Research Focus

Issue No. 42 AUGUST 2000

PROMOTING THE APPLICATION OF RESEARCH IN BUILDING AND CIVIL ENGINEERING

IN THIS ISSUE

Buildings
Fixings for thin stone cladding 4
Wind-moment design of frames 5

Bridges
Advice on steel bridges 7

Commercial framework
French & British project comparison 2

Construction process
Ground vibration from construction 3
Smart use of waste 4

Design
Advice on steel bridges 7
Improving concrete frame efficiency 8
Software for agricultural drainage 6
Wind-moment design of frames 5

Drainage
Software for agricultural drainage 6

Environment
Bringing refuse landfill back into use 3
Environmentally responsible refrigerants 5
Ground vibration from construction 3
Materials in the developing world 7
SMART use of waste 4

Irrigation
Preventing canal sedimentation 4

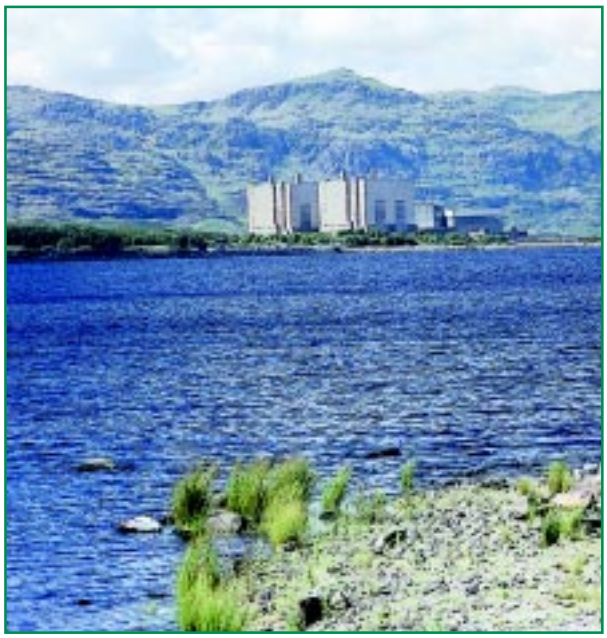
Materials
Deterioration in concrete structures 6
Improving concrete frame efficiency 8
Materials in the developing world 7

Structures
Bringing refuse landfill back into use 3
Deterioration in concrete structures 6
Improving concrete frame efficiency 8

Protecting people and the environment – guidance on managing radioactively contaminated land

Radioactively contaminated land presents many problems to those involved in its management. This involves both long-term 'maintenance' of sites and cleaning-up of land prior to re-use. In either case, health risks to contractors and consultants, sensitive relations with the local communities and risks to the environment from accidental pollution all need to be dealt with. This land may be part of a nuclear-licensed site, or part of a defence site. An added complication is the level of security surrounding these sites, which affects the way in which management or clean-up can be carried out.

A new research project has been launched as the first step in answering some of these difficult questions. This is the SAFEGROUNDS project, managed by CIRIA, WS Atkins and The Environment Council on behalf of the main UK nuclear-licensed site owners (BNFL, UKAEA, AWE and British Energy). The project has been set up at the instigation of the DTI Safety Issues Task Force to help quantify the contaminated land liabilities associated with nuclear-licensed sites, so that future work can be properly budgeted.



Trawsfynnyd Power Station (now closed). Photograph Courtesy of BNFL.

SAFEGROUNDS is a two-year project and will generate a platform of best practice guidance to support effective management and remediation strategies. The first stage, already under way, is preparation of a guide on site characterisation. This is expected to be published on the safegrounds.com website in summer 2000. The long-term aim of the project is to establish a learning network for exchange of best practice and improvement in standards.

A key aspect of the research is the committed involvement of all stakeholders, including the health, safety and environmental regulators, central and local government, the site owners, consultants and contractors working for the site owners, environmental pressure groups and other representatives of the public interest. A dialogue between all these parties will underpin the technical work within SAFEGROUNDS, and enhance the degree of buy-in and broad acceptability of the guidance produced.

The next phase of the SAFEGROUNDS work is to examine the implications of the current regulatory framework for managing this contaminated land, and to provide guidance on the selection of appropriate land management options.

For further information or if you would like to join in this dialogue, please contact David Churcher or Maria Holloway-Strong at CIRIA (020 7222 8891; fax: 020 7222 1708; E-mail: rfocus@ciria.org.uk, or visit the project website at www.safegrounds.com).

ABOUT RESEARCH FOCUS

Aims

The principal aim of *Research Focus* is to promote the application of research in building and civil engineering.

Supported by many organisations in the British construction industry, its brief articles on current research are written for practising engineers, architects, surveyors and their clients with the objective of disseminating research news as widely as possible. Its sponsors wish to promote the benefits of research, improve contacts between industry and researchers, encourage investment by industry in research and the use of research in practice, and facilitate collaboration between all the parties involved.

