

# **Sustainable Development**

Supplementary Planning Document

Guidance on Sustainable Design and Construction Techniques

Draft interim version

June 2007

# **Preface**

## **Status of the document**

This guidance document is to be adopted by borough councillors as a Supplementary Planning Document (SPD), following specialist interest and public consultations. It elaborates on the Core Strategy and Development Control Policies and should be read together with the Making Places SPD. The SPD will form a material consideration to be taken into account when determining planning applications and will inform reasons for refusal, conditions and informatives applied to a permission, together with the scope of planning obligations.

Following public consultation the title of this SPD has been changed from the previous title, of Sustainable Design and Construction Guidance, to aid the clarity as to the intent and contents of the SPD.

## **Contents**

Preface

- SECTION 1 Introduction
- SECTION 2 Assessing Environmental Performance
- SECTION 3 Biodiversity
- SECTION 4 Walking, Cycling and Public Transport
- SECTION 5 Construction Methods and Site Management
- SECTION 6 Construction Materials
- SECTION 7 Energy Supply
- SECTION 8 Energy Conservation
- SECTION 9 Water Conservation and Drainage

Appendix A Core Strategy and Development Control Policies

Appendix B Chelmsford Borough Council Sustainable Design Checklist

Appendix C Examples

## SECTION I Introduction

### 1.1 A guide for planning and building practitioners

Sustainable development is an integral part of Chelmsford Borough Council's policy and practice. The purpose of this Supplementary Planning Document (SPD) is to provide practical advice on the design and construction of all new building schemes, including the refurbishment, improvement or extension of existing properties, and to promote best practice to ensure they are sustainable, i.e:

- locally resourced
- long lasting
- energy efficient
- water efficient

The guide has four functions:

**For developers** - To provide an understanding of the Council's expectations before purchasing land or devising proposals. To assist in the appraisal of development schemes and the justification of proposals, to ensure any associated costs are considered in the business case for development and that abortive design work is avoided.

**For designers** - To provide a manual to assist with designing schemes, by clarifying the standards of materials and performance expected. To assist in the preparation of the sustainable development statement.

**For council urban designers** - To provide the basis for evaluating the effectiveness of policies and interventions and assist with the preparation of site briefs.

**For development control planners** - To provide a manual to assist with determining planning applications.

### 1.2 The Scope of this document

This SPD provides assistance with those aspects of sustainable design and construction pertinent to the wider planning context in Chelmsford. It applies to the design process after the site has been selected. It addresses all types of new development, but does not address site selection or master planning (covered by the *Making Places SPD*).

This document sets out its relationship to current national assessment methods, which contain indicative measures to integrate sustainability into developments, that will apply to development sites in Chelmsford: the *Building Research Establishment Environmental Assessment Method (BREEAM)*, for non-residential buildings (Building Research Establishment, 2007) and the *Code for Sustainable Homes* (Department for Communities and Local Government, 2006c).

This SPD provides guidance on setting objectives, meeting standards, self-assessment, preparing statements and what to do to satisfy the Council's requirements. It deals with the following building design topics:

- Environmental benchmarking standards and assessment schemes
- External space and planting in relation to biodiversity
- Alternatives to the use of individual private cars
- Construction methods and site management
- The selection of construction materials
- Energy supply
- Energy use
- Water systems
- Drainage
- Waste reduction and recycling

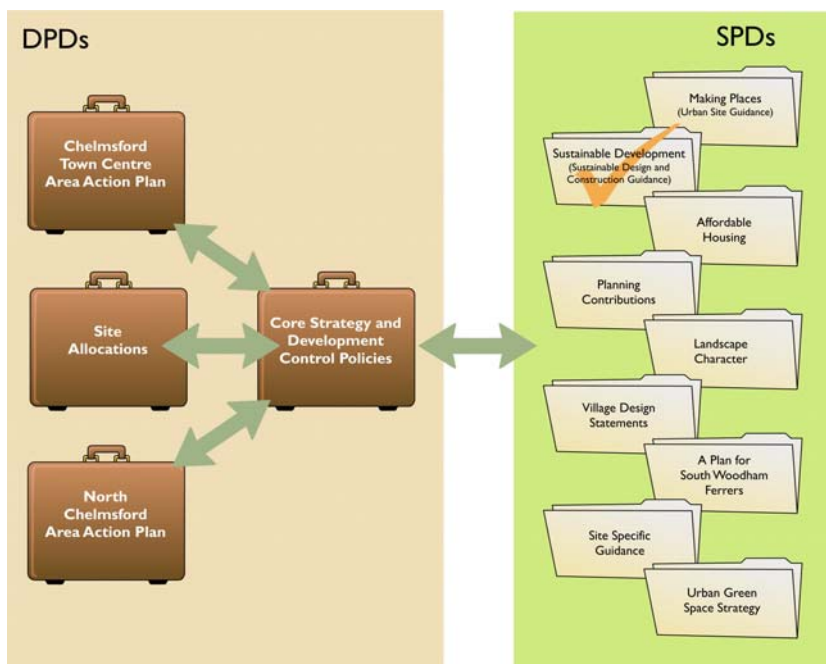
The suitability of the measures recommended in this SPD will be subject to their relation to other site planning and design considerations pertaining to the application site.

### 1.3 Policy context

The role of the planning system in shaping development with lower carbon emissions and resilient to climate change is being developed in Government policy: a Planning Policy Statement on Planning and Climate Change (December 2006 consultation paper), *Building a Greener Future: Towards Zero Carbon Development* (December 2006), *Planning for a Sustainable Future White Paper* (May 2007) and proposed changes to permitted development rights for householders in relation to microgeneration (April 2007 consultation paper). This SPD has been prepared in the context of anticipated changes to legislation and guidance that will follow.

The housing targets for the borough until 2021 represent growth at a rate of about 700 dwellings per year. Chelmsford town centre will become a more intensive 'city centre' serving the sub-region. The intended quantity of housing, together with the expected rate of delivery, the necessity for higher densities and new construction technologies, demands close attention to building design and construction for environmental sustainability, to ensure buildings have a long and useful life, with low environmental impacts. Chelmsford Borough Council is looking forward to working with developers on innovative approaches to delivering the homes required in a sustainable manner.

This guidance has been produced to support the Development Plan Documents (DPDs) comprising the Local Development Framework, which replaces the 1997 Local Plan. The Core Policies and the Development Control Policies of the LDF provide the policy foundation for sustainable development.



The document supplements the policies that inform sustainable development, ranging from spatial strategy to site planning. These are set out in Appendix A, with the relevant policies are cross-referenced in each section.

### 1.4 The built environment

Buildings make a major contribution to our quality of life. In the UK people spend on average 90% of their time in buildings, or within the built environment, at home, work or leisure activities. Buildings must not only provide the appropriate facilities for the activities they contain, but must also provide a healthy and comfortable environment for their occupants/users. The availability of external space around and close to buildings, especially homes is a major factor affecting the quality of life for the occupiers. Within the

buildings the key issues are air quality, daylight and the transmission of noise, with noise being one of the most common causes for disputes between neighbours.

#### **1.4 The impact of new building on the environment**

Design and construction choices made in Chelmsford today directly affect the environment of the east of England for many years to come. Energy use in buildings produces 46% of the UK's CO<sub>2</sub> emissions, with residential buildings accounting for the larger proportion of 27% and commercial buildings accounting for 19%. Additionally transport journeys to and from buildings account for a further 15% of the UK's CO<sub>2</sub> emissions. Construction waste accounts for 48% of the waste produced in the UK and landfill sites are rapidly diminishing. Reducing, reusing and recycling waste is therefore urgent.

Climate change caused by CO<sub>2</sub> and other greenhouse gas emissions poses the long-term risks of rising sea levels resulting in flooding. Research has predicted that the east of England will be one of the areas most affected by climate change (Tyndall Centre for Climate Change Research, 2002). Under the high emissions scenarios it is predicted that by the year 2080 rainfall in winter could be 30% higher and that rainfall in summer could be reduced by 50%. Over the same period the average summertime temperatures could increase by up to 5°C. To avoid damaging and potentially disastrous climatic change, the UK needs to cut its CO<sub>2</sub> emissions by 60% by the year 2050 (The Royal Commission on Environmental Pollution 2000 & DTI).

#### **1.5 The importance of sustainable development for health and wellbeing**

The health and wellbeing of people living or working in, or visiting, developments, is not simply a matter of providing landscaped spaces. Such spaces and the ability to see and hear the wildlife that colonises them has a psychologically beneficial effect on people; but their health and wellbeing is also affected by disturbance arising from air, ground or water contamination, noise, or obstruction to walkways and roadways, resulting from construction work; and the air quality for them within buildings, which can be affected by the chemicals used in the manufacture of materials used in the construction, fitting out and furnishing of buildings. Climate change will result in increased summer temperatures and an increase in intensity of rainfall will result in increased flooding, therefore developments should be designed and constructed to mitigate the effects of the changing climatic conditions.

#### **1.6 A shared public and private responsibility**

Central and regional Government are responsible for the formulation of strategies for energy consumption, the use of resources and development standards for industry, whilst local planning authorities seek to locate development on sites with effective transport links, close to local amenities, away from sensitive and inappropriate locations, in relation to people and habitats. It is the developers of individual developments that cumulatively determine whether resources and energy are used efficiently or wastefully and whether buildings will continue to be well suited to their purpose and are environmentally friendly over the lifetime of the building. Strategic issues pertaining to sustainable building, energy and resource use are addressed at the global, international or national level, in support of which the Council adopts local policies.

#### **1.7 The benefits of sustainable design and construction**

Through the application of these guidelines, developers and the Council together can minimise the damaging impact resulting from development and produce positive benefits for the environment.

##### **Potential benefits for the community include:**

- employment for local people
- the use of local materials
- improved air quality
- less pressure on refuse services.

##### **Potential benefits for the developer include:**

- the easier progress of planning and building regulations applications

- reduced landfill tax
- reduced aggregates tax
- reduced climate change levy
- increased resource efficiency
- popularity of developments amongst an environmentally aware public.

**Potential benefits for occupiers include:**

- lower maintenance costs
- lower running costs
- good natural ventilation
- well lit rooms
- good development value resulting from the demand for sustainable homes.

**1.8 Planning and building construction**

Of those issues that lie within Chelmsford Borough Council’s remit not all are planning matters. Therefore this SPD should be read alongside other Council documents and the design of developments should address all the environmental and sustainability issues collectively and holistically, whether they are planning matters or not. The Building Regulations establish minimum performance criteria for buildings, which the Government directly, and through the Building Research Establishment, encourages developers to exceed. In accordance with this aspiration this document requires developers to plan developments to exceed the minimum requirements under the Building Regulations. The Government plans to raise the level of the standards required under the Code for Sustainable Homes in 2010, 2013 and 2016, therefore this SPD should be reviewed at those times to incorporate changes in Government policy.

**1.9 Securing sustainable performance through planning permission**

The objectives set out in this guidance will be met through a combination of client specification, market demand, Building Regulations and rigorous design. Some can be secured by the Council through planning permissions by the following means: submitted drawings plus statements of intent forming part of the approved application, conditions attached to a permission, planning obligation agreements, and informatives providing further information and guidance.

**1.10 Related design guidance**

Those aspects of sustainable development relating to site design are addressed in the *Making Places: Site Guidance for Designers, Developers and Planners* SPD which should be read in conjunction with this SPD. Sustainable development includes the careful consideration of site location, managing flood risk, re-using brownfield and often contaminated land, proximity to good public transport, employment opportunities, shops and other facilities, reducing journeys by private car and thereby, the resultant air pollution and carbon dioxide (CO<sub>2</sub>) emissions. It is important that new developments complement the existing Chelmsford communities in terms of building type, materials and layout, to ensure they respect and fit in with their surroundings, producing places which people want to live in, work in or visit. The buildings themselves should be designed to be robust, ensuring adequate flexibility to accommodate alternative future uses, with homes designed in accordance with the Lifetime Homes scheme.

**1.11 Sustainability objectives for all developments in Chelmsford**

The following objectives identify the matters that should be pursued in all building projects to attain the most sustainable outcome. Throughout this SPD specific actions will be identified to guide developers in fulfilling the objectives.

Developments should be designed and constructed to:

ASSESSING ENVIRONMENTAL	<ul style="list-style-type: none"> <li>• optimise the performance of development proposals by assessment against objective sustainability criteria</li> </ul>
-------------------------	---

PERFORMANCE (SECTION 2)	
BIODIVERSITY (SECTION 3)	<ul style="list-style-type: none"> <li>• protect and maintain indigenous flora and fauna, together with the soil, water and air resources supporting them and wherever possible enhance these natural assets.</li> <li>• constructed to nurture a diverse ecology in and around the site through the creation of new wildlife habitats and measures to improve conditions for species to inhabit or feed.</li> </ul>
WALKING, CYCLING AND PUBLIC TRANSPORT (SECTION 4)	<ul style="list-style-type: none"> <li>• provide opportunities and facilities for the occupants and users of developments to reduce their use of private fossil-fuel powered vehicles, by the occupants and users of the development, thereby reducing carbon emissions.</li> </ul>
CONSTRUCTION METHODS AND SITE MANAGEMENT (SECTION 5)	<ul style="list-style-type: none"> <li>• ensure that building construction methods are suitably robust in long-term use and the predicted changes to climatic conditions.</li> <li>• ensure construction methods do not expose those installing the materials or maintaining the premises to health risks.</li> <li>• ensure that building construction practises are not harmful or create a nuisance to the environment, the workforce and the general public.</li> <li>• minimise and recycle waste during construction, during operation and upon demolition and ensure they are readily adaptable to future needs.</li> </ul>
CONSTRUCTION MATERIALS (SECTION 6)	<ul style="list-style-type: none"> <li>• ensure that materials selected are sustainable and fit for purpose at the time of selection and will continue to perform as intended throughout the lifetime of the building in changing climatic conditions and require minimum energy levels in their manufacture and transportation.</li> <li>• reduce waste, the selection of materials for a development should include the reuse of existing materials on site and the use of reclaimed or recycled materials; and the selection of materials considering their future disposal at the end of their life, selecting as a preference those that have the ability to be reused or recycled.</li> </ul>
ENERGY SUPPLY (SECTION 7)	<ul style="list-style-type: none"> <li>• provide new developments with electricity generated from renewable sources</li> <li>• provide heating for developments from renewable sources.</li> <li>• provide heating for developments from efficient sources.</li> </ul>
ENERGY USE (SECTION 8)	<ul style="list-style-type: none"> <li>• reduce the demand for energy consumption for space and water heating, all new buildings should be designed to include energy efficiency measures to harness the heating properties of sustainable resources to provide heating and to retain heat.</li> <li>• reduce the demand for energy consumption to ventilate and cool buildings.</li> <li>• reduce the energy demand for lighting whilst ensuring adequate lighting is maintained for the activities to be undertaken within the buildings.</li> <li>• fit/supply appliances in buildings that are energy efficient to reduce carbon dioxide emissions and that should not cause excessive heating within the building.</li> </ul>
WATER SYSTEMS AND DRAINAGE (SECTION 9)	<ul style="list-style-type: none"> <li>• encourage the reduced demand for potable water within developments through the collection and recycling of water and the use of water efficient appliances.</li> <li>• ensure the discharge of surface water from sites into the river and drainage systems does not exceed the existing conditions and in the case of brownfield sites reduces the existing volumes and rates; and in all cases minimising discharge volumes and rates; reduced physical</li> </ul>

damage to the beds and banks of watercourses; reduce the recharge of groundwater; and reduce the risk of pollution, in particular diffuse pollution.

