CIRIA FOCUS ON CIVIL INFRASTRUCTURE EXCELLENCE

Terry Hill CBE, Chairman of Arup and the European Construction Technology Platform discusses the role of innovation

**FCERM**
Collaboration leads to better flood and coastal erosion risk management

**EGP**
Environmental good practice helping improve construction sites

**BIM**
Terry Stocks, Ministry of Justice discusses implementation of BIM and lessons learnt
Comment

At our recent CIRIA event *Innovators of tomorrow’s infrastructure* (19 June, London) Terry Hill CBE, Arup and ECTP Chairman, observed that “infrastructure is the best gift that we can give to society”. This event was part of a series of targeted infrastructure-related initiatives that CIRIA are delivering following the launch of the National Infrastructure Client Leadership Group (see pages 2–5). We continue to help make infrastructure the ‘best gift’ by initiatives such as this, which aim to facilitate cross-sector dialogue and address the challenges faced by industry in delivering new and maintaining existing infrastructure.

John Connaughton, CIRIA Executive Board Chairman and Professor of Sustainable Construction at Reading University (pages 6–9) explores why CIRIA is well placed to meet the growing need within industry for the development and dissemination of robust and authoritative knowledge across a wide spectrum of construction. John believes “the key to this is CIRIA’s strong industry-based membership, its networks of knowledgeable experts across a range of disciplines, and its rigorous peer-review process.”

This cross-sector dialogue and cross-disciplinary collaboration are fundamental to CIRIA’s work and outputs. One great example of this is our work in the largely fragmented area of Flood and Coastal Erosion Risk Management (FCERM). On pages 18–23 CIRIA managers Suzanne Simmons, Lee Kelly and Ruth Hynes examine three research projects and demonstrate how collaborative working practices are benefiting FCERM activity.

According to Peter Johnson, *Construction Division Sustainability Manager* at Kier Group, CIRIA’s Environmental good practice on site guide (C692) is “comprehensive, concise and convenient…[and] is a book that anyone involved in construction should have”. The update of this guide is one of our many collaborative projects underway at any one time (see www.ciria.org/research), and on pages 24–27, we place this project under the spotlight given its importance in providing site-based environmental good practice. Philip Charles, Project Manager, is overseeing the project, to be launched in late 2014.

We cannot talk of industry collaboration without also considering BIM so on pages 28–31 we quiz Terry Stocks, Head of Project Delivery at the Ministry Justice, and lead for the Government Industrial Strategy: Construction 2025 BIM Level 2 programme, to reflect on the learning gained from implementing BIM over a range of projects. Does BIM have the potential to change the industry in the same way that the internet has changed our lives?

I hope that you can get involved in CIRIA’s work and details of projects seeking industry engagement can be found throughout this issue of *Evolution* or by visiting www.ciria.org

We look forward to working with you to develop and deliver industry improvement and a better built environment for all.

Bill Healy
Chief Executive
Contents

2
Infrastructure
CIRIA focus on civil infrastructure excellence

6
Interview
Q & A with John Connaughton

10
Publications

12
The CIRIA Network

14
Infrastructure
Defects in hidden bridge components

18
Water
Collaboration leads to better flood and coastal erosion risk management

24
Sustainability
Improving construction sites through environmental good practice

28
Interview
Terry Stocks, Ministry of Justice discusses BIM – Past, present, future

32
CIRIA training
Update your skills with CIRIA training
CIRIA’s Council and Executive Board are backing new focused activities to consolidate and enhance CIRIA’s activities on civil infrastructure to both raise the profile of this body of knowledge and provide a platform for industry leadership on innovation and good practice.
CIRIA’s new initiatives are to facilitate cross-sector dialogue, addressing challenges faced by industry in delivering new, and maintaining existing, infrastructure. This article outlines these new activities and provides details on how members and the wider industry can come together to accelerate a step change in delivery and management of civil infrastructure.

Strategic investment in civil infrastructure
The Government has highlighted the need for long-term infrastructure investment to ensure that the UK can compete in the global race for growth. Following the formation of Infrastructure UK, the Government now publishes annual updates to its National Infrastructure Plan, most recently in autumn 2013 (HM Treasury, 2013). Together with capital investment for new infrastructure to meet increasing demand, there remains the challenge of maintaining and modernising the existing, ageing and sometimes failing, infrastructure on which we depend.

Aligned with this longer term view of infrastructure investment, the joint Government and industry strategy Construction 2025 (HM Government, 2013) provides a vision for the construction industry in 2025, with targets of:

- 33 per cent reduction in initial cost of construction and associated whole life costs
- a 50 per cent reduction in overall time of delivery from inception to completion (for new build and refurbishment)
- a 50 per cent reduction in greenhouse gas emissions in the built environment
- a significant improvement in exports of products and materials with a 50 per cent reduction in the trade gap between exports and imports.

The Government’s Infrastructure investment pipeline (Infrastructure UK and HM Treasury, 2012) is helping to give a longer term view of infrastructure provision in the UK and helping instil confidence in the construction supply chain so that resources can be effectively targeted and any skills gaps addressed. The recent update to the Industrial Strategy published in May highlighted initiatives such as the HS2 Skills Academy that are contributing to a positive outlook for the UK’s civil infrastructure sector.

Together with this strategic view of the pipeline of major infrastructure projects and related skills requirements, is the need for a co-ordinated effort to ensure that research and innovation is both promoted and harnessed.

CIRIA joining the dots and facilitating leadership
CIRIA is recognised as a hub for thought leadership and facilitating collaboration across the construction supply chain. CIRIA’s established expertise in research management and the production of industry guidance has resulted in a reputation for high quality, authoritative and widely used reports.

However, CIRIA aims to do more. The age of ‘digital design engineering’ and modern methods of construction can bring significant opportunities to modernise the industry and deliver infrastructure faster, at lower cost, and with lower emissions.


It is intended that this new National Infrastructure Client Leadership Group will provide industry leadership to transform good practice in the construction industry, aligned with the themes and vision of Construction 2025. The group identified a number of opportunities for new collaborative activities in 2014, which are now being taken forward with subsequent meetings of the client working group and engagement with the wider supply chain.
The CIRIA National Infrastructure Client Leadership Group brings together some of the largest UK infrastructure providers from the transport and utilities sectors.

The group will build on CIRIA’s extensive track record in infrastructure asset management and infrastructure resilience work and aims to:

- facilitate a cross-sector dialogue between infrastructure clients in order to identify common challenges and opportunities
- identify and develop opportunities to transform current practice aligned with the themes and targets of Construction 2025
- provide a shared platform for engagement in industry leadership activities
- identify needs and opportunities for new infrastructure-focused CIRIA activities.