Formally, *Research Focus* is an unrestricted newsletter containing invited factual records or case studies of building or civil engineering research projects. Articles may be reproduced, provided the source is acknowledged.

Enquiries and Comments

If you wish to know more about a specific project, you should contact the person named at the end of the relevant article. Look on the back page for addresses, telephone and fax numbers of the sponsoring research organisations and professional institutions. General information about their activities may be obtained from them directly.

We welcome your ideas on ways to improve *Research Focus* and so help it to achieve its goals. If you have a suggestion, or an article about an interesting piece of R&D, please send it to the Editor, Roger Venables, at the address below.

Distribution

If you receive *Research Focus* by direct mail (i.e. not with NCE) and the address it is sent to is incorrect, if you would like additional copies for circulation within your organisation or if you would like to be added to the direct mail list, please contact Ms Lesley Wilson at the Institution of Civil Engineers,
1 Great George Street, London SW1P 3AA
(020 7655 2242; fax 020 7799 1325;
Email wilson_l@ice.org.uk).

Research Focus is also downloadable from the ICE website (www.ice.org.uk) and readable using Acrobat software.

Editorial Advisory Board and Editor

Overall editorial policy is set by the Editorial Advisory Board which comprises:

Chairman: Mike Thorn (HR)

Members: Terry Boniface (DETR), Louise Denniff (CIRIA), John Hodges (DFID), Sarah Houghton (SCI), Dr Stephen Ledbetter (CWCT), Peter Lee (industry), Dr Martin Southcott (BCA), Tom Harvey (BRE), Richard Woodward (TRL).

Editor: Eur Ing Roger Venables

Secretary: Dr John Bennett (ICE).

Roger Venables, the Editor, is at Venables Consultancy, 12 Cranes Drive, Surbiton, Surrey, KT5 8AL
(020 8399 4389; fax 020 8390 9368;
E-mail: rf@venablesconsultancy.co.uk).

Research Focus is published by the ICE, typeset by PJM Design and produced by Thomas Telford Ltd, 1 Heron Quay, London E14 4JD. ISSN 0960 5185

French and British project comparison

In the early 1990s Eurotunnel needed a new security scanning system to protect the fixed link: the Euroscan facility. It commissioned a leading UK architectural practice for design on both sides of the channel, and procured medium-sized British and French firms for the construction. Research undertaken by Bartlett Research at UCL, funded by the Engineering and Physical Sciences Research Council, and with the enthusiastic co-operation of Eurotunnel plc, gave a unique opportunity to compare project performance in the two countries with a functionally equivalent building, a common design, and a single client.

The table shows the performance on the two sides of the channel, and how the French performed much better than the British. Both project teams faced the same challenges, largely generated by problems with scanning technology, yet the French team coped with them much more smoothly. Why?

The British Euroscan

The answer lies in differences in the organisation of the two projects.

- The French contract included detail design, the norm in France; the British contractor was deemed not capable of entering into a D&B contract due to the requirements for design information under JCT 80.
- The French re-engineered the project, simplifying the design and taking out costs.
- Under the French contract, the British architect could not object to these changes; under JCT 80, Professional Indemnity considerations meant that the architect refused to allow the British contractor to copy the French changes.
- The simplified design was easier, cheaper and quicker to build. This meant that there was room for manoeuvre as client-induced variations mounted. The British could only cope by increasing programme and budget.
- Once the British project began to run late, work on construction became even less effective as the team had to start working around the installation of the scanning equipment.

The researchers' conclusion is that British procurement arrangements tend to generate complexity in project organisation, while the engineering capabilities of French contractors mean that they are able to simplify the design. Indeed, they argue that it is these capabilities that are essential to their ability to win contracts.

For further information please contact Graham Winch or Andrew Edkins, Bartlett School of Graduate Studies, University College London, Gower Street, London WC1 6BT (020 7387 7050; fax: 070 7916 1887; E-mail: g.winch@ucl.ac.uk).

DETR Environment Transport Regions

PERFORMANCE INDICATOR	FRENCH PERFORMANCE	BRITISH PERFORMANCE
Design costs	£323,525	£465,000
Contractor Tender Price	£3,852,754	£3,897,000
Contractor Out-turn cost	£4,178,652	£4,482,375
Total Acquisition Cost	£4,502,178	£4,947,375
Contractor Cost Increase	8·5%	15%
Contract Programme	equal	equal
Programme Overrun	0%	28%
Site Management Staff	4	8
Procurement	Lump sum after stage D; bespoke contract	Approximate Bill of Quantity at Stage H; Full JCT 80
Strengths/weaknesses	Contractor's engineering capability means value engineering the norm	Architects liability insurance prevents value engineering Process complexity

Note: costs are converted at the 1992 Purchasing Power Parity

Ground vibration from construction operations

The increasing size and power of construction plant and its potential to dissipate intrusive or possibly damaging vibration into the environment, coupled with greater attention being given to environmental aspects of road construction, have led to a need for improved methods of predicting ground vibrations. While there is a growing need to minimise the intrusive effects of construction works, over-conservative restrictions on vibration levels may lead to significant and unnecessary cost increases.

