for Sustainable Homes (level 3 target, which includes a 25% improvement in energy efficiency over the 2006 Building Regulations) or EcoHomes XB for residential conversions (target Excellent)• ZERO/LOW CARBON ENERGY: On-site/decentralised low or zero carbon energy sources to supply at least 20% of the development’s energy requirements (regulated emissions²)• FUTURE PROOFING: Lifetime homes standard (target 50%)

¹ **Major Developments definition**

For dwellings: where 10 or more are to be constructed (or if number not given, area is more than 0.5 hectares)

For all other uses: where the floor space will be 1000sq metres or more (or site is 1 hectare or more). Area of site is that directly involved in some aspect of the development. Floor space is defined as the sum of floor area within the building measured to the external wall faces at each level. Basement car parks, rooftop plant rooms, caretakers’ flats etc. should be included.

² **Regulated emissions:** *This refers to the carbon emissions resulting from energy used to meet those services in a building that are regulated under the building regulations. Currently, these services are: space heating, water heating, fixed internal lighting, cooling and ventilation pumps and fans (South West Regional Assembly, 2007).*

Non-residential development

(office, industrial, retail of 1000sqm or more, and all new schools)

Scale	Requirements
> 1000sqm	<ul style="list-style-type: none"><li data-bbox="450 421 1412 495">• ENERGY EFFICIENT DESIGN AND LAYOUT: Consideration of passive solar design principles<li data-bbox="450 499 1412 573">• SUSTAINABLE CONSTRUCTION: BREEAM standard (target “Excellent”)<li data-bbox="450 577 1412 674">• ZERO/LOW CARBON ENERGY: On-site/decentralised low or zero carbon energy sources to supply at least 20% of the development’s energy requirements (regulated emissions)

Where mixed-use development is proposed, the same requirements will apply for any part of a development proposal which constitutes a major development.

PART THREE:

Achieving the Swindon Standard

For ease of use, the elements of the Swindon Standard are covered in the following separate sections of this guide. However, the approach to designing sustainable buildings must be **holistic** and consider the interrelationship between the key issues.

To illustrate how this can be achieved, **case studies** have been included, and will be regularly updated, on the Swindon Borough Council website (www.swindon.gov.uk). The solutions highlighted in the case studies will primarily be based on the subject of individual sections (e.g. water, waste, etc.). In addition, a further important function of the case studies will be to demonstrate how solutions can be designed to address a range of sustainable construction aims. For instance, “green roofs” have an important role promoting biodiversity. However, they can also be designed as part of a sustainable drainage system and can contribute to energy efficiency by helping to insulate new and existing buildings.

It should be noted that the following sections are not exhaustive and there are many sources of information which can be used to help achieve the Swindon Standard. A list of useful websites and documents is included within each section and the Council’s website will publish up-to-date information which supplements the guidance in this SPD.

Achieving the **Swindon Standard** will be much easier and potentially less expensive when sustainable design issues are considered early in the design process.

What should accompany a major planning application?

The following section details what should be submitted in order to address the Swindon Standard.

ENERGY EFFICIENT DESIGN (passive solar design)

Energy efficiency in design and layout is a key issue in policy DS6 of the Swindon Borough Local Plan. The passive solar design principles detailed in this SPD should be addressed in a dedicated section in any **Design and Access Statement** submitted with a planning application.

SUSTAINABLE CONSTRUCTION

Policy DS6 of the Swindon Borough Local Plan highlights a wide range of sustainable design issues. Information should be submitted which highlights how a proposed development addresses sustainable construction issues in the form of a relevant BREEAM/Code for Sustainable Homes “**Pre-Assessment Estimator**” (PAE) The PAE should accompany all major development applications for residential development, office development,

industrial development, retail development or schools. Although the Code for Sustainable Homes “level 3”/BREEAM “excellent” standards are aspirational and not mandatory targets, the pre-assessment estimators will demonstrate what is being achieved and how Policy DS6 of the Swindon Borough Local Plan is being addressed.

The BREEAM Pre-Assessment Estimators can be viewed at www.breeam.org and the Code for Sustainable Homes PAE can be requested from forwardplanning@swindon.gov.uk

All PAEs should be completed by an accredited BREEAM assessor. To contact a licensed BREEAM/Code for Sustainable Homes assessor, visit www.breeam.org/assessors. The aim of the PAE is to provide a predicted rating for new development in connection with the targets within this document. It does not constitute formal certification of a development by the British Research Establishment (BRE) and should not be taken as such. Full certification requires both a formal design and/or post-construction stage assessment undertaken by a certified BRE assessor and submitted to the BRE. Validation of the final rating of a development is then undertaken by the BRE and an appropriate certificate is issued accordingly.

Major developments not accompanied by a pre-assessment estimator will need to address the environmental issues highlighted in policy DS6 but will not benefit from a BREEAM/Code for Sustainable Homes rating.

