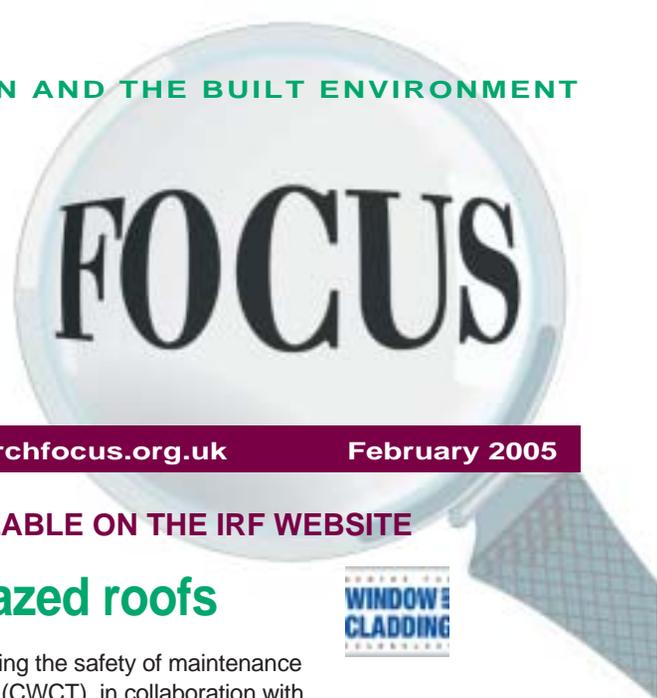


# Innovation & Research



Issue No. 60

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February 2005

FURTHER DETAIL ON EACH ARTICLE IS AVAILABLE ON THE IRF WEBSITE

## Guidance and testing procedure for glazed roofs



Until now, there has been a lack of guidance for designers when they are considering the safety of maintenance workers working on glass roofs. The Centre for Window and Cladding Technology (CWCT), in collaboration with roof glazing designers, contractors, test houses and the HSE, has produced a technical note that highlights safety issues and gives a test procedure.



Glass roof at the British Museum (courtesy of Buro Happold/Mandy Reynolds)

The design of glazed roofs often excludes the potential for walking on glass due to safety concerns, glass manufacturing and processing limitations, and to cost restraints. For maintenance, safe access to most glazed roofs is by a range of methods such as gantries. However, occasional walk-on access may be the only reasonably practical access method. Careful consideration will then need to be given during design to safety and to the need to test the glazed roof assembly for fragility.

Glazed roofs should be designed to resist the possible impacts arising from people working on the roof or in the immediate vicinity. Where workers must walk on the glass, slip resistance must be taken into account.

The CWCT Technical Note provides guidance on roof design, glass selection, potential safety issues and relevant legislation. It will also be of use in preparing risk assessments.

CWCT's fragility test has been devised to overcome the limitations of the ACR fragility test, (ACR[M]001:2000 *Test for fragility of roofing assemblies*), using a combination of soft body impacts based on the ACR test, and hard body impacts based on BS EN 356. The test therefore assesses the ability of the glazed roofing assembly to withstand safely the impacts that are most likely to occur in use.

All these issues, and the CWCT fragility test procedure, are discussed in detail in Technical Note 42 *Safety and fragility of glazed roofing – Guidance on specification and testing*, available from the CWCT. The test procedure will provide a uniform industry approach which will be incorporated into a formal standard later.

For further information please contact Brenda Apted at CWCT, University of Bath (01225 386541; fax 01225 386556; E-mail [cwct@bath.ac.uk](mailto:cwct@bath.ac.uk)).

## RESEARCH & INNOVATION

### Support for engineering research



The Royal Academy of Engineering provides funding for engineering research under its schemes ranging from its prestigious five-year Research Chairs in UK universities to supporting research secondments for periods of up to a year in centres of excellence overseas.

An important objective is to strengthen industrial-academic links through the co-funding of research appointments with industry and every £1 funded by The Academy now attracts over £4 from industry.

During 2004, 4 new Research Chairs and 8 new Senior Research Fellowships were appointed.

One recent research appointment is the establishment of The Royal Academy of Engineering Research Chair in Fire Safety Engineering at The University of Edinburgh, in conjunction with the Building Research Establishment Trust.

The Academy, jointly with EPSRC, also awards eight Post-doctoral Research Fellowships per year in UK universities. These are aimed at outstanding researchers from all branches of engineering who are about to finish their PhD or have up to three years' Post-Doctoral research experience. The scheme provides funding for five years to encourage the best researchers to

remain in the university engineering sector.