TRL has carried out a programme of work for the Highways Agency to develop methods for predicting ground-borne vibrations caused by vibrating rollers, vibratory ground improvement, dynamic compaction and vibratory and impact piling*. Further predictors have been developed for vibration and ground-borne noise from tunnelling. The predictors are based on the analysis of field data acquired and data compiled from a number of sources. This follows previous research on vibration from blasting** .

The research has provided data and advice against which objections to schemes may be judged and a means of assessing

* TRL 429 'Ground-borne vibration caused by mechanised construction works'
** RR53 'Ground vibration caused by civil engineering works'

Full-scale trial of a vibrating roller on TRL vibration test pad

the environmental impact of vibration from construction works. The topics covered were:

- a review of the literature on mechanised construction;
- a review of national and European standards providing threshold values for damage and intrusion by ground-borne vibration;
- the acquisition of field data from construction sites and a full-scale trial to investigate ground-borne vibration caused by compaction plant;
- analysis of the vibration data and development of predictors for vibration from mechanised construction operations.

The Manual of Contract Documents for Highway Works will be revised to reference this TRL research.

For further information please contact Geoff Crabb at TRL (01344 770437; fax: 01344 770356; E-mail: gcrabb@trl.co.uk).

Bringing refuse landfill back into use

The pressure of urban development – including the need for more than 3 million new homes over the next 20 years – makes the redevelopment of brownfield sites an issue certain to dominate future planning strategy. One type of land that presents particular challenges for development is refuse landfill.

One particular challenge is in developing the more recent landfill sites. Older landfills can, with appropriate safeguards, be redeveloped because they contain a much greater proportion of inert construction waste and, prior to the 1960 Clean Air Act, a high percentage of ash. As a result, they have (at least) adequate engineering qualities.

Newer landfills, by contrast, have very poor engineering qualities and major health and safety issues associated with gas production. These have so far constrained their re-use to little more than visual amenity and limited agriculture.

A possible solution is the re-circulation of leachate in which most of the waste mass remains partly saturated. This promotes an increased and even rate of biodegradation and gas extraction over the full depth, and results in higher effective stresses within the waste.

Two BRE research projects studying these problems and potential solutions are now under way, and are aimed at:

- establishing predictive models of the long-term behaviour of different types of new composition refuse landfill;
- identifying the effect and benefits of leachate re-circulation, through field- and pilot-scale investigations on the long-term behaviour of refuse landfill.

Recent landfills are difficult to redevelop because they contain relatively little inert material

The projects are being carried out under the Landfill Tax Credit Scheme regulated by ENTRUST. EB Nationwide Limited are supporting them with funding from the waste management company Shanks and the work is partly sponsored by DETR. The information gained will be used to produce guidance on the timing of refuse landfill development and on problems of foundation/structure interaction.

For further information please contact Ken Watts at BRE (01923 664846; fax: 01923 664085; E-mail: wattsk@bre.co.uk).

IRRIGATION

Preventing canal sedimentation

Sedimentation can cause major problems in irrigation canal systems supplied from rivers that carry high sediment loads. Sediment deposits reduce the discharges that can be supplied and, in many cases, the area that can be reliably irrigated. New software has just been developed as part of a DFID-funded project, to help engineers make important decisions about engineering solutions to control sediment intake into canals.

'There are a range of solutions available to engineers to control sedimentation in canals. These range from sediment exclusion and sediment extraction structures, to canal operation practices to prevent the build-up of sediment', explains Ed Atkinson, project scientist at HR Wallingford.

The software, known as SHARC (Sediment and Hydraulic Analysis for Rehabilitation of Canals), enables designers to select the most appropriate engineering solution for a given situation.

Sedimentation in canals

Atkinson continues: 'The software takes engineers through several stages of selection, initially by asking questions about the irrigation scheme and the nature of the sediment deposits. Once the feasible engineering options have been identified, the program provides a hydraulic simulation to test all the solutions. An environmental impact assessment follows from this and finally the program allows an economic analysis of the chosen system to be carried out, so that decisions based on costs versus benefits can be made'.

The software is based on field-tested procedures developed over years of research into canal sedimentation. It is anticipated that the software will be of great value to government irrigation agencies and consultants working on the rehabilitation of irrigation schemes.