ZERO/LOW CARBON ENERGY SOURCES

A **zero/low carbon energy feasibility study** should be undertaken in line with the methodology detailed in the Code for Sustainable Homes/BREEAM standard and adjusted to focus on regulated emissions. The feasibility study should accompany any major planning application and the recommendations incorporated into the relevant plans. The 20% requirement on regulated emissions should be viewed as a minimum to be achieved on major development sites.

(As **zero/low carbon energy** is an element within the Code for Sustainable Homes and BREEAM standard, points gained for this will naturally count toward the overall CSH/BREEAM rating within the “pre-assessment estimator”. In terms of the CSH, one point should be allocated for housing developments reaching 20% [regulated emissions] within the pre-assessment estimator as this generally equates to 10% [total emissions] included within the Code requirements. On the same basis, developments reaching 30% would be eligible for 2 points. The same principle should be applied when using the BREEAM pre-assessment estimator.)

In cases where achieving the zero/low carbon energy requirement would be impractical, or would render the scheme unviable, developers will need to enter into early discussions with the Council. An open book³ approach will be required where a developer considers reaching the zero/low carbon energy requirement would render a scheme unviable.

FUTURE PROOFING : LIFETIME HOMES

A dedicated section in the **Design and Access Statement** submitted with a planning application should address how any major residential application addresses the 50% lifetime homes target. (As **Lifetime Homes** is an element within the CSH, points gained for this will naturally count toward the overall Code/BREEAM rating within the “pre assessment estimator”).

³ *In such cases developers will be expected to demonstrate to the Council that a scheme becomes unviable as a consequence of meeting the Swindon Standard. Any such claim will need to be confidentially **validated by an independent third party** in advance of a planning application being submitted. The third party will determine, through assessment, in an open book approach, whether meeting the standard would be impractical or render the scheme unviable. Independent third parties play a valuable role in mediating agreements on planning requirements.*

1. Energy efficient design and layout

Applicability	Requirement
Major residential and non-residential developments	Consideration of passive solar design principles

Introduction

Reducing the demand for energy is an essential element in moving toward a more sustainable energy future. Incorporating principles of solar passive gain in the design of new development will maximise the use of solar energy for heating, lighting and cooling, thereby reducing a building's overall energy requirement.

Passive Solar Design

Designing for energy efficiency begins early in the planning process. A layout which takes advantage of natural heat and light from the sun (known as "passive solar gain") and uses air movement for ventilation can reduce the need for artificial light, heat, cooling and ventilation.

Different approaches are required depending on the size and use of buildings, but all should consider how the principles of passive solar gain could be applied.

Natural light

Natural daylighting is the controlled entry of natural light into a building through windows, skylights, atria, and other building envelope components. A properly designed daylighting system should achieve good daylighting factors by distributing it **evenly** and by **avoiding glare** and **overheating**. Not only does this significantly reduce overall energy consumption but natural light also offers occupants a pleasant living and working environment.

In larger commercial offices as much as 40% of energy costs can be accounted for by lighting so good access to natural light should be a key design parameter. However, excessive solar gain can add to the heat generated by lighting, equipment and people to cause overheating and increasing cooling demands. Design features to avoid excessive solar gain should be incorporated such as louvres, external blinds and large roof overhangs to provide shade in high summer sun but still allowing maximum daylight.

Natural Heat

Whilst it may be difficult to provide all of a building's heating requirements through passive solar design in the English climate, a combination of passive solar and energy conservation measures can reduce a new building's conventional heating requirements by 50% to 80%, while saving the home-buyer money in the long term. (Centre for Alternative Technology)

There are six key principles to implementing passive solar design in **new houses (and smaller commercial development)** that can help reduce the overall energy demand:

KEY PRINCIPLES:

1. ORIENTATION

Dwelling Orientation

This is the main principle of them all and is concerned with orientating the dwellings on a site with their main glazed elevation within 30 degrees of south. Dwellings orientated east of south will benefit more from morning sun, while those orientated west of south will catch late afternoon sun delaying the evening heating period.

Road Alignments

Arranging as many roads as possible in a scheme along an East- West alignment. This is to ensure the properties have a natural southerly aspect along the East West alignment.

Internal Orientation

Most frequently used rooms should face towards south, i.e. living rooms and main bedrooms.

Rooms used less often or those that would not benefit from sunlight should be placed to the north of the building (i.e. hallways, bathrooms, utility rooms, stores). Also they should have smaller windows to minimise heat loss

2. OVERSHADOWING

- Avoiding buildings that cast shadows over south elevations.
- Locating taller buildings to the north of a site - and shorter buildings to the south.
- Avoiding obstructions like garages and extensions where these can overshadow a south-facing elevation to a dwelling.
- Careful tree-planting to avoid overshadowing - using deciduous trees that create shade during the summer, and allow sun to filter through during the winter.
- Separation distances between properties - in Swindon we need 21m between 2-storey properties to allow good solar access all year round.

3. WINDOW OPENINGS

- The larger window openings of a dwelling should be on the south side and the smaller openings on the north.
- As a general rule, the windows should be around 15% of a room's floor area for adequate daylighting. (DoE Best Practice Programme)
- Good daylighting means less electrical lighting is consumed.
- Avoid over-sized windows (i.e. more than 50% of the overall facade) if excessive heat gain / loss is to be avoided.

