

Entec

Creating the environment for business

Sustainable Design



A high-angle, slightly faded photograph of a large group of people, mostly young adults, playing steel drums. They are arranged in a circular formation on a dark floor. The drums are mounted on stands. The people are wearing casual clothing like t-shirts and jeans. The overall tone is light and artistic, with a semi-transparent text overlay in the center.

Sustainable Design

Integrating Practice

A lot of people talk about sustainability. At Entec, linking theory with practice is key to delivering innovative design solutions.

Entec's sustainable design team has been instrumental in defining, delivering and learning from some of the most sustainable developments in the UK and abroad.

The team, which is integral to Entec's multi-disciplinary approach, includes specialists in architecture, environmental

design and engineering, energy, surveying and project management.

The collaborative nature of our work ensures that we develop close links with other Entec experts in areas such as ecology, waste, water, flood risk, planning, noise, heritage, contaminated land and engineering. This allows us to focus on our clients' project requirements and to maximise sustainability at all stages.

We support private and public clients by integrating planning policy, environmental regulations and social, economic and environmental risk to deliver long-term, cost effective and sustainable solutions.

Our expertise covers a range of scales from detailed design and construction, through site development and masterplanning to strategic planning and environmental assessment.



Our Approach

Entec's sustainable design team is in the unusual position of setting the standards, designing the solutions and learning the lessons from design, construction and occupation phases of new builds and re-developments of all uses.

Our clients have benefited from this invaluable experience in delivering environmentally friendly and sustainable developments that are commercially viable and technically deliverable.

Each project is approached by addressing each of the key sustainability issues at the appropriate level of detail according to scale and context, to deliver:

- Strategic policies and guidance;
- Site feasibility and development briefs; and
- Site and building design solutions.

Our close-knit sustainable design team continually challenge, evolve and improve

our projects. Our skill is in linking the theory to the practice and learning from the practice to develop the theory.

Lessons learnt on each project are fed into the next as an ongoing cycle. We do not sit back and provide the same information to every client – we listen, learn, develop and deliver.

Energy and Carbon

Modelling software allows us to optimise passive design techniques, saving energy and costs throughout a building's lifetime and reducing the need for low carbon and renewable technologies. We develop passive design strategies in collaboration with our energy team, incorporating the feasibility of co-generating, solar, ground and air based solutions.

Materials and Waste

Our experience in design, detail and construction and our advisory and training role on behalf of WRAP (Waste & Resources Action Programme) enables us to consider materials, environmental impact and performance. We are able to prioritise options and opportunities for retaining, locally sourcing and recycling materials whilst also assessing building fabric insulation, airtightness and thermal

bridging, thermal mass and building-integrated renewable technology.

Water

We have wide ranging expertise from establishing the feasibility and cost for achieving water neutrality in the Thames Gateway to advising on customer acceptability for low-flow kitchen taps. We approach water resources at all scales, from the large-scale considerations of flood risk and sustainable drainage solutions, to building-level solutions such as harvesting and recycling technologies, and individual fitting details such as specifying taps that comply with BREEAM or Code requirements.

Design and Engineering

As designers we have developed specific skills to understand the 'language' of development. This understanding allows us to read places and to go beyond the

confines of understanding a site, into an appreciation of the environmental, socio-economic, visual context and connectivity of a place as a component of a wider development. Combining creativity with robust engineering and assessing against sustainability standards, such as BREEAM or CEEQUAL, enables us to deliver sustainable solutions.

Life Cycle Performance and Sustainable Management

Our experience in all key stages of development enables us to predict reliability, functionality, life, costs and environmental impacts and to select optimal products and systems to deliver sustainability including physical, economic, environmental and social performance.

Selected Experience

Homes & Communities Agency

**Carbon Challenge Lead
Technical Advisor**



Central Office of Information

**Sustainable Development
Advice for the NHS**



Homes & Communities Agency

**Design for Manufacture
Competition –
Lessons Learnt 2**



WRAP

**Advocating Good Practice
in Waste Reduction and
Recovery**



Various Clients

EcoTown Proposals



Defence Estates

**Arborfield Garrison
Sustainable Community
Masterplan**



London Thames Gateway
Development Corporation

Canning Town & Custom House



Gentoo Group Ltd

Low Carbon Advice for Existing and Future Housing



Anglia Ruskin University

Sustainable Design Strategy and Energy Statement



Renaissance Southend

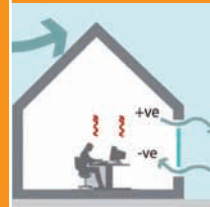
Warrior Square Gardens Sustainable Refurbishment



