



# Demonstrations of sustainability

The Rethinking Construction demonstrations  
and how they have addressed sustainable  
construction issues

Constructing Excellence



## Acknowledgements

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Everyone involved in the demonstrations

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Front cover photo of Gateshead Millennium Bridge  
courtesy of Gateshead Borough Council.



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Economic	
Planning	Local economy and viability
Design	DQI – functionality and flexibility
	Whole life costing
	Accessibility
Construction Process	KPIs
	Local businesses, labour and training
Finished Product	Consider maintenance, operation and staff costs. Use feedback measures and tools
Social	
Planning	Regeneration
	Public consultations and participation
	Public space and public transport
Design	DQI – engagement
Construction Process	Respect for People toolkits
	CCS and CSCS
Finished Product	Satisfaction and productivity
	Encourage community use
Environment	
	Holistic tools
Planning	Reuse land and buildings. Treat contaminated land on site
	Plan the footprint with ecological features in mind
	Consider transport and access
Design	Waste minimisation and management
	Protect and enhance biodiversity
	Specify local and low environmental impact materials
	Optimise passive energy use. Minimise energy use. Consider renewable energy
	Specify flexible information and communication services
	Ensure high indoor air quality
	Specify zero ozone depletion and low NO <sub>x</sub> systems and materials
	Ensure fittings are low water volume. Consider water recycling and permeable design
	Provide facilities for public transport users
	Consider ease of operation and maintenance
	Consider well-being and comfort
	Design for flexibility or deconstruction with minimum waste
Construction Process	Manage for minimum waste
	Protect and enhance existing ecological features
	Minimise air and noise pollution
	Minimise water use and pollution during construction
	Consider transport to site and energy use
Finished Product	Manage for maximum efficiency
	Use post occupancy evaluation
	Follow the design criteria for maintenance, repairs and refurbishment

[illegible]

# Executive summary

This report celebrates the success of the Rethinking Construction demonstrations in addressing sustainability. The demonstrations featured provide tangible evidence of the adoption of more sustainable practices by the construction industry. Innovations include improved community and user participation during planning and design, better treatment and training of construction staff and increased resource use efficiency in the construction process and finished product. Such steps improve the competitiveness, productivity and profitability of the companies involved: the client, contractor and supply chain.

Tools and benchmarks are available to measure and improve performance: the industry KPIs, Design Quality Indicator, Respect for People toolkits, environmental performance indicators and holistic tools such as BREEAM, CEEQUAL and SPeAR. The demonstrations in this report have used these and other tools to quantify their performance improvements.

Since the inception of Rethinking Construction various working groups have focussed on sustainability. Rethinking Construction has now embedded sustainability in the demonstration process, through the National Strategy Panel. The Panel has adopted a checklist, which is being sent out to all Regional Coordinators and new demonstrations, to help guide the uptake of more sustainable solutions.

Using the criteria from the checklist, this report features demonstrations that have applied relevant innovations. Please use the summary table of criteria and demonstrations opposite to navigate around this valuable document.



# Contents

Foreword	5
1 Introduction	7
1.1 What is sustainable construction?	7
1.2 Rethinking Construction	7
1.3 Demonstrations	8
1.4 Rethinking Construction and sustainability	10
1.5 This report	11
Checklist	12
2 Economic sustainability	15
2.1 Planning	15
2.2 Design	16
2.3 Construction process	18
2.4 Finished product	20
3 Social sustainability	23
3.1 Planning	23
3.2 Design	26
3.3 Construction process	28
3.4 Finished product	30
4 Environmental sustainability	33
4.1 Planning	33
4.2 Design	35
4.3 Construction process	45
4.4 Finished product	47
5 The future	49
Appendix 1 – demonstrations we wish we had the space for	50
Appendix 2 – planning and sustainability	53
Appendix 3 – links	54







# Foreword



Alan Crane

Dear Colleague,

Over the past three years the Movement for Innovation, Housing Forum and Local Government Task Force have all formed sustainability working groups. These have examined the varying aspects of the subject, but a common thread has been a focus upon demonstrations as a way of using and proving innovations that increase sustainability. The success of the demonstrations in tackling sustainability is celebrated in this report.

Now the National Strategy Panel has formalised a commitment to ensure sustainable construction becomes embodied in mainstream thinking. Our aim is for sustainable construction to be the norm in all Rethinking Construction demonstrations. A checklist is now being applied to all demonstrations to provoke thought and to provide a framework for information on sustainability to be collected from them.

We recognise that many of the demonstrations so far have already been addressing sustainability criteria. Pressure has come from directions such as clients, planning agreements, internal efficiency targets and the application of common sense. The celebration in this report also shows that the checklist provides an achievable list of criteria for consideration in all demonstrations.

'Accelerating Change' highlighted sustainability as an important cross-cutting issue for the construction industry and this report provides the proof that Rethinking Construction has already been adopting it, and is committed to continuing to do so.

Rethinking Construction is indebted to the work of the various sustainability working groups and others involved in the implementation of sustainability. Amongst those that I particularly want to thank are:

- Rethinking Construction – Brian DeGeer and John Ford;
- LGTF/WellBuilt! – Peter Bishop, Tim Byles, Trevor Pugh, Susheel Rao and Helen Sargent;
- Housing Forum – Judith Harrison, Tom Dacey and Jeffrey Adams;
- M<sup>4</sup>I – Rab Bennetts, Peter Runacres and Sue Innes.

Finally I congratulate all those involved in the demonstrations programme for establishing yet again the clear evidence the industry needs that the targets are attainable, and I look forward to celebrating further successes with them in the future.

Alan Crane  
Chairman  
Rethinking Construction



# 1 Introduction

## 1.1 What is sustainable construction?

The Government set out its commitment to sustainable construction in 'Building a Better Quality of Life'<sup>1</sup>. The document defined sustainable construction by its outcomes. Since then it has consolidated this with changes to the Building Regulations<sup>2</sup>, the Planning White Paper<sup>3</sup>, the Communities Plan<sup>4</sup> and the Energy White Paper<sup>5</sup>. The Sustainable Construction Task Force has presented the business case<sup>6</sup> and Accelerating Change<sup>7</sup> highlighted sustainability as a cross-cutting issue.

### **Building a better quality of life**

**The construction industry can contribute to the achievement of sustainable development by:**

- **being more profitable and competitive;**
- **delivering buildings and structures that provide greater satisfaction, well-being and value to customers and users;**
- **respecting and treating its stakeholders more fairly;**
- **enhancing and better protecting the natural environment;**
- **minimising its consumption of energy (especially carbon-based energy) and natural resources.**

## 1.2 Rethinking Construction

'Rethinking Construction'<sup>8</sup> set out an approach to the construction industry for substantial improvements in quality and efficiency. The Construction Task Force issued a challenge to the industry to commit itself to change, so that by working together the industry would be strengthened, become more efficient and effective, and able to meet the demands of the future. Rethinking Construction's objectives remain:

- to achieve radical improvements in the design, quality, sustainability and customer satisfaction of UK construction;
- for the industry to recruit and retain a skilled workforce, by improving its employment practices and health and safety performance.

<sup>1</sup> Building a Better Quality of Life – a strategy for more sustainable construction, April 2000, DTI

<sup>2</sup> Parts L1 and L2 on thermal performance were updated in April 2002. [www.safety.odpm.gov.uk/bregs/brads.htm](http://www.safety.odpm.gov.uk/bregs/brads.htm)

<sup>3</sup> Planning and Compulsory Purchase Bill, January 2003, ODPM

<sup>4</sup> Sustainable communities: building for the future, February 2003, ODPM

<sup>5</sup> Energy White Paper, February 2003, DTI

<sup>6</sup> Reputation, risk and reward – the business case for more sustainable construction, January 2002, Laing Sustainable Construction Task Group. <http://projects/bre/co/uk/rrr>

<sup>7</sup> Accelerating Change, September 2002, The Strategic Forum, [www.cbpp.org.uk/acceleratingchange](http://www.cbpp.org.uk/acceleratingchange)

<sup>8</sup> Rethinking Construction: The Report of the Construction Task Force, 1998, [www.rethinkingconstruction.org](http://www.rethinkingconstruction.org)

In order to achieve this the Construction Task Force proposed a series of annual targets for improvement that underpin Rethinking Construction, and the key drivers for change and initial processes to be tackled (Figure 1).

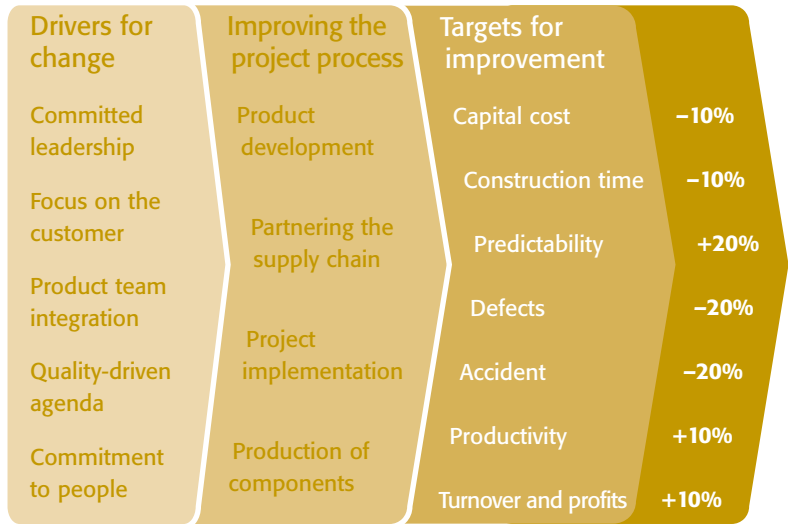


Figure 1: The 5:4:7 mantra of Rethinking Construction

Since the publication of the report, the Rethinking Construction agenda has been taken forward through a dynamic partnership between government, clients and industry. There are now more than 1,000 construction organisations actively involved with the initiative.

1.3 Demonstrations

The demonstrations programme is at the heart of Rethinking Construction. This provides the opportunity for leading edge organisations, from every part of construction, to bring forward exemplars that demonstrate innovation and change, which can be measured, evaluated and shared. These can be site-based or organisational-change projects.

There are more than 400 projects in the programme, with a total value of over £7bn. They provide examples of off-site construction, standardisation, the use of new technology, respect for people activities, partnering and supply chain integration, and other areas of process improvement.

The demonstrations have developed a culture of performance measurement as the primary way to verify innovation and improvement. An industry wide group developed a set of simple headline key performance indicators (KPIs), based upon the seven Rethinking Construction targets and added client satisfaction; in all there are 12 measures.

All demonstration projects are required to measure their performance against these KPIs and to report annually. DTI collects data from industry annually, enabling a comparison to be made between industry performance and that of the Rethinking Construction demonstrations. The projects substantially outperform the average of the UK industry against the key indicators. The following data, published in May 2002<sup>9</sup>, illustrates that comparison for the year 2001.

Headline Key Performance Indicator	Measure	All construction	M4I	All new housing	Housing Forum
<b>Client Satisfaction</b>					
– Product	Scoring 8/10 or better	73%	85%	69%	80%
– Service	Scoring 8/10 or better	65%	80%	58%	67%
<b>Defects</b>	Scoring 8/10 or better	58%	86%	53%	91%
<b>Safety*</b>	Mean accident incidence rate/100K employed	990	495	990	1003
<b>Cost Predictability</b>					
– Design	On target or better	63%	81%	60%	67%
– Construction	On target or better	50%	71%	46%	54%
<b>Time Predictability</b>					
– Design	On target or better	46%	81%	41%	72%
– Construction	On target or better	61%	70%	82%	48%
<b>Profitability</b>	Median profit on turnover**	5.6%	7.6%	6%	3%
<b>Productivity</b>	Median value added/employee (£000)	28	34	28	42
<b>Cost</b>	Change compared to 1 year ago***	+2%	-2%	+3%	+8%
<b>Time</b>	Change compared to 1 year ago	+4%	-8%	+11%	-12%

**Figure 2: Demonstration performance compared to all construction for 2001**

- \* M4I and Housing Forum safety data are project based while 'all construction' data are company based. Of the 18 Housing Forum projects that reported on safety, there were only two reportable accidents, neither of them serious.
- \*\* A number of Housing Forum projects reported difficulty with supply of timber framed components onto site. The delays caused by this impacted noticeably on time and profitability scores
- \*\*\* Housing Forum projects found that when first undertaking an innovation, the cost of research and development of the project often means that construction cost will be the same or higher than the conventional methods already in use. This is often concerned with the initial cost of setting up partnering contracts or necessary technical changes.

These and previous results show that the demonstrations consistently exceed even the targets set in Rethinking Construction (see Figure 1). Significantly, for the first time, the data collected by DTI provides evidence of improvement in overall industry performance. By definition these improvements directly support and contribute towards more sustainable construction.

The demonstrations are vetted by peer review on a regional basis. This maintains quality within the demonstrations, and spreads knowledge on how to capture innovations and convert them first to best practice and then to standard procedure. The regional centres of Rethinking Construction are a major dissemination route for improvement.

#### 1.4 Rethinking Construction and sustainability

From its inception, Rethinking Construction had a commitment to sustainability, although the initial focus was mainly on quality and customer satisfaction, covering a range of economic and social issues. The Housing Forum formed a Sustainability Working Group in 2000 and produced a report in 2001<sup>10</sup>. The Movement for Innovation (M<sup>4</sup>I) also formed a Sustainability Working Group and a spreadsheet tool called the Sustainability Index was created, covering social, economic and environmental factors. However, with the industry grappling with the changes initiated by Rethinking Construction, its use has been limited, even within M<sup>4</sup>I. M<sup>4</sup>I's Sustainability Working Group next published an initial set of benchmarks for environmental performance indicators (EPIs) in 2001.

Work for the Local Government Task Force (LGTF) on a Sustainable Construction Action Plan<sup>11</sup> highlighted the many roles and responsibilities local government can utilise to encourage, procure and produce more sustainable construction. More sustainable construction becomes a tangible prospect now that:

- industry has become comfortable with using key performance measures;
- EPIs are becoming mainstream, through incorporation to the DTI annual surveys and client specification;
- Respect for People toolkits and Design Quality Indicator (DQI)<sup>12</sup> have been launched.

To embed and mainstream sustainability into Rethinking Construction's own operations, a checklist was compiled in late 2002. The checklist is based upon the Sustainable Construction Action Plan and the Sustainability Index, utilising the outputs of all the sustainability working groups, and considering the latest thinking and practice of sustainable construction. This checklist is being made available to all new demonstrations through the National Strategy Panel, to provoke thought and further innovation. The checklist can be found on pages 12 and 13, and provides the structure for this report.

The general context of the report is buildings, as most of the demonstrations featured are buildings and most of the tools are intended for buildings. However the principles apply to all construction and many of the tools are applicable or easily adapted.

<sup>10</sup> The 'e' factor – six guiding principles to improving sustainability in housebuilding. [www.thehousingforum.org.uk/rc/publications/reports/HF\\_E-Factor.pdf](http://www.thehousingforum.org.uk/rc/publications/reports/HF_E-Factor.pdf)

<sup>11</sup> WellBuilt! Sustainable Construction Action Plan for Local Authorities 2002. [www.lgtf.org.uk](http://www.lgtf.org.uk)

<sup>12</sup> Design Quality Indicator. See [www.dqi.org.uk](http://www.dqi.org.uk)

### 1.5 This report

Many of the past and current demonstrations address aspects of sustainability included in the checklist. Rethinking Construction wish to celebrate the innovations, and prove that the checklist provides an achievable framework, that future demonstrations and the whole industry can aspire to.