4. THERMAL MASS

- The use of heavyweight construction within a building, designed to absorb sun during winter therefore warming a building and absorb excess heat during the summer therefore cooling a building.

5. AVOIDING OVERHEATING

- Overhang Rule - an overhang on the south side of a building, designed to reject mid-summer sun and accept mid-winter sun into a building.
- Natural Ventilation is critical to ensuring that excess heat is expelled within a building - especially during the hot months.

6. RESPONSIVE ZONED HEATING SYSTEM

- Also necessary is a responsive, zoned heating system to automatically cut in when and where necessary – this can be more energy efficient than leaving heating on all day, or heating an unoccupied room.

Natural Ventilation and Cooling

Natural ventilation can aid in both cooling a building and minimising heat loss. A passive heat recovery ventilation system that utilises fresh air from the outside by passing it through a simple heat exchanger where incoming fresh air is heated by means of the energy in the exhaust air can recover heat normally lost through mechanical ventilation. Natural ventilation can also help to cool building through fitting opening windows or vents in buildings using displacement ventilation. These systems have few moving parts, are very quiet and use very little power.

Further detail of the principles of solar passive gain are contained in **appendix 4**.

Further Information

Planning for Solar Passive Design (DTI)

2. Sustainable Construction – Residential Development

Applicability	Target
Major residential developments	Code for Sustainable Homes Level 3

Introduction

The Code for Sustainable Homes is a single national standard to be used in the design and construction of new homes in England, based on the BRE ecohomes scheme and owned by central government.

The aim of this section is to give an overview of what is required to achieve level 3 of the Code for Sustainable Homes.

It should be noted that this overview provides a summary of the Code and reference should be made to the sources at the end of this section for detailed information.

The Code for Sustainable Homes

The “**Code for Sustainable Homes**” is a set of sustainable design principles covering performance in nine key categories listed below.

- **Energy and CO₂**
- **Water**
- **Materials**
- **Surface Water Runoff**
- **Waste**
- **Pollution**
- **Health and well-being**
- **Management**
- **Ecology**

Within each category are a number of issues.

Code Category	Issues
Energy and CO ₂	<ul style="list-style-type: none"> • Dwelling Emission Rate⁴ • Building Fabric • Internal Lighting • Drying Space • Energy Labelled White Goods • External Lighting • Low/Zero Carbon • Cycle Storage • Homes Office
Water	<ul style="list-style-type: none"> • Internal

⁴ *The issues in bold are mandatory requirements under the code. These are detailed in the next section.*

	<ul style="list-style-type: none"> • External
Materials	<ul style="list-style-type: none"> • Environmental Impact • Responsible Sourcing - Basic • Responsible Sourcing – Finishing Materials
Surface Water Runoff	<ul style="list-style-type: none"> • Surface Water Runoff • Flood risk
Waste	<ul style="list-style-type: none"> • Construction • Household • Composting
Pollution	<ul style="list-style-type: none"> • Global warming potential • NOx emissions
Health and Well-Being	<ul style="list-style-type: none"> • Daylighting • Sound • Private space • Lifetime homes
Management	<ul style="list-style-type: none"> • Home user guide • Considerate constructors • Construction site impacts • Security
Ecology	<ul style="list-style-type: none"> • Value • Enhancement • Protection • Change in value • Footprint

The Code contains mandatory **minimum standards** for energy, water, materials, waste and surface water runoff (in bold above). It also demands that minimum standards for energy and water to be met before the higher standards of the Code are achieved.

There are further non-mandatory standards within each of the nine key areas listed above, and therefore flexibility exists to design development around the most appropriate principles in the Code. The system works on that basis that points are awarded for each sustainability feature. The points are then added up and a rating allocated to the development.

Achieving Code for Sustainable Homes - LEVEL 3

The Swindon Standard aspires to achieve at least level 3 of the Code for all new major residential development.

In order to achieve level 3 of the Code for Sustainable Homes, “major” housing development should meet the mandatory standards required to reach level 3, topped up by further points gained in other categories as appropriate to the proposed development. The following sections detail mandatory requirements and further categories where points can be gained.

Energy/CO₂

In order to comply with level **3** of the Code, housing development of 10 or more dwellings (or more than 0.5 ha) must demonstrate a:

- **25% improvement over the Target Emission Rate (TER) as determined by the 2006 Building Regulation Standards.**

There is a major incentive in improving the energy efficiency of new dwellings as the more energy efficient the dwelling is, the less the requirement will be for zero/low carbon energy. Designing to utilise solar passive gain for heat, light and cooling can also help to make a building more energy efficient. (**Appendix 4** contains further information on Solar Passive Design).

In addition, the Swindon Standard incorporates a 20% zero/low carbon energy (regulated) in all new major development. (**Section 4** provides further information on the zero/low carbon energy requirement)

Within the energy category, further points can be gained by addressing the following issues:

- **Building Fabric** - improving the heat loss parameter.
- **Internal Lighting** - improving the energy efficiency of internal light fittings.
- **Drying Space** - ensuring secure space is available to drying clothes
- **Energy Labelled White Goods** - installing efficient fridges, freezers etc.
- **External Lighting** - improving the energy efficiency of external light fittings.
- **Cycle Storage** - ensuring secure space is available to store bikes.
- **Homes Office** - ensuring space and services are available to set up a home office.