Full details on all The Academy's Research Support Schemes are available at [www.raeng.org.uk/research](http://www.raeng.org.uk/research).

For further information please contact Rob Barrett, Manager, Research Support at RAEng (0207 227 0500; E-mail [robert.barrett@raeng.org.uk](mailto:robert.barrett@raeng.org.uk)).



Professor Jose Torero-Cullen holds the RAEng/BRE Research Chair in fire safety engineering at Edinburgh.



## Impacts of climate change on UK water resources

Scenarios from the UK Climate Impacts Programme (UKCIP) indicate that, by the end of the 21st century, our atmosphere may warm by up to 5 °C. This may seem to be a small change, but the impacts are predicted to be profound. As the climate becomes warmer, it is predicted that rates of evaporation will rise, winters will be wetter and summers significantly drier. All of these factors would affect the seasonal balance of river flows and recharge across the UK.

Two projects have recently been awarded to teams led by HR Wallingford to investigate the potential for increased drought over the next 30 to 100 years.

The Cross-Regional Programme on Climate Change Impacts and Adaptation, funded by DEFRA, is using the UKCIP climate change scenarios, and the Met. Office Hadley Centre's Regional Climate Model, to create water resources scenarios for two UK regions for the 2020s, 2050s and 2080s.

Each scenario will reflect variations in climate, population growth, housing development,



Map of seasonal changes in temperature and rainfall for the 2080s High Scenario.

economic growth and attitudes to water conservation.

In a second project, for UKWIR (and co-funded by the Environment Agency), HR Wallingford is leading research to model the impacts of predicted climate change on river flows and groundwater recharge across the UK. The team will develop practical approaches that enable climate change risks to be included in decision-making.

For further information please contact Steven Wade at HR Wallingford (01491 822214; E-mail s.wade@hrwallingford.co.uk).

## WASTE & RESOURCE USE

### Net gain for construction waste and resources

CIRIA has launched Construction Waste and Resources ([www.ciria.org/cwr](http://www.ciria.org/cwr)), a website aimed at encouraging waste reduction and improved resource productivity in building and civil engineering.

The result of a project carried out by CIRIA and Viridis to take forward the findings of the Biffaward Construction Industry Mass Balance Study\*, the project was co-funded by the Institution of Civil Engineers' R & D Enabling Fund. It forms part of the Resource Sustainability Initiative, a suite of research instigated by the ICE Waste Management Board aimed at improving resource efficiency of use at all stages of the construction.

The site contains a searchable database of over 100 summaries of commonly used publications covering key topics related to general design and construction

\*The Study Report is downloadable from [www.viridis.co.uk](http://www.viridis.co.uk). For further information on the Resource Sustainability Initiative contact Andrew Crudgington at the ICE (020 7665 2219; E-mail [andrew.crudgington@ice.org.uk](mailto:andrew.crudgington@ice.org.uk)).

good practice, a section on sustainable development criteria, guidance on material optimisation and advice on waste management procedures and regulation. Other features include a case studies area, a paper on model policies taking account of existing planning policy in England, Scotland and Wales, as well as links to other useful websites.

This website is aimed at those who influence company policy, design and procurement decisions, or have responsibilities for procedures on site, but previous knowledge best practice in these areas is no a prerequisite for using this site.

For further information please visit [www.ciria.org/cwr](http://www.ciria.org/cwr) or contact James Milne at CIRIA (020 7549 3300; E-mail [james.milne@ciria.org](mailto:james.milne@ciria.org)).

## Implementing R&D in practice

The AeCORR corrosion detection technique demonstrated cost savings its use can achieve during its commercial debut earlier in 2004. AeCORR was developed during a 4-year EngD project at CICE, sponsored by Balvac Ltd and Physical Acoustics Ltd.

AeCORR is a totally non-destructive technique for detecting active corrosion damage in concrete structures. Unaffected by carbonated concrete, surface coatings or stray currents, AeCORR can detect and indicate the rate

of corrosion-induced damage actually occurring during the monitoring period. This can be long before visual deterioration is evident.

AeCORR was used on two car parks in London to see if early corrosion was occurring and if so, the rate at which damage was being inflicted. The results were used to determine whether interim repairs were required prior to planned waterproofing.

Traditional surveys were unable to give information on the condition of the linking steel between the joints and the post-tensioned slabs – the region of greatest concern. AeCORR trans-



Small, discrete sensors 'listening' for corrosion activity

ducers were mounted to the soffit of selected joints, and monitoring undertaken overnight.

AeCORR detected low to medium active corrosion damage in all the joints; however, as the rate of corrosion damage was not severe, interven-

tion before the planned refurbishment was considered unnecessary.