The software will be downloadable from the HR Wallingford website and available, free, from Summer 2000.

For further information please contact Ed Atkinson, HR Wallingford (01491 822309; fax: 01491 826352; E-mail: exa@hrwallingford.co.uk; Website: http://www.hrwallingford.co.uk).

CONSTRUCTION PROCESSES & ENVIRONMENT

SMART use of waste

BRE has developed SMARTWaste, a new software tool for measuring and managing waste. Whilst this methodology is initially being applied to construction, it is valid for any industry.

SMARTWaste measures waste and categorises it by source, type, amount, cause and cost.

The key first step in managing and reducing waste is to know exactly where, why and to what extent waste is being generated. SMARTWaste provides a robust and accurate mechanism for measuring waste and categorising it by source, type, amount, cause and cost. This data provides the means of identifying and prioritising the actions that must be taken to reduce waste and maximise the recovery of materials.

The SMARTWaste methodology was first used during construction of the Pegasus Court social housing project in Oxford (See Research Focus 36, page 2) and on McDonald's building projects. It was then possible to develop the recently launched software on the basis of a tried and tested methodology.

SMARTWaste is also currently being applied outside the construction sector in prefabrication and precasting works.

For further information please contact Gilli Hobbs at BRE (01923 664454; fax: 01923 664786; E-mail: hobbsg@bre.co.uk)

BUILDINGS

Performance and testing of fixings for thin stone cladding

Developments in the cutting and handling of stone mean that natural stone can now be cut, depending on the stone type and quality, to a thickness as low as 20mm. This has a number of implications for the fixing of natural stone units, which makes them different from the more traditional use of stone at thicknesses of 40 to 75mm.

BS 8298: 1994 gives guidance on fixing details for stone cladding based on experience. This guidance consists of limitations on the size and thickness of the stone units. Where the stone units do not conform to the dimensional constraints of the Standard, testing is required. However, BS8298 does not include guidance on how to carry out such testing.

The Centre for Window & Cladding Technology has recently completed a project to provide guidance on the performance and testing of fixings for thin stone cladding. The aim was to advise on how to proceed with appraisal and testing of fixings and fixing details. It was not intended to duplicate or replace the British Standard but to extend advice on fixings to match the latest developments in the production of stone.

The use of thin stone units means that units of the same area are lighter in weight and that, in general, fixings are subjected to lower dead loads. The whole system of support for the stone may be different for lighter-weight units and again in general, this means that smaller fixings and anchors may be used to connect the stone.

However, stone cladding units are subject to temperature and moisture movement. Thinner stone units have less thermal mass and undergo greater thermal movement. Furthermore, improvements in the insulation of walls means that stone cladding may be subject to lower extreme temperatures. Thin stone units are more likely to be saturated throughout their thickness and thus undergo greater moisture movement.

The CWCT guide details the loads and movements on stone cladding, describes the different methods of fixing stone cladding units and methods of test to ensure their satisfactory performance.

Performance and testing of fixings for thin stone cladding is available from CWCT at £80.00 (£40 for CWCT members).

For further information please contact Alan Keiller, CWCT (01225 826541; fax: 01225 826556; E-mail: cwct@bath.ac.uk).

Wind-moment design of low rise frames

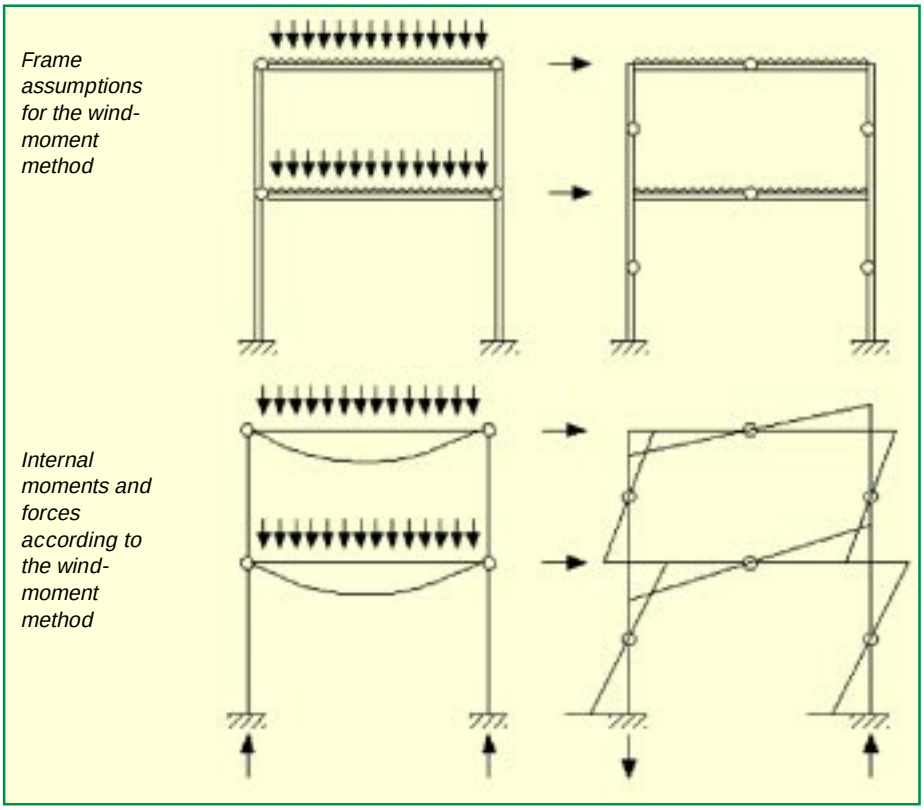
Under a Partners in Innovation project, the DETR and Corus (formerly British Steel) have sponsored the Steel Construction Institute to produce a new research-based publication: *Wind-moment design of low rise frames.* In addition to SCI, the University of Warwick made significant contributions to the new knowledge in the book.