Water

In order to comply with level **3** of the Code, housing development of 10 or more dwellings (or more than 0.5 ha) must demonstrate a:

- **Minimum potable water consumption of 105 litres per person per day.**

Sustainable water management is particularly important as Swindon is within an area where water resources are particularly sensitive.

Grey water (shower, bath and tap water) and rainwater collection systems can be effective ways to reduce internal potable water use. Under the Code, the proportion of water gained from these sources for internal use can be offset against total internal potable water consumption.

Within the water category, further points can be gained by addressing the following issues:

- **External Potable Water Use** - providing a system to collect rainwater for irrigation

Materials

In order to comply with level **3** of the Code, housing development of 10 or more dwellings (or more than 0.5 ha) must demonstrate that:

- **Three of the following 5 elements achieve a relevant Green Guide⁵ (2007) rating of A+ to D: roof, external walls, internal walls, upper and ground floors and windows.**

Materials selection and sourcing can affect the sustainability of a building in a variety of ways. From the impacts caused by extracting raw materials to the manufacture of the insulating materials and paints, sustainability can be greatly enhanced by careful specification.

A “lifecycle” approach to materials specification should be adopted which considers what happens at the end of a building’s life. In this respect, it is useful to think of the idea that materials procurement is about “borrowing materials for the lifetime of the building”.

Within the materials category, further points can be gained by addressing the following issues:

- **Responsible Sourcing (Basic)** - where 80% of key materials are responsibly sourced (materials specified in guidance)
- **Responsible Sourcing (Finishing Materials)** - where 80% of finishing material are responsibly sourced (materials specified in guidance)

Surface Water Runoff

In order to comply with level **3** of the Code, housing development of 10 or more dwellings (or more than 0.5 ha) must demonstrate that:

- **Peak run-off rates and annual volumes of run-off post development will be no greater than the previous conditions for the site.**

Sustainable Urban Drainage Systems (SuDS)

The Environment Agency guidance on Sustainable Urban Drainage Systems (SUDS) highlights the benefits of providing a sustainable solution to help reduce and manage surface water run off which might otherwise cause flooding and pollution. These are physical structures built to receive surface water run off and provide a drainage that mimics natural processes rather than piped solutions. By dealing with rain close to its source, SuDS can deal

⁵ The “Green Guide” is a simple reference guide to the environmental impacts of construction materials most commonly used in housebuilding. Published by the BRE (British Research Establishment)

with polluted water, slow down flows across sites and into watercourses allowing settlement, filtering and infiltration, which also have ecological benefits. In addition to the code requirement for surface water runoff, reductions greater than previous site conditions should be implemented where possible.

Developers are encouraged to work with the Council and the Environment Agency to incorporate SuDS in all new development to reduce the risk of flooding, the pollution to watercourses and to minimise negative impacts on biodiversity. This should be considered at the earliest stages of master planning or layout design. Early consultation with the Council is advised. The Council will make use of planning conditions or legal agreements to secure implementation of SuDS where appropriate. The following sections illustrate and give examples of SuDS techniques that can be successfully applied to most development and can even be applied to existing developments.

Appendix 3 contains further information on Sustainable Urban Drainage Systems. Further technical advice can be obtained from the Environment Agency: www.environment-agency.gov.uk

Within the surface runoff category, further points can be gained by addressing the following issues:

- **Flood risk** - where development is in an area of low flood risk.

Waste

In order to comply with level **3** of the Code, housing development of 10 or more dwellings (or more than 0.5 ha) must demonstrate that:

- **A site waste management plan must be produced and implemented.**
- **Waste storage space is sized to hold the larger of:**
 - **Containers provided under the Local Authority collection/recycling scheme, or**
 - **Minimum capacity of waste storage calculated from British Standard 5906.**

The required content of a site waste management plan is detailed in the technical guidance to the code for sustainable homes.

Within the materials category, further points can be gained by addressing the following issues:

- **Composting** – provision of household composting facilities

Pollution

There are no mandatory elements in the pollution category. Points can be gained by addressing the following issues:

- **Global warming potential** - reducing the blowing agent (used for insulation) emissions arising from manufacture, use and disposal of foamed thermal and acoustic insulation materials.
- **NOx (nitrogen oxides) emissions** - reducing NOx emissions to the atmosphere arising from space and water heating systems (NOx emissions can cause respiratory problems).

Health and well-being

There are no mandatory elements in the health and well-being category. Points can be gained by addressing the following issues:

- **Daylighting** - good daylighting to reduce the need for energy to light the home.
- **Sound** - sound insulation to reduce the likelihood of noise complaints from neighbours
- **Private space** - adequate levels of at least partially private space.
- **Lifetime homes** - homes which are accessible for everybody which can be easily adapted to the needs of future occupants.