BREEAM, DREAM and CEEQUAL Consultancy



Building Modelling and Testing Using IES



Homes & Communities
Agency

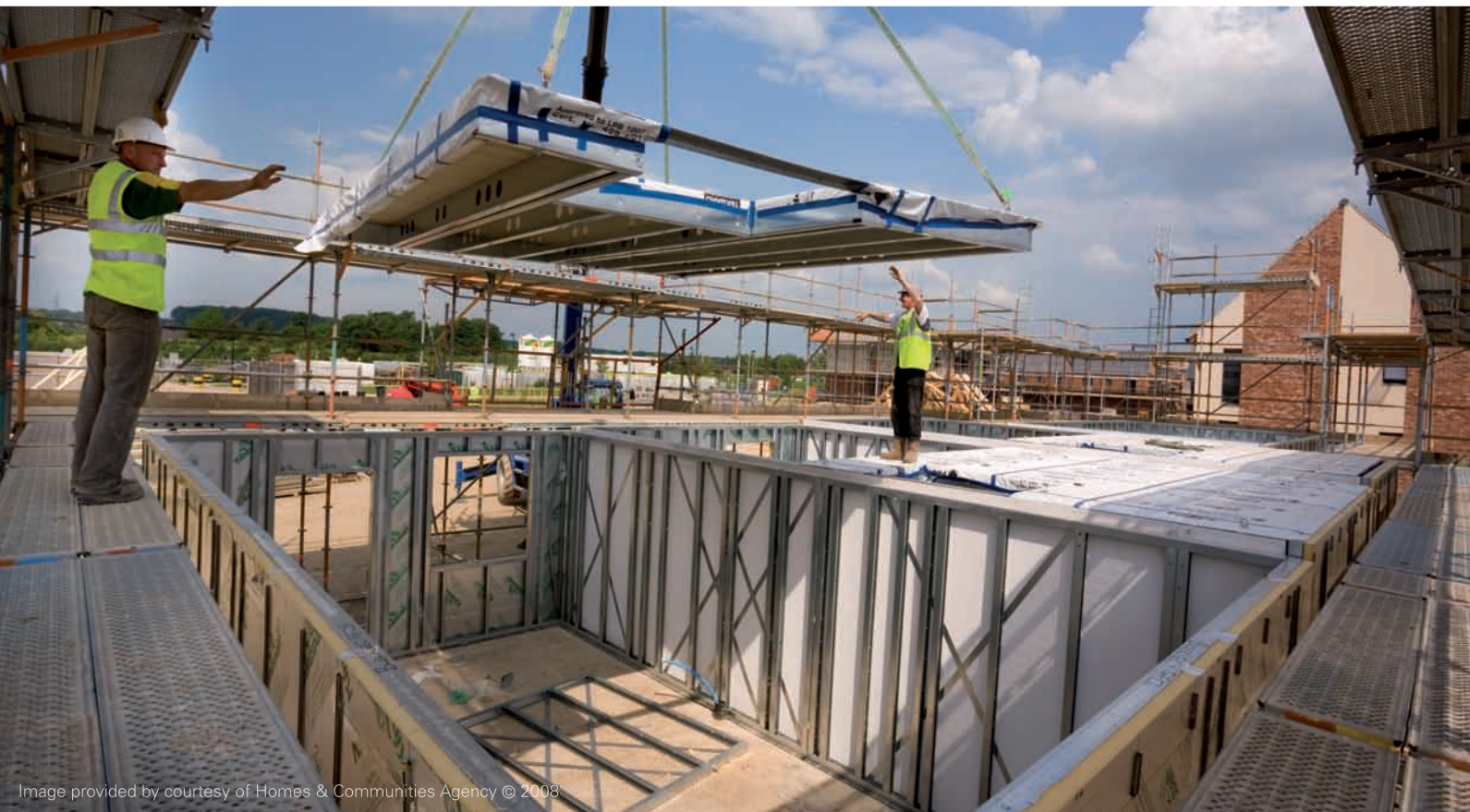
Carbon Challenge Lead Technical Advisor

Entec is supporting the Carbon Challenge in setting high standards for UK housebuilding.

The Carbon Challenge is a recent initiative by Communities and Local Government and English Partnerships (now Homes & Communities Agency – HCA) to deliver a series of low or zero-carbon developments

that show how to achieve the highest level of Code for Sustainable Homes and HCA's Quality Standards.

A generic brief was produced following a robust analysis of previous experiences in environmental design and engineering. Sustainable development principles in terms of environmental



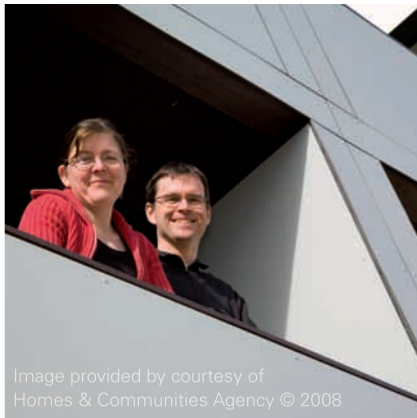


Image provided by courtesy of
Homes & Communities Agency © 2008



performance, design quality, support for innovation, commercial replication, deliverability and affordability were all developed in collaboration with BRE, EST and WRAP.

Individual site briefs, focusing on site specific issues, were prepared in collaboration with regional teams and partners, supporting them to develop the technical aspects of tender documents and evaluation criteria which respond to site specific requirements, managing risk and ensuring technical and financial viability.

Procurement support at each site was provided to help HCA and other partner landowners to manage the risks of delivering such a new and innovative project. This involved advice on the competitive dialogue process; support in writing the PQQ and ITT; evaluating tenders; and attending design workshops to advise on each bidder's design as it develops.

