

# Innovation & Research



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## Working with Wildlife: a CIRIA resource & training pack

CIRIA have recently published a resource and training pack (part-funded by the DTI through the Partners in Innovation scheme), which is aimed at improving the construction industry's ability to address impacts upon wildlife and habitats local to development projects. *Working with wildlife* highlights the virtue of knowing your site whilst addressing the fundamentals of ecology, legislation, and the relationships between wildlife and construction projects.



Balancing industry's needs with nature

**R**ecognising the influence that planning and conservation legislation has upon the industry, the pack promotes the principle of moving beyond simply complying with the minimum legal requirement. Amongst many other issues, the pack highlights the role the client and designer can have in contributing to the achievement of Biodiversity Action Plan targets at the local level.

The pack also highlights how project staff at all levels can be involved in improving performance in relation to wildlife issues and using habitat and species briefing sheets, toolbox talks and presentational materials, it demonstrates what to do and how to do it when certain species are encountered on site.

For further information on the pack visit [www.ciria.org](http://www.ciria.org) or contact CIRIA (020 7549 3300; fax 020 7253 0523; email [irf@ciria.org](mailto:irf@ciria.org)).

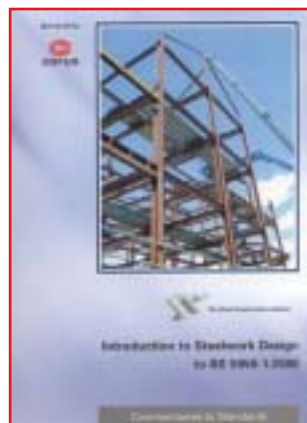


## Guide to steelwork design

A new comprehensive, research-based publication from SCI (P325) provides design guidance on the use of BS 5950 -1:2000, covering the design of all the main structural forms and their components.

**T**he guide provides introductory and background information (and cross-references) to the Code clauses, and provides explanations of how the Code clauses should be applied under a range of situations.

A companion to this publication is *Steelwork design guide to BS 5950-1:2000 Volume 2: Worked examples* (P326). Both publications can be purchased online at [www.steelbiz.org/shop](http://www.steelbiz.org/shop) or from the Publications Department at SCI



(01344 872775; E-mail: [publications@steel-sci.com](mailto:publications@steel-sci.com)) Price: SCI Corporate Members £22.50; Non-members £45 (plus p+p).

For further information please contact Andrew Way at The Steel Construction Institute (01344 623345; E-mail: [a.way@steel-sci.com](mailto:a.way@steel-sci.com))



# New civil engineering applications of tyres

The Institution of Civil Engineers (ICE) has helped fund a new guidance document offering advice on how tyres can be used in civil engineering applications. *Civil Engineering Application of Tyres* – produced by Viridis and the European Tyre Recycling Association – was funded by Biffaward and ICE's Research and Development Enabling Fund.

The guide is aimed at clients, contractors, designers, specifiers and regulators who may not be familiar with tyres and want information on their likely behaviour and properties. It covers the nature, properties and arisings of used tyres, and describes their use in a range of applications, including:

- lightweight fill;
- soil reinforcement;
- drainage material;
- erosion control;
- artificial reefs;
- noise barriers;
- thermal insulation;
- in-ground barriers to remediate hydrocarbon spillages;
- landfill engineering;
- asphalt, concrete and building products.

Each year about 435,000 tonnes of used tyres arise in the UK. These tyres can be dealt with in a variety of ways. In the past many of them were landfilled; however, this has reduced in recent years and will continue to decrease as the Landfill Directive is implemented. This bans the disposal of whole tyres



Tyre wall used to stabilise earthworks slope

to landfill from 2003, and shredded tyres from 2006.

Used tyres can be used as fuel for cement kilns and waste-to-energy plants. However, tyres can be used in a number of forms, including bales of compressed tyres, whole tyres, shredded tyres and crumb. They can be used as a direct substitute for primary aggregates, as truly original materials in

applications for which traditional materials are not available, or as a component of construction products such as asphalt, concrete, sports and safety surfaces and building products.

This is a higher level of use in the waste hierarchy than incineration with energy recovery, and hence is a more sustainable approach to dealing with the arisings of used tyres. Material recycling was estimated to account for 21% of used tyre production in Europe in 2003, and this is expected to rise to 37% by 2010 as disposal to landfill is eliminated.