“This is a great opportunity to use CIRIA to bring together the major client organisations who are delivering capital investment programmes and are facing the same challenges. We all need to achieve better value, deliver quicker with greater certainty and sharing in this forum will assist in all of these areas.”

Doug Waters, Continuous Improvement & Sustainability Leader, Development Team, Gatwick Airport and Chair of National Infrastructure Client Leadership Group

With the new civil infrastructure initiatives, CIRIA aims to build on its reputation for being an honest broker of knowledge and producer of authoritative good practice guidance in civil engineering to:

- build consensus by using CIRIA’s independent status and industry reach
- provide a platform for engagement in industry leadership activities
- broker new innovative collaborations
- identify gaps in knowledge and possible collaborative solutions.

What is planned?

CIRIA will continue to be advised by the National Infrastructure Client Leadership Group to focus its civil infrastructure work. Once consensus on priority topics has been established CIRIA will set up dedicated topic-specific working groups with the participation of the wider supply chain from CIRIA’s Core and Associate membership. This engagement will provide CIRIA members with a unique insight into new and emerging developments as well as the opportunity to influence industry direction and development. Page 12 has details of how to get involved in the first of these working groups on infrastructure data.

Activities relating to smart construction and innovation in infrastructure delivery and management are already being progressed through the CIRIA Network (see page 12-13) with subsequent follow-up activities being planned for later in the year:

In order to create the step change in innovation in civil infrastructure required to meet the challenges laid out in the Industrial Strategy, CIRIA has created its ‘Five steps to accelerate innovation and research in civil infrastructure’:

1. Harnessing client leadership.
2. Identifying priority focus areas.
3. Engaging supply chain.
4. Developing consensus.
5. Showcasing, sharing and embedding innovation and knowledge.

Infrastructure industry signposts
To help navigate the breadth of activity underway in UK infrastructure, CIRIA has compiled a list of useful links to civil infrastructure related resources, initiatives, papers, plans and organisations.

Visit the Resources section of the new dedicated website:
www.civilinfrastructure.org

How to get involved
CIRIA’s civil infrastructure initiative is available exclusively to Core and Associate members. If you are not yet a CIRIA member, find out more about the benefits of joining by visiting:
www.ciria.org/membership

There are several ways that CIRIA Core and Associate members can get involved:

- Attend the 2014 series of civil infrastructure events
  Bringing together key individuals working within the civil infrastructure sector, CIRIA will be holding a series of activities including round-table meetings, seminars and conferences (see page 13 to save the date for the next event).

- Sponsor a civil infrastructure event
  A limited number of sponsorship opportunities are available. These represent a unique chance for visionary organisations to raise their profile within a high quality conference programme and to access, connect with and influence senior clients, construction professionals and decision makers.

- Get involved in CIRIA research
  CIRIA’s good practice guidance covers both the principles of sustainable whole-life infrastructure asset design and management, and technical guidance on the management of key assets such as bridges, tunnels, embankments, dams, culverts and reservoirs.

- National Infrastructure Client Leadership Group
  The group will build on CIRIA’s extensive track record in infrastructure asset management and infrastructure resilience work. Client organisations who wish to find out more should contact Ben Kidd, CIRIA Network Manager, at: enquiries@ciria.org

For up-to-date information on CIRIA’s civil infrastructure themed activities visit:
www.civilinfrastructure.org
Get involved in CIRIA projects and proposals

Infrastructure data – signposting of good practice in capture, management and analysis (P2952)
This new initiative will signpost emerging good practice in the capture, management and analysis of construction and other related data.

Update of CIRIA piling guides (P2908)
Two of the Piling Group reports which, although still relevant, are in need of being updated as significant advances have been made.

Checking and approving advanced numerical modelling (P2895)
CIRIA is planning to develop guidelines in numerical modelling in geotechnical engineering to help alleviate some of the issues.

Risk assessment for contamination in controlled water (P2930)
This project will provide practical guidance on risk assessment and management contaminated controlled water.

Rock slope netting design, installation and maintenance (P2938)
This guide will provide best practice to ensure the consistency of the installation and maintenance of rock slope netting.

Starting on site (P2662)
This project will produce a guide covering all the key stages in the planning and set-up of a construction site.

Deterioration and degradation modelling of infrastructure assets (P2730)
CIRIA is undertaking scoping of a proposed project on deterioration and degradation modelling of infrastructure assets.

Defects in hidden bridge components (P2905)
This guide will provide best practise guidance on the inspection and maintenance of the hidden components.

Risk assessment for contamination in ground water (P2930)
This project will provide practical guidance on risk assessment and management contaminated controlled water in light of the recent changes of the statutory guidance in England and Wales and other recent regulations in UK and EU.

Abandoned mine workings manual (RP940)
This project will develop a new publication to replace SP32 Construction over abandoned mine workings, published by CIRIA in 1984.

Tower crane stability – update (RP999)
The update of the 2006 Tower Crane Stability guide (C654) will demonstrate the safe design of tower cranes in response to changes since 2006. The guide will also highlight the potential for catastrophic events and reference the need for appropriate risk management activity, in light of a series of relevant accidents to tower cranes.

To find out more and to get involved contact CIRIA on tel: +44 (0) 20 7549 3300 or email: enquiries@ciria.org

References


Q&A with John Connaughton
When did you first become aware of CIRIA?

My most significant recollection is winning a CIRIA research contract to produce a guide to the procurement of construction professional services, over 20 years ago. (I think the guide – Value by competition, CIRIA SP117, was published in 1996). I was then an Associate at Davis Langdon and over the years we became more involved – not only as researchers, but also as sponsors and users – in a range of CIRIA initiatives and publications, and came to rely a great deal on CIRIA’s good practice guidance.

Having moved from industry to academia, do you view CIRIA’s role any differently?

I probably value it more. Here at the University of Reading we put a lot of value on what academics call ‘co-production’ research, which is research produced jointly and collaboratively by academic and industrial partners. There is an ongoing debate in academe about this, but we firmly believe that good research can produce new knowledge to enhance industry practice as well as developing the science base of the relevant discipline. CIRIA has always had a very rigorous, peer-reviewed process of getting research into practice (I experienced it first hand as a research contractor on a number of occasions!), which fits this model very well, so I’m a great supporter of CIRIA’s approach.

Innovation – scientific breakthrough, life-long learning, challenging orthodoxy or all three?