**Definitions:**

*Sustainable* To keep going continuously without exhaustion.

*Sustainable development* The Brundtland Commission in 1987 defined this as "meeting the needs of the present without compromising the ability of future generations to meet their own needs".

**References:**

Building Research Establishment, 2007. Building Research Establishment Environmental Assessment Method. [www.breeam.org](http://www.breeam.org)

Chelmsford Borough Council, 2007. Making Places (Site Guidance for Designers, Developers and Planners) Supplementary Planning Document. Chelmsford: Chelmsford Borough Council.

Department for Communities and Local Government, 2006a. Consultation Planning Policy Statement: Planning and Climate Change Supplement to Planning Policy Statement 1. London: Department for Communities and Local Government.

Department for Communities and Local Government, 2006b. Consultation Building a Greener Future: Towards Zero Carbon Development. London: Department for Communities and Local Government.

Department for Communities and Local Government, 2006c. Code for Sustainable Homes A step change in sustainable home building practice. London: Department for Communities and Local Government.

Department for Communities and Local Government, 2007a. Changes to Permitted Development Consultation Paper 1: Permitted Development Rights for Householder Microgeneration. London: Department for Communities and Local Government.

Department for Communities and Local Government, 2007b. Planning for a Sustainable Future White Paper. London: Department for Communities and Local Government.

Royal Commission on Environmental Pollution, 2000. Energy - The Changing Climate - Royal Commission on Environmental Pollution 22nd Report. Norwich: The Stationery Office.

Tyndall Centre for Climate Change Research, 2002. Climate Change Scenarios for the United Kingdom: The UKCIP02 Report. Norwich: University of East Anglia.

## SECTION 2      Assessing Environmental Performance

CP 1, 11, 13, 21      DC 26, 27

This section addresses how to assess and record the performance of development proposals in order to review and improve their design.

### Objective:

- Building design and construction achieving optimal performance and minimum environmental impact, as assessed against objective sustainability criteria.

### 2.1. General

The Building Research Establishment has established an Environmental Assessment Method (BREEAM) for non-residential buildings. In December 2006, the Government introduced the Code for Sustainable Homes, an environmental assessment method for residential developments. The assessment methods seek to minimise the adverse effects of new buildings on the environment at global and local scales, whilst promoting healthy indoor conditions for the occupants. The environmental implications of a new building are assessed at the design stage and are compared with good practice by independent assessors.

The topics assessed under both methods include:

- energy and carbon dioxide emissions
- potable water consumption
- materials
- surface water run-off
- waste and recycling
- pollution
- health and well-being
- management
- ecology.

BREEAM also covers land use and transport.

For **non-residential** buildings an overall assessment of the building's performance is awarded a rating of Pass, Good, Very Good or Excellent, based on the total number of BREEAM criteria met and their respective environmental weighting.

For **residential** buildings a rating of Level 1, 2, 3, 4, 5 or 6 is awarded under the Code for Sustainable Homes. A 'Level 3' rating under the Code for Sustainable Homes is broadly similar to a BREEAM rating of 'Very Good'.

The Code for Sustainable Homes and BREEAM assessment methods offer a range of benefits for developers, which the Council wishes to support, including:

- *Demonstrating compliance:* with environmental requirements from occupiers, planners, development agencies and developers
- *Environmental improvement:* in support of a wider corporate strategy or as a stand-alone contribution
- *Occupant benefits:* to create a better place for people to work and live
- *Marketing:* as a selling point to potential tenants or customers
- *Financial:* to achieve higher rental incomes and increased building efficiency
- *Best practice:* to provide a thorough checklist or tool for comparing buildings
- *Client request:* responding to the requirements of users

BREEAM and The Code for Sustainable Homes are sophisticated assessments that require commitment and expertise from the developer. The Council accepts that the location of some sites may hinder the attainment of the highest standards under the BREEAM assessment method, in which case the developer must demonstrate why the desired rating cannot be attained and that in all other respects the standards are met.

The assessment of developments under the above methods is voluntary but the government encourages developers to have their development proposals assessed and to exceed the minimum performance standards required under Building Regulations. The Council, like other planning and development agencies, will use these assessments to understand the environmental performance of proposals in a manner that is quick, comprehensive and relevant to the determination of planning applications.

The Council is keen to promote a higher standard of sustainable construction than is currently in force under the Building Regulations. The council believes this will encourage an earlier change in attitudes from both developers and the public to the supply of energy-saving new homes and thus contribute to sustainability overall, as is being promoted by the government. Until this is a mandatory part of the planning regime, or is dealt with by upgrading of the Building Regulations, the council will pursue higher standards in the Borough.

## 2.2. The Chelmsford sustainability checklist for planning applications

The Council wishes to promote and monitor sustainability through its own assessment checklist, the purpose of which is fourfold:

- self-assessment, to prompt developers and designers to improve schemes.
- a means of recording and publicising the sustainability credentials of developments receiving planning permission.
- a means of demonstrating that the scheme will attain a minimum rating of ‘Very Good’ under the BREEAM assessment scheme, or ‘Level 3’ under the Code for Sustainable Homes.
- a means of applying conditions to ensure the desired standards are attained.

Set out in Appendix B is the Council’s Sustainability Checklist that developers should complete and discuss with planning officers at the pre-application stage, with the finalised completed form submitted with the planning application.

The appraisal of the sustainability issues relating to a proposed development, based on the information supplied by the applicant, will inform the decision-making process of Planning Officers when determining planning applications, for new building, refurbishment, extensions or other works on a site and will be reported to the Planning Committee.

The design of a sustainable building alone will not be sufficient reason to grant planning permission. The design of the building will also be required to fully address all the other planning considerations pertinent to the development.

To achieve these:	Undertake these:
All new <i>non-residential</i> developments within the Borough to be assessed using BREEAM and attain a minimum rating of ‘Very Good’.	Appoint a BREEAM assessor at the outset of the scheme.
	Provide the results of a Pre-Assessment Estimator during pre-application discussions and submit to the Council along with the Council’s checklist when making a planning application for the development.
	Submit the BREEAM certificate at the completion of the development, in line with planning conditions.

All new <b>housing</b> developments within the Borough to be assessed using the Code for Sustainable Homes and attain a minimum rating of 'Level 3'.	Appoint a Code for Sustainable Homes assessor t the outset of the scheme.
	Provide the results of a Design Stage Assessment during pre-application discussions and submit to the Council along with the Council's checklist when making a planning application for the development.
	Submit the Code for Sustainable Homes certificate at the completion of the development in line with planning conditions.
All building <b>refurbishment projects and extensions</b> to attain the highest standards of sustainability possible in their design, in excess of the Building Regulations, attaining a minimum 'Very Good' rating under the BREEAM or a 'Level 3' rating under the Code for Sustainable Homes assessment levels, as far as possible.	<ul style="list-style-type: none"> <li>• Submit the designs for the buildings for assessment under the BREEAM or Code for Sustainable Homes schemes as appropriate.</li> <li>• Provide the results of a Pre-Assessment Estimator during pre-application discussions and submit to the Council along with the Council's checklist when making a planning application for the development.</li> <li>• The Code for Sustainable Homes and/or BREEAM certificate/s should be submitted to the Council at the completion of the development in line with planning conditions.</li> </ul>

**Intended planning conditions to secure the objectives and informatives:**

**Planning conditions and informatives will be added after the Standard Planning Conditions have been revised and approved.**

**References:**

Building Research Establishment, 2007. Building Research Establishment Environmental Assessment Method. [www.breeam.org](http://www.breeam.org)

Brundtland Commission, 1987. Our Common Future. Oxford: Oxford University Press.

Department for Communities and Local Government, 2006c. Code for Sustainable Homes A step change in sustainable home building practice. London: Department for Communities and Local Government.

**Example:**

**Upton Green, Northampton**

**Contacts:**

Further details on all the BREEAM schemes can be obtained from The Building Research Establishment  
[products.bre.co.uk/breeam/index.html](http://products.bre.co.uk/breeam/index.html)  
[products.bre.co.uk/breeam/ecohomes.html](http://products.bre.co.uk/breeam/ecohomes.html)

Further details on all the Code for Sustainable Homes can be obtained from the Department for Communities and Local Government  
[www.communities.gov.uk](http://www.communities.gov.uk)

Miller Homes, [www.millerhomes.co.uk](http://www.millerhomes.co.uk)

## SECTION 3 Biodiversity

CP 1, 9, 13, 14

DC 2, 10, 11, 15, 18, 46, 60

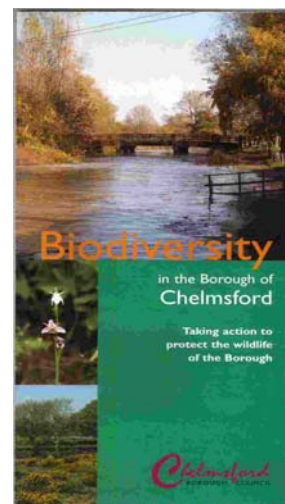
### 3.1. General

This section provides guidance on designing and constructing development to respect local flora and fauna, together with the soil, water and air required to support them, and wherever possible enhance these biodiversity assets or create new habitats to maintain and strengthen the ecological balance that ensures a healthy natural environment.

The ability to see landscaped spaces and see and hear the wildlife that colonises these areas has been demonstrated to have a psychologically beneficial effect on the health and wellbeing of people. The retention of existing and creation of new wildlife habitats within and around a development increases the quality of places for residents and visitors.

### 3.2. Local habitats

Chelmsford Borough Council (2002) has developed a Biodiversity Action Plan “to ensure the long-term survival of the biodiversity within the Borough and to seek opportunities to increase the amount of suitable habitat by improving the management of existing areas and seeking habitat creation where appropriate”. The UK Biodiversity Action Plan identifies 45 habitats and 391 species requiring action plans for their protection; the Essex and Chelmsford Biodiversity Action Plans identify the following as “the Chelmsford Flagship Species”, or habitats and species in decline in the Chelmsford area or otherwise requiring protection:



Chelmsford protected habitats:	Chelmsford protected species:	
<ul style="list-style-type: none"> <li>• ancient woodland.</li> <li>• ancient/species rich hedgerows</li> <li>• old orchards</li> <li>• old ‘veteran’ trees</li> <li>• ancient unimproved grassland</li> <li>• lowland meadows</li> <li>• lowland heathland</li> <li>• lowland wood pasture and parkland</li> <li>• floodplain grazing marsh</li> <li>• coastal grazing marsh</li> <li>• reedbeds</li> <li>• coastal saltmarsh</li> <li>• rivers and streams</li> <li>• ponds</li> <li>• urban habitats</li> </ul>	<ul style="list-style-type: none"> <li>• common spotted orchid</li> <li>• heath fritillary</li> <li>• oxlip</li> <li>• hog’s fennel</li> <li>• native black poplar</li> <li>• song thrush</li> <li>• skylark</li> <li>• grey partridge</li> <li>• stone curlew</li> <li>• bittern</li> <li>• European otter</li> <li>• dormouse</li> </ul>	<ul style="list-style-type: none"> <li>• water vole</li> <li>• brown hare</li> <li>• Pipistrelle bats</li> <li>• great crested newt</li> <li>• stag beetle</li> <li>• Desmoulins’ whorl snail</li> <li>• shining ramshorn snail</li> <li>• white admiral butterfly</li> <li>• bright wave moth</li> <li>• shrill carder bee</li> <li>• hornet robberfly</li> <li>• white clawed crayfish</li> <li>• Allis &amp; Twaite Shad</li> </ul>

#### Definition:

**Biodiversity** Short for ‘biological diversity’. Biodiversity encompasses the diversity and richness of all living things, from human beings to micro-organisms, the diversity of all the habitats in which they live and the genetic diversity of individuals within species. No one organism lives in isolation; the different ways the millions of organisms on the earth interact with each other contributes to the balance of the global ecosystem and survival of the planet.

**Biodiversity Action Plan** A plan to identify species and habitats at risk within a specific area and identify measures for their protection.

### 3.3. Protection and Maintenance of Existing Habitats and Species

**Objective:**

- Development designed and constructed to protect and maintain indigenous flora and fauna, together with the soil, water and air resources supporting them and wherever possible enhance these natural assets.

The powers to ensure the safeguarding of habitats and species lie within the Wildlife and Countryside Act 1981 and subsequent amendments, to protect designated areas and state policies for non-designated areas. The Chelmsford Biodiversity Action Plan identifies specific issues as set out in section 3.1 above.

PPS9 *Biodiversity and Geological Conservation* states:



‘The aim of planning decisions should be to prevent harm to biodiversity and geological conservation interests. Where granting planning permission would result in significant harm to those interests, local planning authorities will need to be satisfied that the development cannot reasonably be located on any alternative sites that would result in less or no harm. In the absence of any such alternatives, local planning authorities should ensure that, before planning permission is granted, adequate mitigation measures are put in place. Where a planning decision would result in significant harm to biodiversity and geological interests that cannot be prevented or adequately mitigated against, appropriate compensation measures should be sought. If that significant harm cannot be prevented, adequately mitigated against, or compensated for, then planning permission should be refused,’ and:

‘The re-use of previously developed land for new development makes a major contribution to sustainable development by reducing the amount of countryside and undeveloped land that needs to be used. However, where such sites have significant biodiversity or geological interest of recognised local importance, local planning authorities, together with developers, should aim to retain this interest or incorporate it into any development of the site.’