Consideration of the Lifetime Homes standard is integral to the Swindon Standard. (**see Section 5**) Points achieved for this will count toward the overall Code rating.

Management

There are no mandatory elements in the management category. Point can be gained by addressing the following issues:

- **Home user guide** - helping owners, occupiers to understand and operate their homes efficiently.
- **Considerate constructors** - construction sites which are managed in an environmentally and socially considerate and accountable manner.
- **Construction site impacts** - construction sites which are managed in a mannee that mitigates environmental impacts.
- **Security** - designing developments which feel safe.

Ecology

There are no mandatory elements in the ecology category. Points can be gained by addressing the following issues:

- **Value** - development which is located in sites of low ecological value
- **Enhancement** - enhancing the ecological value of the site
- **Protection** - protecting ecological features from damage during the construction process.
- **Change in value** - encouraging improvements in ecological value

- **Footprint** - ensuring land and material use is optimised across the development.

Integrating biodiversity into buildings

The built environment and its surroundings offer many opportunities to contribute fully to increasing the Borough's biodiversity. Buildings can help to provide suitable habitats to support a wide range of species that flourish in urban environments.

Taken together, habitats associated with buildings can act as 'stepping stones' within a wider network of connected green spaces, allowing wildlife to move more freely. The 'greening' of a building can also have, and be integrated with, other 'quality of life' benefits e.g. roof gardens for staff/access to open greenspace.

Embracing sustainable design and construction principles can also have far reaching impacts on biodiversity at a local, national and international level e.g. by using timber from sustainably managed forests.

Care should be taken at the design stage to ensure that any biodiversity scheme is appropriate to the location and use of any proposed development and that it does not compromise the integrity of the fabric of the building.

See **appendix 5** for further information on Integrating biodiversity into buildings.

Further Information

Code for Sustainable Homes: Technical guidance

<http://www.communities.gov.uk/index.asp?id=1506120>

A Cost Review of the Code for Sustainable Homes (Housing Corporation and English Partnerships, February 2007)

Assessing the Cost of Compliance with the Code for Sustainable Homes (Environment Agency/WRC January 2007)

3. Sustainable Construction - Non-Residential Development

Applicability	Target
Major non-residential developments (office, industrial, retail of 1000sqm or more, and all new schools)	BREEAM “ Excellent ”

Introduction

The British Research Establishment Environmental Assessment Method (BREEAM) is a method of assessing the sustainability of buildings. The BREEAM standard covers a range of different sites, from offices to schools to retail development.

As the name suggests, the BREEAM method was developed by the British Research Establishment. Ecohomes was part of the BREEAM suite of guidance which has now been replaced by the Code for Sustainable Homes and endorsed by central government. The Code for Sustainable Homes is covered in the previous chapter and is also based on the BREEAM methodology.

The BREEAM Standard

BREEAM assesses the performance of buildings in the following areas:

- **management:** overall management policy, commissioning site management and procedural issues
- **energy use:** operational energy and carbon dioxide (CO₂) issues
- **health and well-being:** indoor and external issues affecting health and well-being
- **pollution:** air and water pollution issues
- **transport:** transport-related CO₂ and location-related factors
- **land use:** greenfield and brownfield sites
- **ecology:** ecological value conservation and enhancement of the site
- **materials:** environmental implication of building materials, including life-cycle impacts
- **water:** consumption and water efficiency

Developers and designers are encouraged to consider these issues at the earliest opportunity to maximise their chances of achieving a high BREEAM rating. Credits are awarded in each area according to performance. A set of

environmental weightings then enables the credits to be added together to produce a single overall score.

How will the BREEAM standard be used in Swindon?

In Swindon, the BREEAM “**Excellent**” standard will be required of the following non-residential developments.

- **OFFICES** (Class B1) of 1000 sqm or more

BREEAM Offices can be used to assess both single and multi storey office developments and is flexible enough to be used where an office is part of a mixed use development where it is easily divisible from the remaining part of the development.

- **INDUSTRIAL** (Class B1 [light industrial] B2/B8 development of 1000 sqm or more)

BREEAM Industrial assesses the environmental impact of storage and distribution, light industrial building units, factories and shops. Buildings assessed under BREEAM industrial will broadly fall into two categories. Firstly, speculative which covers the assessment of speculatively developed buildings with an unknown end occupier. Secondly, fitted out which covers the assessment of buildings that are being designed and fitted out for a known end occupier, or where the end occupier is unknown but the operational area is fitted out.

- **RETAIL** (Class A uses of 1000 sqm or more)

BREEAM Retail can be used to carry out assessment for most types of retail development.

- **SCHOOLS** (all new schools)

BREEAM Schools assesses new build and refurbishment school projects in line with DfES requirements. The Government is keen to ensure that sustainability is at the top of the agenda for all those involved in the construction of schools. DfES requires the following new build and refurbishment projects to achieve at least a “very good” rating:

- Primary schools projects costing £500k or more
- Secondary school projects costing £2m or more
- All projects involving remodelling or complete refurbishment or more than 10% of the total gross internal floor area of the school.