Advice in negotiation with developers was provided primarily associated with monitoring methods and arrangements, S106

agreements and other regulatory planning requirements. This ensured that commitments such as energy, waste, water, material use and site management were fulfilled and integrated into the design from the outset and that their delivery can be enforced.

An evaluation and monitoring process was developed in collaboration with the client. Developers were required to provide regular reports on results, to achieve continuous improvements and to share lessons learnt.

Central Office
of Information

Sustainable Development Advice for the NHS

Although a relatively small percentage of the NHS's £90 billion budget is spent on development projects, all these works will now adopt Entec's guidance on sustainable development.

Entec was commissioned to prepare comprehensive guidance for the NHS Estate to deliver sustainable development through the

services, social obligations and operations of the NHS.

The guidance demonstrates how the NHS Estates can be planned, designed and developed in a more sustainable manner, from the inception of a strategic service requirement up to the end-of-life of health and social care buildings, including all aspects of new build, refurbishment and maintenance work.





Entec engaged a wide range of internal expertise covering all aspects of built development and actively collaborated with a steering group including representatives from NHS Estates, CLG and Defra.

Based on analysis of current performance, a draft definition on sustainable development in the NHS Estate was prepared, structured along the UK

Government's five principles of sustainability.

Within the context of the NHS's Sustainable Procurement Action Plan selection of materials is a key issue. The guidance addresses engagement with the supply chain to consider aspects such as longevity, responsible procurement and designing for re-use at the end of life of a building.

Other issues relating to products and systems include design quality, future-proofing, pollution, climate change adaptation, construction efficiency and waste reduction.

The final guidance is available through the NHS website.

Homes & Communities
Agency

Design for Manufacture Competition – Lessons Learnt 2

The Design for Manufacture Competition was launched by the government in 2005 to demonstrate that low-cost, sustainable dwellings could be delivered through better efficiency, innovative building materials and techniques. Ten competition sites were available to the bidders who could demonstrate that they could design and build sustainable buildings and communities

with a construction cost of less than £60,000 per house, which led to the term 'the Sixty-K competition'.

Entec was appointed by English Partnerships (now Homes & Communities Agency) to assess the success of the competition and to write and design the second 'Lessons Learnt' publication.





Images provided by courtesy of Homes & Communities Agency © 2008

The methods used were both qualitative and quantitative. Site visits and round table meetings were held with the development teams and visits to a number of factories were undertaken, which enabled an understanding of the efficiencies of on- and off-site production.

Further information was gained from on-going monitoring and assessment data on quality standards, costs and construction efficiencies

measured by CaliBRE and SMARTWaste. Some of the initial lessons learnt are:

- In most cases the contractors had not used the systems before; most felt they would use the systems again, however would like to spend more time early in the design stage to iron out any potential problems;
- Using 3D modelling can produce a geometrically accurate 'virtual prototype'

to enable clashes and conflicts to be detected pre-construction and thereby to provide cost and time savings; and

- Thorough testing of innovative features reduces the risk of longer construction programmes through re-working, repeat trade visits and questionable future performance and usability of products and systems.

WRAP (Waste & Resources
Action Programme)

Advocating Good Practice in Waste Reduction and Recovery

Entec was commissioned by WRAP to engage with housebuilders on their approach to waste reduction and recovery. A key objective was to embed WRAP guidance into procurement documents at a corporate level in order to ensure delivery across all projects. Key targets relate to waste reduction, increased waste recovery and higher recycled content.

Entec's approach to housebuilders was based on demonstrating the wider benefits of improving performance on waste reduction and recovery; how this may directly impact on corporate sustainability commitments; and how implementing targets can be cost effective and commercially beneficial.

A close-up photograph of a white t-shirt laid flat. The t-shirt has a red graphic printed on the lower half that reads "I'm wearing post-consumer waste". In the bottom right corner, there is a small black circular logo containing a white letter 'S'. The t-shirt is slightly wrinkled and appears to be made of a soft fabric.

I'm wearing post-consumer waste

S



Support was based on WRAP tools and guidance, and tailored to each individual organisation. This included:

- Advice on good practice in waste reduction and recovery, including promotion and use of WRAP guidance and training;
- Advice on waste reduction through 'designing out' waste, off-site manufacture and other design-stage inputs;
- Drafting of contract documents, specifications and performance indicators;

- Drafting of procurement documents, including advice on suitable wording for corporate policies or environmental statements.

Overall outcomes with housebuilders, which included the Berkeley Group, Miller Homes and Persimmon Homes, were:

- Organisations are at different levels. Some are advanced in their understanding of good practice in waste reduction and recovery in procurement, whilst others are just beginning to understand the process;

- Good acceptance of position papers with one housebuilder taking this forward to develop a new waste and resources policy; and
- The review of objectives and targets has provided some points for discussion and opportunities to revise KPIs in line with WRAP's guidance and Government targets.

Various Clients

EcoTown Proposals

In 2007, the government launched the Ecotowns Competition to develop new zero-carbon communities. This is based in part on Entec's earlier research as part of the Carbon Challenge, to achieve carbon, water and waste neutrality for new settlements.