To achieve these:	Undertake these:
Compliance with the Wildlife and Countryside Act 1981 and all subsequent amendments.	Familiarise yourself with the legislation and PPS9
Protection for: <ul style="list-style-type: none"> <li>• the species and habitats identified in the UK, Essex or Chelmsford Biodiversity Action Plans as the ‘Chelmsford Flagship Species’,</li> <li>• habitats and species in decline,</li> <li>• other important habitats or species requiring protection,</li> <li>• bird species and their habitats listed in the ‘Red List’ of bird species.</li> </ul>	Undertake a preliminary desk study to check for the presence within or close to the development site of internationally, nationally or locally designated wildlife, or geological sites, or landscaped areas, BAP priority habitats and protected BAP priority species.
The protection in situ of:	Undertake, at the earliest opportunity, an ecological survey of

<ul style="list-style-type: none"> <li>• other habitats supporting species identified as being of major importance to the international, national, regional or local biodiversity,</li> <li>• bird species and their habitats listed in the 'Orange List' of bird species.</li> </ul>	<p>the site, at an appropriate number of frequencies and at the appropriate times of day and year, for the species known to exist, or anticipated to be found, on the site.</p>
<p>The protection in situ of</p> <ul style="list-style-type: none"> <li>• other habitats supporting species of importance to local biodiversity.</li> </ul>	<p>Use the ecological survey to determine the available developable site area and the site layout, retaining in situ any valuable habitats or species identified.</p> <p>Design the site layout to ensure there is no disturbance or damage to any valuable habitats or species identified, during construction or the future occupation of the premises.</p> <p>Design the site layout to prevent breaks in 'corridor' habitats.</p> <p>Prepare appropriate management and maintenance regimes for the habitats and/or species being retained on the site.</p> <p>Prepare and implement approved mitigation measures for the relocation of existing valuable habitats or species that cannot be retained in situ.</p> <p>In the landscape design strategy, provide buffer zones on or adjacent to the development site, to protect vulnerable habitats or species from human activity and resultant stress.</p> <p>Protect existing habitat features being retained, including hedgerows and trees, on or adjacent to the site during construction by the erection of protective fencing in accordance with BS 5837:2005 Guide for trees in relation to construction.</p> <p>Retain topsoil from the site for reuse on the site to retain the micro-organisms and seed bank indigenous to the site.</p>

**Intended planning conditions to secure the objectives and informatives:**

**Planning conditions and informatives will be added after the Standard Planning Conditions have been revised and approved.**

**3.4 The Enhancement of Existing and Creation of New Wildlife Habitats**

**Objective:**

- Development designed and constructed to nurture a diverse ecology in and around the site through the creation of new wildlife habitats and measures to improve conditions for species' to inhabit or feed.

<b>To achieve these:</b>	<b>Undertake these:</b>
<p>Extend wildlife habitats that exist on or adjoining the site.</p>	<p>Plan extensions to existing habitats within the site layout and landscape strategy, by the construction of new habitats as appropriate, water features, wetlands, meadows, hedgerows, edge communities or woodland, as appropriate.</p>
<p>Protect vulnerable habitats or species from</p>	<p>Within the landscape strategy, provide buffer zones on or</p>

human activity and resulting stress.	adjacent to the site, for vulnerable habitats.
Establish unimpeded links between existing wildlife habitats, on or adjoining the site, to aid the migration and feeding of small species.	Create links between existing and/or new habitats within the site layout, by the construction of new habitats as appropriate, water features, wetlands, meadows, hedgerows, edge communities or woodland, as appropriate.
Establish conditions for new wildlife habitats on the development site.	Use native species of trees, shrubs and herbaceous plants in planting schemes on development sites, as they offer the greater potential for feeding and breeding by indigenous invertebrates, birds and animals and therefore are better suited to the creation of healthy and vibrant new habitats.
	Provide plant species that are specific food crops or encourage species that are food sources for specific species that live on or adjacent to the site, or are to be encouraged to the site.
	Reuse on site the topsoil excavated from the site in order to retain the micro-organisms and seed bank indigenous to the site.
	Design green roofs for buildings - a roof that is partially or completely covered with a waterproof membrane and soil or other growing medium, planted with vegetation.
	Design brown roofs for buildings – a flat roof covered with a thin layer of crushed rubble and gravel, ideally obtained at minimal cost from the redevelopment site itself, intended to be gradually colonised by spiders and insects to provide a feeding site for insectivorous birds.
	Create nesting and roosting opportunities for wildlife in the design of the buildings.
	Use sustainable urban drainage techniques to create features such as balancing ponds and streams that can be designed, constructed and planted to create wildlife habitats.

#### Intended planning conditions to secure the objectives and informatives:

<b>Planning conditions and informatives will be added after the Standard Planning Conditions have been revised and approved.</b>	
<b>Definitions:</b>	
<i>Ecosystem</i>	Short for 'ecological system'. An ecosystem is the combination of all the living and non-living elements of an area and can range in scale from a puddle to a rain forest.
<i>Indigenous</i>	Plants and/or animals with origins in a particular location e.g. the British Isles.
<i>Invertebrates</i>	Animals that do not have a backbone.
<i>Native species</i>	Those which would naturally have been found growing or living in a locality, without introduction by human beings.
<i>Sustainable drainage</i>	Retention of rainwater on site and its slow release into the river and/or drainage systems.

<b>References:</b>
British Standards Institution, 2005. <u>BS 5837:2005 Guide for trees in relation to construction.</u> . London: British Standards Institution.

Chelmsford Borough Council, 2002. Biodiversity Action Plan for the Borough of Chelmsford 2002/07. Chelmsford: Chelmsford Borough Council.

Essex Biodiversity Project. [www.essexbiodiversity.org.uk](http://www.essexbiodiversity.org.uk). Colchester: Essex Biodiversity Project.

Essex Biodiversity Project, 2007. Integrating Biodiversity into Development – a Guide for Planners and Developers in Essex, Southend and Thurrock. Colchester: Essex Biodiversity Project.

Her Majesty's Stationary Office, 1981. Wildlife and Countryside Act 1981. London: Her Majesty's Stationary Office Publications Centre.

Office of the Deputy Prime Minister, 2005. PPS9 Biodiversity and Geological Conservation. London: The Stationary Office.

Royal Society for the Protection of Birds, 2002. The Population Status of Birds in the UK – Birds of Conservation Concern 2002-2007. Sandy: Royal Society for the Protection of Birds.

The UK Biodiversity Partnership, 2007. [www.ukbap.org.uk](http://www.ukbap.org.uk). The UK Biodiversity Partnership.

### **Examples:**

**Upton Green, Northampton**

### **Contacts:**

The Arboricultural Association, Ampfield House, Romsey, Hampshire, SO51 9PA. Tel. 01794 368717. [www.trees.org.uk](http://www.trees.org.uk)

Biological Records Initiative for Essex, Essex County Council, County Hall, Market Road, Chelmsford, CMI 1QH.

EarthShip Brighton, [www.lowcarbon.co.uk/eb.html](http://www.lowcarbon.co.uk/eb.html)

The Essex Biodiversity Project, The Joan Elliot Visitor Centre, Abbots Hall Farm, Great Wigborough, Colchester, Essex, CO5 7RZ. [www.essexbiodiversity.org.uk](http://www.essexbiodiversity.org.uk)

The Essex Wildlife Trust, Abbots Hall Farm, Colchester, CO5 7RZ. Tel. 01621 862960. [www.essexwt.org.uk/Graham/welcome.htm](http://www.essexwt.org.uk/Graham/welcome.htm)

Natural England, Essex Hertfordshire & London Team, Colchester Office, Harbour House, Hythe Quay, Colchester, Essex, CO2 8JF. Tel. 01206 796666. [www.english-nature.org.uk/default.asp](http://www.english-nature.org.uk/default.asp)

Miller Homes [www.millerhomes.co.uk](http://www.millerhomes.co.uk)

## SECTION 4 Walking, Cycling and Public Transport

CP 1, 8, 13, 19,

DC 7, 8, 30

### Objective:

- To encourage developers to provide opportunities and facilities for the occupants and users of developments to reduce their use of private fossil fuel powered vehicles, thereby reducing carbon emissions.

#### 4.1. General

The Council wishes to encourage a greater number of people to undertake more journeys utilising means of transport other than the private car - by public transport, cycling and walking, especially for short journeys, to reduce carbon emissions from unnecessary car journeys. The foremost consideration relating to sustainable travel is location and proximity to essential services - matters which are addressed in *Making Places* site guidance SPD. Modifying travel habits and reducing car journeys remains a primary issue for sustainable places.

Providing fewer parking spaces is only an option if residents accept the principle of not keeping a car at home, or if parking is strictly controlled on surrounding streets. Reduced parking demands parallel incentives to use public transport, walking and cycling, and developers should demonstrate enlightened and viable means to promote these lifestyle choices. The preparation of a green travel plan in connection with all substantial new development is an increasingly important duty for the developer. Proposals, however must not be in conflict with the Council's parking policy, current at the time of development.

For those journeys that need to be made by private car, the Council will encourage and support alternatives to personal private car ownership and use, through rigorously thought-out schemes that secure the buy-in of residents, such as car clubs and car sharing initiatives. The provision of such



Reserved Car Club Parking, Finsbury Square, London

schemes can increase efficiency of land use in highly accessible locations.

The reduction of car journeys will be beneficial to the health and wellbeing of people. Such benefits will also be attained by walking or cycling, resulting in a less sedentary lifestyle and increased fitness levels.

A reduction in carbon emissions from exhaust fumes will improve air quality for the benefit of all people living in, working in, or visiting the borough. The Council's Air Quality Action Plan will set out the means to improve air quality in those parts of the borough with the greatest risk of pollution.

### Definitions:

<i>Carbon emissions</i>	Carbon released into the atmosphere as carbon dioxide when a carbon based fossil fuel is burned to provide energy or heat.
<i>Car clubs</i>	Schemes organised by developers whereby the developer provides a pool of cars that the residents of the development can book for their own use.
<i>Car free developments</i>	Those where there are either no parking spaces or less than 1 parking space per dwelling.

<i>Fossil fuel</i>	Coal, oil, petroleum and gas, which have been formed from the organic remains of prehistoric plants and animals.
<i>Green travel plans</i>	A travel plan is a package of measures designed to reduce car driving, particularly single occupancy car journeys and promote alternative sustainable means of travel.

<b>To achieve these:</b>	<b>Undertake these:</b>
Promote the provision and use of alternative modes of transport in residential developments.	Prepare green travel plans to facilitate the use of other modes of travel.
	Provide residents with bicycles, stored in convenient secure storage.
	Offer all residents and/or occupiers with an annually renewable free or heavily discounted public transport pass, through a partnership with the Local Highway Authority.
Enable reduced car parking or car free residential developments in appropriate locations	Assess the safe walking distance to essential transport and services (see also <i>Making Places SPD</i> ): Suitable locations are those within: a) a 10 minute walk (approximately 800m) of Chelmsford bus/rail station or the town sign (junction of High Street and Springfield Road, the nominal centre of the Primary Shopping Area) b) a 5 min walk (approximately 400m) of Market Square South Woodham Ferrers, or a principle neighbourhood centre c) a one minute walk (approximately 80m) from a main bus route (see <i>Making Places: Site Guidance for Designers, Developers and Planners SPD</i> ).
Securing the buy-in of occupants, to guarantee commitment to reduced car use	Include covenants in the title deeds, sale contracts and rental agreements, whereby occupants are precluded from parking private cars within the development.
Improve air quality in traffic congested areas	If the location is suitable, additional consideration should be given to the provision of vehicle free developments within or adjacent to Air Quality Management Areas.
	Parking for non-fossil fuel powered vehicles only as a condition of buy-in.
Promote car sharing and reduce the number of vehicles associated with a development.  Encourage use of cars for essential needs only to reduce the dependence on private cars for individual travel.	Propose a car club, car pool or similar car sharing scheme for residential developments:  Research best practice, produce a business plan, devise operational rules, and devise long term guarantees for the scheme. Submit with planning application.  Cars provided by a car sharing scheme operator should preferably not produce carbon emissions in the form of exhaust gases.  Further information can be obtained from National Car Sharing.

**Intended planning conditions to secure the objectives and informatives:**

**Planning conditions and informatives will be added after the Standard Planning Conditions have been revised and approved.**

**References:**

Chelmsford Borough Council, 2006. Making Places Site Guidance for designers, developers and planners Supplementary Planning Document. Chelmsford: Chelmsford Borough Council.

Essex Planning Officers Association, 2001. Vehicle Parking Standards. Essex: Essex Planning Officers Association.

**Examples:**

**BedZed, Helios Road, Wallington, Surrey**

**Gorgie Project, Edinburgh**

**311-313 Trinity Road, Wandsworth, London SW17**

**Contacts:**

BedZed, [www.peabody.org.uk/pages/GetPage.aspx?id=179](http://www.peabody.org.uk/pages/GetPage.aspx?id=179)

Car free developments in London [www.carfreehousing.org](http://www.carfreehousing.org)

Car Plus [www.carplus.org.uk](http://www.carplus.org.uk)

City Car Club [www.citycarclub.co.uk](http://www.citycarclub.co.uk)

Essex Car Share [www.essexcarshare.com](http://www.essexcarshare.com)

Gorgie Project, Edinburgh, [www.eltis.org/studies/74e.htm](http://www.eltis.org/studies/74e.htm)

Street Car [www.streetcar.co.uk](http://www.streetcar.co.uk)

Trinity Road, Wandsworth  
[www.servitehouses.org.uk/Find+a+Home/Home+Ownership/Trinity+Road.htm](http://www.servitehouses.org.uk/Find+a+Home/Home+Ownership/Trinity+Road.htm)

National Car Sharing [www.nationalcarsharing.co.uk](http://www.nationalcarsharing.co.uk)

Whizz Go [www.whizzgo.co.uk](http://www.whizzgo.co.uk)

## SECTION 5 Construction Methods and Site Management

CP 1, 7, 11, 13, 21

DC 26, 38

Construction site matters are addressed through presenting development schemes for assessment under the BREEAM or Code for Sustainable Homes assessment schemes, as well as the Building Regulations. But development design is closely allied to proposed building method and therefore some building sustainability issues can be identified at the planning application stage. Waste management is addressed through presenting development schemes for assessment under the BREEAM or Code for Sustainable Homes assessment schemes. The advice in this section illustrates some of the issues for developers.

### Objectives:

- To help ensure that building construction methods do not have adverse environmental impacts, are suitably robust in long-term use and against the predicted changes to climatic conditions.
- To help ensure construction methods do not expose those installing the materials, or those maintaining the premises, to health risks and that building construction practises do not harm the environment or create a nuisance to the workforce and the general public.
- Developments and buildings should be designed and constructed to minimise and recycle waste during construction, during operation and upon demolition and ensure they are readily adaptable to future needs.

