PRACTICAL APPLICATIONS FOR CONSTRUCTION AND THE BUILT ENVIRONMENT

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Standard for systemised building envelopes

The use of a performance-based specification is essential when designing and procuring building envelopes. Performance is increasingly complex and has to include thermal, acoustic and lighting performance in addition to weathertightness and air permeability. Performance-based specifications have to be comprehensive and relevant to site and project conditions. Furthermore, building envelopes are becoming more diverse in their construction and there is a trend to mix and match different constructions within one roof or wall.

In recognition of these trends the CWCT standards for curtain walling, ventilated rainscreens and slope glazing have been updated and integrated into a single *Standard for systemised building envelopes*.

The CWCT Standards have been in use for twelve years in some thirty-three countries. They are taken as the basis for the National Building Specification (NBS) and the standards of the National House Building Council (NHBC). The new CWCT Standard has been written by CWCT members, drawn from the broad spectrum of the curtain walling industry, under the guidance of its Technical and Standards committees. The document includes the new BS EN Standards for curtain walling and takes account of the changes to the Building Regulations regarding conservation of energy (U-values, air leakage and g-values), sound insulation, fire performance and access for the disabled.

The new BS EN Standards for curtain walling are not appropriate for walls clad with ventilated rainscreens (an increasing proportion of walls) and the new CWCT document fills the gap in the CEN standards. The BS EN Standards include an optional dynamic water test but it cannot be used with curtain walls of complex geometry or with attachments such as brise soleil (a significant majority of custom walls). The CWCT Standard has retained the dynamic aero engine test, which is the only suitable way for testing any ventilated rainscreen and the only practical way of testing most sealed building envelopes.

Facade watertightness testing: dynamic aero engine method in accordance with CWCT 'Standard for systemised building envelopes', courtesy Wintech.

The Standard is arranged as separate parts covering:

PART 1 – Scope, terminology, testing and classification;
PART 2 – Loads, fixings and movement;
PART 3 – Air, water and wind resistance;
PART 4 – Operable components, additional elements and means of access;
PART 5 – Thermal, moisture and acoustic performance;
PART 6 – Fire performance;
PART 7 – Robustness, durability, tolerances and workmanship;
PART 8 – Testing;
PART 0 – Specifiers' checklist and certification.

There is a complementary document *Standard test methods for building envelopes,* which describes each test in detail. The new Standard gives a framework for specifying performance and gives both mandatory clauses and supplementary advice. The specifiers' checklist is included to assist the decision-making required to produce a specification that is applicable to a particular location, building and use.

For further information please contact Brenda Apted at CWCT (01225 386541; E-mail cwct@bath.ac.uk).

European construction technology platform

The European construction sector is facing a number of serious challenges. These include: catering for the growing realisation of the impact of the sector on society at both central and local government levels; increasing productivity to match increasing global competitiveness in construction; environment legislation; the shortage of skilled construction workers; and the sector's health and safety record. Sustainability within the construction sector remains a major concern for the industry, trade associations and governments across Europe.

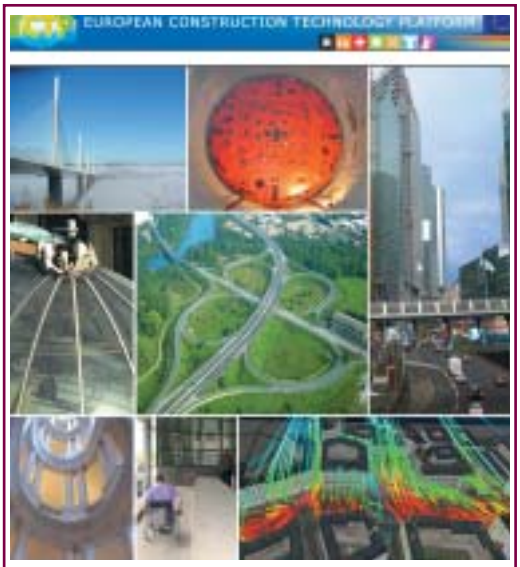
To deal with these issues and to raise the sector's profile and competitiveness, the European Construction Technology Platform (ECTP) was launched at Maastricht in 2004. UK membership includes Taylor Woodrow, Corus, Arup, and the University of Salford.