Avoiding repairs not only produces savings, but it also allows a car park to remain open until waterproofing works are undertaken, avoiding revenue loss and users' disruption.

For further information please contact Matthew Ing at Balvac (01773 542600; E-mail

[matthew.ing@bbcel.co.uk](mailto:matthew.ing@bbcel.co.uk)) or

Professor Simon Austin at Loughborough University (01509 222608; E-mails [a.austin@lboro.ac.uk](mailto:a.austin@lboro.ac.uk)).



## HISTORIC STRUCTURES & MAINTENANCE

### Failing our heritage



Department of Trade and Industry

Many listed buildings are deteriorating for lack of simple routine tasks like clearing gutters. Maintenance is recognised as the best way to care for historic buildings yet few people do it.

A new report\* – *Putting it off: How lack of maintenance fails our heritage* – points the way to a shift in policy and practice to re-shape the way we look after our built heritage. Griff Rhys Jones, BBC *Restoration* presenter, spoke at the launch of the report: 'Maintenance is the key to putting wreckers out of a job,' he said. 'I am delighted to be supporting the report.'



Griff Rhys Jones

The report is the culmination of led by Maintain our Heritage and financed by the DTI, English Heritage and the Heritage Lottery Fund.

Maintenance is the best way to care for historic buildings: it reduces or removes the need for repair, minimizes the loss of original fabric, uses less energy and fewer materials, and extends the

life of the building. Yet all too often lack of maintenance leads inevitably to the need for costly and disruptive repair and restoration.

Current legislation and policies do not adequately encourage main-

tenance. A new strategy is called for: 'There has only ever been a policy of passive endorsement of maintenance', the report concludes, 'not the pro-active encouragement and support it needs.'

\*Copies can be obtained from Maintain our Heritage (01225 482228; E-mail: [tcantell@maintainourheritage.co.uk](mailto:tcantell@maintainourheritage.co.uk)).

For further information on this project please contact Tim Cantell, Maintain Our Heritage (01225 482228; E-mail [tcantell@maintainourheritage.co.uk](mailto:tcantell@maintainourheritage.co.uk)).

## Innovative materials



CIRIA is examining some of the more sustainable options available for construction materials, and two examples – of sewage sludge and agricultural crops – are discussed here. The UK produces over 100 MT of waste each year, much coming from the construction industry. According to DEFRA, the volume of waste is growing at a rate of around 3% pa. Its environmental impact can be reduced by preventing it wherever possible and making more-sustainable use of the waste that is produced.

The UK water industry produces over 1 MT of sewage sludge each year. Most of this sludge has been recycled to agriculture as a soil improver or disposed of at sea but, since 1999, sea disposal has been prohibited.



pre-manufactured straw panels

Additional environmental and financial implications of sludge disposal to landfill have led to the exploration of sustainable and innovative approaches towards sludge disposal or recycling.

CIRIA's new publication *Use of sewage sludge in construction* (C608) promotes a more-sustainable route by assessing the potential benefits and risks of using sewage sludge derivatives within construction processes and materials.

Waste from crop-based materials can normally be disposed of safely and easily with little or no

environmental damage; many traditional construction materials such as concrete use large amounts of energy in their production while materials made from crops generally use much less.

CIRIA has launched *Crops in construction handbook* (C614) to encourage the use in the UK construction industry of products from agricultural crops, including animal-based outputs such as wool.

When arguing the case for alternative materials in construction it is easy to put across the sustainability viewpoint, but CIRIA's new publications also consider in detail the short-term economic and business case. Buy online at [www.ciriabooks.com](http://www.ciriabooks.com).

For further information please contact CIRIA (020 7549 3300; fax 020 7253 0523; E-mail:

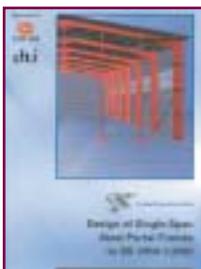
## STRUCTURES & MATERIALS

### Portal frame design



A new 160 page publication is the first of its kind bringing together in one book all the existing guidance on design for single-span steel portal frames and all aspects of design that are not properly covered in any current design guidance.

The use of steel portal frames is well established in the UK. They have become a common structural form in single storey construction due to the economy and versatility to produce a wide range of spans. Until now, there has been little published guidance available on the design of such structures.



New Publication P252; Design of Single-Span Portal Frames to BS 5950-1:2000

This new publication was produced in response to questions raised by designers and steelwork contractors, and as a result of extensive consultations with structural engineers.