### 4.1. General

The construction period has a significant environmental and amenity impact. This section advises on ensuring the construction methods employed minimise the various forms of on and off-site environmental damage and nuisance arising from construction works; and do not expose those installing the materials, maintaining them later, occupying the premises, living adjacent to the development, or the natural environment, to noise, obstruction, health risks, disturbance or nuisance from air, ground or water contamination, as new development is largely undertaken adjacent to existing communities, of residents and workers. Operating within the Considerate Constructors Scheme should become standard practice and it is for developers to ensure the contractor operates responsibly.

Designers should consider the type of construction, whether traditional building, system building, the amount of in-situ work or off site manufacture in terms of resource efficiency as well as speed and cost.

Developers should employ contractors who utilise construction methods that are not detrimental to the health of the operatives undertaking the works, or the environment including site neighbours.

### 4.2. Health & wellbeing issues

The health and wellbeing of construction workers and existing neighbouring communities can be protected through the minimisation of disturbance arising from air, ground or water contamination, noise, or obstruction to walkways and roadways.

To achieve these:	Undertake these:
The use of sustainable construction methods.	Use construction methods accredited with the BRE's Green Guide to Specification 'A' rating standard.
	Ensure that construction methods: <ul style="list-style-type: none"> <li>• are appropriate for the climatic conditions predicted for the next 100 years</li> <li>• pertaining at the time of construction</li> <li>• are robust against changing use and occupancy of the building</li> </ul>

	<ul style="list-style-type: none"> <li>• have a minimum 'whole life' cost, ensuring: <ul style="list-style-type: none"> <li>• structural integrity</li> <li>• the use of sustainable sources</li> <li>• minimum travel distances for plant, labour and materials</li> <li>• low energy needs in construction</li> <li>• low levels of waste production</li> <li>• adaptable work for alteration and extension</li> <li>• no emissions from the manner of construction</li> <li>• no health risks to labourers undertaking the works</li> </ul> </li> </ul>
The prevention of pollution and nuisance arising from the construction works.	<ul style="list-style-type: none"> <li>• Undertake protective methods in accordance with the Considerate Constructors Scheme.</li> <li>• Employ all necessary mitigation measures to prevent nuisance arising from the works.</li> <li>• Minimise all other forms of environmental damage and nuisance arising from construction works.</li> </ul>
Offset the carbon emissions resulting from the construction of the development including the manufacture and transportation of materials.	<p>Plant trees in sufficient quantities, on or off site, to absorb the carbon dioxide emissions resulting from the construction of the buildings, including the manufacture of the materials used in the construction of the buildings.</p> <p>On average 1 tree will absorb 0.2 tonnes of carbon dioxide per year, therefore 5 trees need to be planted to offset every tonne of carbon emissions resulting from the construction works.</p> <p>The BRE and London Renewables web sites provide links to calculating carbon emissions.</p>
Minimise exposure to noxious substances arising from materials and installation methods to those constructing developments and future occupants.	<p>Use:</p> <ul style="list-style-type: none"> <li>• 'breathable' water or vegetable oil based paints that avoid the use of white spirit or other VOCs</li> <li>• natural floor coverings which do not contain synthetic dyes</li> <li>• natural underlay (compressed wood fibre board), linoleum, cork, sisal and coir</li> <li>• mechanical fixings in preference to adhesives</li> </ul>
	<p>Avoid or limit the use of particleboards. If used ensure they are manufactured to European Standards, limiting their free formaldehyde content.</p>
A reduction in waste during demolition.	<p>Undertake a pre-demolition audit of the site as existing, comprising a structural survey, potential for conversion and extension, cost of repair, significance of building for local character, cost of demolition, value of salvaged materials, cost of transporting materials, giving careful consideration to the conversion of existing buildings on the site to the intended new uses.</p>
	<p>Undertake a waste demolition audit using SMART waste or similar methodology.</p>
	<p>Segregate demolition waste into separate waste streams for resale.</p>
	<p>Incorporate demolition waste into new buildings.</p>
A reduction in construction waste during	<p>Produce and implement a waste minimisation plan showing</p>

construction.	<p>how on-site practices will respond to guidance from CIRIA and the Construction Best Practice Programme on minimising construction waste, addressing:</p> <ul style="list-style-type: none"> <li>• designing around standard material dimensions and planed thicknesses</li> <li>• using prefabricate building components</li> <li>• ordering minimum quantities of materials for storage on site and delivered to site only when required</li> <li>• returning damaged materials and off-cuts to suppliers for recycling</li> <li>• separating different types of waste material</li> <li>• separately striping, storing and protecting topsoil and subsoil in accordance with BS 3882:1994 (BSI, 1994)</li> <li>• ensuring materials and products, including packaging, can be recovered for reuse, or recycling</li> </ul>
A reduction in construction waste during the lifetime of the building arising from alterations/conversions and demolition.	Design buildings to be flexible in accommodation of uses to prevent waste arising from future conversions.
	Design loft spaces for inclusion in, or easy conversion to, usable accommodation.
	Design with deconstruction in mind.
A reduction in waste going to landfill sites from occupants.	Provide composters for all residences with gardens and recycling facilities in accordance with the Council's requirements.

**Intended planning conditions to secure the objectives and informatives:**

**Planning conditions and informatives will be added after the Standard Planning Conditions have been revised and approved.**

**References:**

- Anderson, J. & Howard, N., 2000. Green Guide to Housing Specification. Watford: BRE Press.
- Anderson, J. Shears, D.E. & Sinclair, M., 2002. Green Guide to Specification 3<sup>rd</sup> Ed. Oxford: Blackwell Publishing.
- British Standards Institution, 1994a. BS 3882:1994 Specification for Topsoil. London: British Standards Institution.
- Construction Umbrella Bodies (Holdings) Ltd., 1997. The Considerate Constructors Scheme. Ware: Construction Umbrella Bodies (Holdings) Ltd.
- Shorter, B. 2001. Waste Minimisation in Construction Training Pack. London: Construction Industry Research and Information Association.

**Examples:**

**BedZed, Helios Road, Wallington, Surrey**  
**The Wintles, Bishop's Castle, Shropshire**

**Contacts:**

BedZed, [www.peabody.org.uk/pages/GetPage.aspx?id=179](http://www.peabody.org.uk/pages/GetPage.aspx?id=179)  
 BRE [www.bre.co.uk](http://www.bre.co.uk)



The Considerate Constructors Scheme. [www.ccscheme.org.uk](http://www.ccscheme.org.uk)  
Construction Industry Research and Information Association  
HSBC Hong Kong Headquarters Building [www.hsbc.com.hk/about/head.htm](http://www.hsbc.com.hk/about/head.htm)  
[www.fosterandpartners.com](http://www.fosterandpartners.com) London Renewables  
Materials Exchange for the East of England. [www.eastex.org.uk](http://www.eastex.org.uk)  
Waste and Resource Action Programme. [www.wraporg.uk](http://www.wraporg.uk)  
The Wintles, Shropshire, [www.livingvillage.com](http://www.livingvillage.com)

**Definitions:**

- Carbon emissions*            The carbon released into the atmosphere as carbon dioxide when a carbon based fossil fuel is burned to provide energy or heat.
- Considerate Constructors Scheme*    A construction industry scheme to promote and monitor the competent management, efficiency, awareness of local environmental issues and neighbourliness of construction sites and operations.
- Mitigation*                    To alleviate the negative consequences of an action.
- SMART waste*                A computer system devised the Building Research Establishment to help construction companies to reduce their construction waste and maximise their resource use.
- Whole-life cost*                The total environmental impacts of a development throughout its life, including its planning, the manufacture and transportation of its components, its construction, its ongoing occupation and maintenance, through to its demolition and the disposal of the materials.

## SECTION 6 Construction Materials

CP 1, 11, 13, 21

DC 26, 38

This section provides guidance to meet these aims.

### Objectives:

- To ensure that materials selected are sustainable and fit for purpose at the time of selection, require minimum energy levels in their manufacture and transportation and will continue to perform as intended throughout the lifetime of the building in changing climatic conditions.
- To make optimal use of resources and reduce waste, the selection of materials for a development should include the reuse of existing materials on site and the use of reclaimed or recycled materials; and the selection of materials considering their future disposal at the end of their life, selecting as a preference those that have the ability to be reused or recycled.

### 6.1. General

Construction materials matters are addressed through the Building Regulations and through presenting development schemes for assessment under the BREEAM or Code for Sustainable Homes assessment schemes. However, materials are an architectural consideration in the planning application determination. The advice in this section sets out some of the issues for designers and developers.

### 6.2 The Selection of Construction Materials

In general the use of locally sourced traditional materials such as timber, bricks, render panels, clay tiles, slates, etc. is preferable to energy-hungry manufactured materials, such as concrete panels, tiles or uPVC. Some of the manufactured substitutes lack the visual quality of the materials they are intended to replace and largely lose their visual qualities faster than the materials they are substituting, resulting in the development's visual appearance diminishing early in the lifetime of the development.

Architecturally, materials such as glass, metal and timber used in modern constructions are acceptable but the consideration of their use should be carefully assessed against the sustainability issues relating to their manufacture, and the heating and ventilation of the building.

The selection of materials should take into consideration the life cycle impacts of the products, including their durability, the amount of energy and other resources used in their manufacture, the pollution emissions resulting from their manufacture, the habitats damaged or destroyed in the exploitation of raw materials in their manufacture, any undesirable emissions from the product during its lifetime, the ability to re-use or recycle materials, together with a consideration of the issues relating to the disposal of materials at the end of their life. Materials should not be used whose production results in:

- the loss of non-sustainable resources e.g. tropical hardwoods
- the use of large amounts of energy in their manufacture e.g. aluminium and PVCu
- the discharge of large quantities of carbon dioxide into the atmosphere
- the production of large quantities of carbon dioxide in their transportation from their source of origin or manufacture e.g. slate from China
- the production of pollutants as by-products of their manufacture
- the discharge of harmful emissions during their lifetime e.g. volatile organic compounds given off by paint and white spirit, which are harmful to the health of those breathing in the fumes
- materials which are treated in such a manner as to render them unsuitable for recycling upon their removal from the building e.g. some timber treatments.

The Council will challenge the use of materials that may result in such environmental damage arising from their production or manufacture.

The reuse of reclaimed and recycled materials can save on the depletion of natural resources in the manufacture and production of building materials, thereby saving on energy consumption and reducing

carbon dioxide emissions. This also reduces the amount of land required for the disposal of waste and reduces the potential for contamination arising from the tipped material.

### 6.3 Materials and climate change

- Developers and designers should ensure that construction is appropriate for the predicted climatic conditions pertaining at the time of construction. In *Adapting to climate change: a checklist for development - Guidance on designing developments in a changing climate* (East of England Sustainable Development Round Table, 2005), consideration is given to the effects of climate change on the characteristics of materials

In addition, the design of buildings and the selection of construction materials should ensure that buildings that may be susceptible to flood risk throughout their lifetime (within Flood Zones 2 and 3) are resilient to flood risk. Changing climatic conditions are taken account of in the Environment Agency's Flood Maps.

### 6.4 Construction and noise reduction

Chelmsford Borough Council's survey of residents on new housing developments has identified that noise from neighbours, within housing units and from external sources is a nuisance on some developments, which can be mitigated by increasing sound insulation levels (Marketing Assistance Ltd., 2005.) Noise from external sources such as roads and railways should also be addressed. Traffic noise can be considerably reduced through the use of appropriately designed double or triple glazing.

The Code for Sustainable Homes provides credits for achieving standards of sound insulation higher than required by Building Regulations, by using post-completion testing or Robust Details. Guidance on achieving improved noise attenuation between dwellings above that required in Approved Document E of Building Regulations (2003 Edition) 'Resistance to the passage of sound' (ODPM 2003d) is contained in BRE Report BR 406, 'Specifying dwellings with enhanced sound insulation' (BRE, 2000). Guidance on this aspect is contained in the Green Guide to Housing Specification.

To achieve these:	Undertake these:
Use of materials that are sustainable and fit for purpose at the time of selection and will continue to perform as intended throughout the lifetime of the building.	<p>Development schemes and their constituent buildings and hard spaces should be designed and constructed to maximise the use of materials:</p> <ul style="list-style-type: none"> <li>• from reclaimed, renewable and/or recycled sources;</li> <li>• that are fit for purpose throughout the lifetime of the building;</li> <li>• are robust against changing use and occupancy of the building;</li> <li>• can be recycled at the end of the building's life;</li> <li>• do not damage the natural, social or economic environment;</li> <li>• require minimum energy levels in their manufacture and transportation; and</li> <li>• which do not expose those installing them or those occupying or maintaining the completed buildings to health risks.</li> </ul> <p>Developers and designers should ensure that construction is appropriate for the predicted climatic conditions pertaining at the time of construction and therefore select construction materials that have proven durable in tests outside the normal range of the UK's climatic/weather conditions. Some issues identified, that developers should take into</p>

	<p>consideration when selecting materials, are:</p> <ul style="list-style-type: none"> <li>• increased ultraviolet radiation is likely to affect plastics and roofing felt</li> <li>• the strength of bricks will be affected by a change in moisture content</li> <li>• lime mortar and stone will be affected by increases in carbon dioxide levels and driving rain</li> <li>• the strength of concrete will be affected by curing at higher temperatures</li> <li>• MDF (medium density fibreboard) and chipboard are not to be used where flooding is anticipated.</li> </ul> <p>Design buildings and select construction materials to be resilient to flooding.</p>
<p>Minimal negative environmental impacts of the materials selected.</p>	<p>Select 'A' rated materials in the Building Research Establishment's "<i>Green Guide to Specification</i>" and "<i>Green Guide to Housing Specification</i>".</p>
<p>Select materials from natural and/or local sources</p>	<p>Select natural building materials from sustainable supplies, which have a low impact on the environment in their manufacture (taking account of preserving treatments), such as:</p> <ul style="list-style-type: none"> <li>• earth</li> <li>• timber</li> <li>• natural stone</li> <li>• straw</li> <li>• wool</li> <li>• cellulose</li> <li>• cork</li> <li>• hemp</li> <li>• flax</li> </ul> <p>Materials should be sourced from:</p> <ul style="list-style-type: none"> <li>• suppliers within a 50 miles radius of the development site</li> <li>• British origin wherever possible</li> <li>• from other European or Scandinavian sources when British sources are not available</li> <li>• consider the selection of substitute manufactured materials rather than importing natural materials from other countries where the carbon emissions from their transportation would be greater than those arising from the manufacture of the substitute material</li> </ul>
<p>Do not use materials or products that will result in damage to or destruction of scarce natural habitats elsewhere in the world e.g. endangered hardwoods, peat, limestone pavement, etc.</p>	<p>Natural materials from proven sustainable managed resources. To demonstrate that the timber used in the development originates from managed sustainable resources, specify:</p> <ul style="list-style-type: none"> <li>• Forest Stewardship Council,</li> <li>• Pan-European Forest Certification,</li> <li>• Canadian Standards Association,</li> <li>• Malaysian Timber Certification Council</li> <li>• Sustainable Forest Initiative schemes certified timber.</li> </ul> <p>Source materials through suppliers with a good proven record in relation to environmental management and provide documentary evidence to prove the credentials of suppliers</p>

	and the origin of materials.
	Select products that are: <ul style="list-style-type: none"> <li>• reclaimed</li> <li>• manufactured from recycled materials</li> <li>• manufactured from waste or by-product materials</li> </ul>
Use materials that have minimal ozone depletion potential	Select refrigerants in air-conditioning, comfort cooling or domestic appliances that have an ozone depletion potential of zero. Provide documentary confirmation from the manufacturers of this.
Where demolition is necessary, salvage and reuse materials.	Demolish existing premises in a manner that enables the materials to be salvaged and stored for reuse on the site; disposing of surplus materials to second hand building materials suppliers.
The selection of materials that have the ability to be reused or recycled upon the demolition of the development.	Use materials that offer the opportunity for reuse in the future at the end of the useful life of the development i.e. the use timber products not treated with preservatives, as many of the chemical formulations they contain render the timber, after use, as toxic waste.
	Use materials and fixings that enable easy dismantling of the structure to enable the materials to be reclaimed for reuse.
The protection of topsoil on site from degradation and contamination.	Topsoil should be protected through: <ul style="list-style-type: none"> <li>• restricting excavation minimum required including working space</li> <li>• storage on site for reuse, in accordance with BS 3882:1994 (BSI, 1994)</li> <li>• the disposal of excess for re-use elsewhere</li> </ul>
Provide higher levels of sound insulation.	Specify sound insulation levels between neighbouring properties of between 3dB and 5dB better than Building Regulations requirements for impact and airborne noise.