The ECTP aims to analyse the sector's challenges in terms of society, sustainability and technological development. Research and innovation strategies will be developed to meet these challenges, engaging with and mobilising the wide range of leading skills, expertise and talent available within the industry over the coming decades, in order to meet the needs of society. The ECTP is seen as a key grouping to inform future European research calls through Framework Programme 7 and beyond.

Since its launch a year ago, the ECTP has developed *A vision for a sustainable and competitive construction sector by 2030.* This has been signed and committed to by a number of major stakeholders and Terms of Reference have been agreed. Both documents can be viewed at www.ectp.org.

The ECTP then produced a draft Strategic Research Agenda (SRA) to outline how the Vision 2030 will be achieved. This will be followed by 'roadmaps' and strategies for the initial focus areas. The SRA divided the agenda into three key areas:

- meeting client requirements;
- becoming sustainable;
- transformation of the construction sector.



Does the SRA go far enough to deal with the challenges that the industry will be facing?

The SRA was circulated by DTI to leading organisations in the UK construction sector, Government Departments and Academia, seeking their views on the draft. The latest version of the SRA can be viewed at www.ectp.org/docmentation/ECTP-SRA-Draft-2005-Oct-14.pdf and the UK's response can be viewed at DTI's sector web page. The SRA is still in the draft form. Comments or views on the latest version are invited – please forward them to Ms Loveli Sanayat at the DTi – contact details below.

To create the connection between the UK and European research programmes, a UK National Technology Platform (NTP) has been established. Launched at the ICE in June 2005, the UK Platform is chaired by Keith Clarke, Chief Executive of Atkins and will be supported by Constructing Excellence. The Platform will be addressing the future needs of the built environment, and particularly the challenges of innovation and industry transformation in the construction sector. The platform will have three roles: informing the European Research Agenda, informing the domestic construction research agenda, and stimulating the involvement and uptake of research in the UK.

For further information please contact Loveli Sanayat at DTi (E-mail: loveli.sanayat@dti.gsi.gov.uk; or visit the website: www.dti.gov.uk/construction/research/index.htm).

Beach lowering at seawalls

Work continues at HR Wallingford on improving methods to monitor and predict how beaches are suddenly lowered by the effect of storms and tides. The research is leading to a guide on how to mitigate the toe-scour that sometimes undermines seawalls, and in severe cases is the principal cause of their failure.

Evidence recently collected by HR Wallingford indicates that scour holes generated during storms are often refilled within a few hours as the storm subsides. Toe scour, one of the main forms of beach lowering, can be a short-lived phenomenon that is difficult to monitor. This explains why at low tide, when beaches are surveyed, few scour holes are observed.

The 'Tell Tail' scour monitoring system, which records the onset of scour, the depth of scour reached and in-filling of scour holes, was deployed at two contrasting locations of the English coastline: a 1:2 sloping seawall at Southbourne, near Bournemouth; and a vertical sea wall at Blackpool. The results revealed that during a single tidal cycle, beach levels could drop by up to 1m and then refill quickly so that they would not be noticeable at low tide.

Examining the impact of storm waves on toe scour in front of a vertical sea-wall in one of HR Wallingford's wave-flumes.

Tests using the medium-scale physical models in the Froude Modelling Hall, HR Wallingford's new experimental facility, have been carried out to investigate seawall toe scour and validate these field observations. The results are being used in the development of an improved scour prediction method. The investigations have featured wave action superimposed on tidal variations in water level (see photo) – a unique modelling approach.

The aim of the project is to provide new guidance on the mitigation of scour.

For further information please contact Dr James Sutherland at HR Wallingford (01491 822311; Email: j.sutherland@rhwallingford.co.uk).