Probably an over-used term, if I’m honest! In the end, I think that the ‘novelty’ part of innovation is not some kind of test to be applied in an absolute way. Ideas and applications need not be entirely new to be innovative; their novelty is more in the eyes of whoever is developing or applying them. Of course, innovation can signify great (or even modest) scientific breakthrough, but it can also come from the application of existing knowledge in new areas, as well as the transfer of knowledge from the research/science base into practice. And while we all love the idea of the serendipitous discovery, I think that research-based innovation – where new ideas go through a structured process of development, testing and validation – has an awful lot to offer our industry, which has to live with its ‘innovative’ mistakes for longer than many.
How has the balance between knowledge and knowing how to find information changed over the past 20 years?

The importance of being able to distinguish between data, information and knowledge has probably never been so critical than in our current age of (mis)information overload. It is easy to be disdainful of those who believe they can perform robust self-diagnoses of the most complex medical conditions on the basis of a lunchtime internet search. But there is no doubt that the wide availability and easy accessibility of information is changing some of our deeply held beliefs about the nature of scientific and professional knowledge, and who generates, develops, manages and maintains it. The key for me is ‘authority’. Who publishes this knowledge? On what (evidential) basis was it developed? Was it subject to a rigorous peer review process?

Has this made organisations like CIRIA less, or more important?

My answer to the previous question leads directly to my answer to this one. I feel there is a growing desire for robust, authoritative, peer-reviewed knowledge across a broad spectrum of construction problems and challenges that organisations like CIRIA can help satisfy. The key to this is CIRIA’s strong industry-based membership, its networks of knowledgeable experts across a range of disciplines, and its rigorous peer-review process.

At a recent meeting you chaired, several senior CIRIA members commented that the construction research agenda is fragmented. Having reflected on this, how can CIRIA help?

CIRIA can help in a number of ways, but fundamentally by providing leadership, on behalf of its members, for developing and taking forward the national construction research agenda. All my discussions with CIRIA members (and non members) over the past year or so leave me in no doubt that CIRIA is a highly respected, well-connected, authoritative association that occupies a fairly unique place in our industry. My view is that it can use this status to be highly influential in helping to shape a new agenda for construction research that not only responds to social and policy needs, but also reflects the significant contribution that industry can make to the development of knowledge that will benefit all of us.
Moving towards a national construction research strategy. Key points from a CIRIA member meeting, May 2014

At a time of potential growth in the construction sector, it is important that the UK industry is supported by a strong and focused research capability.

The UK Government has been investing significant sums in research, which has also been supported by industry. However, there was felt to be scope for improvement not only in the dissemination and uptake of outputs but also in the shaping of such programmes to best meet industry needs.

CIRIA’s role has been focused on the production of guidance on specific operational or technical problems identified in consultation with its members and wider industry stakeholders. However, its work brings it into contact with relevant government departments, asset owners and university research consortia.

While CIRIA should continue to focus on the production of guidance, it is felt that it should develop a wider role, working with its members and wider industry stakeholders in seeking to define research needs at an industry level.

It is recognised that CIRIA’s independence provide it with a unique position to undertake this role as ‘curator’ of an industry research agenda, albeit with the actual programmes and activities being funded, co-ordinated and undertaken by a wide range of bodies.

It is agreed that CIRIA should consult with its wider membership and develop a delivery plan accordingly.
CIRIA publications

Published 2014

Transport infrastructure drainage: condition appraisal and remedial treatment (C714)

This publication provides guidelines on good practice for the condition appraisal, maintenance and remedial treatment of transportation infrastructure drainage, as well as practical advice.

Price: £70 (£35)
www.ciria.org/c714

Risk assessment for asbestos found on contaminated sites (C733)

The term ‘asbestos’ relates to several fibrous minerals regulated under UK law that are known to cause serious health effects when inhaled. This guide identifies several key areas of uncertainty in current understanding, with recommendations future research and policymaking in order to address them.

Price: £130 (£65)
ISBN: 978-0-86017-737-1
www.ciria.org/c733

Web guides

Managing urban flooding from heavy rainfall – encouraging the uptake of designing for exceedance (RP991)

In 2006, CIRIA published C635, which highlighted how designing for exceedance enabled better management of local flood risk. In 2013, through CIRIA Research Project RP991, the reasons why uptake of designing for exceedance has been slow were investigated and a number of resources have been developed to help encourage designing for exceedance.

Free to download from:
www.ciria.org/c738

Coming soon

Good practice on verification of protection and testing of barriers for hazardous ground gases (C735)

The first guidance on the installation of gas protection systems for buildings was published in the early 1990s. Since then the frequency of installation and variety of systems has increased considerably. This publication provides good practice guidance for the designer, installer, verifier and regulator on the verification and integrity testing of gas protection systems.

Price: £120 (£60)
www.ciria.org/c735

Lessons from incidents at dams and reservoirs – an engineering guide (SP167)

The history of dams and their misfortunes is essential reading for those responsible for the safety of reservoirs. The focus of the guide is on failures and incidents at dams in Britain that have occurred between 1800 and 2012.

Price: £120 (£60)
ISBN: 978-0-86017-735-7
www.ciria.org/sp167

Design for movement in buildings (C734)

CIRIA technical note TN107 was published in 1981, and since then there have been many changes in the industry. This publication aims to provide guidance for the concept, explaining the importance of considering movement early on in the design process. It is aimed at all designers of buildings, mainly in the UK – although the principles are universal.

Price: £50 (£25)
ISBN: 978-0-86017-738-8
www.ciria.org/c734

Forthcoming titles for 2014

- Modular cellular drainage structures (C737)
- Application of Eurocode 7 to the design of flood embankments (RP1000)
- Abandoned mine workings manual (RP940)
- Early-age thermal crack control in concrete (update of C660) (RP722)
- Communicating local flood risk management (RP975)

How to order
Visit: www.ciria.org/books
Tel: +44 (0) 20 7549 3300
Email: enquiries@ciria.org
SIGN UP FOR
THE BIG CHALLENGE

The BIG Challenge to ‘Do One Thing’ invites you to add one new biodiversity enhancement to your construction site, development or existing building.

Launched in October 2013 by CIRIA’s Biodiversity Interest Group (BIG), over 30 organisations have signed up already to highlight and showcase their new biodiversity enhancements.

Anyone signing up for the BIG Challenge will have an opportunity to enter the inaugural BIG Challenge Awards taking place on 14 October at Royal Botanical Gardens, Kew, Richmond, Surrey. Deadline for entries is 25 August 2014.

What are you waiting for?
Sign up for the BIG Challenge today!