It reviews various types of portal structures, expanding on design of single span frames in detail. The use of elastic and plas-

tic frames analysis for portal frames is examined, all aspects of frames stability considered, and serviceability and fire limit state design are addressed. Finally two worked examples are presented, one showing manual calculation, the second an output from a standard computer program.

The guide is available to SCI members at £30.00 + P & P and non-Members at £60.00 + P & P. Buy online at [www.shop.steelbiz.org](http://www.shop.steelbiz.org).

For further information about the guide and its preparation, please contact Hazel Cockings at SCI (01344 872775; E-mail [publications@steel-sci.com](mailto:publications@steel-sci.com)).

## Buildings in hotter summers

Climate change is likely to affect buildings in the UK in many ways, including possible increased occurrence of 'overheating' due to warmer summers. Such overheating not only affects the thermal comfort, quality of life and productivity of building users, but also poses a health threat to those vulnerable to heat stress, such as the very young and elderly. This is likely to lead more air conditioning and consequent increase in CO<sub>2</sub> emissions, a negative impact on the UK's efforts to help limit the scale of global warming.

A project part-funded by DTI was set up to examine the likely impacts of global warming on thermal comfort in UK buildings and to suggest adaptation strategies.



Case study buildings included a typical 1960s office.

It has a particular focus on 'pas-

sive' and low-energy measures and is now nearing completion.

The project has been led by design consultant Arup, working closely with CIBSE,

UKCIP and a mul-



## Sustainability guidance



Sustainable Construction – Practical Guidance for Planners and Developers, a project led by Faber Maunsell and supported by DTI and 23 private and public sector partners, has developed freely available training material aimed specifically at mixed audiences of planners and developers. It explains the relevance of sustainable construction to their professions and gives pragmatic, practical information on measures they should consider.

The successfully piloted training provides a practical introduction to a wide range of measures, and shows how these measures link to requirements within national, regional and local planning policy.



Planners and developers at pilot training hosted by the Welsh Development Agency.

Nigel Griffiths, Minister for Construction, has written an encouraging Introduction to the Training Course materials. The

training is freely available for use by anyone from [www.sustainable-construction.org.uk](http://www.sustainable-construction.org.uk) and should prove a powerful tool in the movement towards a more-sustainable built environment.

For further information please contact Claire Bonham-Carter, Sustainable Development Group,

## Improving design



Design practices have been slow to recognise that knowledge is their main asset. However, many are now coming to grips with 'knowledge management', and the DTI has funded two Partners in Innovation projects led by innovation consultants DBA to help them succeed - Learning from Experience (LfE) and Spreading the Word (StW).

The LfE and StW projects aim to fill the gap in current guidance on these issues for design practises, with focused, practical advice tested in real practice.

LfE looked at how learning – traditionally left largely to individual initiative – can be made more systematic and effective, and the results were published last year. StW is studying the next step: how individual knowl-

edge and scattered documents can be made into a shared resource for everyone to use.

The Learning from Experience Toolkit is a free download from <http://www.constructingexcellence.org.uk/resourcecentre/publications/toolkit.jsp?toolkitID=1>.

For further information please contact Dr David Bartholomew at DBA (01242-523283; E-mail [db@dba-insight.co.uk](mailto:db@dba-insight.co.uk)).

## Stabilisation & solidification of contaminated land



The traditional method used to remediate brownfield land is to excavate any contaminated material and dispose of it in a landfill site. As contaminated soils need pre-treatment before disposal to landfill, then it is more-sustainable if the treated material is re-used on site. This is in line with government policy of moving all waste up the waste hierarchy. In addition to reducing use of the country's remaining landfill capacity, there are environmental benefits that include fewer lorry movements, and consequent reduction in noise and emissions.

No single treatment will work for all sites or for all types of contaminants. However, a versatile technique is Stabilisation / Solidification (S/S). Stabilisation refers to the chemical immobilisation of contaminants, and solidification refers to the physical improvement in the soils properties, although they are interdependent.

This technique can be used either in-situ or ex-situ. Treatment is generally carried out using standard civil or



ground engineering plant. An overview of the procedures, practical guidance on

implementing the technique is set out in the British Cement Association document *The Essential Guide to Stabilisation / Solidification for the Remediation of Brownfield Land using Cement and Lime*.

For further information please contact Dr Chris Clear at BCA (01276 608700; fax: 01276 608701; E-mail:

[cclear@bca.org.uk](mailto:cclear@bca.org.uk), website: [www.cementindustry.co.uk](http://www.cementindustry.co.uk)) or go to [www.concreteinfo.org](http://www.concreteinfo.org) to order copies of the document.