**Intended planning conditions to secure the objectives and informatives:**

**Planning conditions and informatives will be added after the Standard Planning Conditions have been revised and approved.**

**References:**

- Anderson, J. & Howard, N., 2000. Green Guide to Housing Specification. Watford: BRE Press.
- Anderson, J. Shears, D.E. & Sinclair, M., 2002. Green Guide to Specification 3<sup>rd</sup> Ed. Oxford: Blackwell Publishing.
- Building Research Establishment, 2000. Report BR 406 Specifying dwellings with enhanced sound insulation. Watford: BRE Press.
- Department for Communities and Local Government, 2006. Code for Sustainable Homes A step change in sustainable home building practice. London: Department for Communities and Local Government.
- East of England Sustainable Development Round Table, 2005. Adapting to climate change: a checklist for development Guidance on designing developments in a changing climate. London: Greater London Authority.
- Marketing Assistance Ltd., 2005. Chelmsford Borough Council Borough Planning Guidelines Consultation Research Report. Chelmsford: Chelmsford Borough Council.

Office of the Deputy Prime Minister, 2003d. The Building Regulations, Approved Document E, Resistance to the passage of sound. London: Office of the Deputy Prime Minister.

**Examples:**

**BedZed, Helios Road, Wallington, Surrey**

**Fairfax House, London Borough of Lambeth**

**Upton Green, Northampton,**

**Rural Business Centre, Environment Village, Writtle College, Writtle, Essex**

**The Wintles, Bishop's Castle, Shropshire**

**Contacts:**

BedZed [www.peabody.org.uk/pages/GetPage.aspx?id=179](http://www.peabody.org.uk/pages/GetPage.aspx?id=179)

British Standards Institution 389, Chiswick High Road, London, W4 4AL. [www.bsi-global.com](http://www.bsi-global.com)

Canadian Standards Association, [www.csa.ca](http://www.csa.ca)

EarthShip Brighton, [www.lowcarbon.co.uk/eb.html](http://www.lowcarbon.co.uk/eb.html)

The Forest Stewardship Council, 11-13 Great Oak Street, Llanidloes, Powys, SY18 6BU. [www.fsc-uk.org](http://www.fsc-uk.org)

Malaysian Timber Certification Council, [www.mtcc.com.my](http://www.mtcc.com.my)

Miller Homes, [www.millerhomes.co.uk](http://www.millerhomes.co.uk)

The Pan-European Forest Certification Scheme, Pan-European Forest Council, 2eme Etage, 17 Rue des Girondins, Merl-Hollerich, L-1626 Luxembourg. [www.pefc.org/internet/html](http://www.pefc.org/internet/html)

Sustainable Forest Initiative, [www.afandpa.org](http://www.afandpa.org)

The Wintles, Shropshire, [www.livingvillage.com](http://www.livingvillage.com)

**Definitions:**

*CFCs* Chlorofluorocarbon chemicals, used as refrigerants, propellants in aerosols and solvents in the electronics industry, which if released into the atmosphere deplete the ozone.

*Greenhouse gases* Naturally occurring gases in the atmosphere that trap infrared heat energy, raising the temperature of the lower atmosphere and the earth's surface in contact with it. The release of greenhouse gases from manufacturing processes is increasing their concentration resulting in increased temperatures in the lower atmosphere and on the earth's surface.

*HCFCs* Hydrochlorofluorocarbon chemical compounds manufactured to replace CFCs but which if released into the atmosphere are potent greenhouse gases.

*Reclaimed* Waste material salvaged for reuse.

*Recycled* Material salvaged and used to manufacture other products.

*Renewable* Material obtained from replaceable sources.

*VOCs* Volatile organic compounds are a range of gases given off by finishing products in buildings e.g. carpets and paint, which in combination or in high concentration are believed to be detrimental to the health of those inhaling them, during the installation of the materials or during occupancy of the building. Developers should use paints that are water or vegetable oil based that have a natural finish or a low solvent content, as these have lower health and environmental impacts than oil-based paints and varnishes that contain toxic volatile organic compounds that are injurious to health.

## SECTION 7 Energy Supply

CP 1, 11, 13, 21 DC 25, 26, 38

This section provides advice on how to provide new developments with energy generated from renewable sources and minimise energy generated from non-renewable sources.

### Objectives:

- To provide new developments with electricity generated from renewable sources.
- To provide space and water heating for developments from renewable sources.
- To provide space and water heating for developments from efficient sources.

### 7.1 General

There is the opportunity for all developers to consider the use of renewable sources of energy within their developments, to decrease the consumption of energy from non-renewable sources and therefore reduce overall carbon dioxide emissions. Policy DC25 gives general support for renewable energy projects and policy DC26 sets a target to be attained for a measurable, at least 10% reduction in projected carbon emissions as a result of renewable energy. This policy is a prompt towards achieving better outcomes as developers embrace the challenge and consumers recognise the benefits.

Renewable sources that could be considered for **groups of buildings** include:

*Community heating* - provision of a heating system for a group of houses or other buildings, which provides greater efficiencies resulting in less carbon emissions.

*Combined heat and power* - schemes to improve the economies of scale and thereby produce a reduction in the carbon emissions required to provide energy for the development.

### 7.2 Local Circumstances

The British Wind Energy Association identifies the Borough, generally, as having wind speeds below that required for the efficient generation of energy from wind turbines, utilising current technology. Recent wind speed measurements appear to confirm this. The generation of power from wind turbines, utilising current technologies, is therefore generally not viable in the Borough except in a small number of instances where local circumstances may result in sufficiently high wind speeds.

Photovoltaic cells for the generation of electricity are potentially viable within the district. This is subject to the peculiarities of the local circumstances, in terms of both exposure to sunlight, through orientation and avoidance of shading, and other planning matters that might make such panels visually undesirable in that location.

Pre-heating of water through solar panels is potentially viable within the district. This is subject to the peculiarities of the local circumstances, in terms of both exposure to sunlight, through orientation and avoidance of shading, and other planning matters that might make such panels visually undesirable in that location and are visually more intrusive than photovoltaic cells and therefore more difficult to incorporate into developments.

The geology of the Borough is suitable for the efficient installation of ground-sourced heat pumps, which can be installed in the ground horizontally or vertically, making this a technically viable option for all sites. This is however the most costly form of energy production from renewable sources.

Biomass is increasingly being used, however an increase in supplies from within the Borough is required to minimise transportation distances.

**Definitions:**

*Carbon neutral* The release of the same amount of carbon emissions when a fuel is burned as the plant absorbed from the atmosphere as it grew. Schemes are in place to plant trees to absorb the carbon emissions produced by the production or use of energy which are considered to be carbon neutral.

*Carbon zero* The production of energy without the production of carbon emissions i.e. without burning fossil fuels such as coal, oil and gas. Zero carbon energy sources include solar panels, wind turbines, water turbines and ground sourced heat pumps. Ground sourced heat pumps are strictly not zero emission technologies as they require a small amount of electricity to run the pumps, but the requirement is so small they are considered to be carbon zero technologies. All the carbon zero technologies however contain embedded carbon emissions resulting from the production of carbon emissions in the manufacture of the cells, turbines, etc.

*Carbon passive* see carbon zero.

**7.3 General performance standards****To achieve overall energy supply requirements from renewable sources**

Developments of 10 dwellings or more or 1,000m<sup>2</sup> or more on non-residential or mixed use developments incorporating equipment for renewable power generation, to provide a reduction of at least 10% of the carbon emissions resulting from the predicted energy requirements of the scheme.

**7.4 Energy supply**

<b>To achieve these:</b>	<b>Undertake these:</b>
<p>Each development to be assessed for its suitability to implement one or more of the alternative electricity generating, space and water heating technologies.</p>	<p>Developers should demonstrate in the sustainability appraisal, by means of a feasibility study, what renewable energy sources and generating technologies have been assessed and rejected for their development proposals. Renewable sources that could be considered include:</p> <ul style="list-style-type: none"> <li>• <i>passive solar heating systems</i> – use of the daily solar radiation to heat buildings</li> <li>• <i>solar water heating</i> – use of sunlight to heat water in panels exposed to sunlight, then pumped into a building for storage awaiting use.</li> <li>• <i>photovoltaics</i> - panels of cells which absorb sunlight converting it into electricity.</li> <li>• <i>air, ground or water source heat pumps</i> - where a heat exchanger extracts the natural heat of the air, ground or water, gained from the sun, to provide space heating for buildings</li> <li>• <i>urban wind</i> - harnessing of the wind's energy to turn a turbine to generate power, either as the direct movement of the turbine shaft used to operate machinery, or to produce electricity to power electrical equipment.</li> <li>• <i>biomass</i> - all living matter, both plant and animal. Burning plant material as biomass fuel is releasing the sun's energy which has been captured by the plant and only releases the carbon absorbed by the plant in its growth, plus a small amount of carbon emissions resulting from the consumption of energy used to plant, tend, harvest and transport the crop.</li> </ul>

	<ul style="list-style-type: none"> <li>Integrate the chosen system into the architecture.</li> </ul>
	Use natural daylight to provide solar gain in the orientation of buildings and internal layout planning.
	Integrate renewable sources with grid electricity to feed the national grid with excess power.
	Sign up initial electricity supply connections to the site with a 'green' energy supplier.
Where solar or photovoltaic panels are not provided at the time of construction, design the buildings to enable their addition later.	Where the site is in an appropriate location, the design of the development should maximise the opportunities to incorporate south facing roof slopes and flat roofs on buildings to permit the installation of solar panels either initially or at a later date.
Generation of energy for specific purposes.	Integrate photovoltaic cells in structures such as screens and conservatories for specific community end uses such as street lighting.
Ensure that wind turbines or solar panels cause no harm to other properties and the quality of life of neighbours.	<ul style="list-style-type: none"> <li>Set turbines and solar panels back from building edges.</li> <li>Ensure all associated plant is set below the top of the building to hide them from general public visibility.</li> <li>Ensure equipment does not affect neighbours' outlook.</li> <li>Obtain information about noise from wind turbines before specifying or installing.</li> <li>Do not propose adding equipment to historic buildings or in conservation areas without consultation, consideration of appearance or a clear energy justification.</li> <li>Do not propose renewable energy generators before optimising the insulation and energy conservation performance of the building.</li> </ul>

**Intended planning conditions to secure the objectives and informatives:**

**Planning conditions and informatives will be added after the Standard Planning Conditions have been revised and approved.**

**References:**

Office of the Deputy Prime Minister, 2004. Planning Policy Statement 22: Renewable Energy. London: The Stationary Office.

Office of the Deputy Prime Minister, 2004. Planning for Renewable Energy: A Companion Guide to PPS22. London: Office of the Deputy Prime Minister.

**Examples:**

**BedZed, Helios Road, Wallington, Surrey**

**Millennium Green project, Newark, Nottinghamshire**

**Rural Business Centre, Environment Village, Writtle College, Writtle, Essex**  
**Upton Green, Northampton**

**The Wintles, Bishop's Castle, Shropshire**

**Contacts:**

BedZed, [www.peabody.org.uk/pages/GetPage.aspx?id=179](http://www.peabody.org.uk/pages/GetPage.aspx?id=179)

British Wind Energy Association, Renewable Energy House, 1 Aztec Row, Berners Road, London, N1 0PW. [www.bwea.com](http://www.bwea.com)

Energy Saving Trust

[http://www.energysavingtrust.org.uk/generate\\_your\\_own\\_energy/types\\_of\\_renewables](http://www.energysavingtrust.org.uk/generate_your_own_energy/types_of_renewables)

European Biomass Association, [www.aebiom.org](http://www.aebiom.org)

Ground Source Heat Pump Association, The National Energy Centre, Davey Avenue, Knowhill, Milton Keynes, MK5 8NG. [www.nef.org.uk](http://www.nef.org.uk)

Miller Homes, [www.millerhomes.co.uk](http://www.millerhomes.co.uk)

Solar Trade Association, The National Energy Centre, Davey Avenue, Knowhill, Milton Keynes, MK5 8NG. [www.greenenergy.org.uk](http://www.greenenergy.org.uk)

The Wintles, Shropshire, [www.livingvillage.com](http://www.livingvillage.com)

## SECTION 8 Energy Conservation

CP 1, 11, 13, 21 DC 25, 26, 38

This section deals with ways of reducing the consumption of energy to heat, cool, ventilate and light buildings and offers advice on energy conservation and appliances with a low energy demand.

### Objectives:

- To reduce the demand for energy consumption for space and water heating, all new buildings should be designed to include energy efficiency measures to harness the heating properties of sustainable resources to provide heating and to retain heat.
- To reduce the demand for energy consumption to ventilate and cool buildings.
- To reduce the energy demand for lighting whilst ensuring adequate lighting is maintained for the activities to be undertaken within the buildings.
- Appliances fitted/supplied in buildings should be energy efficient to reduce carbon dioxide emissions and should not cause excessive heating within the building.