This report examines each section and criterion of the checklist in turn, and uses past and current demonstrations to show how the criteria can be met. An index of the demonstrations used in this report and which criteria they applied is on the inside front cover. This report has not been able to feature every demonstration that has tackled sustainability, so some others are briefly mentioned in Appendix 1. Some of the demonstrations prove many of the checklist criteria, but to enable this report to show the breadth of achievement by the demonstrations, each demonstration is used to highlight only one criterion from the checklist, with a couple of exceptions.

The checklist is divided into economic, social and environmental sections. Within each of these the processes of planning, design and construction are considered, as well as the finished product. This structure helps users find the areas of interest to them, and it must be stressed that all areas are interconnected and impact upon each other. For example, a client may specify an energy efficient development for environmental reasons, but the solution will probably have lower operating costs and may provide a healthier internal environment for users, thereby increasing satisfaction and productivity. Sustainability is about achieving a balance between economic, social and environmental concerns.

The criteria from the checklist are highlighted in the margin throughout the report. The body text explains the importance of the criteria and gives sources of further information. Demonstrations show how the criteria can be achieved, including the benefits of doing so.



# Checklist

This is the checklist provided to all Regional Coordinators and new demonstrations

The checklist below is for consideration by all applicant demonstrations. Rethinking Construction encourage demonstrations to consider all aspects of sustainability (economic, social and environmental) and to guard against undermining one section for the benefit of another.

Economic sustainability	
Planning	<input type="checkbox"/> For large-scale housing, mixed use and civils projects, report on relevant factors in regional or local economic strategy, and how development will promote viability.
Design	<input type="checkbox"/> Use the DQIs, to develop appropriate levels of functionality and flexibility. <input type="checkbox"/> Appraise options using whole life costing. <input type="checkbox"/> Design for accessibility.
Construction process	<input type="checkbox"/> Use the KPIs <input type="checkbox"/> Maximise opportunities for local businesses, labour and training.
Finished product	<input type="checkbox"/> <b>See environment.</b> Consider maintenance, operational (energy, water etc.) and staff costs. Use feedback measure and tools (e.g. Post Occupancy Evaluation.)
Social sustainability	
Planning	<input type="checkbox"/> <b>See economic.</b> Respond to regeneration impacts required in regional or local economic strategies. <input type="checkbox"/> Use data from public consultations and participation. <input type="checkbox"/> For high density, mixed-use developments plan for high quality public space and safe public transport accessibility. <input type="checkbox"/> Larger schemes require affordable housing, and a mix of housing types and tenures.
Design	<input type="checkbox"/> Use the DQIs, to engage everyone in the design process.
Construction process	<input type="checkbox"/> Use the Respect for People toolkits <input type="checkbox"/> Register sites with the Considerate Constructors Scheme and use Construction Skills Certification Scheme.
Finished product	<input type="checkbox"/> <b>See environment.</b> Consider staff costs, e.g. maximising satisfaction and productivity through a healthy environment. <input type="checkbox"/> Encourage community use of buildings, through the DQIs or as policy.

## Environmental sustainability

Holistic environmental assessment tools have been developed: SPeAR, BREEAM Offices, Retail and Industrial, EcoHomes, CEEQUAL (civil engineering), Bespoke BREEAM for one-off projects, and the 'Sustainability Checklist for Developments'. If a demonstration project is using such a scheme or an equivalent, it passes this section. However assessment is sometimes inappropriate, so the following checklist could be applied. The EPIs provide a set of benchmarks for site and building performance.

<b>Planning</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Reuse land. Treat contaminated land on-site. Reuse buildings.</li> <li><input type="checkbox"/> Plan the footprint of the building with ecological features in mind.</li> <li><input type="checkbox"/> Consider how building users will travel to and access the site, and facilities and amenities nearby.</li> </ul>
<b>Design</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Design for minimum waste of materials. Provide facilities for the minimisation and management of waste.</li> <li><input type="checkbox"/> Protect and enhance biodiversity using the biodiversity EPI. Ensure natural features can be easily managed and maintained.</li> <li><input type="checkbox"/> Specify local and low environmental impact materials (e.g. use A-rated specifications from the Green Guide or equivalent and timber from certified well-managed forests). Use the embodied energy EPI.</li> <li><input type="checkbox"/> Optimise passive energy use (e.g. solar gain). Minimise energy use (e.g. lighting, heating/cooling, ventilation, insulation). Consider CHP and renewable energy sources. Use the operational energy EPI. Fit sub-metering and intelligent building monitoring systems.</li> <li><input type="checkbox"/> Specify flexible information and communication services.</li> <li><input type="checkbox"/> Ensure high indoor air quality through effective ventilation, and specifying materials, finishes and cleaning products with minimal harmful effects.</li> <li><input type="checkbox"/> Specify zero ozone depletion and low NO<sub>x</sub> systems and materials.</li> <li><input type="checkbox"/> Ensure fittings are low water volume. Consider rainwater and grey water recycling. Consider permeable design for hard landscaping. Use the water EPI. Fit sub-metering.</li> <li><input type="checkbox"/> Discourage single-occupant car use, through public transport and cycling provision, making the development safe and secure, providing showers and changing rooms.</li> <li><input type="checkbox"/> Consider ease of operation and maintenance through commissioning time and documentation.</li> <li><input type="checkbox"/> Consider daylighting, ventilation, humidification, personal control, and space for well-being and comfort. The DQIs consider a range of environmental criteria.</li> <li><input type="checkbox"/> Design for flexibility or deconstruction with minimum waste.</li> </ul>
<b>Construction process</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Manage for minimum waste, using the waste EPI. Reuse waste on-site.</li> <li><input type="checkbox"/> Protect and enhance existing ecological features (trees, hedges, ponds etc.) using the biodiversity EPI.</li> <li><input type="checkbox"/> Minimise air pollution (dust and fumes) and noise pollution.</li> <li><input type="checkbox"/> Minimise water use during construction, and guard against pollution.</li> <li><input type="checkbox"/> Consider transport to and from site using the transport EPI.</li> <li><input type="checkbox"/> Consider energy use through plant and site services.</li> </ul>
<b>Finished product</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Manage building systems, ecological features and waste for maximum efficiency considering the design.</li> <li><input type="checkbox"/> Use post occupancy evaluation and feedback.</li> <li><input type="checkbox"/> Follow the design criteria for maintenance, repairs and refurbishment.</li> </ul>



## 2 Economic sustainability

Understandably the industry's overriding concern is the finances of the project in-hand and the companies involved. The industry and its constituent parts, are not sustainable if they are unprofitable. Each year construction activity accounts for 8-10% of GDP, and construction delivers key programmes such as roads, housing, hospitals and schools. The economy as a whole benefits from profitable and predictable construction. Partnering, open-book accounting and Private Finance Initiative (PFI) are some of the changes that are bringing benefits and challenges. The demonstrations have proved the viability of novel contract and management techniques. Profitability depends on the success of organisations in the supply chain both up and down stream. Improved economic performance will ensure clients keep using the UK construction industry.

Gaining planning permission is of considerable financial importance, as the latest planning legislation is addressing. The planning system is a key route towards ensuring development is more sustainable. Improved predictability in gaining permission at planning stage, and therefore lower costs for the applicants, can be achieved through developers and their teams adopting more sustainable designs and processes as standard.

Local economies and communities depend on functional buildings and infrastructure. The economic impact of operation and maintenance costs is obvious, but building-related satisfaction, health, safety and productivity make an economic impact at least one order of magnitude greater.

Economic performance depends on the continuing pride and professionalism of individuals throughout the industry. The workforce is the construction industry's greatest economic asset.

### 2.1 Planning

The planning system is a mechanism for linking national and local goals within a sustainable development context. Many government and regional strategies also have an impact. For example the Regional Economic Strategies prepared by the Regional Development Agencies (RDAs) have a role in prioritising areas for investment. Funding for regeneration and the various assessment criteria of schemes will also direct investment to some extent. Urban Regeneration Companies increasingly play a role in setting and achieving objectives locally. Appendix 2 gives information on central government guidance, plans, development control and building control.

Quality developments can kick-start or add value to regeneration projects. To boost an area and encourage private investment RDAs and local authorities often use leisure and cultural developments, pieces of infrastructure and community developments.

The Gateshead Millennium Bridge (demonstration number 162) is an opening bridge spanning 130 metres across the River Tyne at quay level linking commercial and leisure developments on either side of the river. Two decks carry a footway and a mixed use path supported from a vertical arch rising to 45 metres above river level. When open, the bridge allows vessels of up to 25 metres air draught to pass. Local plans for the economic regeneration of the area drove the project. New buildings and refurbishments in the area, such as The Baltic Centre for Contemporary Art, would be less viable without it.

*For large scale housing, mixed use and civil projects, report on relevant factors in regional or local economic strategy, and how development will promote viability.*



**Gateshead Millennium Bridge**

Quality in design and construction was a requirement of the project from inception. This was particularly relevant as the bridge set the standard for redevelopment proposals in the Gateshead Quays regeneration area.

Economically it is often the case that the local vision must be delivered by both public and private sectors, as neither sector is able independently to plan and deliver sustainable development. Ensuring that combined public and private developments deliver on sustainable objectives is a current challenge.

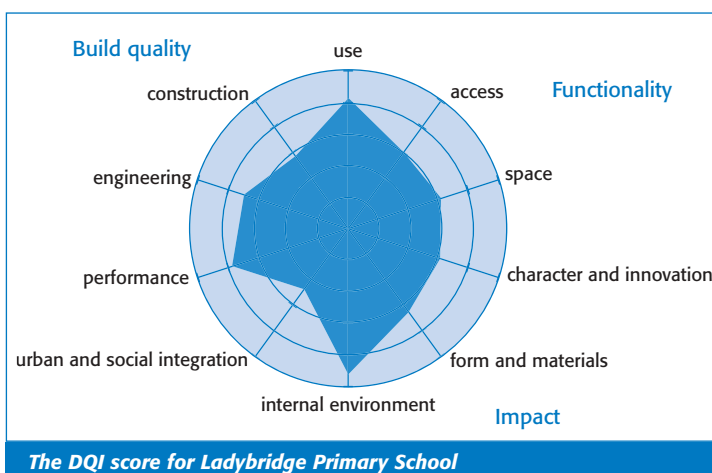
## 2.2 Design

Clients appreciate the economic impact of project design. At the design stage the functions of the building, and operation and maintenance costs are set. Direct benefits of good design are reduced maintenance, management and running costs, while indirect benefits are gained through improved satisfaction and productivity of the building users. A high level of client satisfaction boosts image and reputation, and encourages repeat business.

Design will also impact on the economic performance of the construction process, by designing in health and safety, standard materials specifications and other measures in partnership with the supply chain.

*Use the DQI, to develop appropriate levels of functionality and flexibility.*

Using the DQI at inception allows clients to clearly express their requirements and sets a framework for specific consideration about the quality of the product. It helps to inform client and user choices and develops a better understanding of the value of good design, develops the brief, sets benchmarks and assists in understanding the trade-offs between different choices. The DQI can be used throughout the building process, and post occupancy, to evaluate whether the original intentions have been achieved.



The DQI operates through trained facilitators, who assist stakeholders to complete a non-technical questionnaire that addresses the 'Functionality', 'Build Quality' and 'Impact' of the building. The respondents give their opinion on 90 statements, and then weight the criteria as to how important they think they are. The meetings at which the questionnaires are filled in and discussed are called reviews. The results of all the respondents are aggregated to give the scores in a diagram, such as the one adjacent.



Ladybridge Primary School was taken forward by Stockport Metropolitan Borough Council, along with demonstrations such as Westmoreland School (demonstration number 296). The project learnt from the DQI during design and then applied it upon completion. Some school children came to the review, and it was the best attended DQI review at the time. The DQI helped resolve some final snagging and landscaping issues. The head teacher felt the school was 'like heaven', with good daylighting and a well thought through design.



*Ladybridge Primary School*

Through PFI and enlightened clients, more consideration is being given to whole life costing. The Royal Academy of Engineering<sup>13</sup> found the ratio 1:5:200 demonstrates the typical relationship between:

<b>1</b>	the initial capital cost of an office building
<b>5</b>	its cost in use over 20 years
<b>200</b>	the value of the business done in it over 20 years

Conventional commercial development concentrates on the '1', ignoring the rest. PFI development has the potential to be an improvement because it takes account of operation and maintenance costs. The next stage is designing to release more value from the business, the '200', by optimising the building and its infrastructure for the occupiers' needs, which can be considered to be the whole life value or performance.

Guidance is now available from sources such as the OGC<sup>14</sup>, CIPFA<sup>15</sup>, DfES<sup>16</sup> and Rethinking Construction<sup>17</sup>. These guides show that considering whole life value will help you choose the right building solution and exceed the expectations of building users and owners.

Durham County Council have considered whole life cost through partnering on school projects. Catchgate and Middlestone Moor Primary schools (demonstration numbers 245 and 247) have low energy, low water designs, to save money throughout the life of the school. At Catchgate a wind turbine is providing all the power the school needs. Both schools collect rain water for toilet flushing, using the Eco Vat system. The pump for the system is powered by photovoltaic cells. N-Power, Northern Electric & Gas and Northumbrian Water



*The EcoVat rain water tank at Catchgate*

*Appraise options using whole life costing*

<sup>13</sup> The long term costs of owning and using a building, Evans R, Haste N, Jones A, Haryott R. 1998, Royal Academy of Engineering

<sup>14</sup> Construction Procurement Guidance Note No.7 – Whole Life Costs, 2000, Office of Government Commerce

<sup>15</sup> How to develop a procurement strategy, March 2002, CIPFA and LGTF

<sup>16</sup> Finding the right solution – a guide to option appraisal, May 2002, Department for Education and Skills.

<sup>17</sup> [www.rethinkingconstruction.org/rc/publications/reports/Whole\\_Life\\_Costing.pdf](http://www.rethinkingconstruction.org/rc/publications/reports/Whole_Life_Costing.pdf)

sponsored the systems. Displays in the schools show pupils how much energy and water is being used and saved. This has proved a great hit with pupils and staff, and figures are being used in the curriculum.

### *Design for accessibility*

New legislation affecting design for accessibility comes into force in 2004: the final part of the goods, facilities and services provisions of Part III of the Disability Discrimination Act. The new duties require businesses (employing over 15 people) and public service providers, to make permanent physical adjustments to premises. The Disability Rights Commission has provided guidance<sup>18</sup> to help service providers.

Some clients may want to go beyond legislation to ensure all members of the community are able to access their buildings safely and securely. This covers a range of issues including signing and waymarking, the use of colour and layout. For example, many schools now use wall and door colour to identify areas used by different age groups, and local authorities are experimenting with colour in street furniture and paving to help the visually impaired.



The new headquarters building for the Greater London Authority (demonstration number 219) forms part of the More London Bridge Development. The internal spiral and spiral ramp were designed to enhance accessibility to both the building and the government process. The entrance, lifts and circulation space are all wheel-chair accessible, and the space within the offices, chamber and public space is generally highly flexible.