Ecotowns require an integrated design approach to deliver new sustainable settlements of up to 40,000 residents. Entec uses a resource model

to identify how the wide ranging technical inputs with regard to energy supply, waste management and water provision can be optimised to deliver the desired target of neutrality.

The model is used to support the design decision making process and to act as an interface between the sustainability framework and the design to deliver a truly multi-disciplinary masterplan.





A sustainable design guide is being developed to make recommendations with regards to passive solar design, green spaces for cooling, future proofing for flood risk, incorporating green infrastructure and energy efficient building design.

This includes a sustainable materials palette which identifies the impact of materials on the environment and offers two key selection criteria:

- The direct effects of the material relating to resource depletion, pollution and embodied energy; and
- The indirect effects of the material to its relating to its physical and energy performance.
- Reed used for insulation and/or as matting/boarding as a base for plaster; and
- Clay and other minerals from local quarries.

Opportunities identified for local sourcing of raw materials were:

- Timber produced from sustainably managed forests;

The palette is supported by recommended sources and aids designers to locate opportunities.

Defence Estates

Arborfield Garrison Sustainable Community

Entec is delivering an integrated masterplan for development of a new sustainable community on a brownfield former military site at Arborfield, Berkshire.

The masterplan draws together multiple in-house capabilities to form a comprehensive interdisciplinary design response to the site with reference to ecology and archaeology, access and transport, landscape and visual, architecture and urban design, land quality and utilities, flood risk and drainage, and energy and socio-economics.

An initial high level feasibility report confirmed the potential of the site to deliver a truly sustainable, major residential development located within and around the existing Arborfield Garrison.

After successfully persuading the local planning authority of the potential sustainability and deliverability of the site, the proposals were included within their core strategy. Proposals have subsequently been developed in greater depth to support an outline planning application which will include a full environmental impact assessment and energy statement. The development will provide a mixed community of 5,000 new homes.

Key sustainable urban design features include:

- Green corridors connecting existing ecological and landscape features and acting as routes for alternative transport modes and as cooling channels for the overall site;

- Strategic location of high density cores at walking distance from all areas of the site;
- Re-use of existing buildings and infrastructure;
- Strategic location of schools close to centres or playing fields;
- Open space and tree block buffers along areas of high ecological, landscape and visual value; and
- Passive design and supply of low or zero carbon energy as a viable and attractive opportunity for developers and long term infrastructure management companies.