All new schools within Swindon should aspire to meet the “**Excellent**” BREEAM standard.

Residential Conversions

In addition, major residential conversions, which are not covered by the Code for Sustainable Homes Standard, will utilise BREEAM Ecohomes XB, a standard specifically formulated for such development.

4. Low and Zero Carbon energy sources (LZCs)

Applicability	Requirement
Major residential and non-residential developments.	On-site/decentralised low or zero carbon energy sources to supply at least 20% of the building's energy requirements (regulated emissions⁶)

Introduction

The construction and operation of Swindon's buildings accounts for half the town's energy use. The amount of energy and thus carbon dioxide produced is dependent on a building's energy efficiency, which is largely determined by its design and construction.

Through better design construction and operation, energy use can be dramatically reduced, cutting bills and reducing the emission of carbon dioxide (CO₂), a major cause of climate change.

Low and Zero Carbon energy sources (LZCs)

Low and Zero Carbon energy sources is the standard term used in the Building Regulations to cover both renewable energy technologies, such as solar panels as well as low carbon energy sources such as micro CHP, absorption cooling, ground cooling and heat pumps. It does not include energy efficiency measures.

By using energy sources such as wind, solar, hydro and biomass, and by increasing the efficiency of energy use through Combined Heat and Power (CHP) and District Heating (DH) systems, major reductions in energy use and greenhouse gas emissions can be achieved. Technologies can be incorporated in to the design of new developments such as:

- Solar water heaters, placed on the roof
- Photovoltaic (PV) arrays can be incorporated into wall cladding, roof tiles or glazing to generate electricity
- CHP plant can provide both electricity and heat and can be fired by gas or renewable energy sources such as coppice wood
- Ground store heat pumps or heat exchange systems can be used for heating
- Wind turbines
- Biomass can be integrated into larger schemes

When considering building integrated renewable energy generation, such as wind, solar and photovoltaics, careful siting and design can minimize potential

⁶ **Regulated emissions:** This refers to the carbon emissions resulting from energy used to meet those services in a building that are regulated under the building regulations. Currently, these services are: space heating, water heating, fixed internal lighting, cooling and ventilation pumps and fans (South West Regional Assembly, 2007).

visual noise and other impact. The Energy Savings Trust have published a number of useful factsheets on their website which deal with domestic renewable energy sources. www.est.org.uk

In larger developments, installing a district heating or cooling network should be considered. These distribute heat or cooling from a central plant (such as a CHP plant) across a neighbourhood (for more information contact the CHP Association). There may be potential to connect to an existing district heating or cooling network or to co-operate with neighbouring building developments. Cooling in commercial office buildings is already a significant energy requirement and is likely to grow with our changing climate.

The following sections outline the main sources of low and zero carbon energy sources.

Solar Water Heating

Solar Water Heating can offset a large part of the hot water requirements for a building. Such systems:

- perform best in the summer when other heating needs are at a minimum,
- avoiding the need to run boilers at low loads when they are less efficient.
- can be easily installed.
- need to be operated in conjunction with a traditional water heating method
- can often be incorporated where roofing work is taking place thereby reducing costs.
- are particularly suited to swimming pools, leisure centres and large water users.

Photovoltaic Cells

Photovoltaic (PV) cells generate electricity from the sun and can be incorporated on most buildings as tiling or cladding. Whilst the technology is quite expensive (although prices are falling) they can be used to raise the profile of more prestigious commercial buildings or pioneering residential developments. The cost of photovoltaic cladding can offset the cost of other building cladding materials. They are also effectively maintenance free throughout their life expectancy. However, at present solar water heaters are said to be six times more efficient than solar panels. Also, micro turbines are six times more efficient in terms of energy generation than solar photovoltaics and energy generated from micro wind has a radically lower manufacturing embedded energy cost.

Heat Pump Technologies:

Heat pump technology works on the same principal as refrigeration units, by generating heating or cooling through exploiting naturally occurring heat differentials rather than using electricity to generate new heat.

- **Ground Source Heat Pumps (GSHP)**

These use the natural heat in soil to provide heating and cooling to buildings. The temperature just a couple of metres down into the earth's crust is roughly constant all year at around 12°C in the UK. The difference between this constant temperature and the fluctuating air temperature can be harnessed through a network of underground pipes. Water is pumped through the pipes absorbing the ground heat, which can then be used to provide relatively cheap heating for buildings in the winter months and cooling in the summer months.

The technology is best suited to developments with large open spaces such as car parks or playgrounds, but can also be integral to the building floorplate. It works best with underfloor heating systems in maximising the heating and cooling effect. It is difficult to retro-fit, and is really only viable when incorporated into new buildings during construction.

- **Air Source Heat Pumps (ASHP)**

These are similar in operation to the more prevalent GSHP but they omit the need for a buried heat collection system, deriving their heat (or cooling) from the ambient air or, as is often the case, from the exhaust air in a controlled ventilation system.