Watergate School (demonstration project 257) is a new building providing 80 places

for primary school pupils with severe learning difficulties and includes a nursery class and hydrotherapy pool. The quality, fitness for purpose and maintenance characteristics of the design and construction have a profound impact upon the children, staff, parents and carers. These features were identified as the main drivers for the project; consequently the school staff, governors and children have been actively involved in the project from inception to completion. The school has recently moved in and all is running smoothly. The school building has been designed as an accessible environment for teaching and learning that meets the special educational needs of its pupils and the demands of the curriculum.

### **2.3 Construction process**

The old adage 'you have to measure to manage' is now well supported by an array of benchmarking and performance improvement groups within companies and across the industry. Implementation during the construction process determines the economic performance of the companies involved.

<sup>18</sup> New Code of Practice, including '2004 What it means for you – for service providers'  
[www.drc-gb.org/drc/InformationAndLegislation/Page331a.asp](http://www.drc-gb.org/drc/InformationAndLegislation/Page331a.asp)



The recruitment, retention and skills crisis of the industry has a serious economic impact on the construction process. Difficulties in recruiting and retaining enough trained staff uses site management time, increases costs and reduces time predictability. Some companies are overcoming these problems by using innovative construction techniques, procurement processes and training programmes to guarantee the future of their company and therefore the industry. Companies are questioning whether traditional construction processes will ensure continuing cost reduction, repeat business and profits.

Sustainable procurement is about clients finding the appropriate vehicle by which to deliver the desired building. Many organisations are going down a partnering procurement route and reaping the economic benefits. Partnering is the most popular innovation within the demonstration programme. Contracting parties create a working culture that is based on trust and cooperation. Partnering aims to involve all members of the supply chain as early in the project as possible and promotes a positive culture to reduce conflict to a minimum.

Since 1999, central government (supported by Rethinking Construction, Construction Best Practice and the Construction Industry Council) has published an annual wall chart of the headline KPIs. As explained in the introduction all the demonstrations are required to measure their KPI performance. The demonstrations in this report that have returned their data, support the excellent overall results of the programme, such as:

- demonstrations are 2 percentage points more profitable than average;
- demonstration construction costs are 4% lower than average;
- accidents on demonstrations are 50% fewer than average;
- support for Respect for People KPIs.

To achieve this, the demonstrations have utilised innovative materials, new building technologies, new forms of contract and set up more communicative integrated teams. Reductions in defects and improvement of client satisfaction have an economic impact, but also improve social and environmental performance.

The construction industry currently has a major skills shortage which will only worsen without more recruitment into the industry. Communities have traditionally grown around areas of commerce and local companies service these cities, towns and settlements. 96% of construction companies employ fewer than seven people, so construction is a business on a local scale. National companies have regional sections and whilst a network of subcontractors can travel to service various areas of the country, the majority of employees prefer to work relatively locally.

It is with this in mind that employers are recruiting local people to be trained on long-term refurbishment and regeneration projects. Consequently if a housing estate has a roll-out refurbishment programme over many years, it is in the contractor's interest to recruit and train local employees. At the end of the programme they can move onto another project or perhaps stay on the programme in a maintenance capacity. On a national scale the industry gets much-needed recruits and on a local scale employment increases and money is ploughed back into the local economy.

*Use the KPIs*

*Maximise opportunities  
for local businesses,  
labour and training*



**Trainees with their first installation in the training flat**

Portsmouth County Council Gas Central Heating Partnership (demonstration number 1116/R10.10) provided United House Limited with the opportunity of a long-term refurbishment contract on which to train members of the local community. The four year programme included the installation of gas central heating systems for Portsmouth City Council in approximately 4500 homes.

Because the strategic partnership provides continuity of work, United House has set up an alliance with a local training provider, to help draw people from the local community. They

gain the skills and qualifications that provide not just temporary work but a life-long career. All parties involved contributed to a win-win situation: Portsmouth County Council made an empty property available for the training, United House supported the training and the training approach was recognised as eligible for government support. To date, United House has given employment to two trainees.

#### 2.4 Finished product

Management of the finished product can have a significant economic impact – a poorly maintained building will, in the long run, cost a great deal more than one that is well-maintained. Similarly, careful management of energy and water can substantially reduce operational costs. Taking energy use alone, the typical office in the UK consumes around 200kWh/m<sup>2</sup> over a typical year, while best practice aims to achieve consumption of 100kWh/m<sup>2</sup>. Good environmental design can in fact lead to much lower figures.

This type of economic impact is well-documented and easily demonstrated; what is generally less tangible is the impact of buildings on staff costs. Absence from work can be reduced and productivity increased by improving the environment in which people work. Research in the USA has shown that 'green design' of office buildings leads to a measurable reduction in absenteeism. A reduction of just 1% in absenteeism is enough to pay for the energy costs of a typical office building.

Staff motivation and well-being can also be affected by introducing feedback systems, people generally feel more valued when their opinions are asked about the buildings in which they live or work. For example, in one survey where staff were asked to list the features they would most wish for in a new office building, 80% specified the ability to open windows.

Well-designed 'green' buildings can demonstrate clear financial benefits associated with a more sustainable approach. Many show lower operational costs with no increased construction costs, but the majority can at least demonstrate that extra construction costs are recovered during the first five to eight years through reduced running costs.

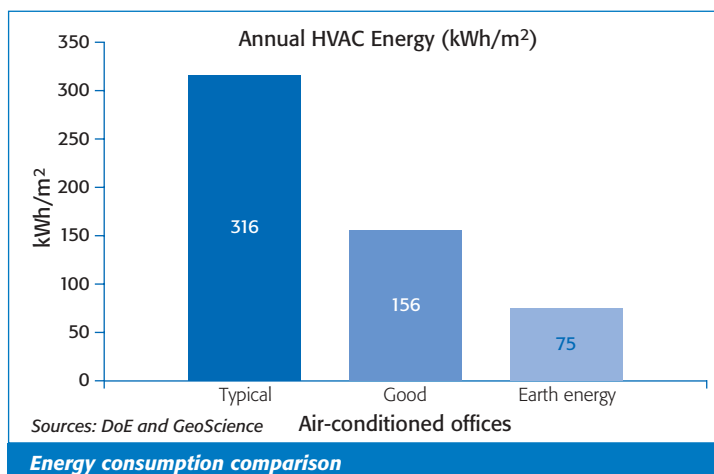
The Dunston Innovation Centre (demonstration number 213) in Derbyshire has a gross floor area of 3300m<sup>2</sup> and offers a range of accommodation from a 'rent a desk' facility to suites of offices of 185m<sup>2</sup>. Tenants are restricted to ICT-based companies. The building is energy-efficient and provides high comfort levels, with heating and cooling by way of heat pumps allied to the largest geothermal system in the UK. Demonstrated benefits include a saving of some 80% in CO<sub>2</sub> emissions, alongside reduced capital costs when compared to the provision of conventional heating/air conditioning. Feedback from tenants regarding the effectiveness of the building's heating and cooling system has been very positive, in all seasons and weathers.

**See environment.**

*Consider maintenance, operational (energy, water etc.) and staff costs. Use feedback measure and tools (e.g. post occupancy evaluation)*



**Dunston Innovation Centre**





## 3 Social sustainability

The construction industry has a significant social responsibility. Construction provides the means for many of the basic human needs: shelter, health care, education, employment and social interaction. Planning and design need to ensure these services can be carried out efficiently to maximise social capital. Social capital refers to the connections between people: 'the institutions, relationships, and norms that shape the quality and quantity of a society's social interactions... social capital is not just the sum of the institutions which underpin a society – it is the glue that holds them together.' (*The World Bank 1999*).

During the construction process, all companies involved should have a commitment to members of the workforce to keep them safe, trained and properly valued. This responsibility extends to any members of the public who interact with the site.

Through corporate social responsibility, this commitment is now spreading to the community who live around construction sites and who will use the finished products. Companies need to prove their social performance, and the utility of their products, to attract staff and business.

### 3.1 Planning

The planning system is fundamental in delivering sustainable development by setting a vision, then controlling how developments fit the vision. Prevailing social attitudes influence that vision. The current trend sees regional assemblies preparing social and cultural strategies, whilst local authorities are investigating social inclusion and producing community safety strategies.

It is often the element of social success that is most difficult to predict and measure when planning developments. The central government guidance explained in Appendix 2 attempts to address the social arena. For example, Planning Policy Guidance note 3 is a key guidance on affordable housing. Community strategies and other actions from Local Strategic Partnerships often have a strong social focus. The recent Sustainable Communities Plan from the ODPM<sup>19</sup> lists the key requirements for a sustainable community, some of which are social:

- effective engagement and participation by local people, groups and businesses, especially in the planning, design and long-term stewardship of their community, and an active voluntary and community sector;
- a well-integrated mix of decent homes of different types and tenures to support a range of household sizes, ages and incomes;
- good-quality local public services, including education and training opportunities, health care and community facilities, especially for leisure;
- a diverse, vibrant and creative local culture, encouraging pride in the community and cohesion within it.

<sup>19</sup> [www.odpm.gov.uk/communities/bplanindex.htm](http://www.odpm.gov.uk/communities/bplanindex.htm)

### See economic

*Respond to regeneration impacts required in regional or local economic strategies*

It is when regeneration is required, generally due to social breakdown in an area, that decision makers realise that economic and environmental measures are insufficient to improve an area. Developers are now needing to assess the social capital they are dealing with, and acting to increase it. There are still problems in agreeing a long-term vision that satisfies all levels of the development process. Local government regulation has sought to encourage authorities to enter into partnerships with other interested bodies to deliver long-term sustainable benefits to the community.



*A view of the Lowry Centre Footbridge*

One such private/public project was the Lowry Centre Footbridge (demonstration number 39) which involved the fabrication, treatment and construction of a hydraulically operated, 90m span, steel foot and cycle bridge. The structure connects the new Lowry Centre on the north side and the Imperial War Museum on the south side, at Salford Quays. Though classified as a public sector project, the project involved significant input from elements of the private sector and the Lowry Trust Development Company. The bridge has

formed a fundamental part of the regeneration of the area into a social asset for Greater Manchester.

*Use data from public consultations and participation*

Progress in covering social sustainability through the planning system has involved the use of public consultations. Local authorities, LSPs, developers and designers are using community involvement to help their decision-making. Community participation has been formalised through the development of schemes such as Enquire by Design<sup>20</sup> and Planning for Real<sup>21</sup>. Such schemes ensure members of the local community are treated with respect, and provide methodologies to gain useful outputs from consultation.

While the public generally does not engage with regional and local plans, there is greater concern for the potential impact of individual developments. In formal public consultation processes, the public can often be the source of design ideas, as well as current and potential uses of the project. From the developers perspective this can also help minimise trouble and maximise support, during construction and use, by fostering a good relationship with the local community.

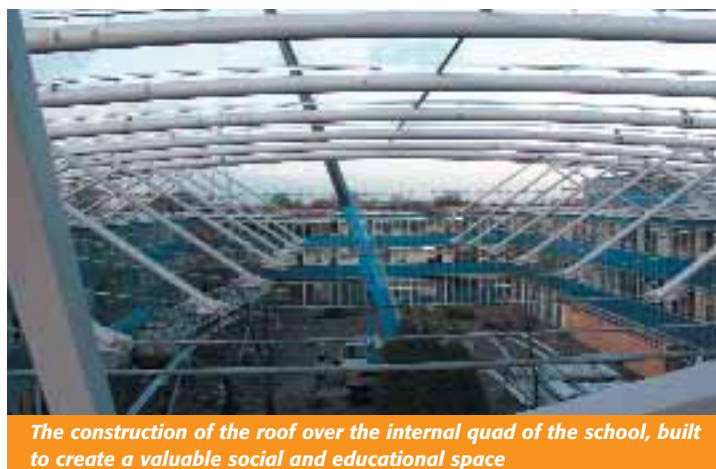
School Works (demonstration number 236) sought to explore how improvement in secondary school buildings might enhance academic achievement. Questions were asked about how the fabric of the school could be changed to create a sense of pride and pleasure amongst pupils and staff, within existing budgetary constraints. School Works was funded by DfES to investigate these issues, effect practical change within a partner secondary school, and inform government policy.

<sup>20</sup> Sustainable Urban Extensions: Planned through design, 2000, The Princes Foundation

<sup>21</sup> The Do-ers guide to planning for real, 1999, Neighbourhood Initiatives Foundation



The aims of School Works were to revolutionise the process of designing and procuring a school building, and to draw out the connections between the school building and the social, emotional and educational development of young people. School Works helped to redesign Kingsdale School in Southwark as a test case. The most important aspect of the project was the full participation of pupils and teachers in the plan and design. The project had the support of the then Schools Standards Minister, Estelle Morris MP, and was recognised as a national model.



*The construction of the roof over the internal quad of the school, built to create a valuable social and educational space*

Increasing the proportion of affordable housing in new developments has sometimes proven both controversial with the professional development community, yet beneficial from the perspective of the local community.

Changes in demographics and the family unit have exerted pressures for change in provision of housing throughout communities. In areas where the population is increasing, such as south east England, local authorities and developers are trying to respond to housing demand. Where population is decreasing, large-scale housing regeneration and renewal is underway. Authorities throughout the UK are also considering the need for affordable housing in relation to social regeneration and key worker housing. Partnerships between private developers and housing associations, through Section 106 agreements, are becoming a common way of delivering mixed tenure developments.

Netherne-on-the-Hill (demonstration number 1033/R4.01) involved the creation of a new village on the site of a former isolation hospital. 43 of the 185 acres were developed to provide housing with community, commercial and sports facilities. The new village has a mix of homes ranging from large detached properties and luxury apartments to retirement homes and affordable housing. 25% of the housing is affordable and 60% of the affordable housing is two and three-bed units.

Recent Planning Policy Guidance and outputs from the Office of the Deputy Prime Minister (ODPM) are resulting in more dense developments. When density is increased, high quality transport and leisure facilities are vital for the cohesiveness and functionality of the community. The ODPM has highlighted the importance of green spaces<sup>22</sup> and many local authorities are preparing green-space strategies. Transport infrastructure, particularly provision of amenities to encourage use of public transport are often part of planning agreements. This is in response to the Government's ten year plan for transport<sup>23</sup>.

*Larger schemes require affordable housing, and a mix of housing types and tenures*

*For high density, mixed use developments plan for high quality public space and safe public transport accessibility*

<sup>22</sup> 'Green space, better places' ODPM 2002. [www.urban.odpm.gov.uk/greenspace/](http://www.urban.odpm.gov.uk/greenspace/)

<sup>23</sup> Transport 2010: the 10 year plan. [www.dft.gov.uk/trans2010/](http://www.dft.gov.uk/trans2010/)



In addition to the affordable housing aspect, Netherne also sought to address issues of public amenity, public transport access and public open spaces. The Section 106 agreement called for Gleeson Homes to sponsor a mini-bus service for residents over the first three years of the life of the development. After three years a commercial service should be viable. Existing public green spaces (a bowling green, cricket pitch and nearby football pitch) were all maintained or enhanced by the developer, and a village green will be created at the heart of the development.