SPA mitigation land around West Court

London Thames Gateway
Development Corporation

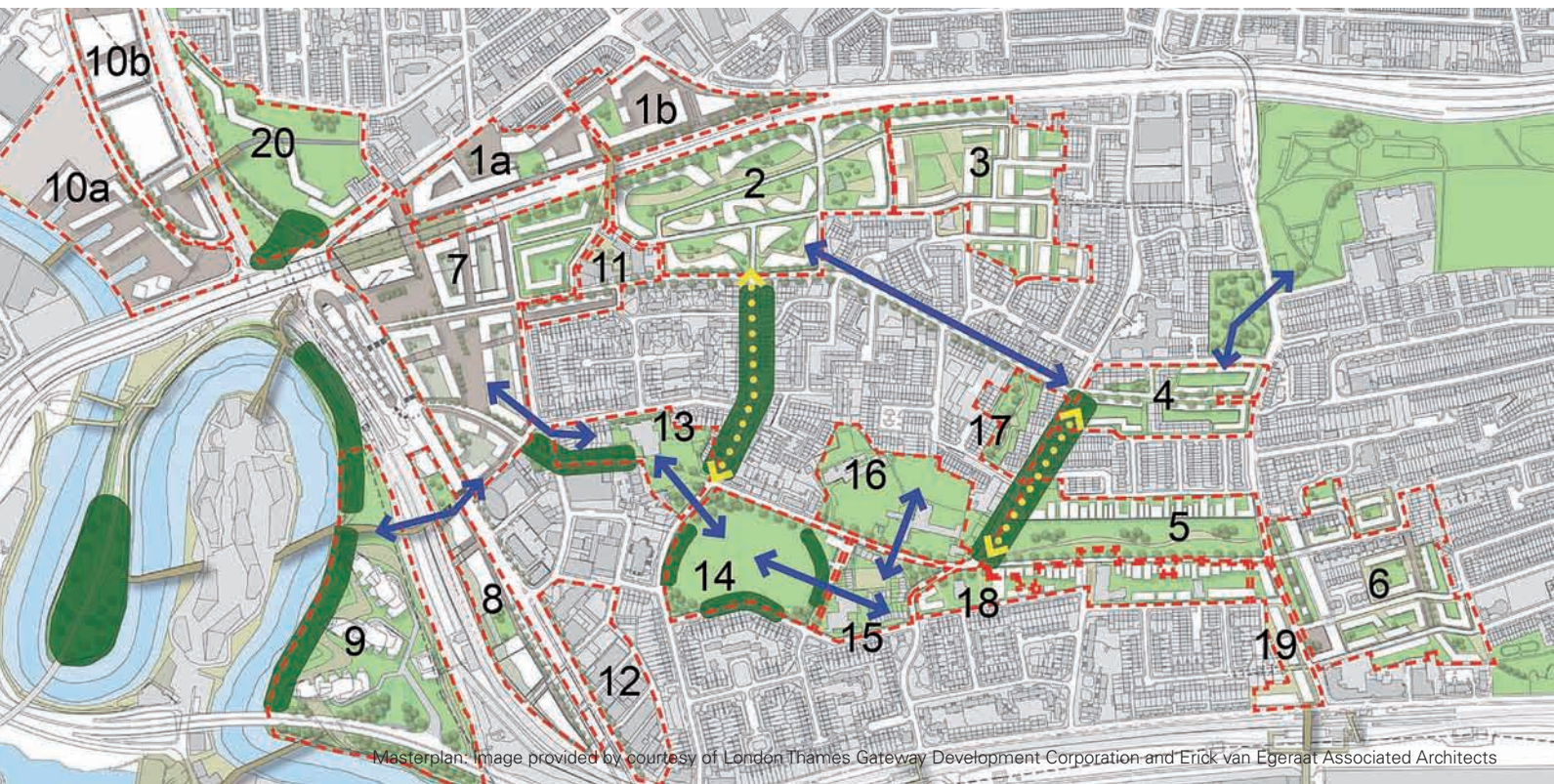
Canning Town and Custom House

Entec was commissioned to advise the Canning Town and Custom House Steering Group, which comprised representatives of LTGDC, Greater London Authority, the London Development Agency, Newham Borough Council, the English Cities Fund and the Environment Agency.

We are proud of our involvement in this project because we are making a real

difference through our advice on sustainability issues. Our client describes the project as a huge learning curve, adding, “that it will help to make Canning Town a better place to live.”

Entec identified opportunities for promoting sustainability at the area level, community level and individual home level. Key outputs related to waste, energy and water, and included:





- A detailed review of opportunities to improve the quality of sustainable design and construction using existing established methodologies, such as passive design solutions and adopting the Considerate Constructors Scheme. This review also included flexible solutions such as pre-demolition audits to maximise potential for waste re-use or recycling.
- A detailed and costed report into the current renewable and low-carbon technologies and their

applicability to the specific area. These included micro and macro-solutions that could achieve a range of carbon savings such as energy from waste, CHP and wind; and

- A detailed analysis of water efficiency solutions, based on the Code for Sustainable Homes. This considered the opportunities for rainwater harvesting and greywater recycling, as well as considering the feasibility of achieving water neutrality across the entire development.

The project team was drawn together in a series of workshops both internally and with key stakeholders from the GLA, LDA, EA and Newham to develop options into an overall strategy. This wider input also provided insight into emerging energy solutions in the local area that could provide mutually beneficial linkages.

The final report provided an analysis of the key policy drivers and existing best practice within the industry and formulated guidance on the most appropriate solutions.

Gentoo Group Ltd

Low Carbon Advice for Existing and Future Housing

Entec was commissioned by Gentoo Group to support their Midas Programme, aimed at reducing the carbon footprint of the group's property portfolio.

Entec delivered energy efficient designs and low carbon solutions at both a strategic and detailed level, taking into account national policy, market costs, risks and deliverability.

In collaboration with Entec's Energy Services Team an energy efficient design and low carbon solution at both a strategic and more technically detailed level (bearing in mind national policy, market costs, risks involved and deliverability) was delivered for Gentoo Homes.

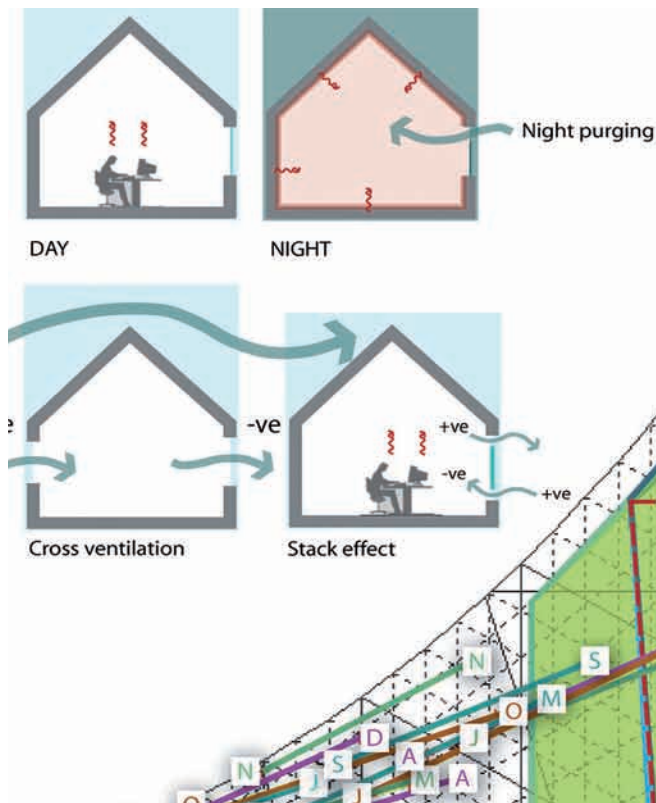




Image provided by courtesy of Homes & Communities Agency © 2008

Based on five standard house types and Gentoo's own standard specification for housing design, detailed advice was provided on site and building design to improve standards of sustainability.