Highways Agency new plastic bridge

Drivers on the M6 in Lancashire will soon be passing under the Highways Agency's first plastic road bridge. The new bridge at Mount Pleasant will be much lighter than the old one but is of a similar strength and will need less maintenance. The innovative new plastic material is so light that the deck can be fabricated at the roadside and lifted into place overnight, meaning disruption to road users is kept to a minimum.

The deck of the bridge will use Fibre Reinforced Polymer (FRP) sections joined together, bonded to and supported by steel girders. FRP materials used in construction generally contain carbon, aramid or glass fibres embedded in a resin matrix. The exact properties of FRPs can be manipulated by the choice and content of fibre, providing a range of structural properties with different values for stiffness and strength. In comparative terms, the type of FRP used for the Mount Pleasant Bridge has around 60% the strength of steel, but is much less dense so that sections used for construction are much lighter.

FRPs are claimed to offer a number of advantages over traditional construction materials. They can be up to four times less dense than steel, so they can be more-easily transported and installed in large sections using a mobile crane, saving up to a possible four weeks on traditional construction methods. FRPs are not susceptible to corrosion from water or salt, and are therefore expected to have superior durability. The components are also virtually maintenance free.

The initial cost of using FRP can be up to three times greater than conventional materials, but there are significant cuts in other construction costs, particularly in the reduced duration of traffic management. The Mount Pleasant Bridge is likely to cost 5 to 10% more to construct using FRP. However, these estimates do not take into account the 'cost to the nation' of congestion saved, and the Highways Agency is confident there will also be significant whole-life cost savings. In future, material costs are also expected to lower as manufacturing techniques improve and more-efficient designs are developed.

Overnight construction of the HA's first plastic footbridge over the A30. The HA will soon be constructing its first plastic road bridge.

The M6 bridge was made possible by research carried out at TRL, which enabled the development of a HA design standard for the design of FRP bridges, which forms part of the Design Manual for Roads and Bridges.

FRP bridges will evolve as the technology develops, good practice becomes established and engineers become familiar with its properties and benefits. They are expected to be particularly useful in motorway widening schemes and in bridge rehabilitation across the country, where lengthy road or lane closures would otherwise be required. The construction of the Mount Pleasant Bridge is an important step towards the wider use of FRP to the benefit of bridge owners and road users.

For further information please contact Ben Sadka, Highways Agency, Federated House, London Road, Dorking, RH4 1SZ (01306 878316; E-mail ben.sadka@highways.gsi.gov.uk).

Sustainability Forum: where next for construction?

The UK Government's strategy for sustainable construction is under review by the DTI, with a revised version due to be published later this year. The Sustainability Forum, which, under the chairmanship of Ian Coull, includes representatives from across the UK construction industry and advises the DTI, the Strategic Forum and Constructing Excellence on sustainability issues, welcomes this initiative.

The Sustainability Forum recognises that there is a need for an overarching Framework for implementing sustainable construction:

- to set a very clear agenda for the UK industry, which everyone in and associated with construction will feel able to buy into, and
- to provide a tool for use by the industry to establish and help deliver best practice.

As part of the DTI's consultation process, the Sustainability Forum has held a series of workshops to identify the targets and milestones that different stakeholders involved in and with the construction industry think the strategy should set for the future. The results of these workshops are being absorbed into the DTI review. When that is published, it is anticipated that there will be an opportunity for public comment.

For further details of the Sustainability Forum go to http://www.constructingexcellence.org.uk/resourcecentre/sustainabilityzone/forum/aboutus.jsp

For further information about the Review please contact George Martin, chair of the Framework Sub Group (E-Mail MartinG@bre.co.uk).

Vibration tests on sensitive floors

The SCI has enlarged its measurements database with vibration tests on a number of recently completed steel-framed hospital buildings. The tests were undertaken to determine the damping, frequency and associated mode shapes in situ, as well as identifying the worst-case response for the floor from walking tests. By frequency-weighting the response for human perception, response factors could be evaluated to enable comparisons to be made with published acceptability guidelines.

The table summarizes the measured fundamental (first-mode) frequency and the maximum response factor determined from walking tests. The wide scatter of the natural frequencies reflects the range of structural types tested.