The document is available as a free-to-download pdf file

from the Viridis web site, [www.viridis.co.uk](http://www.viridis.co.uk) and paper copies can be obtained from TRL Publications via the TRL web site, [www.trl.co.uk](http://www.trl.co.uk).

*For further information please contact Dr J M Reid, Viridis, Crowthorne (01344 770283; fax 01344 770356; E-mail [jreid@trl.co.uk](mailto:jreid@trl.co.uk)).*

## ENERGY & ENVIRONMENT

# Engineering carbon out

One of The Royal Academy of Engineering's central objectives in its support of Research Chairs is to strengthen links between industry and academia. A good example is the joint funding by Scottish Power and The Academy in supporting Professor Marcus Newborough, Research Chair in Energy and Environmental Engineering at Heriot-Watt University. A 5-year appointment, the main research objective is 'engineering carbon out' of the energy system.

We tend to make assumptions that certain things will not change much during our lifetimes. For example, we assume that local weather patterns will remain roughly the same, that fuel for our car will always be available when we visit a petrol station, and that the lights in the kitchen will remain on until we switch them off.

In general, we have become used to relying upon a low-cost 'energy system' to provide energy in the form we require, whenever we want it. However, as we move through the 21<sup>st</sup> century, this 'basic' provision is considered likely to be increasingly challenged by three predictions, which some regard as near certainties:

- diminishing global reserves of cheap fossil fuels and, for most developed nations, reduced security of supply;
- increased atmospheric concentration of CO<sub>2</sub>;
- changing climate because atmospheric CO<sub>2</sub>

concentration influences heat exchange with the sun.

Finding engineering solutions to this energy-and-carbon dilemma is at the core of energy systems research. The central research questions are "How do we 'engineer carbon out' of the energy system?" and "How can we implement solutions at a rate that is compatible with limiting atmospheric CO<sub>2</sub> concentrations and climate change?". The solutions are pan sector (see illustration viewable on the IRF website): they involve changing technologies, changing fuels and changing people's attitudes.

Professor Newborough leads the Energy Academy at Heriot-Watt University, Edinburgh. His focus is on researching pathways to a low-carbon energy system. This involves innovating and investigating supply-side solutions, demand-side solutions and energy utilisation (both in buildings and industrial processes). The work is multi-disciplinary and

covers the full spectrum of the energy system. Current externally-funded projects include:

- reducing the carbon footprint of the UK's existing built asset base by 50% by 2030;
- low-cost electrolyzers for providing hydrogen and oxygen of low carbon impact;
- demand-side management and micro-CHP systems for reducing the carbon footprints of domestic buildings;
- smart meters and displays for influencing energy-use practices and achieving energy-efficiency in the home; and
- advanced heat transfer and process control for reducing the carbon footprints of industrial ovens.

*For further information please contact Professor Marcus Newborough, School of Engineering & Physical Sciences, Heriot-Watt University, Edinburgh, EH14 4AS (0131 451 8311; E-mail [m.newborough@hw.ac.uk](mailto:m.newborough@hw.ac.uk)).*





# Sustainable futures: flood & coastal management



HR Wallingford is coordinating a new 18-month study, funded by Defra and the Environment Agency, on Sustainable Flood & Coastal Management. The project aims to develop practical guidance on how flood and coastal management strategies might meet current needs without compromising those of future generations. The project, due to run to Spring 2004, has 11 partners, including engineering consultants and practitioners, environmental and sustainability specialists, universities and legal experts.

**H**olistic approaches to water management are already evident – witness the European Water Framework Directive, which emphasises whole catchment planning. We are also beginning to consider river flooding and coastal erosion as ‘parts of a whole’ rather than as isolated events.

In this spirit, this new project will investigate a range of influences on flood and coastal management, including:

- climate change;
- land-use planning and development control;
- performance and resilience of defences – exploring ways of designing assets so they cope with floods (and their aftermath) better;
- use and recycling of materials in flood defences;
- social issues and stakeholder engagement – how can those at risk from flooding, or involved in its management, best help themselves?;
- decision support tools available to help manage floods.