ASHP deriving their heat from exhaust air will generally produce higher efficiencies than those taking heat from ambient air. This is because the heat pump needs to do less work to upgrade the temperature. Hybrid systems will produce resultant efficiencies between the two. The efficiency is determined by the co-efficient of performance (COP) - simply put, the ratio between the electrical energy input and the heat output as measured in kilowatt hours. A COP of between approaching 3 and up to 5 will be generally achievable, which means an output of between 3 and 5 kWh of heat for each input kWh of electricity.

Small Scale Wind Turbines

Industrial and leisure sites with some open space can be suitable for small-scale deployment of wind turbines; land in other uses may also be suitable. A new generation of small scale, building mounted wind turbine is now available. The absence of stress vibration problems increases the opportunities for development. With recent and potentially further technological improvements in the noise and other impacts of larger turbines there may also be a case for larger turbines in urban areas.

Energy from Waste

Some industrial developments may produce sufficient waste for on-site energy from waste and CHP to be considered. Certain processes produce large amounts of organic waste and waste can be removed from the municipal or industrial waste stream to operate either aerobic or anaerobic digesters. Biogas produced by either process can be used in a CHP plant, generating heat and electricity and saving fossil fuels in both cases. Biomass may be appropriate for both the domestic and non-domestic sectors and can meet clean air controls.

Biomass

Biomass boilers, which burn the chipped or pelleted products of forestry operations or short rotation coppice (fast-growing willow or poplar crops harvested on a three year cycle) offer the potential for space heating and hot water production from a renewable, non-fossil fuel source that is carbon dioxide neutral in operation. New growth absorbs the CO₂ that is emitted in the combustion process so there is no net increase in carbon products released to the atmosphere.

Simple manually fed domestic stoves perform in the same way but there is a scale of boilers to suit any development, whatever its size. Pellets are also more sustainably transported than wood chips. Either woodchip or pellet forms can be automated and require no day-to-day attention. The combustion residue is small, with pellets particularly, creating virtually no ash. Maintenance is of a routine and low level nature.

The technology is also tried and tested, having been used in Scandinavian countries and North America, for decades.

Combined Heat and Power

Combined Heat and Power plant (CHP) provide both the electricity and heat to a site. They can reach 85% efficiencies in comparison to 30% from traditional electricity generation where the heat is wasted. CHP schemes generally run on gas or diesel fuel although biofuels can be used. The reuse of heat is a key element in the cost effectiveness of a scheme and if heat is not required CHP loses much of its appeal.

CHP technology is well proven and plant size is reducing making it more viable for a range of schemes. District Heating networks offer a potential heat market and heat can be sold to neighbouring buildings or developments thereby earning income for the building operator. Opportunities for CHP can be exploited in:

- **Mixed Use Developments**
Mixed-use developments offer good opportunities for CHP. Heat from industrial or commercial sites could be used in a district heating system whilst small groups of community buildings including shops, offices, halls and swimming pools can exploit small scale CHP. Swindon Borough Council would welcome the provision of district heating infrastructure in new and refurbished developments.
- **Large Buildings**
CHP units are well suited to large buildings, such as offices and shopping precincts and factories.
- **Hospitals and Leisure Centres**
Hospitals and leisure facilities including swimming pools are well suited to CHP as heat is required throughout the year.

- **Refurbished Buildings**
CHP schemes may be suitable in refurbished buildings where the heat produced can be sold or sent to neighbouring buildings to reduce their heating demand. Refurbished buildings could also draw on heat from neighbouring CHP schemes.
- **Town Centre Developments**
Town centre developments may particularly lend themselves to sharing heat and or electricity as the costs of infrastructure will be lower.

Micro CHP

Micro CHP is an emerging technology, which enables the benefits of combined heat and power to be made available on a much smaller, domestic scale than traditional CHP plants. It involves the replacement of a traditional boiler with a gas fired micro CHP generator, which can provide a house with all its heating needs, and significant proportion of its electricity needs. The house will remain connected to the National Electricity Grid, to supplement electricity not provided by the CHP unit, while surplus electricity generated can be sold back to the grid. The CHP boiler unit is similar in size to a standard washing machine, and can be installed in most houses.

Micro CHP can work at up to 90% efficiency, helping to reduce energy costs to the consumer and reduce carbon emissions.

Micro-Generation

Micro-generation is the production of heat and/or electricity on a small-scale from a low carbon source. It includes the generation of energy by householders installing microunits in their own homes. Various technologies can be used for micro-generation – air source heat pumps, ground source heat pumps, fuel cells, micro-CHP, micro-hydro, micro-wind, bio-energy and solar (thermal and PV(photovoltaic)).

Not all of these technologies are necessarily renewable or wholly renewable in their energy production. Micro-CHP, for example, may be connected to a network (fossil fuel) gas supply, and heat pumps require a priming electricity input, which may often be sourced from the national grid and have a fossil fuel origin. These are all decisions over which specifiers can exercise some control.

The principal benefits of micro-generation are decentralised, generally more efficient production that has the capability of:

- Reducing carbon emissions by providing low carbon sources of electricity and heat to homes and small commercial premises.
- Ensuring reliable energy supplies - reducing the load on the distribution network and transmission losses and could avoid over-dependence on energy imports.
- Promoting competitive markets - micro-generation introduces an additional aspect to the energy markets giving people a wider choice of products from which to gain their electricity and heat.