The evaluation of the exposure of humans to vibrations within hospital buildings is covered by BS 6472: 1992 and the NHS document, HTM2045. Both use response factors (sometimes known as a 'multiplying factors') to provide satisfactory limits of vibration magnitude. This is defined as the magnitude of vibration for the environment under consideration divided by the vibration level at the threshold of human perception. Since very sensitive tasks are carried out in operating theatres areas, both guides recommend a response factor of 1.0 for these environments (i.e. the magnitude of vibrations in-service should not exceed the level of human perception).

All floors easily satisfied the response factor requirements for operating theatre environments, out-performing BS6472 and HTM 2045 by a factor of between 2 and 4. Since acceleration response is inversely proportional to mass, these results indicate that significant reductions to the slab thicknesses could have been made in these cases.

Table1 Measured performance within operating theatre areas on steel-framed floors

Floor	Project	Bay size (m)	Overall slab depth (mm)	Beam depth Sec/ Pri (mm)	Fundamental frequency (Hz)	Response Factor measured from walking test
1	Hospital 1 Operating Theatre	11.3 x 7.2	300	625/571 Cellular Beam	6.4	0.25
2	Hospital 2 Operating Theatre	15 x 7.5	175	457 x 152UB/700 Cellular Beam	7.6	0.49
3	Hospital 3 Operating Theatre	8.1 x 8.1	200	533 x 210UB/ 533 x 210UB	8.0	0.21
4	St Richards Hospital, Chichester	5.9 x 5.5	335 + 80 screed	300ASB153/-	14.0	0.29
5	Sunderland Royal Hospital	6.8 x 5.7	337	300ASB185/-	17.0	0.54

The results are currently being considered using FE models together with a software tool developed by the SCI to predict response factor values. It is hoped that these comparisons will lead to improved design equations, to be included in the update to SCI's *Design guide for floor vibrations*, Publication 76.

For Further information please contact Dr Stephen Hicks, Manager Building Engineering at SCI (01344 623345; Fax: 01344 622944; E-mail: s.hicks@steel-sci.com).

Reducing air in pipelines – new design guidance

Air in pipelines can severely affect the flow of water or wastewater for many reasons – reduced flow capacity, flow disruption, reduced efficiency in pumps and turbines, and difficulties in operating filters and screens. Other problems include waterhammer, false flowmeter readings, buoyancy in underwater pipes, corrosion, increased biological activity and blow-back, and accumulation of air trapped at hydraulic jumps that causes vibration and structural damage. A two-year study on preventing air problems in water and wastewater pipelines, led by HR Wallingford, has resulted in the production of a guidance manual.

The study involved experimental and numerical studies, as well as a comprehensive literature review, and was funded by DTI, Thames Water, United Utilities and others. The experimental work was conducted on 150mm diameter pipes set at various slopes, and provided new evidence that a minimum flow velocity (critical velocity) is always required to move air-pockets along downward-sloping pipes. This velocity is strongly dependent on both the pipe slope and the air-pocket volume. New formulae and other design guidance, on air transport and entrainment at hydraulic jumps, have been developed to help in identifying minimum velocities and gradients, and in locating air valves.

The effects of entrapped air on pressure surges due to pipeline flow interruptions have also been studied. Numerical modelling simulations have shown how the presence of single air-pockets can exacerbate transient pressures. This can cause operational problems and engineers need to take measures accordingly in new designs.

The new design manual provides practical information regarding gravity pipes and pumping mains that convey raw or potable water, cooling water, wastewater or stormwater. The improved design guidelines resulting from the studies includes hydraulic removal of air, together with guidance to designers on excluding air at pump inlets,

An air-pocket in a near-horizontal pipe

pipes and chambers, and controlling air using valves and vents. The manual gives an introduction to multiphase flow, and presents its information in a practical way aimed at enabling engineering decisions to be made with increased confidence. It includes contributions from the University of Liverpool and Black & Veatch, and has benefited from consultations with a range of designers, contractors and operators.