Jonathan Simm, Project Director at Wallingford, summarises the research. ‘We start, in spring 2004, with a Scoping Study. This will be followed by a review period after which we plan to develop methodologies, tools and guidance.’

The Scoping Study involves extensive discussion with stakeholders such as Defra’s Flood Management Division, Sustainable Development Unit, Science Directorate and Rural Affairs Division. Organisations such as the EA and English Nature will be consulted, as will those involved in the preparation of guidelines for Shoreline and Catchment Flood Management Plans.

Key issues will be examined further during Phase Two, when new methods and sustainability tools will be developed and applied to selected case studies. The results will then be disseminated and there is potential for a training course once work is complete.

Of key importance to the study are the insights that collaborators bring from their involvement in other national and European research. ‘HR Wallingford is co-ordinating the EU’s FLOODsite Programme, which investigates how we can better understand specific flood processes,’ explains Simm. Staff are also involved in the OST’s FORESIGHT initiative on Flooding, which considers possible scenarios as far ahead as 2080.

*For further information please contact Jonathan Simm (01491 822355; email: [jds@hrwallingford.co.uk](mailto:jds@hrwallingford.co.uk)) or Steven Wade (01491 822214; email: [sdw@hrwallingford.co.uk](mailto:sdw@hrwallingford.co.uk)).*



*Coastline – a resource and a challenge*

## KNOWLEDGE MANAGEMENT

### Knowledge management in construction: toolkit and forum



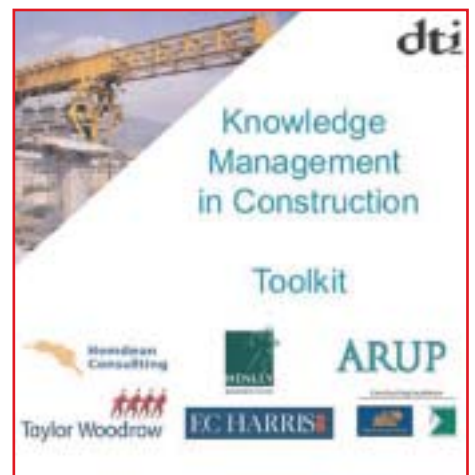
Construction is a knowledge-based industry. Even the smallest project creates and uses knowledge in different forms – printed documents, databases, expert advice and peoples’ experience. Knowledge management is the way businesses make sure people can access and apply the right knowledge, at the right time, and in the right place.

**P**art-funded by DTI through the Partners in Innovation Scheme, Hemdean Consulting and Henley Management College have joined forces with Arup, Taylor Woodrow, EC Harris, and Constructing Excellence to provide practical guidance and support for firms taking their first steps in knowledge management.

The result is a *Knowledge Management in Construction Toolkit*, which will shortly be available on CD from Constructing Excellence. The toolkit includes guidance on developing a KM strategy, preparing a business case, and KM tools and techniques – illustrated using examples and case studies from the construction industry.

The project has also created a knowledge management community – a group of organisations from all parts of the construction supply chain that meets to learn from experts, share experiences and discuss KM issues and challenges. This group is now part of the internationally recognised Henley KM Forum, based at Henley Management College. Membership of the KM Forum is by annual subscription, and is open to organisations from all industries.

*For more information please contact Judy Payne of Hemdean Consulting (0118 947 4652; E-mail [judy@hemdean.co.uk](mailto:judy@hemdean.co.uk); website: [www.henleymc.ac.uk/](http://www.henleymc.ac.uk/)).*



*These are the project partners who worked together in producing the construction toolkit*

## Traditional houses, computerised construction



Modern housebuilding combines state of the art computerisation with traditional methods. Innovative systems in the UK are using computer-guided robots to build whole houses direct from an architect's drawings.

Elements are built horizontally in factory-controlled conditions in layers. First facing brickwork is laid, followed by watertight and reinforced steel fibre concrete, 6 cm polyurethane insulation, 10 cm thick insulating and soundproofing lightweight concrete, followed lastly by absolutely perfect, smooth plasterwork. The joint work between elements connects accurately with the brick face, thus preventing problems with damp or draught. The glazing and doors are fitted under dry conditions within the factory and the whole wall transported to site via lorry. The walls are placed using a crane directly onto a pre-fabricated foundation girder, which is laid onto in-situ concrete foundation channels.