- Affordable heating for all - micro-generation is currently a more costly contributor to reducing fuel poverty than energy efficiency measures but if upfront costs can be defrayed, the lower energy bills associated with such technologies could potentially contribute to reducing fuel poverty.

Delivering and Managing Sustainable Energy Solutions

For small scale developments where micro sustainable energy technologies are used on individual buildings or dwellings, such as domestic CHP or small scale photovoltaics, these would normally be owned by the owner/occupier who would be responsible for its operation and maintenance similar to individual boiler systems. For larger developments where the development is to be served by a local community energy system, the developer would need to arrange for an Energy Services Company (**ESCO**) to design, finance, build and operate the system on a long term contractual basis. The responsibility for delivering energy services from the primary energy plant and infrastructure is invested in the ESCO once the developer has sold the properties and moved off site. The owners/occupiers of the properties would become customers of the ESCO who would meter, bill and collect revenue from the customers.

Further Information

General

Building Research Establishment
www.bre.co.uk

Energy Saving Trust
www.est.org.uk

Energy Efficiency

The Carbon Trust
www.carbontrust.co.uk

Energy Technology Support Unit (ETSU)
www.etsu.com

Centre for Sustainable Energy
www.cse.org.uk

Renewable energy

The British Wind Energy Association
www.bwea.com

Energy issues in historic areas

English Heritage
www.english-heritage.org.uk Planning Policy Guidance Note 15: Planning and the Historic Environment

5. Future proofing - Lifetime homes

Applicability	Target
Major residential developments	50% target

Introduction

The buildings designed now will come under increasing pressure in future to accommodate the demands of new uses and new users. Designing flexible buildings now, which address the impacts of climate change, can avoid the costly process of demolition and reconstruction which can put further pressure on environmental resources.

Lifetime Homes

Flexible residential design is focussed on **accessibility** and design features that make houses flexible enough to meet whatever comes along in life: a teenager with a broken leg, a family member with serious illness, or parents carrying in heavy shopping and dealing with a pushchair. Swindon Borough Council have already prepared Supplementary Planning Guidance concerning "Access for All" which will be relevant in designing flexible future development.

The Part M building regulations provide a baseline for designing for accessibility. "Lifetime homes" features supplement the requirements of building regulations and add to the built-in flexibility that make homes easy to adapt as peoples' lives change.

The lifetime homes standards are as follows:

Car Parking

1. Where car parking is adjacent to the home, it should be capable of enlargement to attain 3.3m width.

Access from Car Parking

2. The distance from the car parking space to the home should be kept to a minimum and should be level or gently sloping.

Approach

3. The approach to all entrances should be level or gently sloping.

External Entrances

4. All entrances should be illuminated, have level access over the threshold and have a covered main entrance.

Communal Stairs

5. Communal stairs should provide easy access and, where homes are reached by a lift, it should be fully accessible.

Doorways & Hallways

6. The width of internal doorways and hallways should conform to Part M, except that when the approach is not head on and the hallway width is 900mm, the clear opening width should be 900mm rather than 800mm. There

should be 300mm nib or wall space to the side of the leading edge of the doors on entrance level.

Wheelchair Accessibility

7. There should be space for turning a wheelchair in dining areas and living rooms and adequate circulation space for wheelchairs elsewhere.

Living Room

8. The living room should be at entrance level.

Two or more storey requirements

9. In houses of two or more storeys, there should be space on the entrance level that could be used as a convenient bed space.

WC

10. In houses with three bedrooms or more there should be a wheelchair accessible toilet at entrance level with drainage provision enabling a shower to be fitted in the future. In houses with two bedrooms the downstairs toilet should conform at least to Part M.

Bathroom & WC Walls

11. Walls in the bathroom and WC should be capable of taking adaptations such as handrails.

Lift Capability

12. The design should incorporate provision for a future stair lift and a suitably identified space for a through the floor lift from the ground floor to the first floor, for example to a bedroom next to the bathroom.

Main Bedroom

13. The design and specification should provide a reasonable route for a potential hoist from a main bedroom to the bathroom.

Bathroom Layout

14. The bathroom should be designed for ease of access to the bath, WC & wash basin.

Window Specification

15. Living room window glazing should begin no higher than 800mm from the floor level and windows should be easy to open/operate.

Fixtures & Fittings

16. Switches, sockets, ventilation and service controls should be at a height usable by all (i.e. between 450 and 1200mm from the floor).

Further information on "Lifetime homes" is available at www.lifetimehomes.org.uk which suggests that not only will the occupiers of homes benefit from Lifetime Homes, but so too will tax payers - to the tune of £5.5 billion over sixty years. These savings come from reduced expenditure

on adaptations and reduced need to move people to residential care. There could also be further savings in health care and re-housing costs.

Further Information

www.lifetimehomes.org.uk

www.jrf.org.uk/housingandcare/lifetimehomes/