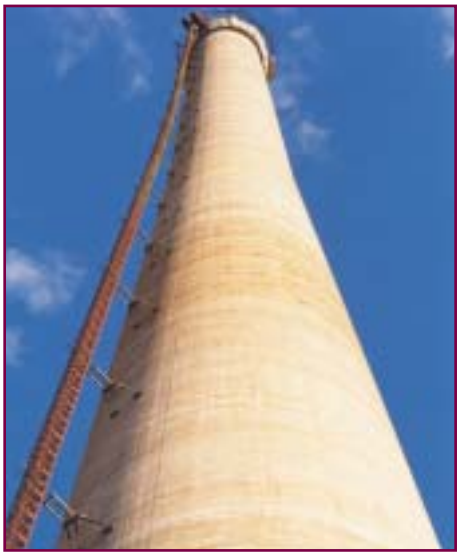
For further information on the Design Manual *Air problems in pipelines* contact the Information Department at HR Wallingford (01491 835381; E-mail publications@hrwallingford.co.uk or see http://www.hrwallingford.co.uk/publications/search.html to purchase the design manual).

For further information on this project including published research reports and access to the manual contents, see the project website at www.hrwallingford.co.uk/projects/air_in_waterpipelines.

Concrete towers enable larger wind turbines

Wind energy is one of the fastest growing UK renewable energy technologies, and construction of wind farms supports an industry that grew by 20% in 2004. The next five years will see implementation of a large programme of offshore and onshore wind farms, contributing significantly towards the UK's renewable energy target of 10% by 2010.

The technology and economics of wind energy continue to improve, bringing with them a demand for higher power outputs. To achieve this, towers must become taller and stronger to accommodate developments in turbine technology and future site constraints.



(Top) *Quick and efficient construction with precast elements* *(Courtesy of The Concrete Society)*
(Above) *In-situ slipformed concrete tower; an alternative to the precast option* *(Courtesy of Bierrum)*

Current specifications predominantly use 1.0 to 2.5MW turbines, requiring 40m blades and 60 to 70m towers. However, several wind farm developers are now introducing new generation 4.5 to 5MW turbines with a rotor length of up to 60m. This calls for a tower of around 100m in height, which must also be stronger and stiffer than those currently specified.

These demanding requirements point the way towards the use of pre-stressed concrete towers. In addition to meeting the structural challenges, a concrete solution also offers benefits such as low maintenance, high durability and good dynamic performance in terms of resonance and damping properties. A long service life ensures that as technology advances, future turbine upgrades can be fully accommodated. Recent studies also show that concrete towers can have a reduced environmental footprint, with levels of embodied CO_2 up to 60% less than competitor materials.

Concrete towers are used across Europe for onshore and offshore installations, and building on this experience, structural engineers Gifford and Partners have recently completed feasibility studies and conceptual designs for the UK. This work was commissioned by The Concrete Centre, from whom a full report is available (see contact details below). A shorter overview can be downloaded from www.concretecentre.com.

For further information please contact Alan Bromage, The Concrete Centre (01276 606800; E-mail abromage@concretecentre.com).

TUNNELLING

British Tunnelling Society's UK tunnel database

As part of it's primary aim to promote excellence in tunneling, the British Tunnelling Society (BTS) launched the UK Tunnel Database on 26 October 2005. Currently, about 200 UK tunnels constructed over the last 30 to 50 years are recorded, and many more projects will be added in the coming months and years. Information is provided across the whole spectrum of the industry from road, rail and metro tunnels to water, sewer and cable tunnels.

Over the past 20 years several advances in methods and equipment have made tunnelling a highly technical and controlled procedure. Tunnels in ground conditions and urban environments that were previously difficult to tackle, such as the Jubilee Line Extension in London, can now be successfully achieved through the use of advanced Tunnel Boring Machines.

The wider use of sprayed concrete tunnel linings have also successfully contributed to the Channel Tunnel Crossover, the Round Hill Tunnel and the Heathrow Terminal 5 projects.