Concrete and reinforcement grids make the wall exceedingly strong and through the use of watertight steel reinforcement it is not necessary to use a cavity wall. Research has shown that up to 50% can be saved on heating costs due to the perfect connection between the insulation of two walls, completely excluding thermal bridging. The brickwork is near perfect thanks to the use of a computer-guided brickwork robot. This innovative new system ensures that bad weather doesn't stop or adversely affect construction.

*For further information please contact Anna Scothern, Head of Concrete Performance, The Concrete Centre (01344 725742; fax 01344 761214; E-mail [ascothern@concretecentre.com](mailto:ascothern@concretecentre.com)).*



BCA-Robotic: Perfect brickwork thanks to a computer guided-robot

## Quicon® design rules developed

Over the last four years, The Steel Construction Institute (SCI) has developed a unique, simple steelwork connection system, designed to make site operations faster and safer.



Quicon® Connection System being erected on a Dartford site.

The key components are a standardised shoulder bolt and T-piece. The T-piece comprises a flange with drilled clearance holes at standard spacing and a web with two or more keyhole-shaped holes. Shoulder bolts and T-pieces are attached to the structural members in the fabrication shop. To erect the system, the shoulder bolts fitted to each end of the supported beam are aligned with and inserted into the keyholes in the T-pieces attached to the supporting beam or column. The supported beam is then lowered into its final position, with the shoulder bolts resting at the base of the narrow part of the keyholes.

To provide guidance to steelwork contractors using the system – called Quicon – the SCI has produced a design guide that is issued under licence to them. Caunton Engineering has taken the first licence.

The guide was produced following an extensive test programme at Salford University and analysis of the test results to validate the design rules. The connection components (plate thicknesses, overall dimensions and shoulder bolt size) have also been standardised. The rules have been formulated in design tables similar to those used for fin plate connection design.

The guide covers universal beam section sizes ranging from 610 x 305 x 238 to 305 x 102 x 25 in grades S355 and S275. The tables allow Quicon® T-pieces with either a single or double column of keyholes to be used and the document provides detailing guidance.

Caunton Engineering has already used Quicon® on a pilot project at Dartford's Edison's Park, in February 2002, and achieved a time saving for erection of 50%.

*For further information please contact Dr Bassam Burgan, The Steel Construction Institute (01344 623345; E-mail: [b.burgan@steel-sci.com](mailto:b.burgan@steel-sci.com)).*



## BRIDGES

## Durability & performance of deck hinges



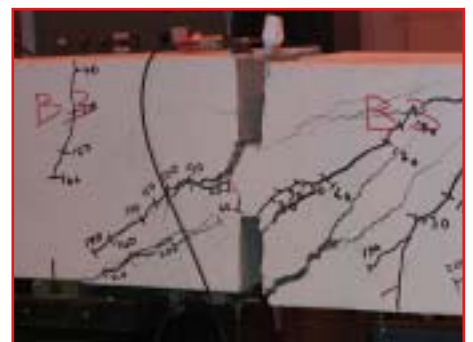
Deck hinges have been used in over 100 major bridges in the UK to simplify design and construction, particularly where differential settlement may occur. The hinges are generally inaccessible for inspection, being located under (and often over) live carriageways, but are vulnerable to chloride ingress, which can cause localised corrosion and affect in-service behaviour.

TRL has been contracted by the Highways Agency to examine the behaviour of hinges in bridge decks and to develop a management strategy based on detailed analysis and testing programmes.

The research is based on laboratory testing supported by theoretical studies to model the behaviour of hinge deck structures. A series of small and large-scale specimens are being tested. These contain details to simulate the effects of deterioration and design or construction faults, including corroded and notched reinforcement, missing bars, misplaced bars and cracked concrete. In parallel with the testing, a programme of analysis is being undertaken by Ove Arup. The analysis will be used to develop assessment methods for determining the strength of the hinge, taking account of its physical condition.

The conclusions will be presented in a Highways Agency guidance document on the management of bridges with deck hinges.