For more information visit www.bigchallenge.info or tel 020 7549 3300 or email enquiries@ciria.org
Through the Network, CIRIA has cemented its reputation as being at the forefront of thought leadership in the construction industry by promoting innovative practice and its collaborative, cross-sector and cross-disciplinary approach to facilitating knowledge sharing. Over the last 12 months the CIRIA Network has held over 35 events attended by almost 2000 delegates. CIRIA members are increasingly realising the benefits and competitive advantage to be gained in being part of CIRIA’s work.

What is the CIRIA Network?
The CIRIA Network responds to changing industry needs, tackles legislative issues, helps to shape the agenda, encourages thought leadership and disseminates good practice. The CIRIA network has four main functions:

1. Community building – promoting the common interests and values of members.
2. Communicating – sharing knowledge and experiences.
3. Learning and facilitating – helping members learn and develop.
4. Making connections – bringing together people from different disciplines and sectors to help them develop their business.

Ruth Hynes, who joined CIRIA as Assistant Network manager in January, has overseen a busy start to the year. Arriving from RIBA where she worked on their CPD Providers Network in the assessment, promotion and communication of technical seminars. Ruth is excited about helping to grow the CIRIA Network. “In my first three months at CIRIA, I’ve met some of the industry’s most influential people and helped to deliver a range of different knowledge sharing activities. I’m looking forward to playing an important role in facilitating collaboration, knowledge sharing and consensus building for the industry”.

Ruth Hynes, Assistant Network Manager

The start of 2014 saw a flurry of activity with the CIRIA Network, starting with a launch event in January for CIRIA’s latest publication Transport infrastructure drainage: condition appraisal and remedial treatment (C714), closely followed by two consensus-building workshops in February on River weirs (RP1009) and Starting on site (P2662).

March was equally busy, with well received thought leadership events on Collaborative working (in partnership with the European Construction Institute) and Smart construction, helping to shape CIRIA’s portfolio of existing and planned research projects. The Biodiversity Interest Group hosted an event on the hotly debated topic of biodiversity offsetting and there was still time in March for the Network to fit in a site visit to learn about Lean processes from the manufacturing sector at the Jaguar LandRover production plant in Halewood, Liverpool.

In April two events were held that looked at both engineering history and ahead to the future. An event on the inspection and maintenance of seaside piers evoked images of a ‘golden age’ in Victorian engineering. Meanwhile a joint event with the Construction Industry Council (CIC) 2050 Group, timed to coincide with Green Sky Thinking Week, involved a number of younger professionals including those from the 2050 Group, and explored the challenges that the industry could face looking ahead to 2050. For more information go to: http://cic.org.uk/networks-and-committees/2050group.php

Smart construction and intelligent use of data for infrastructure asset management

The CIRIA Network has hosted a number of events on the topic of Building Information Modelling (BIM) over recent years. An event on the 13 March took this topic one step further by bringing together broader aspects of ‘big data’ applications to infrastructure including satellite applications, remote sensing and data analytics. The topic has been identified as being of common interest across members of the new CIRIA National Infrastructure Client Leadership Group (see page 2-5) and CIRIA has now set up a new proposal to take explore this topic (P2952). A working group will be set up involving clients plus the wider supply chain and expressions of interest are sought from CIRIA’s Core and Associate members to participate in a round-table meeting planned to take place in summer 2014. Expressions of interest should be sent to enquiries@ciria.org with the subject ‘P2952 Infrastructure data Working Group’.
A common theme in all of the CIRIA Network’s activities in 2014 has been the challenges laid out in the Government’s Industrial Strategy: Construction 2025, with its ‘vision’ for the UK industry leading the world by 2025. Working collaboratively with the Construction Leadership Council and associated groups such as Infrastructure UK and Green Construction Board, the CIRIA Network will be hosting a number of thought leadership events to highlight the challenges from Construction 2025. On 19 June, CIRIA hosted an event at the Barbican entitled Innovators of tomorrow’s infrastructure that brought together many of the themes already discussed in 2014, showcasing new and emerging innovation and providing a valuable networking opportunity for CIRIA’s wider membership.

Presentations highlighting innovation in emerging areas of intelligent asset management, immersive visualisation technology and off site construction and a challenging keynote address from Terry Hill CBE, Arup, emphasised that “game changing innovation and substantial R&D investment is required to provide resilient infrastructure for future generations, as we continue to rely on an aging infrastructure stock, much of it dating from the Victorian era.”

Summarising the evening, Prof John Connaughton, chair, reiterated Terry’s message “infrastructure is the best gift that we can give to society”.

For the second half of 2014, major events are planned on infrastructure resilience to continue the growth of CIRIA’s new civil infrastructure theme activities (see page 2-5), and an awards ceremony in Kew Gardens to showcase the Biodiversity Interest Group’s “Do one thing” challenge (the BIG Challenge), which has been going from strength to strength with more than 30 entries to date.

Resources from all CIRIA Network activities are available to all CIRIA Core, Associate and Network members at: www.ciria.org. New resources recently added include webinar recordings from authors of CIRIA’s Lean guides, authors of chapters of the International Levee Handbook, and additional case study examples of infrastructure innovation from Costain who kindly sponsored the event on 19 June.

The CIRIA Network continues to be a valuable vehicle for engagement with CIRIA’s members on thought leadership, consensus building and industry improvement. On behalf of the CIRIA team, we would like to extend a big thank you to all those who have and who continue to work with us in delivering the CIRIA Network’s activities. We would invite members to participate in helping CIRIA shape the agenda for the industry in 2015 – suggestions for topics for future events, knowledge sharing activities or site visits should be sent to: ruth.hynes@ciria.org

Save the date: Infrastructure risk and resilience to natural hazards, 18 September 2014

Understanding and managing risks from natural hazards to infrastructure is a key priority for both infrastructure operators and the UK Government. The construction industry and civil engineering community have a key role to play in both the design of resilient infrastructure and returning infrastructure assets and networks to normal service following major events. This event will explore the context of risk to critical infrastructure and approaches by infrastructure asset owners to assess vulnerabilities, improve resilience and reinstate infrastructure following major events.
Failure of just a single element of infrastructure can have far reaching and severe impacts on businesses and communities.

This is easily demonstrated by the examples of a burst pipe cutting off a water supply, weekend engineering and maintenance works on the railway networks or the closure of a bridge structure. One example is the Hammersmith flyover/bridge, which was closed during Christmas 2011 due to safety concerns over multiple defective tensioning cables that had been hidden from view and subject to high load/use. All of this, combined with a maintenance regime different to that which the designer had planned for, as well as on a structure as unique and individual as the city that it serves, led to an emergency closure at a point when it was most needed – during the Christmas getaway. This led to many traffic jams, missed flights and frustrated people looking to escape for the festive break.