### 8.1 General

While energy efficiency matters are addressed through the Building Regulations and schemes for assessment under the BREEAM or Code for Sustainable Homes assessment schemes, energy efficiency can have a significant influence on site layout and building design. Therefore this section offers advice to developers on some of the issues.

### 8.2 Local Circumstances

There will be an increased demand for power arising from a housing growth rate of about 700 dwellings per year to meet the Government's growth targets for the borough until 2021. The means exist to achieve very high standards of energy efficiency and Chelmsford Borough Council is therefore determined that new development in the Borough minimises the increased demand for energy to heat, cool and operate buildings. This need is focussed by climate change: the East of England Sustainable Development Round Table predicts that by the year 2080 the average summertime temperatures for the Borough could increase by up to 5°C. To avoid damaging and potentially disastrous climatic change, the UK needs to cut its CO<sub>2</sub> emissions by 60% by the year 2050 (The Royal Commission on Environmental Pollution 2000 & DTI).

### 8.3 Exceeding building regulations

The Council encourages developers to exceed the minimum standards stated in Part L of the Building Regulations in order to promote real progress in raising building performance in Chelmsford.

### 8.4 General performance standards

#### To achieve overall energy efficiency ...

All new buildings and extensions should be designed to attain a minimum energy consumption rating of 'Level 3' under the Code for Sustainable Homes for all residential or 'Very Good' under the BREEAM assessments for all non-residential, development proposals.

### 8.5 Insulation and energy conservation

To achieve these:	Undertake these:
All new buildings and extensions should be insulated to conserve energy	Design and construct all new buildings to include energy insulation efficiency measures in excess of the minimum legal requirements established in Part L of Building Regulations.
	Exceed the minimum requirements insulation standards for non-domestic buildings set out in Part L2 of Building Regulations.
Offset the carbon emissions from operation of the development.	Plant trees in sufficient quantities, on or off site, to absorb the carbon dioxide emissions from the future operation of the buildings.

## 8.6 Heating

To achieve these:	Undertake these:
Heating of all new buildings and extensions designed to minimise energy consumption and the resulting carbon dioxide emissions.	Establish minimum need energy targets for all new developments through the adoption of best industry practice and exceed the minimum standards stated in Part L of the Building Regulations.
Design developments to harness the natural attributes of the site to reduce the energy consumption of buildings.	All new developments should make use of the “thermal mass” present in a building’s structure to absorb and store heat, helping to reduce peak internal temperatures and cooling requirements.
	Orientate glazing and rooms to make best use of passive solar energy for heating.
	Minimise the shading of buildings where passive solar gain is being employed.
	Plant shelterbelts on developments in advance of construction works commencing, to provide shelter from prevailing or dominant winds to reduce the external cooling of the buildings and thereby reduce energy consumption to heat the building.
	Design the layout of the site to prevent the proposed built form creating major increases in wind speeds, as heat loss from buildings is greater when wind speeds are high.
	Reduce the demand for heating by using built forms that reduce the exposed surface area of the buildings, as the greater the exposed surface area of the building the greater will be the heat loss.
Reduce the demand for heating and energy consumption	<ul style="list-style-type: none"> <li>• Reduce unplanned ventilation.</li> <li>• Install efficient heating installations with effective controls.</li> </ul>

## 8.7 Ventilation & Cooling

To achieve these:	Undertake these:
Provide natural ventilation for all new buildings and extensions providing adequate fresh air in both summer and winter for their	Install passive stack effect ventilation to extract moisture from kitchens, bathrooms and clothes drying areas.

intended occupation and use..	Design buildings no more than 15m in depth, from façade to façade, to enable cross ventilation.
	In deeper plan buildings install central atria to make use of the stack effect.
	Orientate and install windows to optimise daylight, while avoiding excessive solar gains that could lead to unnecessary cooling requirements and that allow controlled ventilation without blowing papers off desks, or causing draughts, when background fresh air ventilation is required in winter, or excessive heat loss that would require additional heating.
	Make use of thermal mass and night ventilation to reduce peak temperatures.
	Reduce lighting loads to minimise the resultant space heating from lighting.
	Separate high heat load processes (e.g. computer servers) from the general accommodation.
	Select equipment with reduced power requirements (i.e. flat screen monitors etc) to minimise the resultant space heating.
	Design the layout of the site to prevent the proposed built form creating major reductions in wind speeds, thereby reducing the natural cooling of buildings in summer, resulting in excessive solar gain, as heat loss from buildings is lower when wind speeds are low.

<b>Definitions:</b>	
<i>Atria</i>	Voids with glazed roofs in the centre of large buildings to enable daylight to enter the areas of the floors surrounding them.
<i>Passive ventilation</i>	Ventilation without the aid of mechanical means.
<i>Passive stack</i>	To naturally draw air from the outer perimeter and up through the centre of the building.
<i>Solar gain</i>	Short wave heat energy from the sun passes through glass and heats up objects in a room, which will give out radiant heat of a longer wavelength, which is unable to escape through the glass, resultantly the room gets warmer.
<i>Thermal mass</i>	Any mass that absorbs heat then releases it into the surrounding air later once that air has become cooler than the mass, thereby heating the air.

## 8.8 Lighting



Notley Green County Primary School, Great Notley, Braintree, Essex

To achieve these:	Undertake these:
Developments to be designed to minimise the energy demands to provide adequate lighting.	Make maximum use of daylight through appropriate design and layout while avoiding excessive solar gain.
	Design the areas outside windows to ensure natural daylight entering rooms via windows is not impeded.
To prevent the unnecessary consumption of energy install energy efficiency measures.	Install daylight sensors, timed switches and presence-detection sensors to prevent external lighting being left on unnecessarily.

**Definitions:**

*Daylight factor* The measure of the subjective daylight quality in a room, described as a percentage ratio of outside luminance divided by the internal luminance.

*Daylight targets* Target levels of illumination to be provided in the rooms within a development.

**8.9 Appliances**

To achieve these:	Undertake these:
Any appliances fitted or supplied within a building to be energy efficient and not produce high levels of heat.	Provide A-rated white goods under the European Commission’s ECO Label scheme, or A or B rated washer dryers or tumble dryers.
	Fit low water use appliances to conserve energy.
	Alternative means of drying clothes should be provided, such as an airing cupboard, clothes dryer in suitably ventilated room, or washing lines in gardens or on balconies as an alternative to the use of tumble driers.

**Intended planning conditions to secure the objectives and informatives:**

**Planning conditions and informatives will be added after the Standard Planning Conditions have been revised and approved.**

**Definitions:**

*White goods* Electrical appliances provided in kitchens i.e. fridges, freezers, washing machines and dishwashers.

**References:**

Chartered Institute of Building Services Engineers, 1997. Natural ventilation in non-domestic buildings. Application Manual AM10: 1997. London: Chartered Institute of Building Services Engineers.

Chartered Institute of Building Services Engineers, 2000c. Mixed mode ventilation AM13. London: Chartered Institute of Building Services Engineers.

Energy Saving Trust. General Information Leaflet 27 – Passive Solar Estate Layout. London: Energy Saving Trust.

Littlefair P.J., 1991. Site Layout Planning for Daylight and Sunlight – A guide to good practice. Watford: BRE Press.

#### **Examples:**

**Ashcroft Building, Anglia Polytechnic University, Chelmsford Essex**

**BedZed, Helios Road, Wallington, Surrey**

**Millennium Green project, Newark, Nottinghamshire**

**Notley Green County Primary School, Great Notley, Braintree, Essex**

**The Queens Building, Anglia Polytechnic University, Chelmsford, Essex**

**Rural Business Centre, Environment Village, Writtle College, Writtle, Essex**

**Upton Green, Northampton**

**The Wintles, Bishop's Castle, Shropshire**

#### **Contacts:**

BedZed, [www.peabody.org.uk/pages/GetPage.aspx?id=179](http://www.peabody.org.uk/pages/GetPage.aspx?id=179)

Miller Homes, [www.millerhomes.co.uk](http://www.millerhomes.co.uk)

The Wintles, Shropshire, [www.livingvillage.com](http://www.livingvillage.com)

Desktop guide to daylighting – for architects. Good Practice Guide 245. Best Practice Programme. [www.actionenergy.org](http://www.actionenergy.org)

The Installers Guide to Lighting Design. Good Practice Guide 300. January 2002. Best Practice Programme. [www.actionenergy.org](http://www.actionenergy.org)

## SECTION 9 Water Conservation and Drainage

CP 1, 11, 13, 21 DC 26, 38

This section deals with water efficiency and provides guidance on design and construction to reduce the demand for water consumption in new buildings or extensions.

### Objective:

- To encourage the reduced demand for potable water within developments through the collection and recycling of water and the use of water efficient appliances.
- To ensure the discharge of surface water from sites into the river and drainage systems does not exceed the existing conditions and in the case of brownfield sites reduces the existing volumes and rates; and in all cases minimising discharge volumes and rates; reduced physical damage to the beds and banks of watercourses; reduce the recharge of groundwater; and reduce the risk of pollution, in particular diffuse pollution.

### 9.1 Local Circumstances:

The Environment Agency has identified the Borough as being within a larger area of water stress, classifying the situation as serious (the worst classification) (Environment Agency, 2007).

The consultation document Water Efficiency in New Buildings (Department for Communities and Local Government & Department for Environment and Rural Affairs, 2006) identifies the Borough within a wider area that has unsustainable or unacceptable water abstraction regimes. This situation will become worse under the climate change predictions of the East of England Sustainable Development Round Table for an increase in temperatures, and a decrease in precipitation of between 15% and 60%, which will not be compensated for by a predicted increase in winter precipitation levels of up to 30% (East of England Regional Assembly & the East of England Sustainable Development Round Table, 2001).



The government's targets for growth in the Borough will increase the demand for the already scarce resources of potable water and new development will be accompanied by a strategy for water supply and waste water capacity.

The Environment Agency's published Flood Maps (2007) identify 50-60% of the Chelmsford town centre as liable to flooding together with other areas in the Borough. The predictions of the East of England Sustainable Development Round Table for an increase in winter precipitation levels of up to 30% will increase the risk of flooding (East of England Regional Assembly & the East of England Sustainable Development Round Table, 2001). Developments and buildings should be designed and constructed to employ techniques for reducing surface water run-off and sustainable urban drainage to reduce artificial water discharges from the development into the river system.

## 9.2 General performance standards

To achieve overall water efficiency
<p>All new buildings and extensions should be designed to attain a minimum potable water consumption rating of</p> <p>'Level 3' under the Code for Sustainable Homes for all residential or</p> <p>'Very Good' under the BREEAM assessments for all non-residential, development proposals.</p>

## 9.3 Water Use

To achieve these:	Undertake these:
<p>A reduction in the demand for potable quality water in the design and construction of new developments.</p>	<p>Developers should demonstrate that all water demand management and reduction options have been considered in the preparation of development proposals. The following water efficient technologies could be installed:</p> <ul style="list-style-type: none"> <li>• water meters</li> <li>• dual flush WCs with a maximum 6-litre flush and lower 4-litre flush and where possible lower flush volumes should be considered:</li> <li>• waterless urinals to office or commercial washrooms;</li> <li>• low flow spray/aerator taps on WC and bathroom basins;</li> <li>• low flow showers, with a flow rate of less than 9 litres/minute in all domestic bathrooms and office or commercial shower rooms;</li> <li>• do not install power showers with high flow rates as these can use more water than a bath</li> <li>• install auto shut off taps, tap controls and infrared switches to office or commercial washrooms, to ensure water is not wasted through taps left running;</li> <li>• install water-efficient washing machines or dishwashers, where provided</li> </ul>
	<p>In the design of new communal landscaped areas select native and/or drought-resistant plant species to reduce the need for irrigation.</p>
<p>Collect and recycle water</p>	<p>Install greywater collection systems to reuse water to flush WCs and to irrigate landscaped areas and gardens.</p>
	<p>Provide on-site collection of roof run-off rainwater for reuse. Provide residential properties with rainwater butts of the following capacities:</p> <ul style="list-style-type: none"> <li>• a minimum of 100 litres for properties with a balcony, terrace or patio</li> <li>• a minimum of 150 litres for a 1-2 bed home</li> <li>• and a minimum of 200 litres for a 3+ bed home.</li> </ul> <p>Commercial developments should provide rainwater collection systems with a minimum capacity of 20 litres per m<sup>2</sup> of roof (measured horizontally on plan). The rainwater butts must be secured so they cannot fall over, have a tap placed at the bottom positioned such that a watering can may be placed beneath the tap to be filled with water and enabling the butt to be drained completely.</p>

Use rainwater to flush WCs and to irrigate landscaped areas and gardens.

**Intended planning conditions to secure the objectives and informatives:**

**Planning conditions and informatives will be added after the Standard Planning Conditions have been revised and approved.**

**Definitions:**

*Greywater* Waste water from sinks and washbasins.

*Potable water* Water of drinking quality.

**9.4 Drainage**

**To achieve overall drainage efficiency**

Adhere to CIRIA guidance that surface water generated on a greenfield site should be attenuated to the greenfield 1 in 1 year run-off rate. Brownfield sites should demonstrate a reduction in run-off rates, in terms of both volumes and peak flow rates of surface water leaving the site. Ensure the above incorporate the predicted increased volumes of water resulting from climate change.

<b>To achieve these:</b>	<b>Undertake these:</b>
<p>Reduced surface water rates and volumes discharged into the surface water drainage and river systems.</p>	<p>Design appropriate sustainable drainage systems based on an assessment of</p> <ul style="list-style-type: none"> <li>• the soil permeability</li> <li>• hydrology characteristics of the site,</li> <li>• the run-off characteristics of the proposed development.</li> </ul> <p>To achieve this utilize the following as appropriate:</p> <ul style="list-style-type: none"> <li>• Minimise paved areas.</li> <li>• Install porous surfaces to paved areas.</li> <li>• Drain surface water into lawns and planted areas.</li> <li>• Install soakaways, designed using the percolation tests as identified in BRE365.</li> <li>• Install filter strip vegetation areas.</li> <li>• Install filter drains.</li> <li>• Install infiltration trenches.</li> <li>• Utilise existing ditches, where present.</li> <li>• Install swales.</li> <li>• Install green roofs and brown roofs.</li> <li>• Collect surface rainwater for re-use on site and to reduce surface drainage needs.</li> </ul> <p>(All in compliance with the priority sequence set out in Building Regulations H3)</p> <p>Install basins, ponds and wetlands to store surface water on site for short term flood water storage, ensuring</p> <p>10% of the site area, in Flood Zone 1, and</p> <p>20% of the site area, in Flood Zones 2 and 3, is available unless the flood capacity is alternatively accommodated.</p>

Protect the quality of surface water discharged into the surface water drainage and river systems from contamination.	Establish and implement adequate maintenance regimes for sustainable urban drainage systems.
	An agreement must be put in place for the adoption, maintenance and operation of the drainage system, and a plan instigated for long term monitoring of performance.
	Install a high standard with regard to the number and accessibility of drainage inspection chambers and access/rodding points to private drains and sewers to enable blockages to be easily addressed, with means of access provided at each individual unit.