*For further information please contact Albert Daly at TRL (01344 770449; fax 01344-770356; e-mail [adaly@trl.co.uk](mailto:adaly@trl.co.uk)).*



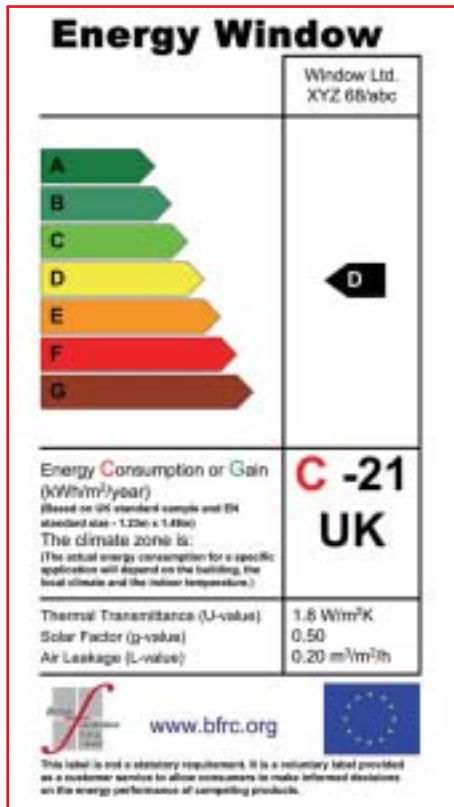
Beam with hinge detail after failure



# Window energy rating – the future for windows



Consumers, specifiers and legislators are increasingly focusing on the energy-efficiency of building products. To respond to the challenge of raised expectations, the window industry must provide energy-efficiency information that is easily understood and can be used to compare fenestration products. The simple U value does not fulfil these requirements because it only focuses on the heat loss from the window and takes no account of the solar heat gain that windows are responsible for and which can improve the overall energy efficiency of a building.



An example of the proposed format for the Energy Label

In the past, selecting energy efficient windows has been difficult due to the lack of independent and validated information. There has been a need for a method that is both easy to understand and independent. The British Fenestration Rating Council (BFRC), in conjunction with the UK glazing industry and European partners, has designed a window rating system to meet this need for simple and accurate information.

The BFRC provides external certification for the total thermal performance of windows using a 'fair, accurate and credible' assessment. The window energy-rating scheme:

- allows consumers to rapidly compare products' energy efficiency;
- allows specifiers to select windows based on validated performance;
- allows legislators and others to ensure that windows meet legal requirements;
- allows energy agencies to direct support to energy-efficient products;
- links thermal window performance to other thermal assessment systems.

Windows are rated using the familiar A to G scale on the basis of their total energy efficiency, where an A-rated window is more energy efficient than a G-rated window, and

which can be used by consumers, specifiers, government inspectors and energy agencies.

**Calculating the Rating** – The window energy rating assesses the whole window energy performance and covers the frame design and material, the glass type and all the other components that make up the window. The rating is carried out by computer simulation of the product, based on European Standards and the use of climate data and building models.

**Industry working through partnership** – The

BFRC is leading the development of the rating system, with the support of key companies and trade bodies representing the glazing industry, as well as the Energy Saving Trust. These organisations come together at the Energy Efficiency Partnership for Homes Glazing Strategy Group, which exists to promote energy efficient glazing in the domestic sector.

*For further information please contact Dr Robin Kent, Project Coordinator, British Fenestration Rating Council (08700 278 494; fax 08700 278 493; <http://www.bfrc.org>).*

## IT & CONSTRUCTION MANAGEMENT

### SHERPAs for construction sites



Stent Foundations Ltd, with the Centre for Innovative Construction Engineering (CICE) at Loughborough University, have developed SHERPA (Stent Handheld Piling Assistant), a site-based system for recording the construction of rotary bored piles. Michael Ward, a CICE research engineer, has undertaken the work.

An in-depth study identified existing problems associated with traditional paper-based data capture methods:

- the difficult working environment;
- the need for real-time sharing of data between working gangs;
- the absence of any data verification;
- insufficient or late design information, leading to multiple revisions and duplicate information;
- data transfer errors;
- little or no analysis of the process or production activities undertaken.

A three-tier system evolved from the study: a database loaded onto a site-based server computer; a wireless local area network; and wireless touch-screen tablet computers, operated by site staff.