A key part of this involved the undertaking of a Standard Assessment Procedure (SAP) to achieve a 25% carbon reduction from normal

standards. The work also considered airtightness and other efficiency improvements to standard designs.

Further advice was given on ways to achieve other building specific credits from the Code for Sustainable Homes, such as by highlighting options for alternative construction materials that have a lower environmental impact.

The final report identified a range of issues for building low carbon homes and weighed up the balance between short-term cost implications and long-term planning, whilst also considering appropriate measures related to the scale of development.

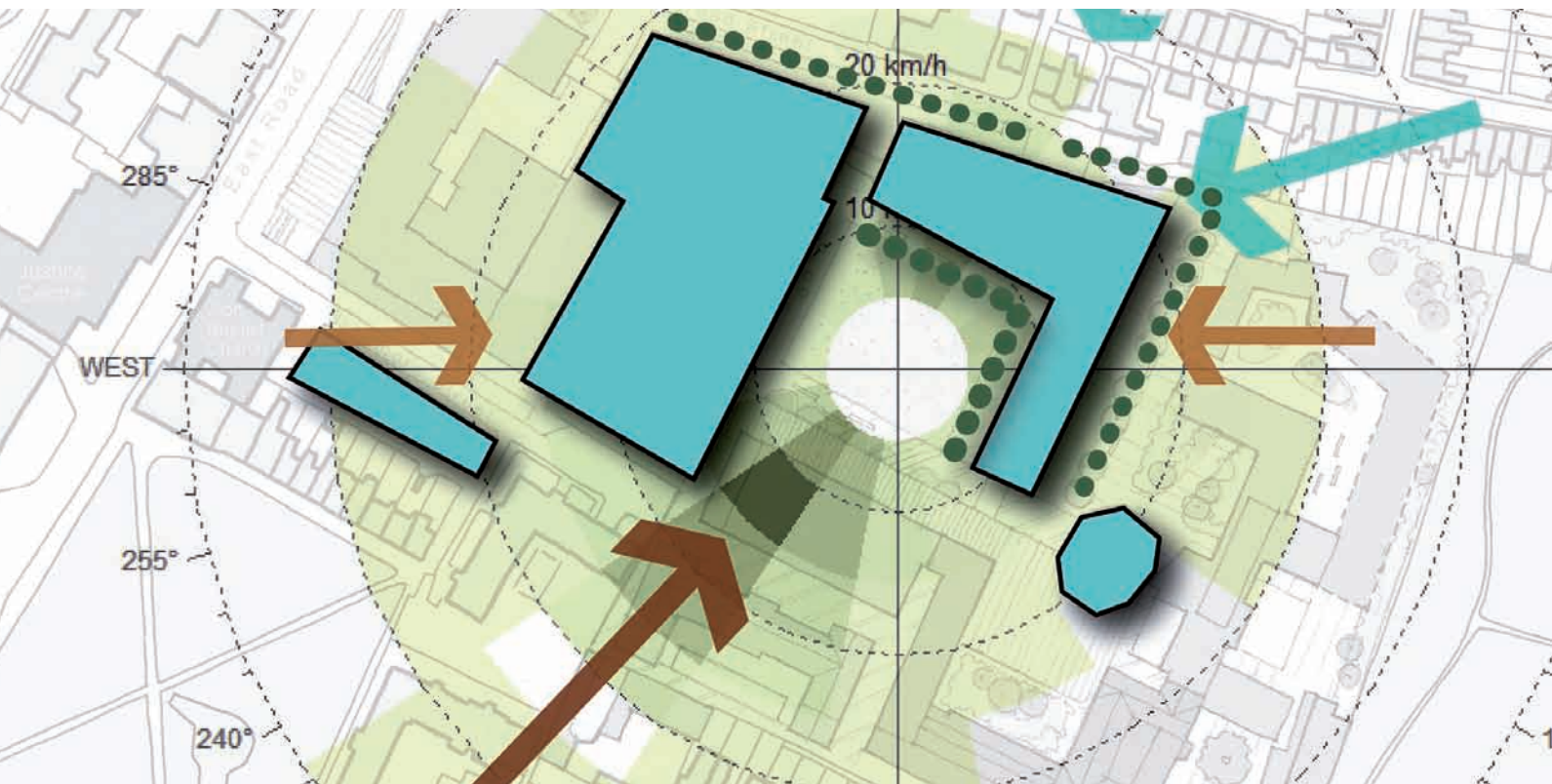
Anglia Ruskin University

Sustainable Design Strategy and Energy Statement

Entec is providing a range of services to Anglia Ruskin University, from identifying site constraints to designing detailed solutions.

Environmental and sustainable solutions have been integrated into the £40m refurbishment of Anglia Ruskin University's Cambridge campus.

From early in the conceptual design stage, the design has been guided by environmental principles aimed at designing out constraints and designing in cost efficiency and sustainability.





A constraints and opportunities report was undertaken into the key EIA issues that might affect the design, providing guidance on mitigating particular constraints such as overshadowing of a primary school, potential ecology on the site, and transport implications.