### 3.2 Design

As with the economic impact, high quality design can lead to improvements in the performance of the building in social terms. These impacts are difficult to quantify, but are generally synonymous with the economic issues, such as improved satisfaction, productivity, health and safety. Rethinking Construction is a trailblazer organisation in facilitating the uptake of the DQI.

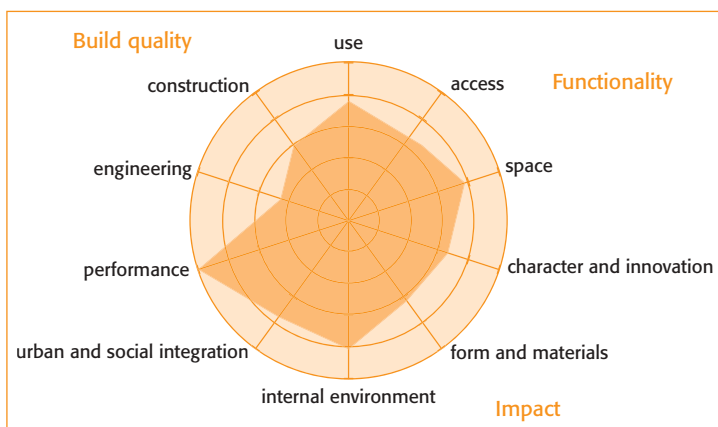
*Use the DQI, to engage everyone in the design process*

The Design Quality Indicator (DQI) has been developed to help all stakeholders in the built environment to gain more value from the design of buildings, and to assist in improving the quality of buildings. Much value can be gained by involving end users closely in the design stage, and the DQI provides a template for doing so.



*The Basketball hall at Jesse Boot*

The Jesse Boot Basketball and Dance Centre in Nottingham, provides an example of how engaging users in design through the DQI adds value. The design development took 12 months and flooring was a key issue. It was agreed with users that high quality flooring would provide a better sporting experience, which in turn would create better performance. The results of this investment are two fold: the dance studio has tripled its business and the sports hall is now the recognised location for all major sporting events in the region. The DQI score shows the build quality gained maximum marks and social integration scored very highly.



*The DQI score for Jesse Boot – see explanation of the questionnaire, review and scoring on page 16*

There are other ways to involve users in design. Southern Housing Group's 'Millennium Plus at the Nightingale' project (demonstration number 1001/R1.01) features a number of pre-assembled components which were integrated with a concrete based tunnelform structure to improve the built quality. Residents from the Estate Development Committee contributed to the design and layout of the homes, working closely with the developer and the design team. A group of residents, together with other representatives from the project team visited construction sites as well as completed homes that were built using these technologies before they gave their approval for the Nightingale scheme. For the variety of choices provided to tenants in areas such as internal layouts, colour schemes of finishes and type of kitchen units the project was awarded the 2001 Building Homes Award in the 'Best Options and Choices' category.

A £100,000 social investment development fund under resident control has been financed jointly by Southern Housing Group's charitable arm (Southern Housing Foundation) and the builders (Countryside in Partnership). The project aimed to provide jobs too, with a target to recruit 30% of the construction workforce locally and by helping to improve residents' work skills through traineeships and NVQ training courses.

The key quality improvements of the scheme which have a significant impact on the long-term sustainability of the scheme are in the areas of space provision and sound and thermal insulation standards. The tunnelform concrete structure meant that the roof structure could be constructed with panels rather than the traditional trusses, offering extra space (5-50% in excess of Parker Morris standards). The wall and ceiling construction exceed the new Building Regulations Part E (2003) for airborne and impact sound insulation quite significantly. Good thermal insulation levels, combined with the provision of efficient heating systems led to an average SAP level of 97, thus keeping the running cost for residents to a minimum.

### 3.3 Construction process

The construction process is a vital stage at which the construction industry can prove its commitment to its workforce, and also interact well with the general public. Health and safety has the potential to be the most significant social and economic impact during construction. The Health and Safety Executive provides specialist resources for construction<sup>24</sup>, and a partnership approach has been taken to form Working Well Together<sup>25</sup>.

Improved communication is an important ingredient for success, both with the workforce and the surrounding community. Members of the workforce will be safer and more productive if they know what is going on, and know they can approach management with any concerns. Sometimes disturbance cannot be avoided, but informing local residents and businesses can lessen negative impact.

#### *Use the Respect for People toolkits*

Recruiting and retaining talented people is the most urgent business challenge facing the construction industry. Change and improvements can only happen through people, and their efforts in the workplace. Through providing respect and the right conditions for its workforce, the construction industry will reap the benefits.

In response to the Construction Minister's challenge for the industry to radically improve its performance on people issues, Rethinking Construction established a working group to examine the issues associated with people in the industry. Arising from this work, the Respect for People Indicators allow organisations and projects to measure and compare their performance and identify and prioritise actions. Once the priority areas have been identified, the supporting toolkits facilitate more detailed evaluation and focus on actions for improvement.



**The purpose provided restaurant for construction workers at Woolgate Exchange**

The Woolgate Exchange in London (demonstration number 141) comprised the fitting out from shell and core to provide a new office for German Bank West LB. The project demonstrated that quality of worker facilities is important. Contractor Interior has all but abandoned the use of portacabins for fit-out team offices. At Woolgate Exchange, the construction managers, consultants and contractors shared a modern open-plan office with IT and CAD systems, meeting and reception rooms. A high quality restaurant was provided for the construction workforce.

Creating the right environment is one thing, building good relationships is another. Interior encouraged an open-door policy and adult treatment of staff. Woolgate Exchange was compared to a similar project that did not use these innovations. The other project recorded 40% more worker inductions. High turnover of staff costs money and a disaffected workforce are more likely to have accidents and produce defects.

<sup>24</sup> [www.hse.gov.uk/construction/index.htm](http://www.hse.gov.uk/construction/index.htm)

<sup>25</sup> [www.wwt.uk.com](http://www.wwt.uk.com)

The Considerate Constructors Scheme (CCS) was set up five years ago by the industry to improve construction's image. Through a voluntary code of practice, the Scheme is raising the standards of management beyond statutory requirements. The results on site for example are to minimise the disturbance or negative impact on neighbours, the general public and the environment. The Scheme has now registered 6,000 sites since inception and in the last year has registered £8bn of contract value, about 15% of total construction value. The Scheme expects registrations to rise to 25% of all construction value in two years.

*Register sites with the Considerate Constructors Scheme and use the Construction Skills Certification Scheme*

The Construction Skills Certification Scheme (CSCS) aims to register every competent construction operative within the UK, thus driving out 'cowboy' builders. As well as reducing consumer confidence, substandard work costs time and money through defects, undermines health and safety standards, dissuades new recruits and drives out qualified workers. Personnel are awarded the card by proving their competence through a mandatory health and safety exam and qualifications or references from employers. The industry aims to have a fully qualified workforce in 2010. CSCS currently has over 500,000 members: more than 20% of the workforce. The industry as a whole and all clients will benefit from the Scheme.



Most people's perception of the construction industry is determined by their experiences with the domestic market. The government's Quality Mark scheme aims to improve the industry's performance and the general public's perception of it. The Quality Mark scheme complements CSCS by focusing on the domestic market, and following successful pilots, the initiative is set to roll out nationally. Just as CSCS is making its scheme available to an increasing number of trade sectors, Quality Mark's roll-out programme will establish a benchmark to enable trades people to deliver competently and proficiently. Consumers wanting to locate a reputable tradesman can do so through the Quality Mark website.



*The swimming pool at Lythe Hill Hotel leisure complex*

Lythe Hill Hotel (demonstration number 294) involved the construction of a new leisure complex on the site of an existing luxury hotel. CCS was specified, and the site certainly required a considerate approach from the contractors Benson Limited. Care had to be taken due to the hotel remaining operational throughout the construction period, difficult site access, and a lake below the construction site. Benson normally use CCS and find it a valuable scheme.

### 3.4 Finished product

There is growing evidence that building occupiers are seeing environmentally benign buildings as a significant improvement. Building tenants influence building design to a much greater degree than was the case during the 1980s and this has had, and continues to have, a marked effect on office building design and specification. Surveys in the early 1990s, for example, showed that 89% of office occupiers were against air-conditioned buildings.

**See environment**  
*Consider staff costs,  
 e.g. maximising  
 satisfaction and  
 productivity through a  
 healthy environment*

It is increasingly unlikely that buildings will have a single use throughout their lifespan, as neighbourhood composition changes increase more rapidly, through demographic and economic transformation. A key feature of maintaining high levels of occupant satisfaction throughout changing uses and users is the continuing use of feedback mechanisms to discover how users perceive the building, and where issues lie. Feedback can be used to help target resources most effectively for existing buildings, but intrinsically can also help to improve satisfaction levels, as people feel that their opinions are valued.



*Bennetts Associates new offices, courtesy of Morley von Sternberg*

The Bennetts Associates New Offices (demonstration number 326) features the use of appropriate low-tech environmental construction methods in a sensitive refurbishment of their own office accommodation. Sustainability and embodied energy have been considered when selecting materials and components for the building: windows are mild steel, carpets are made from recycled materials, and linoleum has been used rather than vinyl flooring. Wherever possible, timber used in the new offices was salvaged from buildings on the site that had fallen into disrepair.

However, environmental issues are not the only features of sustainability important to this project. Staff consultation was, and still is, an important feature of the project. Staff were consulted throughout the design process and feedback was given via office meetings, and a post-occupancy evaluation was underway as this report was published.

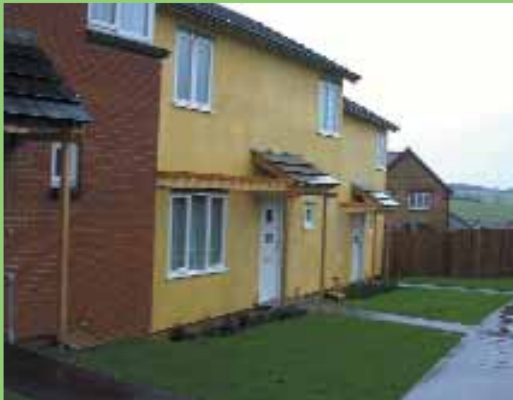
The social and economic fabric of the area around the offices has deteriorated over the years, and the refurbishment of the offices will have a very positive impact here. Bennetts could have moved their offices to a different part of London, with the likelihood that these buildings would have deteriorated further, but instead have chosen to contribute to the regeneration of the area through improving the building fabric and retaining the economic and social benefits that thriving businesses bring.

Good management of buildings, as well as good design, has a significant effect on perceptions of an area. Statistics show that crime levels are higher in areas where the quality of the built environment is poor, and people generally feel less safe in such areas. Low occupancy levels tend to lead to higher levels of vandalism, and therefore poorer public perception, and so a vicious cycle is created.

The brief for the Cambridgeshire Heritage and Archive Centre (demonstration number 269) called for an innovative design and construction of a low-energy building using sustainable materials. The project provides a secure facility to store archive and archaeological materials, together with office and laboratory accommodation for documenting, sorting and treating the material, and public access areas including a library and search room. More unusually, however, it specifically aims to provide broader community use of the facilities, with areas for artists workshops and exhibitions, drama performances and public demonstrations of conservation work.

*Encourage community  
use of buildings, through  
the DQI and policy*







## 4 Environmental sustainability

Buildings and the construction process account for a large proportion of total UK environmental impact. For example, the operation of buildings produces about half of UK carbon dioxide emissions. Environmental impacts are more tangible than many of the social and macro-economic impacts of the built environment, and guidance and tools are readily available on how to reduce negative effects.

Assessment tools have been developed, some of which focus exclusively on environmental issues, others that also aim to assess economic and social impacts. Some examples are:

- BREEAM<sup>26</sup> (BRE's Environmental Assessment Method) covering Offices, Retail, Industrial, bespoke projects and homes, called EcoHomes;
- CEEQUAL<sup>27</sup>, a civil engineering environmental quality assessment and award scheme;
- SPeAR<sup>28</sup>, a sustainable appraisal method for projects;
- The Sustainability Checklist for Developments<sup>29</sup> (for large mixed use projects).

Such tools allow consideration and balancing of a range of environmental issues. Changes to planning policies and agreements are seeing adherence to such schemes being encouraged and possibly becoming mandatory. North Somerset Council have negotiated a Section 106 agreement for about 1500 new homes to achieve EcoHomes 'Good'. Investors have also driven improvements including:

- English Partnerships have performance criteria based on EcoHomes and other BREEAM Schemes, requiring a minimum standard of 'Very Good';
- The Housing Corporation is now basing funding for social housing upon achieving an EcoHomes 'Pass' result, with a recommendation of 'Good'.

The demonstrations allow for the promotion of innovation within a market-led environment, and assessment of the feasibility of that innovation. Many demonstrations have proved their environmental performance by using assessment tools. For example Cabot Community Sports Centre (demonstration number 359) used a bespoke BREEAM and achieved an 'Excellent' rating. The Mason Moor housing development in Southampton (1088/R7.16) achieved an EcoHomes 'Very Good' rating for no extra construction cost, keeping within 110% of the Total Cost Indicator rates.

The checklist states that if a demonstration is applying such a tool or equivalent, it can be considered to pass this section. However when formal assessment is inappropriate, the checklist criteria could be applied separately. Targets are necessary to encourage action and assess performance. It can be difficult to set environmental targets, when current performance is unknown, and the costs of meeting targets are uncertain. Clients are increasingly asking for compliance with environmental targets, and companies are integrating them into their standard procedures. The EPIs provide a framework for operational energy and water, embodied energy, biodiversity, construction site transport and waste. The DTI has now included a measure of all the EPIs, except embodied energy, into their annual surveys. The first set of responses will be published in summer 2003.

### 4.1 Planning

Through Planning Policy Guidance (PPG – see Appendix 2) many environmental concerns have been dealt with by central government. For example PPG11 contains guidance on energy efficient patterns of development and buildings. PPG12 states environmental concerns should be comprehensively and consistently taken into account in development plans.

<sup>26</sup> [www.bre.co.uk/breeam](http://www.bre.co.uk/breeam)

<sup>27</sup> [www.crane-environmental.co.uk/Projectsheets/CEEQUAL.pdf](http://www.crane-environmental.co.uk/Projectsheets/CEEQUAL.pdf)

<sup>28</sup> [www.arup.com/environmental/HTML/WhatWeDo/SPeAR.htm](http://www.arup.com/environmental/HTML/WhatWeDo/SPeAR.htm)

<sup>29</sup> The Sustainability Checklist for Developments: a common framework for developers and local authorities. BRE April 2002. Available at [www.brebookshop.com](http://www.brebookshop.com)

A significant number of local authorities have now prepared Supplementary Planning Guidance (SPG – see Appendix 2) that focus upon environmental performance criteria such as energy efficiency and materials selection. Such documents use the opportunity local authorities have to influence the performance of all planning applicants, and encourage the move towards more sustainable construction. This can help local authorities achieve their commitments to reducing climate change (for example, if they have signed the Nottingham Climate Change Declaration) and generally helps fulfil the role of community leadership.

The Building Regulations provide the enforceable aspect of building control. The revision to Part L is increasing the efficiency of new build and major refurbishments. The Regulations do not yet cover other environmental issues, but again local authorities can take the opportunity to advise designers and builders on more sustainable practice.