The site-based database has been created utilising open-source software, which is accessed through the use of web pages served by the site server. This means that the only software required on the tablet-computer is a web-browser. The use of a web-based solution also allows access to all parties in the contract and from any location, thereby increasing openness between the contractor and client, an important aspect for Stent.

The main enabler has been the development of a site-based wireless network, which is entirely free from cabling and operates via 12v batteries. This allows the wireless network to be deployed and reconfigured to suit the changing site environment and working areas by generating a series of Wireless Network Cells.

"Traditionally, wireless networks involve access points connected to a wired backbone infrastructure. It was, and still is, difficult to get peoples' heads around a large outdoor wireless network being created without any cabling whatsoever" says Michael.

The system has already been deployed at both Wembley National Stadium and Kings Cross, where it has undergone intensive site-testing and further on-site development. Such is the potential of the system that it has now evolved into a project control tool, which can be used to monitor the progress of the work either on-site or in the head-office.

*For further information please contact Michael Ward at CICE (01509 228549; Email: [m.j.ward@lboro.ac.uk](mailto:m.j.ward@lboro.ac.uk)).*



Use of touch-screen tablet computer

# CIRIA infrastructure guidance gives a safer ride



Embankments and cuttings form over half of all UK transport infrastructure assets. They are an important means of physically forming the trafficked surface of transport infrastructure. Embankments and cuttings require maintenance and the need to undertake it has become increasingly apparent as the materials within these structures age. This aging can lead to instability, with both economic and safety implications.



Poor compaction and steep slopes are characteristic of railway embankments

**C**IRIA – in collaboration with major infrastructure owners (British Waterways, Highways Agency, London Underground, Network Rail) and a research consortium led by Mott MacDonald (with Cementation Foundations Skanska and the Transport Research Laboratory) – has produced two new reports to provide authoritative best practice guidance on these critical earthworks. The purpose of these reports is to increase awareness of cuttings and embankments as civil engineering structures and of their maintenance requirements.

Funding for the projects was provided by British Waterways, Highways Agency, London Underground (and the then Infracore SSL, now part of Metronet), Her Majesty's Railway Inspectorate and CIRIA Core Programme Sponsors.

**Infrastructure embankments: condition appraisal and remedial treatment 2nd edition** is an updated version of the influential report (C550) produced in 1999. The report has been fully updated to reflect changes since the publication of the original guidance document in practice, legislation and infrastructure owners' asset appraisal and management strategies.

**Infrastructure cuttings: condition appraisal and remedial treatment** provides guidelines on good practice for the appraisal of infrastructure cutting condition, and describes many of the remedial treatments available. Frequent cross-reference is made to the second edition of the embankments report to reduce duplication, to provide a pair of companion documents for earthwork asset management, and for information compatibility.

A third project is in progress to provide best practice guidance on condition appraisal and remedial treatment of masonry and brick arch bridges. CIRIA is developing further projects to provide a suite of guidance on asset management.

For further information please contact CIRIA (020 7549 3300; fax 020 7253 0523; email: [irf@ciria.org](mailto:irf@ciria.org); website: [www.ciria.org](http://www.ciria.org)).

## WASTE & ENVIRONMENT

### Waste audit of Staffordshire

Staffordshire Environmental Fund commissioned a waste audit of Staffordshire and Stoke-on-Trent, to determine approximate quantities of waste arising there and whether, through the introduction of new technologies, significant volumes of these wastes could be diverted from landfill. It included waste being processed within the sub-region but arising in adjoining areas.

**U**ndertaken by Viridis, TRL Ltd, and Linden Consulting Partnership, the audit estimated quantities of specific waste streams and identified those with the potential for re-use or recycling and their source. Information was provided on the industries generating specific wastes and their location within postcode areas, in order to demonstrate where clusters of wastes could be occurring. This work provided evidence to support feasibility studies and business plans for proposed waste management businesses and sustainable growth parks.

To download a free copy of the report, please visit [www.viridis.co.uk](http://www.viridis.co.uk).

For further information please contact Daniel Whittaker, TRL Limited (01344 770450; fax: 01344 770356; email: [dwhittaker@trl.co.uk](mailto:dwhittaker@trl.co.uk)).