Effectively a replacement for SCI's earlier, *Wind-moment design for unbraced frames*, published in 1991, the new design aid reflects the results of more recent studies, primarily in considering frames that are unbraced in both principal directions. A desire to include this type of frame is the reason for limiting the scope of application of the method to buildings with four storeys or less (compared with the eight storeys allowed by the original guidance).

The restrictions on class of section have been relaxed, so that both Class 1 and 2 sections are now acceptable. Additional studies have enabled the maximum bay width limit, formerly 9m, to be increased to 12m in order to extend the application of the method.

The design guidance published in 1991 stipulated the use of suitably stiff and ductile moment-resisting major-axis connections, recognising the fundamental importance of these connection attributes to the validity of the frame design assumptions. However, not until 1995 were details of an appropriate range of standard 'wind moment connections' published (in the SCI/BCSA publication *Joints in steel construction: moment connections)*. Parametric studies at the University of Warwick have confirmed that the frame design rules based on assumed connection behaviour hold good for frames using the standard connections, the behaviour of which was determined by testing in the mid 1990s.

Future work requirements include the development and testing of a range of standard minor-axis connections that will perform in the way that was assumed when the design rules for frames with no bracing were developed. Research in this area is now in progress.



For further information please contact Dr Graham Couchman, The Steel Construction Institute (01344 623345; fax: 01344 622944; E-mail: g.couchman@steel-sci.com).

Ultimate in environmentally responsible refrigerants

The phasing out of CFC and HCFC refrigerants, and environmental concerns about some of their HFC-based replacements, is creating interest in more environmentally responsible refrigerants.

Air is probably the ultimate environmentally responsible refrigerant. However, so-called air-cycle refrigeration systems are traditionally inefficient and have been restricted to specialist applications such as aircraft cabin air conditioning.

BRE and the University of Bristol are now developing an air-cycle system that produces hot and cold water for hot water services and air conditioning and that overcomes the energy-efficiency limitations of previous systems.

A working demonstration system has been built to heat and cool a suite of offices at the University of Bristol using a standard 4-pipe fan coil system – see accompanying illustration.

For further information please contact David Butler at BRE (01923 664763; fax: 01923 664095; E-mail: butlerd@bre.co.uk).

Demonstration air-cycle heating and cooling system

New software improves agricultural drainage

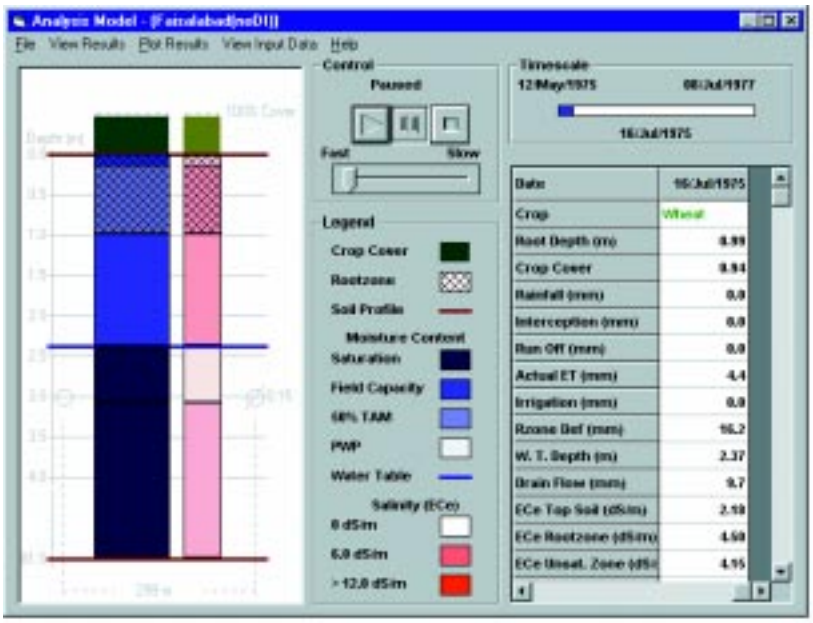
Around 20 to 30 million hectares of irrigated land are affected by waterlogging and salinisation due to inadequate drainage systems. Without effective drainage, the benefits of irrigation are reduced and agricultural production is at risk. A DFID-funded project, led by HR Wallingford, identified the need for improved planning and design of agricultural drainage in developing countries. As part of this project, specialists at HR Wallingford and Cranfield University developed a computer-based training package and complementary design modules to improve the planning and design of drainage systems.