*Reuse land. Treat contaminated land on-site. Reuse buildings*

Progressive controls with regard to reuse of land and buildings, such as the Government's target of 60% of housing to be on brownfield land, are at the vanguard of policy with regard to sustainable development. The University of East London demonstration used later in this report, is a prime example of contaminated land being dealt with on site (see the case history on [www.m4i.org.uk](http://www.m4i.org.uk)). Reusing buildings can save significant amounts of waste material. Existing buildings can often be the basis of the character of the neighbourhood. There can be complex local sensitivities in developing historic buildings and defunct sites.



*The Old Bailey*

16/17 Old Bailey (demonstration number 46) is an example of the re-use of land and buildings. The works comprised the demolition of the majority of the existing buildings, and retaining the façade, which was subject to refurbishment. The new six-storey office building entailed piled foundations, concrete substructure, structural steel framework clad with aluminium and glazed curtain walling. Internally, the building includes extensive M&E services, raised access floors, suspended ceilings and Category A finishes. There was a social and

economic benefit in keeping a well-recognised façade, and environmental benefits in using fewer materials, and creating less waste.

*Plan the footprint of the building with ecological features in mind*

When considering a site, whether greenfield or brownfield, there will be particular areas of the site that support a concentration of biodiversity, such as ponds and hedgerows. Many constraints need to be accounted for by the footprint and layout of buildings on the site, but lasting benefits can be gained by aiming to maintain and protect these features by placing buildings and access routes as far away as possible. For example, building users can benefit from better views, and existing trees and hedges can afford protection to the users and the buildings, even to the extent of features being used as part of the building performance. The planning authority will expect to see that site plans have considered the UK Biodiversity Action Plan (BAP) and local plans where relevant.

The new Wessex Water headquarters (demonstration number 11) considered the surrounding countryside in the layout and maintained as many mature trees as possible. Development on the reclaimed sloping site had to be as sensitive as possible, as the site is adjacent to an Area of Outstanding Natural Beauty (AONB). The building hugs the contours of the land to minimise visual impact. More details of the Wessex Water project are given further in the report.



*Wessex Water Headquarters, courtesy of Peter Cook*

Any development that may generate traffic or alter traffic patterns may be required to produce a transport assessment for the local planning authority. All developers will need to consider this issue. Beyond traffic assessments, developers need to consider points of access to the site, for vehicles and pedestrians, and how the development integrates with the surrounding area. New users of the development will need amenities and the developer must consider where the nearest facilities are, how users will reach them, and whether it is viable for facilities to be provided on site. The Urban Design Compendium<sup>30</sup> provides a wealth of information about integration and access issues.

*Consider how building users will travel to and access the site, and facilities and amenities nearby*

While Rethinking Construction has sought to engage with sustainability-themed demonstrations, few have come forward to address how transport is dealt with at the planning stage. Beddington Zero Energy Development in Sutton (demonstration number 1016/R2.06) is an example of a project that has addressed this through unique site facilities to support reduced reliance on the private car. This is dealt with in greater detail in the section on 'Design' that follows. Car parking at Swindon's new hospital (demonstration number 124, see page 36) has been deliberately limited to encourage use of public transport and car sharing.

## 4.2 Design

The operation of buildings accounts for one of the most significant environmental impacts of the UK. Design of new build and refurbishment projects can improve building environmental performance in many ways. Thoughtful design that involves members of the supply chain can also promote efficiency on the construction site.

Lean construction provides a variety of proven methods for reducing waste at the design stage: standardisation, off-site construction, and using modular components can all help to minimise waste of materials. Provision for operational site management can also be considered in the design, such as providing space and facilities for building users to reduce, reuse and recycle waste. For example, BREEAM rewards specifications that allow for internal and external storage and services for the building users to recycle waste.

*Design for minimum waste of materials. Provide facilities for the minimisation and management of waste*

Off-site construction has featured strongly among the demonstrations. Approximately 40% of the housing demonstrations are using some element of off-site construction. These projects account for about 25% of the total value of the housing demonstrations, but have produced

<sup>30</sup> Urban Design Compendium, Llewelyn Davies, 2000 for English Partnerships and The Housing Corporation

roughly 70% of the number of units. This indicates how much less wasteful these methods are. The Housing Forum has published a commentary on the use of off-site fabrication<sup>31</sup>.

The Great Western Hospital Relocation (demonstration number 124) is an excellent example of waste management being considered from the original design concept. The project was a pathfinder project for the implementation of the Natural Step, an environmental initiative to work towards sustainable development. This meant all partners were encouraged to undertake a strategic review of their actions.



*The Great Western Hospital*

Carillion partnered with the wall panel supplier to create a bespoke product, saving approximately £285,000 in time and material waste. The panel supplier agreed to take back and recycle off-cuts. Similarly a standard ceiling tile size was specified for the entire hospital, saving waste of materials. Off-site construction resulted in no scaffolding being required on site, saved waste and also reduced the risk of accidents. The Hospital introduced a range of innovations and measured their financial impact, which is featured in an accounting report<sup>32</sup>.

*Protect and enhance biodiversity using the biodiversity EPI. Ensure natural features can be easily managed and maintained.*

The planning section of the checklist focuses on the footprint of the building and how this impacts on the biodiversity on the site. This section highlights the steps that need to be taken in considering the landscape and building design once the footprint has been decided. Building elements can be used to encourage bird and bat populations, and 'green' roofs provide excellent habitats for insects. Ponds, hedgerows, grassland, and heathland are all examples of landscape features that should be protected and can be enhanced through good design. Developers and designers can better understand national and local biodiversity priorities through the UK BAP<sup>33</sup> and associated local plans.

The Association of Wildlife Trusts<sup>34</sup> and the Institute of Ecology and Environmental Management<sup>35</sup> are useful contacts to go beyond legislation and make the most out of existing and potential biodiversity. Integrating the building and landscape design will minimise overlap and improve team communication, producing a better quality design. Users and maintenance must be considered in the design for it to meet requirements and whole life costs. The biodiversity EPI considers steps taken at design and construction stage. A biodiversity EPI report will be available in summer 2003, explaining the results of the latest research.

The Christchurch Junior School Replacement (demonstration number 165) made reference to the UK BAP in their external works. A diverse range of plants were used for structural planting and ornamental areas, including many native species which have increased the biodiversity on the site and will attract and encourage wildlife. Native tree and shrub planting around the perimeter of the school site not only enhances the ecological diversity on the site but enhances the appearance and provides shade and shelter for pupils and staff. The landscaped areas are designed to require low levels of maintenance in the future. The playing field is self draining through natural percolation thus avoiding the need for

<sup>31</sup> Homing in on Excellence: a commentary on the use of offsite fabrication methods for the UK housebuilding industry, [www.rethinkingconstruction.org](http://www.rethinkingconstruction.org)

<sup>32</sup> [www.ciria.org.uk/pdf/sustainability\\_accounting/x105.pdf](http://www.ciria.org.uk/pdf/sustainability_accounting/x105.pdf)

<sup>33</sup> [www.ukbap.org.uk](http://www.ukbap.org.uk)

<sup>34</sup> [www.awtc.co.uk](http://www.awtc.co.uk)

<sup>35</sup> [www.ieem.org.uk](http://www.ieem.org.uk)



maintenance of a land drainage system. Bark mulch for planting areas and peat free planting composts were used from Eco Composting in Christchurch, a local recycling centre for green waste. All this and more was achieved on a tightly limited budget.

There are many reasons for choosing local and low impact materials. Local suppliers can be cheaper and provide specifications that fit the local vernacular. Less transport will reduce costs and benefit the local community and environment. Reusing and recycling materials on site, and purchasing materials with a high recycled content, will have a similar result, as well as saving on the Aggregate Levy and Landfill Tax.

The embodied impact of materials has been widely researched. The use of novel materials such as sheep's wool and recycled paper insulation is increasing. The impacts of traditional specifications like mineral wool have been measured and compared (for example in The Green Guide to Specification). Energy use and pollution during the production of materials is important, but most natural materials are also likely to be less detrimental to the health of tradespeople and building users. Finishes and fittings are often replaced, and synthetic versions can have significant impacts compared to more natural specifications. For example painters suffer a 40% higher lung cancer rate than average<sup>36</sup>.

Timber is widely acclaimed as one of the best natural building products. Due to increasing concern about forestry practices around the world, many certification systems now exist to monitor and certify the timber supply chain. The Forest Stewardship Council (FSC)<sup>37</sup> is a well-recognised independent and international standard. Central government has specified FSC timber for some years and now local authorities are following suit in their procurement policies.

The New Architectural and Planning Studios at the University of West of England (demonstration number 354) focussed on the embodied impact of materials. Amongst many innovations, agricultural straw bales, readily available from the local area, were used in structural steel walling elements to take advantage of their insulation properties. The bales were assembled into large panels off site and brought to site to receive final finishing.

Fairfax House in Lambeth (demonstration number 370) is the first construction project in Britain to be independently certified by the FSC for its use of

*Specify local and low environmental impact materials (e.g. use A-rated specifications from the Green Guide or equivalent and timber from certified well-managed forests). Use the embodied energy EPI*

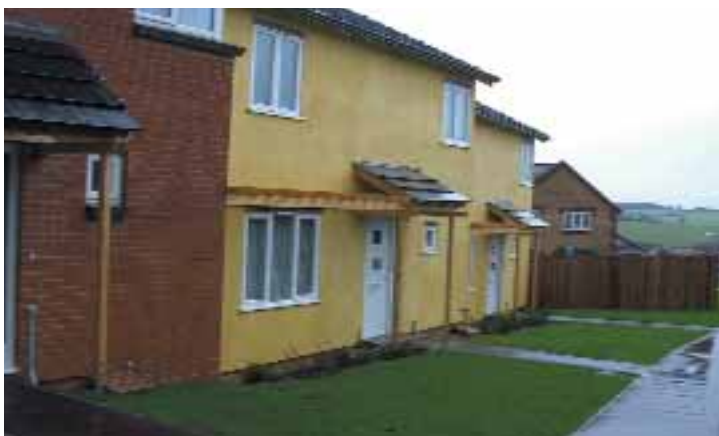


*The Douglas Fir rafters during construction of Fairfax House*

<sup>36</sup> <http://193.51.164.11/htdocs/monographs/vol47/47-13.htm>

<sup>37</sup> [www.fsc-uk.info](http://www.fsc-uk.info)

sustainable timber. This means that not only can the project claim to use timber from well-managed sources, but that an independently verified chain of custody exists between the timber used in the building and the forest it came from. This chain of custody proves that the construction project is using timber in a sustainable way. The project used FSC tropical hardwoods as well as European softwoods. The FSC content, including the frame, cladding and second fix items, is estimated to be 70%. The residents are proud that their homes have contributed towards the global sustainability of forests.



*The hemp homes adjacent to the traditional homes at Haverhill*

The hemp houses at Haverhill (demonstration number 1021/R2.11) compared traditional brick and block construction with hemp and lime houses on a small housing development. The extremely low-energy material production process uses hemp stalks, which are usually a waste material. The hemp homes performed as well as the traditional in thermal, acoustic, durability and permeability tests<sup>38</sup>. Hemp homes require less excavation and the breathing quality of the walls means less condensation and generally a warmer and drier internal environment.

The East Dorset Housing Association (demonstration number 1044/R5.02) took materials specification seriously. Units were constructed using a Swedish system of large timber frame closed panels complete with windows and doors. The panels are highly insulated, ecologically sound, able to be erected very quickly and are of excellent quality. For example, the pre-finished, triple glazed timber windows are guaranteed not to need repainting for 30 years. The roof manufacturer and roof light manufacturer worked together to enable the roof lights to be fixed using less timber cuts and waste. Waste was halved compared to traditional sites early in the demonstration, and further reductions were achieved on later sites. The need for quarry products was reduced, no materials containing gypsum or toxic products were used, low smoke zero halogen cables were installed and soil pipes were specified that were manufactured from recycled plastic. Many steps were taken to choose low-toxicity paint and other building materials, resulting in healthier homes. More details are available<sup>39</sup>.

*Optimise passive energy use (e.g. solar gain).  
Minimise energy use (e.g. lighting, heating/cooling, ventilation, insulation).  
Consider CHP and renewable energy sources.  
Use the operational energy EPI. Fit sub-metering and intelligent building monitoring systems*

Building operation accounts for 40-50% of energy consumed in the UK. The government has taken many actions to control energy use, through the Climate Change Levy, revision to Part L of the Buildings Regulations and providing grants for renewable energy. The Climate Change Levy charges all commercial energy users for fuel use. The new Part L sets more stringent energy efficiency standards for new build and refurbishment of domestic and commercial properties. The EU Directive on energy labelling of buildings was published in January 2003. The government has three years to implement it. Likely changes are: Part L revisions will apply to the whole building when refurbishment and extensions take place above the floor area threshold, energy labels will be produced for all buildings at point of sale or change of tenancy and plant inspections will become more strict.

<sup>38</sup> <http://projects.bre.co.uk/hemphomes/HempHouseatHaverhillfinal.pdf>

<sup>39</sup> See [www.edha.co.uk](http://www.edha.co.uk) and the case study on [www.sustainablehomes.co.uk](http://www.sustainablehomes.co.uk)



There are many possible solutions to reduce fossil fuel use. Many sources of guidance and grants are available to help you choose, design and install the right system, such as Action Energy and Clear Skies<sup>40</sup>. General actions will include:

- using passive gain and loss where possible, such as natural light, air movement, thermal mass, temperature gradients and other natural phenomena;
- when passive solutions are constrained or do not fulfil requirements, minimise the energy use of the mechanical systems installed;
- consider what renewable energy sources are available, such as solar water heating, wind turbines, biomass and photovoltaics;
- ensure monitoring of thermal performance and energy use is in place, and the building is as responsive and easy to use as possible.

Such actions may reduce capital cost, should reduce operational costs and will lead to a more comfortable healthy internal environment. A range of demonstrations have considered all or some of these areas. One of the earliest demonstrations was a new facility building for the Environment Agency (demonstration number 4). The glazing and innovative external solar shading was a low cost solution that resulted in good energy efficiency and thermal performance, despite teething problems in the system.

Great Notley Country Park Discovery Centre (108) provides a sports centre, an environmental education facility, and a social community resource. The design incorporates a number of innovative ideas to reduce energy consumption, generate energy, recycle waste products and minimise environmental degradation. It is hoped that the site will be a net producer of energy rather than a consumer of it. The building has been insulated to a high standard and has a Termodeck heating and cooling system integrated with the building structure, which ensures good controlled ventilation. The centre is equipped with a 6kW wind turbine generator, coupled to a grid connection. There are solar roof panels to reduce energy consumption by heating water for showers.



*Great Notley Country Park Discovery Centre (copyright Peter Mackinven)*

Flexible information and communication services allow the users of a building to adapt their working and leisure patterns to suit themselves rather than the constraints of the building. It can allow greater remote working, reducing the need to travel, and increasing the productive use of space. New high-performance commercial and domestic developments often make a selling point of the 'future proof' and flexible nature of the information and communication provision. To encourage home working and more flexible use of commercial space, such specifications need to become standard in new build and refurbishment.