A further report detailed the potential for maximising passive design solutions, whilst controlling overheating by utilising IES software to thermally model the design

solution. It also included a feasibility study into renewable energy solutions.

As the design developed, Entec's role evolved into championing environmental and sustainable solutions, ensuring that the design did not compromise in-built sustainability. Working alongside the architects and building services engineers, the building systems were designed and developed, adopting a CHP solution to

deliver carbon savings of between 15 – 25%.

The IES thermal model was further developed to calculate carbon savings from passive design solutions.



Renaissance Southend

Warrior Square Gardens Sustainable Refurbishment

Public open spaces are the living environments of an urban context – Entec has developed a tool for assessing and improving landscape design.

Entec is providing sustainability and CDM consultancy for the £1.8 million transformation of Warrior Square Gardens, one of the few open public spaces within central Southend. The landscaping project was designed to turn the area into

a sustainable and welcoming outdoor amenity for the local community.

Entec applied its 'sustainable landscape checklist' (SLC) methodology in the absence of recognised landscape design tools at the earlier design stages. The SLC is a tool created to assist landscape design teams to understand the full range of opportunities for making sustainable design

decisions and to appraise design proposals. It includes detailed considerations relating to hard and soft landscape works, planting, procurement, climate change mitigation and preparedness, energy efficient lighting, water management, material recycling and sourcing, management and security, ecology and 'green' transport solutions.

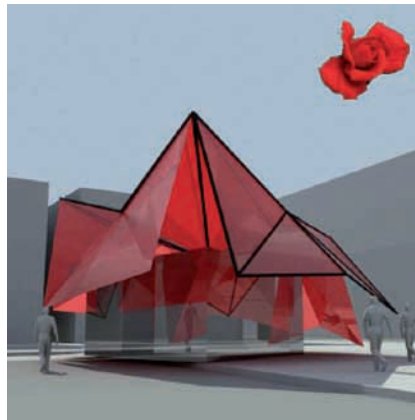
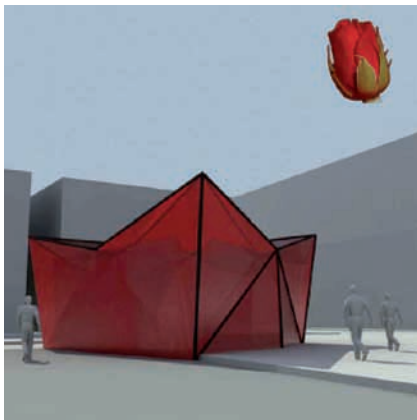
Through collaboration with the project team and provision of additional technical guidance, Entec helped steer the design while responding to the wider team's vision, requirements and budget.

Environmental sustainability measures included the reuse of rainwater, permeable surfaces for surface water management, use of materials with a low whole life impact on the environment, use of recycled material, enhanced habitat corridors, consideration of the impacts of planting on the local microclimate, improved pedestrian and cycle facilities, energy efficient lighting, low pollution specification and low maintenance detailing.

A new kiosk was designed with measures to reduce environmental impact, such as the use of its sculptural roof for

solar control to support passive heating and cooling and reduce dependence on mechanical systems, recycled material in construction specification, efficient lighting, efficient water fittings, low pollution coatings and waste separation storage.

Entec is also sustainability consultants for the specification, tendering, procurement and construction process.



BREEAM, DREAM and CEEQUAL Consultancy

As part of an integrated design team, Entec offers the skills and experience of accredited BREEAM and CEEQUAL assessors. By working closely with the design team, Entec's assessors can inform the design process throughout the project lifecycle, making sure that findings from initial and subsequent assessments are fed back in to the design process and thus enabling 'best value' to be achieved.

Although BREEAM is widely considered to be the current industry standards, Entec can also offer an alternative in the form of the civil engineering equivalent CEEQUAL and the defence sector's alternative DREAM – both of which, like BREEAM, are an externally verified certification scheme. Whilst it is accepted that certification under BREEAM, CEEQUAL or DREAM may not always be appropriate, the principles of the assessment criteria can be applied to the

design process, providing a series of environmental and sustainable criteria and checklists to be reviewed during the project lifecycle.

BREEAM Services

We offer a range of BREEAM services as well as the final assessment for certification. Examples of these services are:

- Pre-planning advice for sustainability targets and the applicability of BREEAM;
- Pre-assessment estimation – a tool used early in the design process to provide an indicative rating at the early stages;
- Design stage assessment – undertaken around RIBA stage E, which can be submitted for interim certification by BRE;

- Post construction review assessment – undertaken after practical completion and pre-occupation, this assessment is submitted to BRE for final certification;
- Pre-tender advice can be provided to ensure that all aspects related to achieving a desired BREEAM rating are covered within the tender;
- Tender evaluation assistance can be provided to ensure that contractor's proposals meet the requirements to achieve the desired BREEAM rating; and
- Peer reviews can be undertaken on third party designs or in progress assessments to help establish whether assumptions made are valid and that the projected score is accurate.

breeam

Entec's BREEAM Registrations:

- Code for Sustainable Homes;
- Ecohomes;
- Multi-residential;
- BREEAM Offices;
- BREEAM Industrial;
- BREEAM Bespoke;
- BREEAM Education;
- BREEAM Courts;
- BREEAM Prisons;
- BREEAM International;
- BREEAM Communities;
- Defence Related Environmental Assessment Method (DREAM);
- Civil Engineering Environmental Quality Assessment (CEEQUAL).