John Skutsch, project manager of HR Wallingford explains: 'The problems of waterlogging and salinity can often only be addressed by lengthy drainage and reclamation programmes. For the drainage systems to be effective, drainage engineers need to understand the issues involved in drainage and have the most suitable design tools'.

The software, known as WaSim, was designed to demonstrate issues of drainage and salinity in irrigated agriculture, to help train engineers. WaSim works by simulating the soil/water/salt relationships in response to different management strategies and environmental scenarios. WaSim provides accurate simulations using actual rainfall and evapotranspiration data. It is able to simulate durations of up to 30 years. The software provides a visualisation of its calculations that enhances understanding and reduces any tendency by users to see it as a 'black box'.

The project team has also developed a set of software modules to assist drainage engineers to carry out simple but repetitive calculations involved in field drainage design. Used in conjunction with the training package, quantitative solutions to water-table and salinity problems can be developed and compared.

The software is available free from HR Wallingford, and will shortly be available for download from the project website at the address given below.



A sample screen from the WaSim software

For further information please contact Dr John Skutsch, HR Wallingford (01491 835381; fax: 01491 825428; E-mail: j.skutsch@hrwallingford.co.uk). Project Website: http://www.hrwallingford.co.uk/projects/WASIM.

Diagnosis of deterioration in concrete structures

Concrete is the most widely used construction material in the world for buildings and civil engineering structures of all kinds. An unfortunate but inescapable fact is that all structures will deteriorate with time, though the rate at which they do so will be affected by many factors. Deterioration can change the appearance of a structure and may affect its behaviour under normal working conditions or its structural safety. A Concrete Society Working Party has recently completed a two-year project, with the support of the DETR through its PII scheme, that has been considering all aspects of the diagnosis of deterioration in concrete structures.

Evidence of deterioration may take the form of visible signs of damage, such as cracking or excessive deflections, or a structure may be damaged by fire or overloading. Finally, faults may be identified when a detailed inspection is carried out, for example, when the ownership or use of a structure changes.

In some cases deterioration may be too severe to justify retaining the affected structure or component but, generally, repair and protection strategies can extend the useful life by many years. Repair and protection measures should be selected to meet the needs identified through the diagnosis and assessment of the problems with the structure. Costs must be assessed in relation to the value of the structure over its remaining useful life and the costs of demolishing and replacing it. To make the necessary decisions, the underlying causes of defects must be identified so that a clear remedial strategy can be determined.

The main output of the Concrete Society's project will be a Technical Report*. It is intended as a broad introduction to the subject of concrete deterioration, with many references to more detailed publications. It may thus be used as a reference document in its own right, or as a base for more-specialised investigation. The report is intended for the engineer or surveyor responsible for a concrete structure, or for advising clients and owners. It should also be useful for those who undertake inspections and testing programmes, and interpret the results.

*Technical Report 54, *Diagnosis of deterioration in concrete structures: identification of defects, evaluation and development of remedial actions*, Summer 2000, available from The Concrete Society, Century House, Telford Avenue, Crowthorne, Berkshire, RG45 6YS

For further information please contact Dr John L Clarke, The Concrete Society at the above address (01344 466007; fax: 01344 466008; E-mail: jclarke@concrete.org.uk).

DETR Environment Transport Regions

Construction materials in the developing world

There is an increasing awareness of the environmental impacts of minerals extraction and of the need for geological resource studies to guide strategic mineral and development planning. In many developing countries there is often no factual basis to assess either the potential total or workable construction mineral resources, nor their quality, to inform the planning process.

The minerals industry plays a vital role in the world's economic development. Construction is an important product of this development and the demand for construction minerals in the building of roads and railways, houses, schools and hospitals, factories and offices is substantial and increasing. Sand, gravel and quarried rock are extensively extracted in most countries for the manufacture of a range of construction mineral products including such basic commodities as aggregates, cement and concrete. Unlike other forms of development, minerals can only be worked where they occur and, because a major cost component of these bulk, low-value commodities is transport, they must also be won as close as possible to the urban centres where they are consumed.