Microtunnelling and directional drilling are also increasingly popular, often preferred to traditional excavation for the installation of new services, because ground surface disruption is minimised.

The BTS recognize that as cities and towns become more and more developed, the opportunities to expand infrastructure at ground level become more limited and the alternative of creating underground space becomes more attractive. Subsequently the need for a comprehensive and up-to-date record of tunnels is significant.

To access the database or to find out more about the British Tunnelling Society please go to www.britishtunnelling.org. For each project the available published information has been collated under: project name and tunnel use; details of the organization involved, the period of construction, tender value and form of Contract; project details including diameters, lengths, geology, method of excavation, ground support, tunnel linings and any information on rates of progress; special feature where relevant; and references for further research.

CTRL: Tunnel 250: May 2002
QA Photos Ltd: courtesy of Rail Link Engineering

For further information on the project please contact Gavin Bowyer at the Institution of Civil Engineers (020 7665 2233; Fax 0207 799 1325; E-mail bts@ice.org.uk).

Contaminated land and groundwater remediation technology transfer from bottle to brownfield

The Environmental Engineering Research Centre (EERC) at Queen's University Belfast (QUB) takes another step forward as a centre of excellence through the appointment of Professor Robert M (Bob) Kalin to a Research Chair co-sponsored by the Royal Academy of Engineering and Keller Ground Engineering. Complementing the RAEng Chair is a strategic investment by QUB in academic staff to meet its decade-old environmental engineering vision of 'Integration of the built environment within the natural environment using science and engineering to meet the principles of social, economic and environmental sustainability'.

Sustainability has become the mantra for our generation and requires that fundamental science and engineering is translated into innovative and practical solutions that meet EU Legislation on water, soil, air and waste, as well as social, economic and environmental targets.

The aim Professor Kalin has set for the RAEng Keller Chair is to enhance the environmental engineering expertise of the 60 EERC QUB researchers working in coastal and fluvial hydraulics, ground engineering, hydrogeology, and contaminated land with a new research focus in environmental forensics, biogeophysics, environmental planning and environmental economics. The target is one unified research vision to meet the goals of sustainable re-development and water resource management, for example in the requirements of the Water Framework Directive. The portfolio of research led by Professor Kalin was recognised in 2005 with two UK Brownfield Briefing Awards for innovative engineering and novel applications of bioremediation.

The EERC recognises the evolving global leadership of the civil engineering profession to meet sustainability goals, and this new initiative will be further leveraged by continued collaboration to develop and implement new environmental engineering technologies worldwide, with the FIRST FARADAY partners, the new DTI KTN in Integrated Pollution Control, and through Professor Kalin's long-standing work with the IAEA's programme on water resource management.

(Top) *Prof. Bob Kalin discussing EERC research with Lord Sainsbury.*
(Above) *Joint Keller / FIRST FARADAY INSTEP soil mixing research project (Prof. Kalin PI) on DNAPL bioremediation.*

Particular research effort during the next 5 years will aim at new technology for:

- integrated ground engineering and remediation treatments;
- leading environmental forensic applications for risk assessment; and
- development of holistic solutions (treatment trains) for environmental liabilities and risk where site boundaries and environmental responsibilities are at odds.

For further information on the Royal Academy of Engineering's Research Schemes please contact Mr. Rob Barrett, (0207 2270500; E-mail robert.barrett@raeng.or.uk). For information on the Environmental Engineering Research Centre please contact Professor Bob Kalin (02890 974018; E-mail r.kalin@qub.ac.uk).

A firm footing for reducing slip-related accidents

Slips, probably not recognised as one of the major safety concerns in many businesses and organisations, are the most common cause of injury in the workplace and account for 37% of all reported major injuries (www.hse.gov.uk/slips). Statistically, slipping is one of the most common risks confronting us all.

The common misconception that slips are inevitable often leads to the risks not being taken seriously. For employers, and owners and managers of walking surfaces, the likelihood of slip-related accidents should be a major concern. The new CDM regulations (as currently written) will require designers to design surfaces for in-use conditions, so they will need to formally assess the risks of slipping to ensure that floors are safe. In addition, dealing with civil action resulting from injury sustained from inadequate surfacing takes up valuable time and money.