### Intended planning conditions to secure the objectives and informatives:

<b>Planning conditions and informatives will be added after the Standard Planning Conditions have been revised and approved.</b>	
<b>Definitions:</b>	
<i>Brown roof</i>	A flat roof covered with a thin layer of crushed rubble and gravel, ideally obtained at minimal cost from the redevelopment site itself, intended to be gradually colonised by spiders and insects to provide a feeding site for insectivorous birds.
<i>Green roof</i>	A building roof that is partially or completely covered with a waterproof membrane and soil or other growing medium, planted with vegetation.
<i>Run off</i>	Rainwater which does not percolate through the ground but flows across the surface of a site into drainage systems or other sites.
<i>Sustainable drainage</i>	The retention of rainwater on site and its slow release into the river and/or drainage systems.

**References:**

British Standards Institution, 1991. BRE365 Soakaways. Bracknell: HIS BRE Press.

CIRIA, 2006. Designing for exceedance in urban drainage – good practice C635. London: CIRIA.

CIRIA, 2007a. The SUDS Manual C697. London: CIRIA.

CIRIA, 2007b. Site handbook for the construction of SUDS C698. London: CIRIA.

Department for Communities and Local Government, 2006. Planning Policy Statement 25 Development and Flood Risk. London: The Stationary Office.

Department for Communities and Local Government & Department for Environment and Rural Affairs, 2006. Water Efficiency in New Buildings – A consultation document. London: Department for Communities and Local Government.

Department for Communities and Local Government, 2007. Code for Sustainable Homes. London: Department for Communities and Local Government.

East of England Regional Assembly & the East of England Sustainable Development Round Table, 2001. Our Environment, Our Future The Regional Environment Strategy for the East of England. Flempton, Suffolk: East of England Regional Assembly.

Environment Agency, 2007. Making better use of our water resources – Identifying areas of water stress – Consultation document. Bristol: Environment Agency.

Environment Agency, 2007. <http://www.environment-agency.gov.uk/subjects/flood/826674/829803> Accessed 15<sup>th</sup> May 2007.

Martin. P. et al., 2000. Sustainable urban drainage systems – design manual for England and Wales (C522). London: CIRIA.

Martin, P. et al., 2001. Sustainable urban drainage systems – best practice manual for England and Wales (C523). London: CIRIA.

National SUDS Working Group, 2004. Interim Code of Practice for Sustainable Drainage Systems. London: National SUDS Working Group.

**Examples:**

**Beaulieu Park**

**BedZed, Helios Road, Wallington, Surrey**

**Great Notley Garden Village, Braintree, Essex**

**The Dry Garden, The Royal Horticultural Society Garden, Hyde Hall, Essex**

**Housing Association Homes, Heybridge, Essex**

**Millennium Green project, Newark, Nottinghamshire**

**New Hall, Harlow**

**Notley Green County Primary School, Great Notley, Braintree, Essex**

**Upton Green, Northampton**

**Contacts:**

BedZed, [www.peabody.org.uk/pages/GetPage.aspx?id=179](http://www.peabody.org.uk/pages/GetPage.aspx?id=179)

Environment Agency, 2007. <http://www.environment-agency.gov.uk/>

Essex and Suffolk Water. [www.eswater.co.uk](http://www.eswater.co.uk)

Miller Homes [www.millerhomes.co.uk](http://www.millerhomes.co.uk)

## **Appendix A – Core Strategy and Development Control Policies**

### **CORE STRATEGY POLICIES**

#### **CP1 – Securing Sustainable Development**

The overarching policy to secure sustainable development from spatial location to use of materials and construction methods to help reduce the depletion of natural resources and the production of greenhouse gases.

#### **CP2 – The Borough-Wide Spatial Strategy**

The Borough-wide Spatial Strategy for sustainable housing and job growth whilst safeguarding and enhancing key existing assets and resources.

#### **CP5 – Containing Urban Growth**

Urban growth contained by defining the physical limit of the urban areas of Chelmsford and South Woodham Ferrers and the Defined Settlements.

#### **CP7 – Area Action Plans**

The proposed Area Action Plans for Chelmsford Town Centre and North Chelmsford, to set out an integrated land use and urban design framework to direct development proposals and public realm investment.

#### **CP8 – Promoting Accessibility**

The requirement for development proposals to be accessible to all, by all forms of sustainable modes of transport.

#### **CP9 – Protecting Areas of Natural and Built Heritage and Archaeological Importance**

The protection and enhancement of the Borough's natural and historic environment, biodiversity, archaeological and geological conservation.

#### **CP10 - Protection from Flooding**

Development protected from flooding with appropriate measures to mitigate flood risk.

#### **CP11 – Energy and Resource Efficiency, Renewable Energy and Recycling**

Development to have a net beneficial effect on the local and global environment by promoting more energy efficient development, which minimises consumption of energy and the production of pollution and waste, and incorporates facilities for recycling water and waste. Support for renewable energy proposals.

#### **CP12 - Protecting and Enhancing Recreational Provision**

Formal and informal recreation facilities at appropriate locations.

#### **CP13 – Minimising Environmental Impact**

Development proposals to minimise their impact on the environment without significant and adverse impacts on health, amenity including air quality, and the natural and historic environment.

#### **CP14 – Environmental Quality and Landscape Character**

Enhancement of the environmental quality of the Borough's countryside and settlements, through the preparation of a Landscape Character Assessment and Village Design Statements.

#### **CP21 – Ensuring Buildings are well designed**

New buildings to be well designed, fit for purpose, appropriate for the site and its setting and adaptable for long term use. New buildings should be designed to make best use of sustainable construction techniques, buildings to meet changing needs and to sustain the Borough's housing and commercial building stock.

## **DEVELOPMENT CONTROL POLICIES**

### **DC2 – Controlling Development in the Countryside Beyond the Metropolitan Green Belt**

The countryside protected for its landscapes, natural resources and areas of ecological, historic, archaeological, agricultural and recreational value.

### **DC10 – Green Wedges**

Protect and enhance the open character of the Green Wedges

### **DC11 – Coastal Protection Belt**

Protection of the character of the undeveloped coastline, historic features, wildlife habitats and other sites of nature conservation importance.

### **DC12 - Replacement Dwellings in the Countryside**

Criteria for replacement or rebuilding of an existing dwelling outside the Urban Areas and Defined Settlements

### **DC15 – Protecting and Enhancing Biodiversity and Geology**

Restore, maintain and enhance biodiversity and geological conservation interests.

### **DC17 – Protected Lanes**

Protected Lanes

### **DC18 – Development Adjacent to Water Courses**

Resist development adjacent to rivers, the Chelmer and Blackwater Navigation and other watercourses where the design and layout of the proposed development fails to be sensitive to the landscape; allow for river use and provide fauna passages suitable as wildlife corridors.

### **DC19 – Conservation Areas**

Conservation Areas character

### **DC22 – Registered Parks and Gardens**

Special character of parks or gardens

### **DC26 – Energy Efficient Design and Use of Materials**

Planning permission will not be granted for development which fails to meet the following standards:

- i) developments of ten or more dwellings or non-residential developments of 1,000 sq. m. or more incorporate renewable energy systems to provide a reduction of at least 10% of the carbon emissions resulting from the development's predicted energy requirements; and
- ii) all new dwellings attain a minimum rating of 'Level 3' under the Code for Sustainable Homes (or its successor), and all non-residential buildings have a minimum BREEAM rating of 'Very Good'; and
- iii) the re-use of materials from on-site waste generation and management in excess of that required by the Code for Sustainable Homes; and
- iv) it will not have a detrimental impact on the amenity of the local environment, taking into account the existing character of the area.

### **DC27 – Water Efficiency and Sustainable Drainage**

All Developments will, where practicable, and with the agreement of the relevant statutory authority or other agency concerned, incorporate measures to:

- i) reduce the demand for water usage by and within developments
- ii) provide sustainable drainage systems.

The council will actively seek to promote agreement to the use of such measures and systems (where practicable) with the relevant authorities and agencies.

### **DC30 – Air Quality**

Within designated Air Quality Management Areas the Borough Council will promote measures to improve air quality.

### **DC31 – Amenity and Pollution**

Avoiding polluting emissions to land, air, and water by reason of noise, light, smell, fumes, vibration or other.

**DC41 – Protecting and Enhancing Open Spaces and Indoor Sports Facilities**

Protect existing public and private open space,

**DC46 – Site Planning**

Site planning and design of building and spaces.

**DC60 – Farm Diversification**

Diversify the range of economic activities on a farm

## **Appendix B**

### **Chelmsford Borough Council**

### **Chelmsford Sustainability Checklist for planning applications**

#### **Why a Sustainability Checklist?**

All new building projects have a long-term impact on the environment. The Council aims to achieve environmentally sustainable development in large and small schemes for which it grants planning permission. While some aspects of sustainable building are addressed by the building regulations, it is for town planning to consider all sustainability matters in the round.

#### **Why you need to complete this checklist**

This form acts as a prompt for the benefit of applicants preparing development proposals. It will enable the planning officer to assess the merits of your proposals and to follow up issues relevant to the grant of planning permission.

#### **How we will use the information**

This information will form part of the case officer's report on your planning application. The information will also be used to monitor all development proposals to help the Council review policy and its service to applicants. Please refer to the Council's guidance document on Sustainable Design and Construction for advice.

1	Are you aware of any protected species (e.g. bats, great crested newts or badgers) on the site or are there any trees, wildlife or habitats such as hedges, ponds or watercourses on the site? (Please provide details)
2	Has an ecological survey of the site be carried out prior to development, or will one be undertaken?
3	How do you intend to protect the trees, habitats or protected species referred to above?
4	What measures will be taken to enhance the ecological value of the site?

	<p>Planting of native species <input type="checkbox"/> Other, please specify:</p> <p>Installing bird/bat boxes <input type="checkbox"/></p> <p>Green/Brown roofs <input type="checkbox"/></p> <p>Creation of a pond/s <input type="checkbox"/></p>
5	<p>What measures have you considered, as part of this development, to encourage occupiers to use other means of transport than the private car?</p> <p>Close to frequent bus route <input type="checkbox"/></p> <p>Safe cycle and pedestrian routes around the site and to local facilities <input type="checkbox"/> Other, please specify:</p> <p>Cycle storage provision <input type="checkbox"/></p> <p>Close to local amenities <input type="checkbox"/></p>
6	<p>How has the development been designed to make best use of passive solar gain?</p>
7	<p>Will there be a space and fixings provided for occupiers to dry their clothes (external or internal)?</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If 'Yes', please provide details:</p>
8	<p>What measures will be taken to apply Sustainable Drainage Systems*?</p> <p>Rainwater harvesting <input type="checkbox"/> Other, please provide details:</p> <p>Minimise paved areas <input type="checkbox"/></p> <p>Permeable hard surfaces <input type="checkbox"/></p> <p>*Further information on <a href="http://www.environment-agency.gov.uk/business/444304/502508/464710/">http://www.environment-agency.gov.uk/business/444304/502508/464710/</a></p>

9	What recycling and composting facilities will be provided (number of bins, capacity and location)?
10	<p>Do you intend to have the site registered with the Considerate Constructors Scheme (CCS)*</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>No but I will use an alternative scheme <input type="checkbox"/></p> <p>*Further information: <a href="http://www.ccscheme.org.uk/">http://www.ccscheme.org.uk/</a></p>
11	<p>Has the development been designed to comply with the Lifetime Homes* criteria?</p> <p>Further information: <a href="http://www.lifetimehomes.org.uk/">www.lifetimehomes.org.uk/</a></p>

## **Appendix C - Examples**

### **Ashcroft Building, Anglia Polytechnic University, Chelmsford Essex**

This is a five storey teaching block, containing teaching and seminar rooms, with a flexible meeting/exhibition space on the top floor, constructed with a steel frame supporting TermoDeck hollow core precast concrete planks with structural topping. The south façade is a 'bio-climatic' double wall (an inner and outer skin of glass set 1,200mm apart with motorised sunshade louvers and maintenance walkway in the space between. In summer excessive solar gain is prevented by activating the sunshade louvers and by utilising the gap between the glass skins as an open flue, controlled by motorised louvres at the head of the wall. In winter the double skin reduces heat loss. The all-glass façade allows the rooms to be lit with natural light as far as possible, reducing the need for artificial light.

### **The Queens Building, Anglia Polytechnic University, Chelmsford, Essex**

This university building comprising offices, lecture and student facilities was constructed in 1996. It was based on natural ventilation using two central atria to extract exhaust air, with inlet air being manually controllable through wall vents into peripheral heating plenums. Exposed coffered concrete ceiling slabs formed the basis of the night cooling strategy, which are operated by natural ventilation, again using the central atria for the exhaust air. Triple glazed windows were fitted containing inter-pane venetian blinds between the outer single glazing and the inner double pane glazing. The two atria, together with double light shelves assisted the daylighting strategy and an artificial lighting control system. Other energy saving features were high fabric insulation levels, compact design and condensing gas boilers. Overall, monitored energy consumption was reduced by 68% compared with a comparable air-conditioned building, an annual saving of 285kWh/m<sup>2</sup> of usable floor area.

### **Beaulieu Park, Chelmsford**

Beaulieu Park has a balancing/attenuation pond situated in a farmer's field adjacent to the site, which collects grey surface water run off from the development and the adjacent football field. Countryside Properties Plc initially wanted to bring in a concrete tank above ground but CBC encouraged the developer to create a natural feature and the pond now has a natural appearance. It was initially designed as a dry pond, however in reality it continuously holds water.

### **BedZed, Helios Road, Wallington, Surrey**

BedZED is a mixed-use, mixed-tenure development that incorporates innovative approaches to energy conservation and environmental sustainability, built on reclaimed land.