In recent years the British Geological Survey (BGS) has carried out several research projects on construction minerals in developing countries funded by the Department for International Development (DFID) under the Engineering Knowledge and Research (KaR) Programme. The fundamental objective has been to provide a framework for geologists and engineers to plan and execute resource surveys for construction minerals, and to undertake any exploration and development of these non-renewable natural resources in an environmentally sensitive and sustainable manner. The projects include:

- investigations of limestone resources for cement raw materials in Thailand and Egypt;
- marine aggregates for construction, reclamation and coast protection in SE Asia;
- utilisation of volcanic rocks in construction in east Africa and South America;
- studies of beach sand resources for concrete products on tropical islands in the SW Pacific;
- utilisation of mineral wastes for quarrying in central America and southern Africa; and
- a generic series of construction materials workshops held in 14 developing countries.

For further information please contact David Harrison, British Geological Survey, Keyworth, Nottingham NG12 5GG (0115 936 3213; fax: 0115 936 3352; E-mail: djha@bgs.ac.uk).

DFID Department for International Development

(TOP) *Large scale extraction of limestone for stone and cement production, Saraturi, Thailand*
(ABOVE) *River mining of sand and gravel, Costa Rica.*

More design advice from the Steel Bridge Group

Following the successful issue in 1998 of 30 research-based Guidance Notes on best practice in steel bridge construction, the Steel Construction Institute's Steel Bridge Group has prepared a further 20 Notes to assist bridge designers in their work. The new Notes focus on design details, and add to the existing notes on materials, fabrication and on-site work.

The Steel Bridge Group comprises experienced senior engineers from consultants and fabricators. It aims to provide independent, practical advice, not only to bridge designers but also more generally to designers of steel structures, and both groups have taken up the advice in the first set of 30 notes.

Views on design detailing tend to be subjective and reflect what has 'traditionally' been done within a particular company. The new Notes on this subject bring together a consensus of what is really needed by designers, whilst acknowledging the practical implications for fabricators and contractors. The advice presented is not prescriptive, nor contains a fully-dimensioned set of figures, but it should contribute to an understanding of how to detail a particular bridge project.

Many of the other Notes in the second issue set down practices that are common but which have not previously been generally recorded, other than in project-specific documentation. They offer the 'why you should do it' and 'how to do it', and should thus become a valuable standard reference for bridge design.

The new guidance notes are applicable to a wide range of bridge types.

As before, the Steel Bridge Group invites feedback from all users of the Guidance Notes, with the aim of keeping the advice as up-to-date and as relevant as possible. The first issue was published by the SCI in a ring-binder format. The format was chosen to facilitate additions and revisions, and the new issue of 20 Notes will fit into the binder.

To purchase the Notes please contact SCI Publication Sales: 01344 872775.

For further information, or to offer comment on the Notes, please contact David Iles, The Steel Construction Institute (01344 623345; fax: 01344 622944; E-mail: d.iles@steel-sci.com).

The Steel Construction Institute

Improving concrete frame efficiency

The efficiency of concrete frames is ever-improving through targeted research aimed at giving clients best value. Two major initiatives in this area – a completely revised specification for structural concrete in buildings and a series of best practical guides – have recently been completed.

NATIONAL STRUCTURAL CONCRETE SPECIFICATION FOR BUILDING STRUCTURES (NSCS)

The NSCS was launched in May 2000. It is charged with improving the efficiency of concrete frames to the benefit of all in the procurement process – from client to designer and contractor.

The new specification now includes prestressed concrete, foundations, basements, and water resisting structures. It is in two main parts, with guidance notes for each.

Part 1 forms a simple, unambiguous performance specification incorporating many of the principles developed in the European Concrete Building Project at Cardington (ECBP), described below. Part 2 contains project-specific information to and from the specialist concrete contractor, and clearly identifies any departures to Part 1 clauses.

The specification's history is a model for industry collaboration with funders. Earlier concept work was undertaken by the Reinforced Concrete Council and Construct, with part funding from the ICE R&D enabling fund. Later phases were undertaken by BRE and latterly Construct, with DETR PII part-funding, and broad industry involvement including Ove Arup, Stanhope and BAA .

Full size concrete test frame at Cardington

BEST PRACTICE GUIDES FOR IN-SITU CONCRETE FRAMED BUILDINGS

Distilling the many lessons learnt from the ECBP research has been no easy task. However, a series of six best practice guides has now been launched on the following topics.