*Specify flexible  
information and  
communication services*

At Primrose Field in Harlow (demonstration number 1024/R2.14) Swan HA worked with Integer to convert the standard Integer housing brief into one for social housing. One of the features of the Integer system that Swan included was the provision of an intelligent cabling system. Cables were put in place for communications (phone, fax and internet),

<sup>40</sup> [www.actionenergy.org.uk](http://www.actionenergy.org.uk) and [www.clear-skies.org](http://www.clear-skies.org)

*Ensure high indoor air quality through effective ventilation, and specifying materials, finishes and cleaning products with minimal harmful effects*

entertainment (terrestrial TV, radio, cable TV and internet) and data (computer and internet). Removable cornices allow the main cables to be easily accessed for future upgrading, and a service void behind the internal plaster board allows extra sockets and switches to be placed easily. The door entry system is linked to tenants' phones and TVs, ensuring ease of use and improved security. These measures reduce maintenance costs for the association, and provide improved social opportunities, skills development and home-working options for the tenants.

People in the UK typically spend about 90% of their time indoors, so the quality of the indoor environment matters. Poor indoor air quality (IAQ) can have a significant adverse effect on health (from sick building syndrome to asthma and cancer), comfort and productivity<sup>41</sup>. IAQ problems can have various economic consequences at personal, organisational and national level, including costs directly due to treating health problems:

- absenteeism and reduced worker performance;
- increased staff turnover;
- damage to relations between landlords and tenants or between employers and employees, and the time taken to deal with complaints;
- legal liability;
- devaluation of a building or company;
- deterioration of furnishings, equipment, and building fabric.

Indoor air pollutants arise from a wide range of sources, including people and their activities, equipment and building services, building and furnishing materials, the outdoor air, water and soil. From these sources come pollutants that may be:

- biological (such as viruses, bacteria, fungal spores, mites and their metabolic products);
- inorganic (for example radon, carbon dioxide, carbon monoxide and nitrogen oxides);
- particles or fibres;
- formaldehyde and other volatile organic compounds (VOCs);
- complex mixtures such as environmental tobacco smoke.

Achieving good IAQ is not just a matter of meeting standard ventilation requirements; the first choice for reducing indoor pollution should be source control wherever possible. For example, substitution of products or processes, pre-treatment of materials, or isolation of sources will reduce pollution. Therefore, to avoid IAQ problems, it is important to understand the sources of indoor air pollution, the pollutants produced by these sources and their likely health effects. Source control requires attention both to new materials and components and to the promotion of good maintenance and cleaning. Where source control is not a viable complete solution, consider ventilation close to the source, more efficient general room ventilation, control of ventilation by the building users and air cleaning, not just a higher ventilation rate.

The new Docklands campus for the University of East London (demonstration number 49) used several innovations. With the brief emphasising the requirement for a low-maintenance, low-energy building, resistant to external noise, the design team focused upon reducing the big energy consumers of heating, cooling and ventilation. This led to the architect, Edward Cullinan Architects, specifying Termodeck, a hollow precast concrete ceiling plank through which tempered air is supplied. As Termodeck requires a sealed and

<sup>41</sup> Building Regulation, Health and Safety, 2001, Raw *et al.* BRE Report 417

insulated building, it also helps to cut out noise and outdoor pollution. The system does not recirculate air – eliminating one potential cause of sick building syndrome. As the solution demands an exposed structure, the installation and maintenance of finishes – a source of indoor pollutants – is reduced.

Buildings can contain high levels of ozone depleting substances in the air conditioning system and insulation. A passive approach to heating and cooling buildings will therefore also help you to reduce the damage done to the ozone layer. It is easy to specify materials in the roof, wall and floor components, as well as the boiler insulation, that do not contain ozone depleting chemicals. For example the following list inherently have zero ozone depletion potential:

- mineral fibre (e.g. Rockwool);
- glass fibre (e.g. Owens Corning);
- cork (e.g. Korklite);
- cellular glass (e.g. Foamglas);
- expanded polystyrene beads;
- nitrile rubber (pipework insulator);
- cellulose (e.g. Warmcell).

A significant group of ozone depleting chemicals are Hydro-Chloro Fluorocarbons (HCFCs), which are now banned for use in the manufacture of insulation. They are only allowed for on site use until January 2004. HCFCs can still be used as refrigerants, but will be phased out by approximately 2010.

Nitrogen oxides, commonly referred to as NO<sub>x</sub>, contribute towards global warming and acid rain, and react with oxygen to produce ozone, which is a pollutant at ground level. They arise from burning fossil fuels, so reducing consumption of these will reduce NO<sub>x</sub> emissions. Energy from renewable resources (except the combustion of biomass) does not produce any NO<sub>x</sub>. It is also possible to specify low NO<sub>x</sub> burners in boilers, which run more efficiently and have lower emissions.

It has not been possible to identify a demonstration for this criteria, as data has not been recorded for it, but a number of the demonstrations have achieved it through avoiding air conditioning and careful materials specification.

As more dwellings and commercial buildings have water meters, and the costs of treating water increase, reducing water use becomes more of a concern. Water consumption can be easily reduced by specifying fittings such as dual flush toilets, spray taps and efficient white goods. These can all be achieved at little or no extra cost, and bring immediate cost savings in use. The Department for Environment Food and Rural Affairs (DEFRA) and the Environment Agency maintain a database of water saving research and initiatives<sup>42</sup>. The water EPI provides a methodology and benchmark for designers interested in operational efficiency.

For new build projects, rain water collection for toilet flushing can have other benefits through awareness raising and reducing peak demand on drainage and waste water services. Currently, water use exceeds supply only in the East of England, but this may change with predicted climate change and the costs of water treatment will increase with time.

*Specify zero ozone depletion and low NO<sub>x</sub> systems and materials*

*Ensure fittings are low water volume. Consider rainwater and grey water recycling. Consider permeable design for hard landscaping. Use the water EPI. Fit sub-metering.*

<sup>42</sup> [www2.defra.gov.uk/db/research/default.asp](http://www2.defra.gov.uk/db/research/default.asp)

Sustainable urban drainage systems (SUDS) are the subject of extensive research and guidance from CIRIA<sup>43</sup>, the Environment Agency and Scottish Environment Protection Agency<sup>44</sup> for example. It has been demonstrated that permeable products and related systems can have significantly lower maintenance costs than traditional solutions, reduce pressure on existing drains and help to replenish aquifers.

The Hotels Water Efficiency project (demonstration number 368) managed by the Mandix Consultancy in Cardiff, is an unusual demonstration. It has focussed on adding value for the client by helping them to control their operating costs, improve their service levels and raise their environmental performance through the installation of water efficiency devices. The project monitored hotels for one year, guided the installation of water efficiency measures, and then monitored usage for a further year. Monitoring was carried out by the Centre for the Built Environment at Cardiff University. The hotels have decreased their water use by 14-53% per guest per year: this is saving them £5-24 per guest per year. This project has been supported by the Environment Agency, The BOC Foundation, Corus Group plc, Wales Tourist Board, Envirowise, Mandix, HCIMA, water undertakers in Wales, Green Globe 21, Plumb Centres Ltd, installers and manufacturers.



**A swale on the edge of the Henry Box development**

The Henry Box development near Witney in Oxfordshire (demonstration number 293) had to provide an affordable housing solution to being in the middle of a flood plain. The site is relatively flat with minimal fall to outlet available. It uses a narrow shallow combined kerb drainage system to allow for achievement of a sustainable drainage system. Positive drainage such as the kerb drains and storage facilities work alongside passive drainage such as soil absorption and swales, leading to an efficient and sustainable facility<sup>45</sup>.

*Discourage single-occupant car use, through public transport and cycling provision, making the development safe and secure, providing showers and changing rooms*

The energy used to transport people to an office building can be equal to the energy used within it. Providing facilities to encourage modes of transport such as cycling and walking will have many benefits such as reduced car parking costs (providing car parking can cost as much as £800 per space<sup>46</sup>) and a healthier workforce. Partnerships with infrastructure and public transport providers will be necessary for larger developments. Many local authorities and private companies have produced Green Transport Plans, and enjoy the benefits described above. For new build, providing facilities for public transport users will help towards BREEAM and EcoHomes ratings.

Beddington Zero Energy Development (BedZED – demonstration number 1016/R2.06) is a mixed housing and commercial development of 82, one to four bedroom flats and houses, with 1600m<sup>2</sup> of work space. BedZED is a Peabody development in partnership with BioRegional Development Group, designed by Bill Dunster Architects.

As part of the planning permission, BedZED needed a legally binding green transport plan. The three-point transport strategy aims to: reduce the need to travel, promote public

<sup>43</sup> [www.ciria.org.uk/suds/suds\\_projects.htm](http://www.ciria.org.uk/suds/suds_projects.htm)

<sup>44</sup> [www.sepa.org.uk/guidance/urban-drainage/](http://www.sepa.org.uk/guidance/urban-drainage/)

<sup>45</sup> 'Plain sailing'. Article in Surveyor, 30 May 2002

<sup>46</sup> [www.local-transport.dft.gov.uk/travelplans/resource/08.htm#8.2.2](http://www.local-transport.dft.gov.uk/travelplans/resource/08.htm#8.2.2)



transport and offer alternatives to using private cars. BedZED's target is a 50% reduction in fossil-fuel consumption by private car use over the next ten years compared with a conventional development.

There is the chance to live and work on site, plus a sports facility and car pool. Other planned facilities include a café, clubhouse and premises for a local children's nursery. These additional facilities have successfully embedded a strong community spirit and also play a part in reducing the need to travel. BedZED enjoys good transport links, served by train, tram and bus routes. Design issues have included:

- secure drop-off points for deliveries;
- generous bike storage;
- links into Sutton's existing cycle network;
- a 'pedestrian first' policy, with good lighting, drop kerbs for prams and wheelchairs and a road layout that keeps vehicles to walking speed.

BSRIA, BRE, CIBSE and HVCA carry a wealth of information on effective commissioning. A recent publication<sup>47</sup> provides a protocol for handover of office building operations. A poorly commissioned building is likely to consume far more resources and have a poor internal environment compared to a properly commissioned project. Poor handover is often due to ill-defined responsibilities and time constraints towards the end of projects.

Design team professionals are in an ideal position to ensure documentation and commissioning is effective and robust. Designers also have vital role to play in making the building as straightforward to use as possible, removing the need for lengthy documentation. If a designer has gone to the trouble of installing features such as low environmental impact materials, documentation should advise future managers of what should be specified in maintenance and refurbishment.

For demonstrations, successful commissioning is a key consideration in ensuring client satisfaction and many partnered teams remain in touch with the building users after completion. Many housing demonstrations involve monitoring of tenant satisfaction and living costs for an initial period.

Gusto Construction's award-winning Millennium Green development (demonstration number R6.09) at Collingham embraces environmental good practice and sustainable development objectives, combined with traditional ideals and common sense.



*An aerial view of the BedZED development, courtesy of Bill Dunster Architects*

*Consider ease of operation and maintenance through commissioning time and documentation*



*View of a Millennium Green House, courtesy of Gusto Construction*

<sup>47</sup> HOB0 Protocol, Handover of Office Building Operations, 2003, BRE Digest 474

The properties use up to 60% less energy than a standard new house through the use of solar panels, rainwater recycling, heat recovery ventilation systems and high levels of insulation. Additional benefits including high-performance timber windows, grade A electrical appliances, central vacuuming system and ISDN compatible telephone and internet connections throughout, give homeowners the opportunity to enjoy a better quality of life. Gusto provides all homeowners with an information pack, explaining the various features of the houses, and how to use the house efficiently.

*Consider daylighting, ventilation humidification, personal control, and space for well-being and comfort. The DQI considers a range of environmental criteria*

Studies of good design and daylighting<sup>48</sup> in educational buildings show academic achievement improves 5-20% with improved standards. Similar findings also apply to comfort in dwellings, recovery rates in healthcare buildings and productivity in commercial buildings.

Comfort often relates to the degree of control and understanding an individual has of their environment. Many demonstrations have featured buildings with high-quality indoor environments.



*Notley Green School at playtime, indoors and out, courtesy of Timothy Soar*



*Housing fronts at the Ecopark development in Thamesmead*

The Great Notley (now Notley Green) Primary School (demonstration number 115) was designed and built by an innovative team appointed in April 1997 by Essex County Council and the Design Council. A commitment to devising a new approach to brief development formed the starting point for a tracking process. The end product was an interactive sustainable learning environment built within standard budgets, featuring breathing walls, good daylighting, oriented to maximise solar gain but not to overheat in summer, with a responsive underfloor heating system. The building services gained the Building Services innovation award in 2000.

Gallions Housing Association's Ecopark development in Thamesmead (demonstration number 1115/R10.09) uses a combination of sustainable features through a selection of 39 houses. A detailed monitoring and evaluation strategy to review the success and practicality of the features incorporated within the scheme is being undertaken and will help to focus the Associations future development strategy. Some of the technologies incorporated in the scheme

are to maximise solar gain as well as improve well-being and comfort: super-insulating windows, passive ventilation, underfloor heating and integral sun spaces (similar in style to a conservatory). An on site visitors' centre is open to showcase the development to other registered social landlords, members of the development and construction industries, school children, the media and interested members of the public.

<sup>48</sup> The value of good design – how buildings and spaces create economic and social value, 2002, CABE



With most buildings expected to last at least 60 years, and considering the changing needs of society, many buildings may need to alter use during their lifetime. Once refurbishment is no longer an option, buildings need to be deconstructed, creating the minimum of waste. Ease of deconstruction allows more value to be extracted from the building.

*Design for flexibility  
or deconstruction with  
minimum waste.*

Off-site construction is a key method that allows for flexibility in layout, location and deconstruction. Lifetime housing needs to cater for the needs of single occupants, young families and the elderly. In other building types, flexibility is of commercial importance, for example in offices and laboratories.

The Dorman Museum (demonstration number 216) was Phase One of the museum extension. The end elevation was contracted entirely of proprietary systems to be suitable for dismantling and re-erection for possible future extensions. Since then Phase Two of the project has used this feature, successfully removing the façade, building an extension and reassembling the façade. This was the optimum solution in terms of construction cost and time.



**The Dorman Museum extension**

The housing demonstrations have featured various innovations. At White Rock Court in Liverpool (demonstration number 1003/R1.03) a panel system was used to allow flexibility in internal layout as no internal walls are load-bearing. The Central Oakridge Regeneration in Basingstoke (demonstration number 1122/R11.01) has proved a regeneration scheme with a difference. In consultation with the local community, the project has involved a large element of off-site construction and pre-assembly. Some of the units feature the flexibility to expand into the loft space or via sideways extensions. This helps to fulfil the commitment to lifetime homes.



**Central Oakridge Regeneration in Basingstoke**

### 4.3 Construction process

Many construction organisations have departments dedicated to environmental performance. Most site managers deal with environmental issues on a daily basis: for example ensuring waste is transported to a certified disposal site, protecting waterways and arranging for equipment to minimise air pollution. Lean construction techniques increase efficiencies in using all resources, such as time, energy and materials, and so have an impact across the criteria. Many of the criteria below are part of standard practice, ensuring compliance with regulation, with the Environment Agency playing a key role. For this section each of the criteria are explained separately, and two demonstrations are used to show fulfilment of the criteria overall.