Typical commercial waste

## PIPELINES & DESIGN

### Airing problems in pipelines

HR Wallingford is leading a new project looking at how to prevent problems caused by air in water and wastewater pipelines. The work is funded under the DTI Partners in Innovation Programme and involves nine other collaborators from the water utilities, academia and industry.

**T**rapped air in pipes causes various problems, including the vibration and knocking familiar to those of us with home central heating systems. On a larger, engineering scale, the presence of air can cause damage to pumps and fittings in water-conveying pipelines, loss of flow capacity and an increased risk of pipe rupture. Air scouring can also result in particulate contamination of potable water. The cost of such damage is high and the overall aim of the project is to improve engineering efficiency by providing better guidance on pipe design and operation.

Between 2003 and 2005, the research team will collate existing information and practical experience and then carry out targeted experimental and numerical studies to fill in the gaps. The main output of the project will be a Guidance Manual on how to prevent air problems in pipelines. It will contain current best practice as well as the results of new studies.

The project partners are University of Liverpool, Black & Veatch Consulting, Arup, BP Institute (Cambridge University) CIRIA, Dean & Dyball, MWH, United Utilities plc and Thames Water Utilities.

For further information please contact Manuela Escarameia (01491 822337; Email: [mme@hrwallingford.co.uk](mailto:mme@hrwallingford.co.uk)) or visit the project website at [www.hrwallingford.co.uk/projects/air\\_in\\_waterpipelines](http://www.hrwallingford.co.uk/projects/air_in_waterpipelines)).



Air/water flow in laboratory experiments at HR.



# Controlling pollution emissions from construction and demolition: new guidance

Construction sites can be a major source of local pollution if not managed and controlled properly. Pollution emissions from construction sites can have an adverse impact on health and the local environment. Particles and vaporous discharges can cause problems to the health of site personnel and local residents, by affecting the eyes, nose, mouth, lungs and skin. Fine particles can penetrate deep into the lungs, causing respiratory and cardiovascular problems. Large particles can cause nuisance through soiling of surfaces such as cars, property and washing. Excessive noise can be a hazard to site workers and can annoy neighbours and disturb local wildlife. It is therefore vital that construction personnel follow good environmental practice to control these emissions, comply with legislation and prevent problems.



(Top) A circular saw generating dust when cutting roof tiles. (Above) the same circular saw using a water spray when cutting tiles.

Courtesy of Marley Building Materials

**B**RE has recently published guidance on the control of air pollution and noise emissions from construction sites. The new *Pollution Control Guides* look at the key activities responsible for creating emissions and suggest ways of minimising these in construction and demolition processes.

The Guides have been produced from a three-year collaborative Partners in Innovation project part funded by DTI involving BRE, the construction industry, clients, regulators and material suppliers. They are based on existing good practice and information gained from an in-depth 18-month case study, and provide an integrated approach to minimising emissions of dust, noise and vapours from construction sites.

The guides will be of use to everyone involved in the design, construction and demolition of buildings, including project managers, contractors, developers, clients, regulatory authorities, manufacturers, trade associations and training organisations. The full set of guides in the series is as follows.

**Part 1: Pre-project planning and effective management** – an essential part of any construction project, including completing risk assessments and methods statements, training, satisfying planning requirements, handling public relations, housekeeping management and monitoring pollution.

**Part 2: Site preparation, demolition, earthworks and landscaping** sets out guidance on controlling pollution emissions associated with earth moving and, demolition of existing buildings.

**Part 3: Haulage routes, vehicles and plant** sets out guidance on location of haulage routes and materials for their construction, including wheel washing facilities, and controlling emissions from vehicle and plant.

**Part 4: Materials handling, storage, stockpiles, spillage and disposal** sets out guidance on controlling emissions associated with these issues, especially for powders such as cement, spillage and storage. Disposal and burning of waste materials is also considered.

**Part 5: Fabrication processes and internal**

**and external finishes** sets out guidance on controlling emissions associated with these processes and finishes. Guidance is given on, for example, cutting (see Illustration), shaping and machining materials, mixing processes, foundation laying, welding and soldering, installation of fire proofing and insulation and sand blasting and façade cleaning.