Simple, cost-effective measures, better application of risk assessment and management controls, and improved understanding of the causes of slipping can significantly reduce these accidents.

CIRIA's new guidance *Safer surfaces to walk on – reducing the risks of slips* provides advice to clients, designers, managers and others with a responsibility for the provision, specification and maintenance of safe flooring surfaces, and is a single source of clear guidance covering all the issues, from the flooring itself, to activities taking place, visual impacts, wear and the maintenance regime.

Uneven wear on timber stair treads and landings change slip resistance characteristics over time

The guide is designed to provide an authoritative background to 'slips', and to assist those involved in: specifying new floor materials for new and refurbished premises; assessing the suitability of existing floor materials for changes in use; managing the use, environment or maintenance (including the cleaning regime) of flooring surfaces; and investigating slip incidents on flooring surfaces.

The primary source and emphasis for the document has been the considerable quantity of research carried out by the Health and Safety Laboratory (HSL) and the Health and Safety Executive (HSE). CIRIA guidance *Safer surfaces to walk on - reducing the risks of slips* (C652) was officially launched at the RIBA on 26 January 2005 in London.

To find out more about the publication, visit www.ciriabooks.com or contact CIRIA (020 7549 3300; Fax: 020 7253 0523; E-mail: enquiries@ciria.org).

Affordable infrastructure

DFID Department for International Development

Poverty reduction remains the central goal of global development efforts, and increasingly it is acknowledged that this can be achieved and sustained only through a country's carefully determined growth pattern. Governments' development plans need to include policies that are specifically poverty- and inequality-reducing.

The South East Asia Community Access Programme (SEACAP) aims to improve the sustainability and affordability of rural access. This in turn will lead to improved access to economic opportunities, trade, social and health and education services, thereby creating opportunities for pro-poor growth and poverty alleviation.

SEACAP is a poverty-targeted transport initiative facilitating the improvement of sustainable access to rural communities, centred on Vietnam, Cambodia and Laos PDR. The programme is influencing funders to provide low-cost, maintainable, locally owned access to poor people. It is achieving this through adoption of local materials and training local people in evidence-based sustainable techniques. To do this, DFID provides funding for applied research, its dissemination to implementing agencies and support to help them adopt improved techniques.

Problematic rural road access

The combination of twenty-four individual projects with a common objective demonstrates a response to local demand and a comprehensive multi-level approach with high expectation of the results being embedded in national practice. All projects focus on the needs of the poor, maximising participation and creating a locally sustainable infrastructure system. They also seek to maximise work with other partners in both the public and private sectors and at local, regional and international levels within the region.

SEACAP has seen a successful first phase with the completion of four projects and frequent outputs from all contracted projects. Early successes have been the production of two films on rural road access and poverty reduction in Vietnam, development of low-cost surfacing in Cambodia, training via commune handbooks, and setting up knowledge transfer systems including a rural transport workshop in Vietnam. These have attracted the Asian Development Bank to incorporate SEACAP into their programmes and persuaded the World Bank to pledge funds for this approach.

For further information please contact Yogita Maini at DFID (E-mail: y-maini@dfid.gov.uk or Le Minh Nguyet in Vietnam E-mail: seacap@crownagents.com.vn).

Context-aware information delivery for on-site construction operations

CICE

The information-intensive nature of construction projects requires that construction personnel have on-demand access to project information. Current information delivery methods are primarily static and do not take into account people's changing context. Delivering information, especially to site staff, based on their context (such as location, time, existing task, and profile) has the tremendous potential to improve construction productivity.

As part of the WiSeCon project, a conceptual framework and a prototype application have been developed to enable context capture, context-reasoning and discovery, and the integration of resources based on the captured context. The implementation was based on a Pocket-PC platform and made use of a wireless local area network (WiFi) to capture the user context – user identity through the IP address of their mobile device; user location through real time tracking within the WiFi network; and user task through integration with a project management application.