It is estimated that there are in excess of 10,000 major bridge structures in the UK, each with their own set of potential defects. There are many factors that can lead to bridge structures to fail, either through multiple defects of components, hidden or otherwise.
As each component within a bridge will contribute to how it works as a whole structure, it may only be a single element that fails, or the same failure may occur with similar elements a number of times. This can contribute to the failure, potential failure or to a point where a bridge structure becomes inherently unsafe and must be withdrawn from service as it is no longer fit for purpose.

The increased effects of climate change combined with exceptional weather events (such as that of extreme cold, heat and flooding) have caused situations where bridge structures have been placed under unusual, unforeseeable or exceptional load cases. Increases in atmospheric pollution and in road traffic and loadings have exacerbated the effects of climate change, resulting in consequential decreases in the durability of bridges. This has led to major maintenance or remedial works, where the investigation of hidden components of bridge structures to determine their condition, has become essential.

Fortunately where some potential threats have occurred in the past, such as reductions in spending and maintenance budgets, over recent years an increase in risk management and effective prioritisation for maintenance of structures have helped budgets to go further. Also, effective cost management and project management have led to an increase in formalised procedures such as lessons learned now being recorded on most significant construction and infrastructure asset management projects within the UK and beyond.

These formalised procedures make it easier to bring together asset owners, contractors, consultants and the wider supply chain to share good practice and move the industry forward. This is one of the key overall benefits to industry that a new CIRIA project *Defects in hidden bridge components* is looking to deliver.

While challenges lie within the assessment of the condition of bridge structures, there has been no shortage of evolving technologies and strategies that are addressing this issue. Many areas of technology have also had an effect on the detection of defects, and subsequent maintenance of bridge structures. Remote monitoring via wireless broadband has now led to new possibilities for monitoring defects, either through visual inspection, Google Maps/Street View and even unmanned aerial vehicles.

There has been a call to produce guidance on defects in hidden bridge components, which has come primarily from bridge owners and from those within the bridge stakeholder community including specialist consultants and contractors. It is recognised that the stock of bridges in the UK is extensive using materials including masonry, iron, steel and reinforced concrete, which are all designed and built with materials appropriate for their time and maintained using a variety of traditional and contemporary technologies and methodologies. However, current good practice might be beneficial, and a review of real project experiences will provide salient lessons for bridge asset managers.

The guide will allow for better and more efficient determination of the integrity of components and whole structures, avoiding severe deterioration or failure of components irrespective of bridge age or use.

New CIRIA guidance is proposed on understanding the potential for defects in hidden bridge components. This will include the identification, inspection, investigation, repair, replacement, maintenance, monitoring and management of such defects in the context of whole structure integrity. This is a particularly difficult aspect of bridge infrastructure asset management, which all bridge owners need to understand. Bridge owners need to know, with confidence, the condition of their structures. For the project CIRIA will engage closely with industry to share knowledge and build upon experience gained to date. The key objective of the project will be to produce an industry standard reference document that has the acceptability and approval of the UK bridge stakeholder community.

There have been several major pieces of work, research and studies relating to significant failure types, as well as specific structure types. These have included failures to post tensioned road structures, steel railway structures and the guidance will reference rather than repeat these. The result will be an all-encompassing ‘go to’ reference guide, which will collect and present all of the various work that has been undertaken so far, and fill in the gaps of where guidance does not yet exist.
Effective cost management and project management have led to an increase in formalised procedures such as lessons learned.”

The timing of this project and subsequent publication is considered appropriate by industry. Reductions in budgets, and increased pressure for efficiencies combined with emerging technologies have resulted in the need for this project and its published guidance. And, thanks to generous support from those in the bridge stakeholder community, this project and the new guide is now possible.

The project will start soon and it is expected that the published guide will be available by spring 2016.

Get involved
It is not too late to get involved, either through contributing expertise or funding or simply by helping to shape the subject matter for contents.
For more information contact Victor Zasadzki, CIRIA, on: victor.zasadzki@ciria.org or tel: 020 7549 3300 or visit: www.ciria.org/p2905
Lee Kelly, Suzanne Simmons and Ruth Hynes, CIRIA, discuss three CIRIA research projects that show how collaborative working environments are benefitting flood and coastal risk management activity.

### Introduction

Enabling and facilitating cross-disciplinary collaboration in the largely fragmented area of Flood and Coastal Erosion Risk Management (FCERM) has been a key aspect of CIRIA and its partners’ work in recent years. Three CIRIA research projects aim to show how the establishment of collaborative working environments can help to improve infrastructural flood resilience at local, national and international levels. These projects aim to demonstrate the efforts of CIRIA and its partners in helping individuals, communities and cross-sector industries to become better equipped in dealing with flood-related issues in the future.

### Context

Before the publication of the Pitt Review following the June 2007 floods (Cabinet Office, 2008), there already was a recognition at government agency, professional and administrative levels for the need to collaborate more effectively on infrastructural flood resilience. The Pitt Review focused on places, people and communication at the centre of improved flood risk management and highlighted the need for collaboration and co-operation among the wide variety of stakeholders. The extreme weather and subsequent flooding events of recent years have continued to affect communities, the built environment and national infrastructure. While more effective planning may have led to protection in some areas that were prone to flooding, fragmentation in communication, administrative boundaries and clarity over responsibilities across sectors was still a concern. The improvements that emerged from the Pitt Review recommendations have not been universal. Industry acknowledges that the Stern Review published in 2006 initiated much good work that was further complemented by the Pitt Review (Cabinet Office, 2006). John Dora, chair of CIRIA’s guide C688 published in 2010, believes it was these two reports that “started changes in how government sees infrastructure interdependencies and resilience.”

Widespread commitment from professional organisations to collaborate on flood related issues has appeared through emerging forums such as the Infrastructure Operators Adaptation Forum and the Inter-Institutional Flood Risk Management Group. Although these forums deal with different aspects of flood risk, and include different organisations doing different things, there is a risk that they may also become fragmented, despite the commonality of their cause, if cross-sector industries are not aware of or fully engaged in their objectives.

John questions how best industry can collate and disseminate the vast “world of knowledge seeking and knowledge transfer”. How can industry avoid fragmentation of the key messages that need to be addressed collectively on the subjects of multi-level collaboration, cross boundary co-operation, and transparency on skills and data sharing?
Local example – Designing for exceedance in urban drainage – good practice (C635) / Managing urban flooding from heavy rainfall – encouraging the uptake of designing for exceedance (RP991)

CIRIA Designing for exceedance in urban drainage – good practice (C635) was published one year before the significant 2007 flooding that sparked high profile enquiries and recommendations (Digman et al., 2006). The simple principles and practical common sense supported in the guide may well have become sidelined – a victim of bad timing, and being ‘ahead of the game’, rather than poor advice. Chris Digman, lead author of the guide, found anecdotal evidence suggesting that although as a concept the ideas in C635 were accepted, they were rarely implemented. He remembers how the 2007 floods “empowered and encouraged practitioners and decision makers,” and how C635 supported practitioners by providing information that validates the designing for exceedance (DfE) approach.