In addition, Entec has experience of providing many services which comply with BREEAM requirements and can be included as evidence. Examples include:

- SAP calculations;
- SBEM modelling;
- Housing quality indicator assessments;
- Life cycle assessments;
- Ecological assessments;
- Flood risk assessments;
- Surface water scheme designs which can incorporate SUDs;
- Noise assessments;
- Travel plans;
- Contaminated land assessments;
- Low or zero carbon energy supply assessments; and
- A variety of other services used as part of a BREEAM assessment.

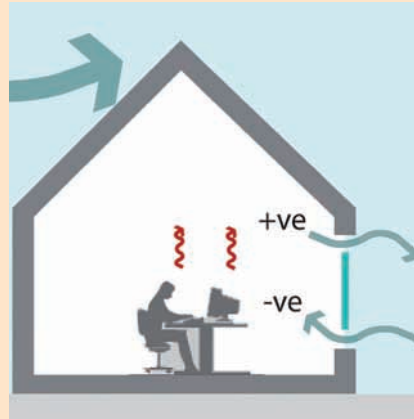
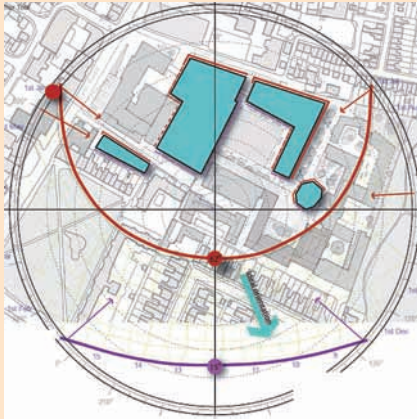
Building Modelling and Testing Using IES

Entec uses a building simulation programme called Integrated Environmental Solutions, Virtual Environment (IES VE). The programme can be integrated with Google Earth giving any project a wider geographical and urban context and it is also compatible with Google Sketchup which allows for easy enabling data sharing with other constituents of a project team.

A development concept can be tested for overshadowing, energy conservation, daylight and lighting levels, thus informing the design team in decisions about massing and building uses and services and supporting Environmental Impact Assessments (EIA). Computer simulation can be used in addressing planning policy, to support the design process, to verify statutory compliance such as energy conservation building regulations (Part L for England and Wales) and to assess

best practice. Simulation can also support environmental assessment methods that have wider environmental impact categories, such as the Code for Sustainable Homes, BREEAM and CEEQUAL.

A three-dimensional (3D) model of a designed building is constructed in computer software and input schedules are set up such as hourly weather data, heating and lighting systems, construction materials, people usage patterns, equipment and windows operation. The building is then simulated for a whole year in today's climate or that of, say, 20 years from now and the output provides room temperatures, humidity, fuel usage and carbon dioxide emissions. The building and systems can then be changed and optimised by a design team to reduce carbon emissions as far as possible.



A range of analyses possible using IES include:

Building Energy Conservation (VE Compliance)

VE Compliance is an accredited tool used to verify compliance with energy conservation building regulations for all regions in the UK.

Dynamic Thermal Modelling (ApacheSIM)

ApacheSim is an advanced, dynamic thermal simulation application for buildings which can also perform carbon emissions calculations.

Natural Ventilation Simulation (MacroFlo)

MacroFlo enables the simulation of natural ventilation and mixed mode building service systems.

Solar Gain (SunCast)

SunCast is used to generate visual, graphical and numerical information that can be used to explain how the sun impacts the building (inside and outside) and the overshadowing of neighbouring buildings.

Daylight Analysis (FlucsDL)

FlucsDL performs lighting design calculations to determine the daylighting levels in a room and perform point-by-point lighting analyses to give light level values within a room.

Lighting Levels (RadianceIES)

RadianceIES is a detailed 3D simulation tool designed to predict daylight and electric light levels, and the appearance of a space prior to construction.

Clients

Anglia Ruskin University

Barratt Homes

Central Office of Information

Council of Reserve Forces' and
Cadets' Associations (CRFCA)

Defence Estates

Homes & Communities Agency
(formerly English Partnerships)

Gentoo Group

Greater London Authority

London Borough of Bromley

London Development Agency

London Thames Gateway
Development Corporation

Metropolitan Police Service

O&H Properties

One NorthEast

Persimmon Homes

Reading Borough Council

Standard Property Investments

Swindon Borough Council

Tesco Stores

Waste & Resources Action
Programme (WRAP)

Further Information

Entec also offers key skills in:

- Urban Design
- Landscape Design
- Landscape Planning

For further details on our landscape design and other services:

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Entec is one of the UK's largest environmental and engineering consultancies. Our technical and business skills are dedicated to delivering strategic, technical and engineering solutions which bring commercial benefits to customers at home and overseas. This know-how is based on over 60 years of consulting experience in the public and private sectors.

Entec

Creating the environment for business

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