*Manage for minimum waste, using the waste EPI. Reuse waste on-site*

The Quarry and Landfill Tax have resulted in alterations to site practice, as contractors and the supply chain find methods that save money. Pressure is added by planning and client requirements to retain all demolition waste and top soil, and increase the proportion of reused and recycled materials used. The waste EPI is a simple measure of performance. Other tools include SMARTStart and SMARTWaste<sup>49</sup>.

*Protect and enhance existing ecological features, (trees, hedges, ponds etc.), using the biodiversity EPI*

The local authority and Environment Agency have a role to play in this criteria: for example, ensuring plans for native planting are adhered to, Tree Protection Orders observed and water resources are protected. The biodiversity EPI provides a simple measure to assess performance, at design stage, during construction process, and when considering the finished product.

*Minimise air pollution (dust and fumes), and noise pollution*

Air and dust pollution have a significant impact on site managers who control pollution, deal with regulatory officers and respond to complaints from the public. Recent guidance on air pollution<sup>50</sup> provides best practice in control, and demonstrates the benefits of doing so. The Considerate Constructors Scheme rewards improved performance in noise and dust control.

*Minimise water use during construction, and guard against pollution*

The construction industry accounts for the highest number of water pollution incidents. The Environment Agency provides a comprehensive source of guidance on the NetRegs website<sup>51</sup>. CIRIA have published a 'Pollution Prevention in Construction' training pack and code of practice and 'Control of water pollution from construction sites: guidance for consultants and contractors'.

*Consider transport to and from site using the transport EPI. Consider energy use through plant and site services*

Transport of staff, materials and waste contributes significantly to carbon dioxide emissions, and deliveries and workforce car parking can seriously disturb the local community. The Considerate Constructors Scheme rewards site managers who plan car parking, ensure routes to site are well identified and keep deliveries out of rush hours or other sensitive times. Planning permissions are increasingly setting limits on how much road transport a construction site can produce. Congestion Charging is another pressure upon construction to manage its transport more effectively. Recent research on the transport EPI has refined the indicators and collected data on the costs of transport<sup>52</sup>.

The Richard Doll Building (demonstration number 417) is a new cancer research centre for the University of Oxford. Nicholas Hare Architects, working in conjunction with the main contractor HBG Construction, are using this project as a vehicle to understand and better manage building waste to ensure that it is kept to a minimum.

At the pre-construction stage the architects placed emphasis on the following goals within their design process:

- construction materials were chosen with regard for their sustainable origins and their proximity to the site to reduce transportation;
- suppliers with a more enlightened approach to waste management and recycling were identified, specifying (where possible) those who encouraged this process;
- waste was designed out by methods such as modular design with regard to suppliers unit/sheet size, thereby reducing unusable off-cuts.

<sup>49</sup> [www.smartwaste.bre.co.uk](http://www.smartwaste.bre.co.uk)

<sup>50</sup> Controlling air pollution, Vina Kukadia et al 2003. CRC

<sup>51</sup> [www.netregs.org.uk](http://www.netregs.org.uk)

<sup>52</sup> Construction site transport, April 2003, BRE

These very simple waste minimisation techniques, complement the more visible design features of the project such as naturally ventilated offices with exposed concrete soffits, solar shading to reduce heat-gain and highly insulated construction fabrics.

Building on experience from previous projects the contractor will be measuring and sorting waste in order to quantify and understand which portions of the works generate most waste. Sorting out waste helps to maximise the potential for these waste products to be recycled either by return to the supplier or for reuse by charities and other bodies.

Weston and Cronkinson Farm Primary Schools (demonstration number 336) were specified to use all six EPIs by Cheshire County Council. Operational energy and water and embodied energy were considered at design stage. On site application of the waste, transport and biodiversity EPIs entailed some changes to site management. Waste contractor notes were used to estimate the volume of waste leaving the site. All vehicle movements to site were recorded by the manager, allowing Willmott Dixon to assess how much transport is costing them and what actions they can undertake to improve performance on future sites. Weston School was sited in a maize field and scored 6/10 and 5/10 for impact during design and construction in the biodiversity EPI. Cronkinson Farm was delayed due to the late discovery of newts on the site. Since participating in the capture programme, the contractors have maintained and replanted a hedgerow and wild edge to the site, for wildlife and educational uses, as agreed with the head.



*Weston Primary School, courtesy of Nathan Loeb*

#### 4.4 Finished product

The management of buildings has not been a focus of demonstration projects. Therefore in this section each of the criteria are explained separately, and one demonstration is used as an illustration.

Water and energy consumption can be reduced by up to 80% through careful management. Good waste management practice, following the 'waste hierarchy' – reducing, re-using, recycling and as a last resort disposing of waste – can reduce operational waste disposal costs by anything up to 90%. It is well-documented that the majority of businesses can save between 1 and 4% of their turnover through undertaking a waste minimisation exercise<sup>53</sup>.

As has already been outlined in the economic and social sections, post occupancy evaluation is vital to efficient building management. Occupants need information on how to use a new or refurbished building. In the Housing Forum demonstrations report (February 2002) 66% of demonstrations were reported to engage users by providing high-quality information about the building. The Environmental Office building at BRE provided a user-friendly source of information by producing mouse mats with an explanation of the environmental control

*Manage building systems, ecological features and waste for maximum efficiency considering the design*

*Use post occupancy evaluation and feedback*

<sup>53</sup> [www.envirowise.gov.uk](http://www.envirowise.gov.uk)

printed on them. Information must be close at hand for building users to access easily. Once occupants are well informed, more value can be gained from evaluation and feedback. The BRE Environmental Office held a building users feedback group for several years, at which users could discuss their concerns with the facilities manager.

*Follow the design criteria for maintenance, repairs and refurbishment*

The environmental impact of a building will continue throughout its life cycle. Its operation and management, repair and maintenance, and its demolition all have different impacts. The ongoing maintenance, repair and refurbishment of buildings can have a greater impact over the lifespan of the building than its original construction. Good operational management of buildings is therefore crucial to reducing their environmental impact. Maintaining buildings appropriately, taking into account both materials and methods used, can reduce their impact on ecological systems and help to improve the biodiversity of an area.



**Wessex Water Headquarters, courtesy of Peter Cook**

The Wessex Water New Operations Centre (demonstration number 11) has received great acclaim. Much focus has been upon the innovations used during construction. The design and construction considered the building users and function in mind. Careful attention was paid to thinking through the structure, M&E services and office equipment so they mesh together. When the building won the British Construction Industry Awards, the judges visited it one year after completion. They found none of the DIY adjustments and additions to the lighting,

ventilation, electrical supply and filing systems that people usually carry out to make up for the deficiencies in the original design. Clean and calm is the first impression, apart from the smokers shelter, a genuine bike shed like structure positioned discreetly away from the main building.

Focussing on predominantly natural ventilation, the building utilises solar water heating panels, condensing boilers, grey/ rainwater collection and recycling, and a Building Management System with zone control stations to monitor and control the building's environmental systems and artificial lighting control systems.

## 5 The future

There is a positive future for the Rethinking Construction agenda and sustainable construction. This report shows how far many demonstrations have gone in achieving elements of more sustainable planning, design and construction, leading to higher quality finished products. There were many demonstrations which also address aspects of sustainability that we did not have the space to feature, these are listed in Appendix 1.

As Rethinking Construction evolves, it will encourage more sustainable projects.

- The regional centres and national network will provide a resource for learning about what others have achieved;
- The checklist provides a framework for assessing all demonstrations;
- Changes in planning and government policy continue to put sustainability further up the agenda for Rethinking Construction, clients and the supply chain;
- Joining with Construction Best Practice to form Constructing Excellence will improve dissemination and conversion from innovation to best practice, to standard procedures, especially within small and medium-sized enterprises (SMEs).

The demonstrations have illustrated industry best practice in terms of economic sustainability: improving profitability and predictability, and decreasing defects for example. Demonstrations have also resulted in a raft of quality improvements, leading to greater client satisfaction. These quality improvements can be equated to improvements in social and environmental sustainability. Prime examples are community consultation, end user involvement, whole life costing, energy efficiency, water efficiency, materials specification, waste recycling and off-site construction, which are becoming standard practice in some companies. These innovations have sometimes been overlooked, as the projects are also innovating in other areas. Rethinking Construction, through its own commitment to continuously improve, has decided to encourage more projects to be innovative in their approach to economic, social and environmental sustainability, through using the checklist. Central data gathering will monitor the wider practices of the projects. The overall objective is to encourage mainstream construction to become more thoughtful about planning, design, process and the finished product for the user, local community and environment.

Upcoming demonstrations prove that economic, social and environmental concerns can be embraced equally. This is the mainstreaming of sustainability. Rocket Pool Drive in Wolverhampton (demonstration number 1123/R11.02) expects to gain a 'Very Good' EcoHomes rating. Using local off-site construction, the project is reducing the environmental impact of transport and materials waste, reducing running costs through super-insulation, supporting local business and employment, providing better working conditions, and reducing the likelihood of deprivation and anti-social behaviour. Thermal comfort and indoor air quality will be high. The properties provide flexible and convenient accommodation with features like knockout panels for easy installation of a bed-to-bath hoist, and provision of a home office.

There are barriers to more sustainable construction too. More work is needed to analyse the business benefits of sustainable construction, and collect data from the industry on what it is achieving. The application of whole life costing is constrained by the separation of developer and end user, or capital and revenue. However, these barriers are being overcome, by government policy and fiscal measures, sustainable construction pioneers, and business sense.

Rethinking Construction will continue to support the KPIs, EPIs, Respect for People and DQI, as measures that help the industry move towards more sustainable construction.



# Appendix 1 – demonstrations we wish we had the space for

## 74 – Oxford Industrial Park Development

'industrial accommodation with associated offices – flexible work space'

## 109 – St John the Evangelist Church

'new extension and refurbishment on extremely tight archaeologically sensitive site, to improve thermal performance'

## 237 – Mayfield Farm Constructed Wetlands, Heathrow

'solving glycol pollution through reed bed technology'

## 265 – Birmingham Schools Public Private Partnership

'committed to a strategy of sustainable development, including the use of innovative design, materials and energy management initiatives'

## 297 – Office alterations and refurbishment for the Environment Agency

'client specified BREEAM Excellent and other performance measures, but funding problems limited achievement'

## 312 – Dunston Innovation Centre

'energy efficient office building with multiple occupation that provides high comfort levels of heating and cooling at low cost using renewable energy technology'

## 347 – St Nicholas Court, York

'environmentally sustainable affordable housing on a brownfield site'

## 364 – Tayside

'recycling sub-soils and a reed bed ecological waste treatment system for gully waste, saving operating costs and reducing environmental impact'

## 425 – Skelton Grange, Environment Centre

'offsite constructed timber frame plus larch timber and mineral wool composite cladding building embodies state-of-the-art construction and servicing to sustainable agenda'

## 1007/R1.07 – Wilton Road, Reading

'the project fulfilled Ealing Family housing association's business ambition to build houses that have low operation and maintenance costs'

## 1010/R1.10 – Greenwich Millennium Village

'a development using a wide range of innovations, including EcoHomes'

## 1018/R2.08 – Oakfield High Street, Ryde, Isle of Wight

'a mixed tenure development: 50% affordable, 50% open market sale, including supported housing, on a brownfield site. The project is a catalyst for urban development in the area, there is a commitment from IOW HA to use and train local labour and there has been heavy community involvement. SUDS has been incorporated'

## 1020/R2.10 – Nuffield Road, Cambridge

'enhanced energy efficient specification, including triple glazing and ventilation with heat recovery, which developer Granta will monitor, to suggest changes to standard design brief'

## 1031/R3.06 – Mount Calvary Church, Swansea

'retained existing church for housing'

## 1036/R4.03 – Respect for People, Birmingham

'focus upon relations with the community, the contractors and local business'



**1037/R4.05 – Castle Vale Estate, Birmingham**

‘it has addressed the issues of form, density, versatility, high energy efficiency and environmental considerations, using an integrated team approach’

**1038/R4.06 – Barnwood School Site, Guildford**

‘initiatives for employment of local labour, trainee recruitment and measures to reduce materials wastage’

**1039/ R4.07 – Bryce Road Phase 2a, Dudley**

‘basement Ecopod compares Combined Heat and Power, condensing boilers, heat pumps and photovoltaics’

**1042/R4.10 – Modular Housing, Chelmsford & Romford**

‘modularised construction guaranteed for a minimum of 60 years and demountable for possible relocation. Sites are cleaner and safer, construction time is reduced, as are defects and waste’

**1050/R5.08 – Harlow & Redbridge Foyer, Harlow & Ilford**

‘low capital cost community facilities’

**1051/R5.09 – Kenavon Drive, Reading**

‘extensive remediation undertaken, application of grey water technologies, timber frame housing from renewable sources, the use of recycled aggregates on site, detailed planning and management of a lean, functional procurement process to eliminate waste, defects and delays, use of materials and labour from the Reading area as well as the extensive consultation process’

**R5.12 Hightown Praetorian Homes for 21st Century, Hemel Hempstead**

‘flexibility of internal layout, better internal environment, lower running and maintenance costs, reducing waste and its impact on the environment’

**1059/R6.05 – Lansbury West Estate**

‘Respect for People trial focussed on increasing staff retention, providing training opportunities and minimising resident disruption’

**1060/R6.06 The Terraces in Glasgow**

‘timber frame construction, passive ventilation and sustainable materials to create better quality on a limited budget’

**1065/R6.11 – Raines Dairy, Stoke Newington**

‘using off-site construction, to include live-work units’

**1066/R6.12 – Tattenhoe Grid Squares, Milton Keynes**

‘a partnering team was chosen from the outset and sought to show continuous improvement in design, sustainability, innovation, technology and customer satisfaction. All sites are mixed tenure’

**1074/R7.02 – Charles Avenue, Chichester**

‘comparison of EcoHome running costs with traditional homes’

**1089/R8.01 – Winston Square, Barry, South Wales**

‘regeneration of run-down residential and retail area’

**1091/R8.03 – Construction of Houses at Craigmillar, Edinburgh**

'future energy costs have been considered with the houses insulated with 150mm thick recycled paper. Measurement of waste created during the construction process'

**1096/R8.08 – Faifley HA, Phase 7 New Build, Clydebank**

'features heat box arrangement, enhanced insulation, 150mm thick timber kit frame and low emissivity glazing to reduce running costs'

**1104/R9.06 – Refurbishment project, Benwell, Newcastle**

'regeneration of the local community with a genuine focus on the residents of the estate'

**1106/R9.08 – Sherrards Close, Wissendine, Rutland**

'designed to Lifetime homes standards, utilising green components and aiming to achieve a SAP rating of 100: the first rural Eco-house in the East Midlands'

**1108/R10.02 – Perthshire Housing Partnership**

'efficiency and quality timber frame through partnering'

**1111R10.05 – Hillingdon Hospital, Uxbridge**

'focus on health and safety in procurement and design, and Respect for People issues'

**1121/R10.15 – Refurbishment contract, Phase 24, Fleet**

'increasing comfort, reducing running costs, reduction of waste, provision of recycling and training on the use of electronic communication'

**1124/ R11.03 – Coningsby Street, Hereford**

'design ethos centres around a courtyard development providing a sense of community and security'

**1131/R11.10 – Whitegates Phase 2, Lochgilphead**

'sustainability secured through partnering'

# Appendix 2

## – planning and sustainability

In planning for sustainability, and for sustainable construction, it is important to distinguish between those areas that local authorities have control over, and those they can influence. Planning is in a state of flux since the release of the Planning and Compulsory Purchase Bill<sup>54</sup>. The main changes are in the shape of Regional Spatial Strategies prepared by Regional Planning Bodies and local development schemes prepared by local authorities. These will replace regional and local plans. For the sake of simplicity, focus here is on the current system, split into three parts.