Eight years on from C635, Chris considers that the timing for a review was potentially right as now there is a “greater understanding of managing surface water … and some of the foundations in place through the Flood and Water Management Act (FWMA) 2010”. The move from ‘outputs to outcomes’ provides opportunities for partnerships and integrated solutions that can lead to potentially greater acceptance of DfE as a solution. In 2013/2014 CIRIA assessed how C635 had been received, testing how far designing for exceedance had entered into the landscape of flood risk management in the UK since 2006. As a consequence CIRIA research project Managing urban flooding from heavy rainfall – encouraging the uptake of designing for exceedance RP991 investigated the uptake of designing for exceedance, with outputs (C738a, b and c) published in early 2014 (Digman et al., 2014). Visit www.ciria.org/c738 for details

Collaboration

Investigations into how DfE had been taken up revealed the C738 authors’ suspicions were correct. About one-third of the target audience were using a widely recognised, cost-effective and common sense approach to flood risk management. A lack of uptake in the UK was further revealed following a search of good case studies highlighting the issues showed that only a few were worthy of referencing in the project. One scheme that was highlighted as an exemplar of local collaboration, was the work carried out in St Blazey in Cornwall after the town experienced floods in 2010. It sparked the formation of the Par and St Blazey Community Flood Group that today has over 80 flood wardens. Their breadth of local and historical knowledge informed the creation of a community flood plan in 2011, owned and maintained by the group in conjunction with their local town and parish councils.

Charles Richards, chair of Par and St Blazey Community Flood Group, sees the risk of flooding as a reality faced by many communities, including his own, having experienced it first-hand. He describes flooding as “a problem that can have profound and lasting impacts upon people, relationships, households, communities, businesses and local economies, all too often presenting a risk to life”. He believes that there is a “need to plan for, and respond to, exceedance events and this needs to be done as efficiently as possible".

Charles saw a key challenge as being the development of a solution that could be supported by residents. He remembers “the final design was the result of iterative development through consultation with residents”. By working closely with local people, a solution-focused approach was adopted and fears over highway safety and maintenance to date allayed.

The impact

Charles states that “in very simple terms … the project works …. In the three years since the solution has been introduced, there has not been a single instance where water has reached the main road. Water has broken out of the channel (further up the catchment but has been successfully re-directed back into the channel”.

Figure 2 Flooding of rail tracks at Adlestrop (River Evenlode), 21 July 2007 (courtesy Network Rail)
A combination of technical expertise, awareness of risks, their mitigation, pragmatism and critically, community endorsement combined to create an exemplar at local level for FCERM that demonstrates an approach that CIRIA hope to persuade wider uptake within the professions and beyond. By collaborating with the authors of C738, the sharing of good practice has been disseminated to a range of interest groups in the form of recommendations, identified success factors and lessons learnt in delivery of DfE projects.

The result
Out of 10 identified lessons learnt from RP991, a key success factor related to collaboration within and between organisations, highlighting the statutory duty of flood risk management authorities to work together through early engagement. In addition the need to engage widely with a range of disciplines and stakeholders to facilitate knowledge sharing is endorsed. Charles Richards adds that industry should continue to learn by being aware that “many of the solutions we introduce are in direct response to observed flood events. There is a need for us all to continue to look critically at environments, continue to model, and consider what problems could arise in the future”.

National example – Flood resilience and resistance for critical infrastructure (C688)
Following the summer flood events in 2007 and the subsequent Pitt Review, the importance of critical infrastructure and potential interdependencies, and the need for cross-sector dialogue to better understand system interdependencies was highlighted.

John Dora emphasised that the development of the cross-sectoral national collaborative project, which produced CIRIA C688, was mostly driven by these, with a collective recognition from cross-sector infrastructure owners and operators to develop an approach that could lessen the risks posed to their assets from extreme flooding. This highlighted the importance of identifying critical infrastructure, potential interdependencies and preventing cascade failures.

John notes that Flood resilience and resistance for critical infrastructure (C688) was drafted at a time “when impacts and cross-sectoral interdependency issues were being recognised at government and the scientific level”. He believed “there had been a growing awareness, amongst asset management and infrastructure operators, that whilst risk-based approaches to asset and infrastructure management were throwing up ways of prioritising maintenance and renewal of assets, practitioners were conscious that some elements of infrastructure were more critical to service delivery than others”. The 2007 floods demonstrated this to great effect when the Tewkesbury water treatment works at Mythe were “rendered inoperative” and the key electricity substation at Walham was “very close to inundation”. Hull City’s flooding event resulted in 8000-plus flood damaged properties and ongoing social and economic consequences for Hull and the wider regions. The City’s woes were further compounded when many services, affecting schools and local businesses, were out of commission for weeks.

Collaboration across differing systems
Although a variety of organisations were engaged in the project John noted that many had “disparate modus operandi, business models and expertise”, ranging from the regulators, to the operators, scientists, and consultants. These were organisations with responsibility for differing scopes and scales of operations, some managing vast amounts of fixed infrastructure with long asset lives, such as transport infrastructure, or alternatively from utilities and telecommunication sectors, that have shorter asset life cycles.
A practical approach to collaboration

John recalls a consultation workshop session where a hypothetical city was modelled, and flooded, and various types of infrastructure were ‘knocked out’ over the course of the workshop, with the consequences deliberated and debated. He said that “it was through this task that everyone involved on the project got to know each other and respect each other’s drivers and needs”.

The impact

An Infrastructure Operators’ Adaptation Forum was set up after the project to look at the wider issues. It was thought that groups like these would continue to enable cross-sectoral organisations to collaborative on national level interest areas. Ben Kidd, CIRIA, conveyed that although the networks and collaborations are being created and maintained “more could still be done to make the necessary linkages with operational and business continuity aspects of national infrastructure, linking with groups such as the Cabinet Office-led Infrastructure Security and Resilience Industry Forum.”

CIRIA guide Flood resilience and resistance for critical infrastructure (C688) provides an overview of the regulatory framework, outlines the main issues in this area and includes business continuity management processes, whole life asset management plans and climate change adaptation strategies.