The guides are available from BRE Bookshop ([www.brebookshop.com](http://www.brebookshop.com)), priced at £19.95 each, or £65 for the set.

## MATERIALS, ENVIRONMENT & RIVER ENGINEERING

### Sustainable river mining

**DFID** Department for International Development

Throughout the developing world, river sand and gravel is widely exploited for the construction industry. Aggregate is often extracted directly from the active channels of river systems. It often requires almost no processing other than size selection and is considered a renewable resource. However, in-channel mining of sand and gravel inevitably alters a river's sediment budget, and may substantially alter channel hydraulics. The impacts of such mining on farmland, river stability, flood risk, road and bridge structures and ecology are typically severe. Such degradation may make it difficult to provide for the basic needs (water, food, fuelwood and communications) of communities naturally located beside the river.

**D**espite the importance of this extractive industry in most developing countries, the details of its economic and environmental geology are not fully understood and therefore do not adequately inform existing regulatory strategies. *Effective development of river mining* aims to provide effective mechanisms for the control of sand and gravel mining operations to:

- protect local communities;
- reduce environmental degradation;
- facilitate long-term rational and sustainable use of the natural resource base.

Funded by the DFID KAR programme, the research has involved a multidisciplinary team of researchers from the UK, who have carried out field investigations on river systems in Jamaica and Costa Rica. The British Geological Survey has led the project, with input from Camborne School of Mines, University of Warwick, Alliance Environment and Planning Ltd, and WRC-NSF Ltd. Overseas partners are principally the Mines and Geology Division in Jamaica and Costa Rica's Instituto Costarricense de Electricidad.

Outputs from the project include 7 techni-

cal reports on CD, covering aggregate supply and demand issues; resource evaluation; alternative materials; environmental, aquatic and social impacts; and planning guidelines. A Code of Practice has been developed, which regulators can use for examining and reconciling the conflicting claims of sand and gravel extraction and the environment.

For further information please contact David Harrison, British Geological Survey, Keyworth, Nottingham, NG12 5GG (0115 936 3213; Email: [djha@bgs.ac.uk](mailto:djha@bgs.ac.uk)).



River aggregate processing plant, Jamaica

# e-Learning about concrete



A major industry and DTI-funded research and dissemination project concludes soon with the distribution of some 18000 e-learning discs on concrete design, material and construction to universities, and the imminent release of a CPD version.

**W**ith pressure from Government, the Joint Board of Moderators and the professional institutions to ensure that undergraduates and practising engineers are well versed in issues such as environment, health & safety and best practice, the timing is perfect.

In addition, during the project, a survey of lecturers uncovered a need for more case study material to bring design and construction theory to life through real projects and best practice examples, obtained from industry sources.

Formwork for concrete buildings typically accounts for 40% of costs and dominates speed of construction. To ensure that the most-efficient construction techniques are considered

during design, designers need to be familiar with the latest techniques. The use of modern methods of construction such as hybrid concrete construction, tunnel form and tilt-up, which bring efficiency and quality improvements, is growing rapidly. They bring factory processes effectively to site, but there is still a lack of widely available material to explain their application. The updated CALcrete suite now has examples and explanations covering these techniques and many more subjects, including environmental issues. It is vital that professionals of all disciplines understand the issues concerned, the hierarchy of impacts, and the power of designers to influence energy in use – the most critical factor after transport used by occupants to get to work.

The project is also incorporating material and best practice guides from previous PII projects, such as the experimental concrete frame at Cardington, and follow-on work by the BRE at St George Wharf, London.

The new Eurocode for design of concrete structures – Eurocode 2 – is due to be launched later this year, alongside continuing changes to concrete and materials standards. A major industry awareness and training exercise is under way to ensure its smooth adoption, and to demonstrate the efficiencies possible in design and construction. The CALcrete team has worked closely with the UK developers of EC2 to ensure learning modules on reinforced concrete design to EC2 are fully up to date and available now for this important task.

*For further information please contact Martin Southcott, project manager for the PII project. (01344 725735; E-mail msouthcott@bca.org.uk) or visit the CALcrete PII project and secure free downloads by going to The Concrete Centre's website: [www.concrete.com](http://www.concrete.com).*



Hybrid concrete construction brings factory quality and efficiency improvements to site

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