The captured context was then used as a filtering mechanism to query the project database to determine the relevant data for the particular context. Using over-the-air service provisioning technique, relevant information was pushed as icons onto the construction worker's mobile device (see figure). Clicking on a particular icon results in access to context-relevant information on an as-needed basis.

The System Interface

The key benefit of this delivery mechanism is that relevant information is delivered to the right person at the right time based on the interpretation of his or her context. In this way it is possible to minimise distractions for mobile workers, particularly those related to the volume and level of information. In addition, user interaction with the mobile device can be reduced by using context as a filtering mechanism to deliver only context-relevant information to users. This has the potential to increase usability, by decreasing the level of interaction required between the mobile devices and the end-users.

The emergence of complementary technologies such as user profiling, ubiquitous computing, and sensor networking enables the capture of many other context parameters resulting in a wide range of possible applications to enhance existing construction processes.

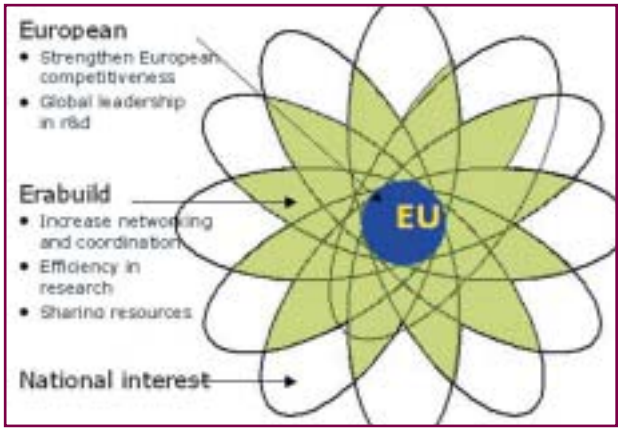
For further information, please contact Professor Chimay Anumba, Director, Centre for Innovative and Collaborative Engineering (01509 22 8549; E-mail c.j.anumba@lboro.ac.uk).

ERABUILD: European research on sustainable construction and operation of buildings

The building and civil engineering industries form a major sector of Europe's economy. Both technical and process improvements are needed throughout the sector to reduce adverse environmental impact and to enhance quality and competitiveness.

Many of the issues that require research and development in order to bring about improvement are common to several countries across Europe. Cooperation between national research funders would improve the cost-effectiveness of addressing these common issues and enable a wider range of topics to be funded by avoiding un-necessary duplication of work.

To encourage such cooperation the European Commission has supported ERABUILD, an ERA-Net project in the field of sustainable construction and operation of buildings. DTI, through the Construction Sector Unit, is one of eight participating countries in the ERABUILD project.



ERABUILDS relationship between national and european research

The objective of the ERA-NET scheme is to step up the co-operation and co-ordination of national research and technology programmes. The scheme will contribute to making a reality of a 'European Research Area', by improving the coherence and co-ordination of research programmes across Europe.

The scheme will also enable national systems to take on tasks collectively that they would not have been able to tackle independently. National systems can benefit from this scheme by exchange of information and good practices, by exchange of strategic ideas concerning national research planning and in terms of quality, in particular quality of evaluation and quality of training. The ERA-NET scheme aims to avoid duplication and to develop complementarities and synergies between different national research programmes.

ERABUILD started in 2004, with the comparison and analysis of existing national research programmes. Currently, pilot activities are under way to enable the project partners to "learn by doing". These activities, which include joint calls for proposals, will allow partners of ERABUILD to gain wider experience and knowledge of what barriers to cooperation exist and how these can be overcome. These two areas of activity will provide the foundations for the planned trans-national research activities, which will be one of the key outputs from the project.

The ERABUILD partners are:

Austria; Denmark; Finland; France; Germany; Netherlands; Sweden; and UK.

Further information on the ERABUILD project and joint calls can be found on the project website www.erabuild.net or contact Ms Loveli Sanayat, Department of Trade and Industry (E-mail: loveli.sanayat@dti.gsi.gov.uk).

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