For more information go to: www.ciria.org/c688

CIRIA have supported a number of academic projects related to infrastructure resilience that have started since C688 guidance was published (see ARCC Change Network website). It is now investigating ways in which to bring the community together once again to develop new good practice, particularly related to recovery of infrastructure following floods after major events in winter 2013/2014 in which critical infrastructure was once again impacted heavily.

CIRIA proposal: infrastructure recovery following floods

CIRIA aims to develop new good practice technical guidance on the recovery of critical infrastructure following major flood events, building on the cross-sector knowledge sharing established in the development of CIRIA C688 guidance. To find out more visit: www.ciria.org/p2972

International example – International Levee Handbook (C731)

Leaves in the USA, known as flood embankments in the UK or dikes in the Netherlands, are a vital part of modern worldwide flood risk management. Their principal function is to provide protection against fluvial and coastal flood events along coasts, rivers and artificial waterways.

Figure 4 Flooding in St Blazey with water from the Prideaux stream (courtesy Francis Mayulewicz, Environment Agency)
In 2008 it was acknowledged by the international community of flood risk managers and engineers that there was a lack of good internationally agreed guidance on the design and management of levees. Good practice was not greatly shared between nations, and so optimum benefits in terms of efficiency and effectiveness of assessment, design, construction and management of levees were not achieved in all cases. It was considered that had the situation continued with fragmented and inconsistent approaches, there would be a lack of co-ordination between engineering-related disciplines and a failure to adopt obvious improvements in management and design practice.

Collaboration across differing countries

To resolve this issue, six leading nations came together to create a single reference source, The International Levee Handbook (ILH) (CIRIA, Ministry of Ecology, USACE, 2013). Germany, France, Ireland, the Netherlands, the UK and the USA worked collaboratively, over five years, on CIRIA’s most ambitious research project to date. A core team of experts and practitioners, from the full range of relevant disciplines drawn from all partner countries, were selected to author the handbook. Assembling a high-calibre team enabled the group to comprehensively encapsulate the vast wealth of knowledge and experiences attributed to levee evaluation, design, construction and maintenance. However, with this were a unique set of challenges.

It was recognised that there would be challenges in co-ordinating work between different nationalities, so to overcome this each chapter team appointed a lead who was responsible for co-ordinating and drafting their own chapter. In addition, the Technical Editorial Team (TET) implemented a PIME (principles, issues, methods and examples) theory mid-way through the project to ensure consistency. This was significant in allowing teams to identify how the content of their chapter should be drafted in-line with the other chapters.

The result

This collective effort, specifically in the field of geotechnical engineering, meant the project was “highly commended” for the International Category at the Ground Engineering Awards 2014. Jonathan Simm, technical director at HR Wallingford and technical lead for the ILH congratulated the team’s success “in the face of stiff competition from some major international geotechnical projects.”

Following the publication of the Handbook, CIRIA and the UK and Ireland National Backing Group for the ILH agreed to ensure that the recommendations from the Handbook would be applied in practice and that the community created to produce the publication be maintained and extended. As a result a UK and Ireland community of practice (CoP) is currently being scoped and it is anticipated that its establishment will enable professionals to research and develop further advice and good practice guidance on approaches to the management and design of levees.


The future

Dan Rogerson, the UK Minister for Flooding, stated at this year’s National Flood Forum that increasing national resilience would “require close co-operation within and between communities and we, in government, need to ensure we are facilitating, not creating obstacles that prevent it.”

A move towards collaborative solutions is effectively coming from the Government and at the same time many flood risk management schemes and infrastructure recovery projects are developing in direct response to localised impacts of severe weather.

However, establishing and maintaining cross-sector and cross-disciplinary collaboration is a significant challenge, as many of these partnerships were either created in reaction to extremities or the resources have not been available at the time to foster them.

CIRIA and its partners, working internationally or locally, have demonstrated that collaborative working within FCERM and infrastructure sectors often result in:

- successful, advantageous outputs with multiple benefits realised
- experiences and practices being shared between a wide range of disciplines and stakeholders – everyone’s perspective is valid
- the complexities associated with the infrastructure interdependencies, investment models and funding sources are simplified when all relevant sectors are actively engaged and contributing
- strong leadership, shared objectives, effective ‘open’ communication are key to successful collaboration.

CIRIA is well placed to manage knowledge sharing environments and good practice in FCERM globally. By continuing to bring together leading industry figures and organisations to share information, good practice and lessons learnt, and developing its extensive series of guidance in this area, CIRIA and its partners will continue to ensure communities and infrastructure become more resilient to flooding in the future.
References
Statutes
Flood and Water Management Act 2010 (c. 29)

Get involved in CIRIA projects and proposals

Dam and Reservoir conduits (tunnels, culverts and pipes) (RP982)
The project will produce a succinct consolidated guidance report on the inspection, monitoring, investigation, maintenance and repair of conduits at reservoirs that complements existing related guidance but addresses reservoir specific issues.

Design, modification and removal of river weirs (RP1009)
This project will review and update the current Environment Agency guide on River Weirs, originally published in 2003.

Management and rehabilitation of old waterfront walls (RP997)
CIRIA will produce a significantly updated manual that will build on and supersede the 1992 publication ‘Old Waterfront Walls - management, maintenance and rehabilitation’.

Application of EC7 to flood embankments (RP1000)
This guide will update UK practitioners on the interpretation and application of EC7 in the context of flood embankment design, construction and management that also supports the application of the principles and guidance in the International Levee Handbook. The guide would address a clearly identified gap in current UK practice in relation to the current Eurocode 7.

Communicating local flood risk management (RP975)
This project, through collaborative working will identify, collate, develop and share recent research, evidence and good operational practice to provide practical advice for effectively communicating local flood risk management to the public, thereby providing support for taking appropriate actions, and engaging stakeholders.

Groundwater control - design and practice update (RP990)
The report was first published in 2000. The report will be updated to include a hydrogeological assessment as part of the Environmental Impact Assessment now and further updates as required.

Demonstrating the multiple benefits of SuDS – a business case (Phase 2) (RP993)
This project will support SuDS delivery, particularly retrofitting by developing and collating an evidence base, case studies, guidance and agreed methodology to better understand costs and value the broad range of benefits providing a more compelling business case.

Guidance on management of unexploded ordnance in off-shore situations (RP998)
This project will develop good practice guidance on the assessment and management of UXO in offshore and near shore environments.

Update to the Coastal and marine environmental site guide (RP1002)
Since the publication of CIRIA’s Coastal and marine environmental site guide (CS84) in 2003 and associated pocket handbook Coastal and marine environmental pocket book (CS94) there is now a need to update the content in light of recent and forthcoming changes in legislation.

Infrastructure recovery following floods (P2972)
CIRIA propose to develop new good practice technical guidance on the recovery of critical infrastructure following major flood events.