### Central government guidance.

With the recent revisions of several government Planning Policy Guidance (PPG) notes<sup>55</sup>, sustainability is now beginning to be more clearly interpreted for the planning process. Relevant guidance includes:

- PPG1, which contains general policy and principles ('Good design can help promote sustainable development; improve the quality of the existing environment; attract business and investment; and reinforce civic pride and a sense of place');
- DETR's 'Planning for Sustainable Development: Towards Better Practice' (1998) referenced in PPG3, which describes further action required;
- PPG11, which contains regional planning guidance, especially on energy efficient patterns of development and buildings;
- PPG12, which encompasses guidance on development plans, stating environmental concerns should be comprehensively and consistently taken into account. The development plan regulations require local authorities to 'have regard to environmental, social and economic consideration when preparing development plans.'

### Plans and development control

At the planning stage, especially when considering the Structure Plan, Local Plan or Supplementary Planning Guidance (SPG), local authorities have the opportunity to consider the area as a whole, rather than individual sites or buildings. This gives an ideal opportunity for holistically incorporating sustainability into the planning and construction processes. County, district, borough and unitary councils are working together to achieve a set of inter-linked plans, with structure and local plans complementing and enhancing each other.

The Development Control role is the implementation of the policies established in Structure and Local Plans as well as guidance set out in SPG. Local authorities have the opportunity to influence the performance of all planning applicants, and encourage the move towards more sustainable construction.

### Building control

The building control function is incorporated in the national Building Regulations. Present requirements enforce consideration of energy efficiency measures, through Part L. In the future there is scope for the regulations to be extended to include wider issues of sustainability but until then officers have no power to enforce such issues. However, in direct discussions with developers, architects and builders, officers are in an ideal position to promote Council policies, using their knowledge and influence to inform and encourage the use of more sustainable materials and practices.

### Community strategies

Under the Local Government Act 2000, local authorities have a duty to prepare a community strategy through a local strategic partnership (LSP). The duty includes the promotion of local social, economic and environmental well-being. In some areas this is bearing upon planning depending on the actions of the LSP and take up of the community strategy.

<sup>54</sup> [www.publications.parliament.uk/pa/cm200203/cmbills/012/03012.i-vii.html](http://www.publications.parliament.uk/pa/cm200203/cmbills/012/03012.i-vii.html)

<sup>55</sup> Planning Policy Guidance notes are statements of national planning policy. They are available at [www.databases.dtl.gov.uk/planning/npp/ListCategories.asp](http://www.databases.dtl.gov.uk/planning/npp/ListCategories.asp)

## Appendix 3 – links

These links focus on English and UK-wide organisations. Many specific organisations and activities are underway in Scotland, Wales and Northern Ireland, for which the Rethinking Construction Centres can be taken as starting points:

**Northern Ireland** ([www.engj.ulst.ac.uk/RCCNI/latestnews.htm](http://www.engj.ulst.ac.uk/RCCNI/latestnews.htm))

**Scotland** ([www.pullingtogether.co.uk](http://www.pullingtogether.co.uk) and [www.thelighthouse.co.uk](http://www.thelighthouse.co.uk))

**Wales** ([www.rethinkingconstruction.org/rc/regional/wales.asp](http://www.rethinkingconstruction.org/rc/regional/wales.asp)).

### Rethinking Construction links

Construction Best Practice (CBP) run regional clubs to disseminate best practice ([www.cbpp.org.uk/cbpp/bpclubs](http://www.cbpp.org.uk/cbpp/bpclubs))

CBP has a theme page of information on sustainable construction. Information can also be accessed through the A-Z facility ([www.cbpp.org.uk/cbpp/themes/suscon/intro\\_1.jsp](http://www.cbpp.org.uk/cbpp/themes/suscon/intro_1.jsp))

Local Government Task Force promote Rethinking Construction to local authorities ([www.lgtf.org.uk](http://www.lgtf.org.uk))

The Housing Forum runs demonstrations for housing developments ([www.housingforum.org.uk](http://www.housingforum.org.uk))

The Movement for Innovation (M<sup>4</sup>I) runs demonstrations for non-housing developments, and have regional clusters for information dissemination ([www.m4i.org.uk](http://www.m4i.org.uk))

Rethinking Construction has developed from 'Rethinking Construction' (the Egan Report). It is now an umbrella organisation for M<sup>4</sup>I, The Housing Forum, LGTF, and work with central government ([www.rethinkingconstruction.org](http://www.rethinkingconstruction.org))

### English regional links

The Regional Development Agencies, Government Offices, and Regional Assemblies have been active in sustainability and construction in some regions and not in others. In some regions, sustainable development 'round tables' have been set up in partnership with the three government bodies. Below is a list of the organisations and key achievements.

#### South West

Government Office for the South West ([www.gosw.gov.uk](http://www.gosw.gov.uk))

Somerset Trust for Sustainable Development: aims to make sustainable design and building practices the norm rather than the exception throughout Somerset, ([www.sustainablehousing.org.uk](http://www.sustainablehousing.org.uk))

South West Development Agency ([www.southwestrda.org.uk](http://www.southwestrda.org.uk))

Sustainability South West (SSW) is the round table body ([www.oursouthwest.com/ssw](http://www.oursouthwest.com/ssw))  
SSW have produced Future Foundations, a charter for building better ([www.futurefoundations.co.uk](http://www.futurefoundations.co.uk))

The Architecture Centre, Bristol ([www.arch-centre.demon.co.uk](http://www.arch-centre.demon.co.uk))

#### South East

South East England Development Agency have a Construction and Property Sector Group ([www.seeda.co.uk](http://www.seeda.co.uk)) The group is run by the Thames Valley Centre for the Built Environment, with which Rethinking Construction is building a relationship ([www.tvcbe.org.uk](http://www.tvcbe.org.uk))

## East

East of England Development Agency ([www.eeda.org.uk](http://www.eeda.org.uk))

East of England Regional Assembly ([www.eelgc.gov.uk](http://www.eelgc.gov.uk))

East of England Sustainable Development Round Table ([www.sustainability-east.com](http://www.sustainability-east.com))

GO-East have also been active ([www.go-east.gov.uk](http://www.go-east.gov.uk)) GO-East have focused on sustainable construction, leading on Environmental Performance Improvement Clubs for example.

## London

Government Office for London ([www.go-london.gov.uk](http://www.go-london.gov.uk))

Greater London Authority (the Mayor and the Assembly for London) ([www.london.gov.uk](http://www.london.gov.uk)) The Mayor's Plan for London and Energy Strategy have been relatively forward thinking, but no specific work on the construction industry yet.

Hackney Building Exploratory ([www.buildingexploratory.org.uk](http://www.buildingexploratory.org.uk))

London Development Agency ([www.lda.gov.uk](http://www.lda.gov.uk))

London Open House ([www.londonopenhouse.org](http://www.londonopenhouse.org))

## West Midlands

Advantage West Midlands is the RDA ([www.advantage-westmidlands.co.uk](http://www.advantage-westmidlands.co.uk))

Government Office for the West Midlands ([www.go-wm.gov.uk](http://www.go-wm.gov.uk))

Rethinking Construction is acting through the West Midlands Construction Forum.

Sustainability West Midlands is the round table body.

## East Midlands

East Midlands Development Agency ([www.emda.org.uk](http://www.emda.org.uk))

East Midlands Regional Assembly, who support the Sustainable Development Round Table ([www.eastmidlandsassembly.org.uk](http://www.eastmidlandsassembly.org.uk))

Government Office for the East Midlands ([www.go-em.gov.uk](http://www.go-em.gov.uk))

## North West

Centre for Construction Innovation, Manchester ([www.cube.org.uk](http://www.cube.org.uk) and [www.ccinw.com](http://www.ccinw.com))

Liverpool Architecture and Design Trust ([www.ladt.org.uk](http://www.ladt.org.uk))

North West Development Agency ([www.nwda.co.uk](http://www.nwda.co.uk)) They have developed a sustainability appraisal system.

## North East

Durham County Council prepared 'Building in Sustainability' on the behalf of a regional partnership.

Northern Architecture ([www.north.org.uk](http://www.north.org.uk))

One NorthEast is the RDA ([www.onenortheast.co.uk](http://www.onenortheast.co.uk))

The Architecture Centre, Kent ([www.architecturecentre.org](http://www.architecturecentre.org))

## Yorkshire and Humberside

Yorkshire Forward are currently undertaking work on the construction industry. They have used a novel approach in their regeneration plans for six market towns, using their Urban Renaissance Panel of international consultants and designers ([www.yorkshire-forward.com](http://www.yorkshire-forward.com))

### Government links

Audit Commission ([www.audit-commission.gov.uk](http://www.audit-commission.gov.uk))

Department of Environment Food and Rural Affairs (DEFRA): environment, sustainable development and rural development issues covered ([www.defra.gov.uk](http://www.defra.gov.uk))

Department of Trade and Industry (DTI) covers the construction industry ([www.dti.gov.uk/construction/sustain](http://www.dti.gov.uk/construction/sustain))

Department for Transport (DfT): activities include measures for integrated transport, mobility and inclusion ([www.dft.gov.uk](http://www.dft.gov.uk))

Environment Agency: interested in waste and pollution on construction sites, SUDS and operational water use ([www.environment-agency.gov.uk](http://www.environment-agency.gov.uk))

Housing Corporation ([www.housingcorp.gov.uk](http://www.housingcorp.gov.uk))

Improvement and Development Agency (IDeA) ([www.idea.gov.uk](http://www.idea.gov.uk))

Information for local government from central government ([www.info4local.gov.uk](http://www.info4local.gov.uk))

Local Government Association (LGA) ([www.lga.gov.uk](http://www.lga.gov.uk))

Office of the Deputy Prime Minister(ODPM): construction legislation, local government, the regions, neighbourhood renewal, planning, regeneration, supporting people and urban issues covered ([www.odpm.gov.uk](http://www.odpm.gov.uk))

Office of Government Commerce (OGC) – they have developed the Gateway Process for project management, and other guidance, for example of Health & Safety excellence ([www.ogc.gov.uk](http://www.ogc.gov.uk))

Sustainable Development Commission ([www.sd-commission.gov.uk](http://www.sd-commission.gov.uk))

### General links

Association of Environment Conscious Builders (AECB) ([www.aecb.net](http://www.aecb.net))

Building Research Establishment (BRE). See here for more information about BREEAM, EcoHomes, envest, Environmental Profiles, Green Guide, SMARTStart, SMARTWaste and much more ([www.bre.co.uk](http://www.bre.co.uk))

British Council for Offices (BCO) ([www.bco.org.uk](http://www.bco.org.uk))

British Standards Institution (BSI) ([www.bsi-global.com](http://www.bsi-global.com))

Building Services Research and Information Association (BSRIA) ([www.bsria.co.uk](http://www.bsria.co.uk))

Business in the Environment ([www.business-in-environment.org.uk](http://www.business-in-environment.org.uk))

Chartered Institute of Building (CIOB) ([www.cio.org.uk](http://www.cio.org.uk))

Construction Industry Research and Information Association (CIRIA). Also has details of Construction Industry Environmental Forum (CIEF) and Construction Productivity Network (CPN) ([www.ciria.org.uk](http://www.ciria.org.uk))

Chartered Institute of Environmental Health (CIEH) ([www.cieh.org.uk](http://www.cieh.org.uk))

Chartered Institute of Public Finance and Accountancy (CIPFA) ([www.cipfa.org.uk](http://www.cipfa.org.uk))

Commission for Architecture and the Built Environment (CABE) ([www.cabe.org.uk](http://www.cabe.org.uk))

The Confederation of Construction Clients (CCC) – an organisation that represents construction clients and has developed the Clients' Charter and Toolkit. ([www.clientsuccess.org](http://www.clientsuccess.org))



Considerate Constructors Scheme (CCS) is a code of practice for improved construction sites ([www.ccscheme.org.uk](http://www.ccscheme.org.uk))

Construction Industry Council (CIC) is the representative forum for the industry's professional bodies, research organisations and specialist trade associations. ([www.cic.org.uk](http://www.cic.org.uk))

Construction Industry Training Board (CITB) ([www.citb.org.uk](http://www.citb.org.uk))

Construction Resources ([www.ecoconstruct.com](http://www.ecoconstruct.com))

English Partnerships ([www.englishpartnerships.co.uk](http://www.englishpartnerships.co.uk))

The Energy Saving Trust ([www.practicalhelp.org.uk](http://www.practicalhelp.org.uk))

Green Register of Construction Professionals ([www.sustainable-energy.org.uk/gr](http://www.sustainable-energy.org.uk/gr))

Institute of Civil Engineers (ICE) ([www.ice.org.uk](http://www.ice.org.uk))

Institute of Environmental Management and Assessment (IEMA) ([www.iema.net](http://www.iema.net))

Institute of Public Finance ([www.ipf.co.uk](http://www.ipf.co.uk))

Joseph Rowntree Foundation ([www.jrf.org.uk](http://www.jrf.org.uk))

National House-Building Council (NHBC) ([www.nhbc.co.uk](http://www.nhbc.co.uk))

Prince's Foundation ([www.princes-foundation.org](http://www.princes-foundation.org))

Royal Institute of British Architects (RIBA) ([www.architecture.com](http://www.architecture.com))

Royal Institute of Chartered Surveyors (RICS) ([www.rics.org](http://www.rics.org))

School Works is a body working towards better school refurbishment and management ([www.school-works.org](http://www.school-works.org))

Sponge is a network for young professionals in sustainable construction ([www.spongenet.org](http://www.spongenet.org))

Strategic Forum – chaired by Peter Rogers. Web pages currently hosted by Construction Best Practice ([www.cbpp.org.uk/acceleratingchange](http://www.cbpp.org.uk/acceleratingchange))

Sustainability Works: a reference tool for sustainable housing ([www.sustainabilityworks.org.uk](http://www.sustainabilityworks.org.uk))

Transport 2000 ([www.transport2000.org.uk](http://www.transport2000.org.uk))

WellBuilt! a network for local authority professionals interested in more sustainable construction ([www.wellbuilt.org.uk](http://www.wellbuilt.org.uk))

### European links

There are a lot of European research projects, organisations, and draft legislation about sustainable construction. Here is a selection:

BEQUEST – providing a permanent resource of information for people who need guidance on methods to improve the environmental sustainability of Urban Development ([www.surveying.salford.ac.uk/bqextra](http://www.surveying.salford.ac.uk/bqextra))

EuroAlliance of Companies for Energy Efficiency in Buildings (EUROACE)

EGBF – European Green Building Forum ([www.egbf.org](http://www.egbf.org))

European Construction Industry Federation (FIEC)

PRESCO – creating a European Code of Practice for Sustainable Building (<http://go.to/presco.net>)

Constructing Excellence

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