Early age strength assessment on site

Knowledge of concrete at early age increases efficiency through potential early striking and re-use of formwork and earlier prestressing. Best practice is discussed, including the use of cast-in pullouts to determine early age strength.

Improving concrete frame construction

Frame construction can be continuously improved in terms of cost, time, and quality. Monitoring, recording and feeding-back details of construction activities, and the application of lean manufacturing techniques, offer potential savings of 30% time and 45% man hours.

Improving rebar information and supply

This encourages a newly developed, standard electronic form of information exchange to speed design, and to reduce errors, reworking and waste.

Concreting for improved speed and efficiency

This guide provides recommendations for improving the efficiency of the concreting process whilst maintaining quality. This requires consideration of the concrete procurement process as a whole and of the interaction of concreting with inter-related construction processes.

Early striking for efficient flat slab construction

This summarises a detailed Construct guide on early striking and re-propping load calculation.

Rationalisation of flat slab reinforcement

This examines different design, analysis and detailing methods resulting in major variations in amount and complexity of reinforcement. It provides guidance for savings of up to 25% of reinforcement or 50% of fixing time and the trade-off between these parameters (available September 2000).

In 2001, two further guides will be published covering flat slab design, and associated shear reinforcement systems.

For copies of the Specification (NSCS) or Best Practice Guides, contact the Concrete Bookshop: 01344 725704 or see partners' websites for details and/or pdf versions:
BCA: www.bca.org.uk
RCC: www.rcc-info.org.uk
Construct: www.construct.org.uk
BRE: www.bre.co.uk
DETR: www.detr.gov.uk.

For further information please contact Martin Southcott of BCA and the Reinforced Concrete Council (01344 725733; fax: 01344 761214; E-mail: msouthcott@bca.org.uk).

BCA

SPONSORING ORGANISATIONS

GOVERNMENT

Department of the Environment, Transport and the Regions,
Eland House, Bressenden Place, London SW1E 5DU
(020 7890 5704, fax 020 7890 5759)
Website: www.construction.detr.gov.uk
Email: pii_cirm@detr.gov.uk

Department for International Development,
94 Victoria Street, London SW1E 5JL
(020 7917 7000, fax 020 7917 0019)
Website: www.dfid.gov.uk
Email: enquiry@dfid.gov.uk

RESEARCH ORGANISATIONS

British Cement Association,
Century House, Telford Avenue, Crowthorne, Berkshire, RG11 6YS
(01344 762676, fax 01344 761214)
Website: www.bca.org.uk
Email: library@bca.org.uk

BRE,
Garston, Watford, Hertfordshire, WD2 7JR
(01923 664000, fax 01923 664010)
Website: www.bre.co.uk
Email: enquiries@bre.co.uk

Centre for Window and Cladding Technology,
University of Bath, Claverton Down, Bath, BA2 7AY (01225 826541, fax 01225 826556)
Website: www.cwct.co.uk
Email: cwct@bath.co.uk

Construction Industry Research and Information Association,
6 Storey's Gate, Westminster, London, SW1P 3AU (020 7222 8891, fax 020 7222 1708)
Website: www.ciria.org.uk
Email: enquiries@ciria.org.uk

HR Wallingford Ltd,
Wallingford, Oxfordshire, OX10 8BA
(01491 835381, fax 01491 832233)
Website: www.hrwallingford.co.uk
Email: hrmfu@hrwallingford.co.uk

The Steel Construction Institute,
Silwood Park, Ascot, Berkshire, SL5 7QN
(01344 623345, fax 01344 622944)
Website: www.steel-sci.org.uk
Email: reception@steel-sci.org

Transport Research Laboratory,
Old Wokingham Road, Crowthorne, Berkshire, RG45 6AU (01344 773131, fax 01344 770356)
Website: www.trl.co.uk
Email: bdu@trl.co.uk

PROFESSIONAL INSTITUTIONS

Institution of Civil Engineers,
1 Great George Street, Westminster, London, SW1P 3AA (020 7222 7722, fax 020 7222 7500)
Website: www.ice.org.uk
Email: enquiries@ice.org.uk

Institution of Structural Engineers,
11 Upper Belgrave Street, London SW1X 8BH
(020 7235 4535, fax 020 7235 4294)
Website: www.istructe.org.uk
Email: mail@istructe.org.uk

INDUSTRY

ABP Research & Consultancy Ltd
Ove Arup Partnership
Bechtel Limited
Fordham Johns Partnership
Geotechnical Consulting Group
Laing Technology Group Ltd
Sir Robert McAlpine Ltd
Mott MacDonald Group Ltd
Pick Everard
Posford Duvivier
Rofe, Kennard & Lapworth
Scottish Hydro-Electric plc
Southern Testing Laboratories
Symonds Group
Taywood Engineering Ltd
Wilde & Partners
George Wimpey plc