## IRRIGATION & SUSTAINABILITY

### Small-scale rural irrigation



Recommendations on how small-scale irrigation can sustain and improve rural livelihoods were developed as part of a DFID-funded international research project carried out by HR Wallingford, the Local Training Academy in Nepal, the Bangladeshi Agriculture University and Imperial College, UK. The research found that small-scale irrigated agriculture can make an important contribution to food security, improved nutrition and rural prosperity.

The HR Wallingford research presents the pre-conditions and measures needed to ensure that real benefits are obtained from small-scale irrigation. Five general conclusions have been drawn.



Small, farmer-managed irrigation near Kathmandu, Nepal.

- 1 Irrigation is an effective tool for poverty reduction** if it is part of an integrated package of rural development support.
- 2 The direct and indirect benefits of irrigated agriculture** over rain-fed agriculture include more-secure food supply and income for irrigators; extra income for people supplying or providing services for irrigators; and other uses for the water supplied.
- 3 The multiplier effects** stemming from improved livelihoods include better family health and education.

- 4 Favourable pre-conditions will maximise benefits**, for example access to water, a minimum viable farm size, access to markets and credit, and a variety of crop and livestock enterprises. A cohesive and co-operative social environment is also required to successfully operate and maintain community irrigation systems and contain any negative environmental impacts.

**5 Irrigated agriculture cannot function in isolation.** A complementary package of interventions and political will is needed.

The International Water Management Institute (IWMI) in Sri Lanka has recently expressed interest in including these findings and recommendations in

publications on *Pro-Poor Intervention Strategies in Irrigated Agriculture*. IWMI's plan to spread the word about this research enhances its potential application to other areas of the world interested in maximising the benefits obtained from small-scale irrigation.

For further information please contact Tom Brabben at HR Wallingford (01491 835381; E-mail: [t.brabben@hrwallingford.co.uk](mailto:t.brabben@hrwallingford.co.uk)).

### SPONSORING ORGANISATIONS

#### GOVERNMENT

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Department of Trade and Industry  
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(020 7215 0848 or 0826)  
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E-mail: [terry.boniface@dti.gsi.gov.uk](mailto:terry.boniface@dti.gsi.gov.uk)

#### Department for International Development

1 Palace St, London SW1E 5HE  
(020 7023 7000; fax: 020 7023 0072)  
Website: [www.dfid.gov.uk](http://www.dfid.gov.uk)  
E-mail: [enquiry@dfid.gov.uk](mailto:enquiry@dfid.gov.uk)

#### RESEARCH ORGANISATIONS

##### British Cement Association

Riverside House, 4 Meadows Business Park, Station Approach, Blackwater, Camberley, Surrey, GU17 9AB (01276 608700)  
Website: [www.cementindustry.co.uk](http://www.cementindustry.co.uk)  
E-mail: [CClear@bca.org.uk](mailto:CClear@bca.org.uk)

##### Centre for Innovative Construction Engineering

Loughborough University, Loughborough, LE11 3TU (01509 228549; fax: 01509 223982)  
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E-mail: [j.c.brewin@lboro.ac.uk](mailto:j.c.brewin@lboro.ac.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](http://www.cwct.co.uk)  
E-mail: [cwct@bath.co.uk](mailto:cwct@bath.co.uk)

##### CIRIA

Classic House, 174-180 Old Street, London, EC1V 9BP (020 7549 3300; fax: 020 7253 0523)  
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##### The Steel Construction Institute

Silwood Park, Ascot, Berkshire, SL5 7QN (01344 623345; fax: 01344 622944)  
Website: [www.steel-sci.org](http://www.steel-sci.org)  
E-mail: [reception@steel-sci.com](mailto:reception@steel-sci.com)

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E-mail: [mail@istructe.org.uk](mailto:mail@istructe.org.uk)

##### Royal Academy of Engineering

29 Great Peter Street, London SW1P 3LW (020 7227 0500; fax 0207 233 0054)  
website: [www.raeng.org.uk](http://www.raeng.org.uk)  
E-mail: [robert.barrett@raeng.org.uk](mailto:robert.barrett@raeng.org.uk)

#### INDUSTRY

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tidisciplinary steering group.

The biggest problems are likely to occur in the South-East, where overheating is already a significant problem and where rises of up to 7°C in mid-summer temperatures by the 2080s are predicted under the most severe of the climate scenarios.

*For further information please contact Jake Hacker, Ove Arup Partnership (020 7755 4050; E-mail [jake.hacker@arup.com](mailto:jake.hacker@arup.com)).*

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### page 3 (Middle right)

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