BedZED houses are arranged in south facing terraces to maximise heat gain from the sun, known as passive solar gain. Each terrace is backed by north facing offices, where minimal solar gain reduces the tendency to overheat and the need for energy hungry air conditioning. Through the innovative design and construction, heat from the sun and heat generated by occupants and every day activities such as cooking is sufficient to heat BedZED homes to a comfortable temperature. The need for space heating, which accounts for a significant part of the energy demand in conventional buildings, is therefore reduced or completely eliminated. Buildings are constructed from thermally massive materials that store heat during warm conditions and release heat at cooler times. In addition, all buildings are enclosed in a 300mm insulation jacket. Reductions in energy consumption during construction have been supported by consumption figures during occupation that are way below UK averages. To enable residents and workers to keep track of their heat and electricity use, meters are mounted in each home and office kitchen.

During construction reductions in energy and water consumption were achieved through careful construction methods. Where possible, BedZED is built from natural, recycled or reclaimed materials. All the wood used has been approved by the Forest Stewardship Council or comparable internationally recognised environmental organisations, to ensure that it comes from a sustainable source. Embodied energy is a measure of the energy required to manufacture a product and transport it to the market. To reduce the embodied energy of BedZED, construction materials were selected for their low embodied energy and sourced within a 35-mile radius of the site where possible. The energy expended in transporting materials to the site was therefore minimised.

BedZED generates power from a small-scale combined heat and power plant (CHP), powered by off-cuts from tree surgery waste that would otherwise go to landfill. The heat from the CHP provides hot water, which is distributed around the site via a district heating system of super-insulated pipes. Should residents or workers require a heating boost, each home or office has a domestic hot water tank that doubles as a radiator. The BedZED design concept was driven by the desire to create a net 'zero fossil energy development', one that will produce at least as much energy from renewable sources as it consumes. Only energy from renewable sources is used to meet the energy needs of the development. BedZED is therefore a carbon neutral development - resulting in no net addition of carbon dioxide to the atmosphere and is the UK's first and largest carbon-neutral eco-community.

A legally binding Green Transport Plan was a condition of planning permission, that promotes walking, cycling and use of public transport, with target of a 50% reduction in fossil-fuel consumption by private car use over the first ten years of the development compared with a conventional development. BedZED has good public transport links, including two railway stations, two bus routes and a tramlink. A car pool for residents has been established, and all these initiatives have helped to provide a strategic and integrated approach to transport issues and shows that it is possible to reduce reliance on cars. The car club has reduced car ownership and improved accessibility for those who are unable to afford a car. On-site charging points for electric cars and a free public electric vehicle charging point is already available in Sutton town centre. BedZED's 10-year target is to produce enough electricity from photovoltaic panels (which convert sunlight into energy) to power 40 electric vehicles. For owners of electric vehicles energy and parking will be free of charge.

There is a strong emphasis on waste water recycling. Reductions in water consumption during construction have been supported by consumption figures during occupation that are way below UK averages. The development is provided with roof gardens, which reduce run-off rates and volumes.

### **EarthShip Brighton**

Earthship Brighton is one of Europe's first Earthships. Earthships are solar powered homes and work spaces, built from a massive waste problem – used tyres. They are buildings that work with the planet's natural systems - using the sun's energy and rain to provide heat, power and water. They do not make use of greenhouse gas emitting power stations, nor do they rely on mains water or waste services, making them autonomous and therefore cheap to run. Earthship Brighton will provide a local resource for education on the links between buildings, climate change, waste management and consumerism.

The Earthship is constructed from waste tyre walls, adobe walls, bottle walls and stone floors. The walls are painted with natural paint. Power and heat is generated by, 1.116kw Unisolar Photovoltaic solar panels, a 900watt Whisper H40 Wind Turbine, a 15kw Wood Pellet Boiler and a Solar Thermal Heating system.

The two greywater planters to clean the waste water from the sinks and shower have been constructed, supplying the low flush toilet with recycled greywater. A blackwater treatment reed bed will be constructed for the treatment of toilet waste.

After construction the site will be restored to a Sussex chalk Downland. The landscape plan for the site has been produced by a local ecologist and endorsed by the Sussex Wildlife Trust.

### **Fairfax House, London Borough of Lambeth**

Lambeth Council's Corporate Environment Charter promotes 'efficient use of natural resources in respect of purchasing goods and services' and consideration of 'national and global environmental implications together with the needs of future generations'. Lambeth Housing is committed to using sustainable timber and requires contract administrators, other construction professionals and contractors individually and jointly to demonstrate that their projects use only sustainable timber. Fairfax House, a housing construction project for Lambeth Housing to refurbish twenty 1970s homes, was independently certified for its use of well managed timber. Lambeth Housing set down explicit contractual requirements for FSC timber via the tendering and contract specification process. Officers then worked with the appointed contractor to ensure that the timber used had a robust 'chain of custody'.

### **Great Notley Garden Village, Braintree, Essex**

Great Notley Garden Village is a 2000-unit housing development with a country park and wetland for amenity value. Braintree District Council own and manage the lakes as part of the country park. The

retention ponds and wetlands are to attenuate flood flow and treat storm water. The developer was Countryside Properties, who made commuted payments to the water body and drainage authority. The scheme was designed before SUDS techniques were fully and was considered to be somewhat new territory and has proved a success.

There is a shallow (max 150mm) reed bed filtration basin, 50% covered by different types of reed which removes the impurities from the surface water run-off the outflow from which feeds into the main lake. The lake is a storage pond for storm water, which always contains water and is fished, providing an amenity feature. The lake also contains some reeds, which are for wildlife and amenity reasons and help to reduce erosion rather than for filtration purposes.

### **Gorgie Project, Edinburgh**

The experimental "car-free" residential development for 120 flats in the Gorgie area of Edinburgh, by Canmore Housing Limited, a local Housing Association, was the first of its kind in Britain. It represents a new form of urban living which is not dominated by the car and it has attracted a great deal of interest. Car-free residential areas, in which the residents undertake not to own cars, allow higher environmental quality than usual in new developments, with cars completely excluded.

### **Housing Association Homes, Heybridge, Essex**

In 1997, Essex & Suffolk Water started a project with the Building Research Establishment (BRE) involving a small development of new Housing Association Homes in Heybridge, Essex. 12 homes were fitted with water efficient appliances, comprising 6 litre WCs, low volume baths, low flow showers, spray mixer taps and reduced flow basin taps. Point of use metering was installed in these 12 houses and in 12 control homes, without these appliances, and monitored for 14 months. Three further homes were fitted with individual greywater recycling units. The average volume of water used per person per day was 97 litres in the water efficient houses compared to 102 litres in the control houses, a difference of 5 litres per person. If only the consumption from the water efficient appliances and their equivalent in the control houses is compared, the water efficient houses used 13% less water per person than the control houses. One of the outcomes from the project is a specification for water efficient new homes, costing only £48 per property to fit, with lifespan of about 10 years and which will pay for themselves in the first year through savings on metered charges.

### **The Dry Garden, The Royal Horticultural Society Garden, Hyde Hall, Essex**

The Dry Garden was designed to demonstrate sustainable horticulture techniques and practically illustrate how a garden can be created without the need for artificial irrigation. The Garden has resulted in a direct saving of around 15,000 litres of water per month during the growing season. Gardening has become an increasingly popular pastime and The Royal Horticultural Society estimates that a garden of 1,500m<sup>2</sup> would require 105m<sup>3</sup> of irrigation per annum to remain in good health.

### **Millennium Green project, Newark, Nottinghamshire**

Gusto Homes, is a small, privately owned house building company, committed to incorporating environmental good practice and sustainable development objectives into its housing. Environmental design features were incorporated into the houses including solar water heaters, passive solar heating and an advanced air management system.

The company has designed and implemented a number of water efficiency measures in each new home including fitting 'Freerain' rainwater harvesting systems, which led to demonstrable savings through a reduction in the size of water infrastructure, such as storm drains and soakaways, needed for the development. In this project 24 homes and the company's own office were fitted with 'Freerain' rainwater harvesting systems. The rainwater system uses underground storage tanks large enough to provide non-potable water to the home for 18 days, for toilet flushing, washing machines (which has the added advantage of reducing the amount of detergent required, as the water is softer than mains water) and gardening purposes. Various water efficient appliances, including dual flush toilets, aerated taps and shower units complement the rainwater harvesting system. If the supply of rainwater becomes low, the tank is automatically topped up by mains supply, which illuminates a light in the control box, enabling homeowners to observe whether the water supply is from rainwater or the mains. Two of the houses were additionally fitted with equipment providing monitoring data direct to Severn Trent Water. Analysis of the water use

in two homes fitted with monitoring equipment was carried out by Gusto, in conjunction with Severn Trent Water and the Environment Agency, indicating that the harvested rainwater accounted for 50% of water consumption in the houses, whilst the combination of the rainwater system and water efficient appliances reduced total household consumption by 50m<sup>3</sup> per annum. Gusto was also able to make demonstrable savings through a reduction in the size of water infrastructure, such as storm drains and soakaways, needed for the development.

### **New Hall, Harlow**

A 93-unit housing development with a balancing pond to reduce flood risk, constructed as a water feature with a reed bed upstream.

### **Notley Green County Primary School, Great Notley, Braintree, Essex**

The single storey building is naturally ventilated and minimises artificial lighting requirements. Three bands of rooflights are positioned where the roof is turned up in a series of folds, and circular rooflights illuminate the corridor. The load bearing timber stud walls are highly insulated to achieve low energy consumption and clad in low maintenance horizontal cedar boarding. The roof is planted with a sedum moss as part of a proprietary system laid on an insulated plywood deck. All materials were assessed in terms of their use, embodied energy, environmental impact, lifecycle costings and recyclable potential.

### **311-313 Trinity Road, Wandsworth, London SW17**

This is a new development of 12 one & two bedroom apartments, by Servite Houses, offering contemporary designs and environmentally friendly features. The development has been designated as car free, and residents will be able to utilise Servite's established links with Street Car, who will give residents the opportunity of opting into the car sharing scheme.

### **Upton Green, Northampton**

This is a development of 123 new homes on the outskirts of Northampton, by Miller Homes, designed to achieve the top score of 'Excellent' in the BREEAM/EcoHomes assessment method and to achieve the highest NHER (National Home Energy Rating) of 10 for energy usage in the home. Thermal insulation exceeds Building Regulation requirements by 50% and by 20% in lofts. They are constructed from environmentally friendly materials, mainly locally sourced. The homes have high ceilings and tall windows to maximise natural light.

Thermal insulation exceeds Building Regulation requirements by 50% and by 20% in lofts. They are constructed from environmentally friendly materials, mainly locally sourced. The homes have high ceilings and tall windows to maximise natural light.

54 homes have solar collectors on south facing roofs, providing 70% of the hot water requirement for a typical 4 bedroom family home and are fitted with the latest condensing boilers, which operate at 94% efficiency. All houses have rainwater harvesting systems and the development has been constructed with a sustainable urban drainage system.

Each house is fitted with a rainwater harvesting system, with a reservoir buried beneath the rear garden, to store water that can be used for watering the garden, cleaning the car. It is also filtered and used in the home for the washing machine and flushing selected water closets., which reduces the discharge from the site. The development has also been constructed with a sustainable urban drainage system, where rainfall is disposed of by a series of linked, shallow ditches providing a controlled flow into the river. The ditches and swales (ponds) are planted to provide nature conservation as well as an amenity function.

### **The Wintles, Bishop's Castle, Shropshire**

The Wintles is a development of 41 houses by Living Villages, with the philosophy of creating an attractive lifestyle that is also environmentally friendly. Living Villages houses are designed to be flexible, taking into account the changing needs of families over the years. Internal stud walls can be moved to alter the size of rooms to suit the occupiers requirements. The flexible room layouts are also ideally suited to those who want to work from home, and the development is wired for broadband and other technological advances.

The houses are designed to face towards the sun and incorporate large high performance windows to draw in as much light and warmth as possible and many have sun spaces and internal balconies. The development makes the most of this free energy with high levels of insulation, triple glazing, draught-free building techniques and solar panels. Living Villages houses are designed to maximise the effectiveness of heating energy used. Heat is input to the dwelling in the areas where it is most needed: living rooms, bathrooms etc. and left to permeate upwards through the less frequently used areas. Bedrooms are unheated, relying on this upwards movement of heat (the general principle has been called 'the thermal onion', meaning that heat is released into the centre of the onion and gradually moves outwards, thus heating the outer layers to a lesser extent - the outer layers serving to insulate the inner). The heat generated is retained by a highly insulated building shell, draught-proof windows and doors and thermal mass within the building. (Thermal mass is dense material, like brick, stone or concrete that acts like a storage heater, taking in heat during the day and letting it out gently as the house cools down.) For cold spells, the houses are fitted with gas condensing boilers that can react quickly and efficiently to any changes in room temperature as well as providing a heat boost to the water temperature if necessary. For those who like a real fire in the winter, flues for wood-burning stoves have been installed. It is intended that in periods of extremely cold weather, the heating in the upper rooms can be supplemented by small electric heaters. The ventilation systems help to eliminate unhealthy dampness and mould. Where fitted, heat recovery systems extract the warm, moist air from bathrooms and kitchens and take the heat out of it. The stale air is vented outside, then the collected heat is transferred to fresh air coming into the building and distributed to the bedrooms and living rooms at a constant, comfortable temperature. Air intake filters on the mechanical heat recovery systems prevent dust entering with the incoming fresh air, and the internal vacuum cleaner systems extract dust from the house and vent it to the outside – particularly beneficial to asthma and hayfever sufferers.

The houses are oriented towards the sun to enable solar panels to be fitted onto the roofs to harness sunlight to heat water and generate electricity.

For the health of the residents and the planet, wherever possible the houses are built with materials that are free from toxins or harmful products of the petro-chemical industry, including the use of non-toxic paint and timber from sustainable sources. Lime is used in preference to cement as it has been used as a building material for thousands of years, and although energy and CO<sub>2</sub> are used in its production it gently returns back to limestone in time, absorbing CO<sub>2</sub> in the process. Producing and transporting building materials burns energy, so the development uses locally-sourced materials wherever possible. Reclaimed materials, particularly bricks, slates and roof tiles are used whenever possible, as they are eco-friendly, and also help new buildings to blend in with their surroundings.

### **Rural Business Centre, Environment Village, Writtle College, Writtle, Essex**

The Rural Business Centre's new offices and lecture theatre breakout rooms are a demonstration project for a more environmentally responsible design approach to the construction process and the building in occupation. The building is orientated south to maximise solar heat gain into the building. It has high thermal mass through exposed concrete floors and walls, enabling the building to function as a heat sink storing solar heat gains, body heat and heat generated by office appliances. The stored heat is reemitted back into the building at times when the external temperature is lower than the internal ambient temperature. The building has high levels of external insulation. The building has a passive stack ventilation system.

The roof is a photovoltaic array - an amorphous silicon structural standing seam roof. Materials have been selected for their high recycled content and low global environmental impact.