Seaside piers - inspection and rehabilitation (P2942)
This project will provide guidance for individuals and teams to understand enough about the potential structural problems and their solutions to appoint appropriate inspection and repair specialists

Update to C634 Accelerated Low Water Corrosion (ALWC) (P2951)
CIRIA will provide an update to C634 Accelerated Low Water Corrosion.

To find out more and to get involved contact CIRIA on tel: +44 (0) 20 7549 3300 or email: enquiries@ciria.org
Improving construction sites through environmental good practice

Introduction
Construction activities will inevitably have an impact on the environment and neighbours. However, good environmental practice enables these impacts to be managed positively. Impacts can take one of many forms, for example effects on surrounding neighbours, transport, noise or pollution or indirect effects associated with product selection. Clients, their professional advisers, contractors and the whole construction supply chain, all have responsibilities for environmental management.

The construction industry is coming under increasing pressure to ensure its activities have reduced impact on the environment. The construction industry is responsible for high levels of waste – around 10 per cent of all raw materials on many sites end up as waste.

With the pressure being applied not only by regulators, environmental groups, other businesses and residents there is a need for practical guidance to allow construction sites to manage effectively the requirements placed upon them, which includes embedding sustainability into their practices.


The vision for Construction 2025 is “an industry that leads the world in low-carbon and green construction exports.” The drivers to meet this vision are:
- improving client capability and procurement
- building a low-carbon construction industry
- understanding future work opportunities.

The Strategy sets out some bold aspirations for the industry for 2025 – a 33 per cent reduction in initial and whole life costs of construction, a 50 per cent reduction in the overall time from inception to completion for construction projects, a 50 per cent reduction in greenhouse gas emissions in the built environment and a 50 per cent reduction in the trade gap between total exports and total imports for construction products and materials (HM Government, 2014).

The question therefore arises as to what do the targets mean for construction sites? In simple terms it sets the task for continuing to tackle daily challenges (ie minimising pollution and avoiding nuisance) as well as addressing emerging practice including Building Information Modelling (BIM) and the circular economy that in effect seeks to ‘close the loop’ within projects and ‘promote’ the adoption of resource efficiency.

With this in mind, there is more than ever the need for practical, site-based guidance to support workers in meeting the obligations they are set (eg legislative or contractual), and assist them in identifying and applying improvements in practice.

CIRIA has been supporting the construction industry in its goal of continuous improvement since 1999 through its environmental good practice on site guide. The fourth edition is currently in preparation, and this article provides an insight into the latest update.
Who is the guide aimed at?
The site guide provides practical advice and guidance for environmental managers and site-based personnel on how to deliver sustainable construction on site by effectively managing a range of environmental issues (see below for details of the topics covered).

However, the guide ‘value’ is not just limited to those on the ground. Those involved in the pre-construction phases of projects, including designers and clients and those supporting the constructions including suppliers can influence the ability of site-based personnel to meet their by adopting the good practice contained within the guide.

Structure of the guide
The guide continues to be divided into four sections:

1 Benefits and obligations
   ■ outlines the benefits of good practice and the environmental obligations that a site operates under in terms of both the legislation and the contract conditions
   ■ presents the reasons for adopting good environmental practice on site.

2 General site management issues
   ■ explains how the overall establishment and management of the site can form the basis of environmental good practice
   ■ covers management responsibility, from the initial set up of the site through to project completion and demobilisation.

3 Construction activities
   ■ identifies the environmental issues that need to be considered when carrying out the various pre-construction, construction, post-construction activities and other important issues ranging from site clearance and piling to site handover and commissioning.

4 Environmental issues
   ■ provides advice on how to manage impacts across a range of environmental issues including ecology and biodiversity, historic environment, land contamination, nuisance (eg dust, noise), resource management (eg materials, waste), traffic management and water.

The guidance continues to be supplemented by case studies and legal examples, highlighting the benefits of adopting environmental good practice and the penalties for failing to do so respectively.

What is different in the fourth edition?
The third edition of the guide (C692) was published in 2010. Since then there have been changes in legislation, developments in practice and emergence of new issues/challenges that the industry needs to take account of.

An overview of some of the emerging issues (already alluded to above) is presented here. They are included because they are yet to be established within the industry, and they have not yet filtered down to the target audience of this guide, but will have an increasing importance within the industry in the future.

Building Information Modelling (BIM)
BIM is the compilation of a single database of fully integrated and interoperable information that can be used by all members of the design and construction team, as well as by owners or operators throughout a facility’s life cycle. Each element within a building or facility is created as an ‘intelligent object’ that contains a broad array of data as well as its dimensions and each of these elements ‘knows’ how it relates to other elements of the same project and the overall design.

Daniel Whiteley, Head of Environment, BAM Nuttall Ltd
“The good practice site guide has been an invaluable resource throughout my career in environmental management, so being involved in the update of the fourth edition has been extremely satisfying. I am confident it will continue to provide sound advice and guidance to a new generation of environmental specialists for many years to come. The challenge to ensure it remains as important a resource into the future means that alongside the more traditional aspects of pollution prevention, waste management and ecology we are embracing contemporary elements such as resource efficiency, BIM and other sustainable construction practices and the benefits they can bring to the industry.”

Dr Liz Howe, Species Team Leader and Herpetologist, Natural Resources Wales (NRW)
“As a species ecologist with NRW for many years it has been possible to see the changes in approach by developers and their ecologists over the years. It is always best for biodiversity if development is planned well from the start and there is a better chance to get positive outcomes if there is good guidance available. Whilst there has been a range of focused species conservation management handbooks prepared by NGOs and the country conservation agencies, the CIRIA publications have filled the 'one-stop' niche to bring together the many and varied aspects of on-the-ground work at a particular site in a clear, concise and authoritative way. The new fourth edition will be a welcome update covering new up-to-date information.”

Dr Eva Gkenakou, UK Sustainability Manager, Construction, Brookfield Multiplex Europe
“CIRIA’s C692 has been the main guide that we use at Brookfield Multiplex Construction Europe as the definitive source of information on how to fully address environmental requirements while implementing best practice. The environmental good practice ‘series’ have been complemented by the pocket book, a great addition that provides practical and concise advice for site managers and supervisors. All our people with construction-related duties are trained to the Environmental good practice on site course as this is not only construction-focused and very comprehensive but has also received rave reviews from those that have attended it.”

25
BIM has been identified as key for drilling right into the construction supply chain as it can help to provide better design, improve co-ordination and collaboration between all parties on a construction project and help to strip waste from key processes. Many public sector procurers and clients will begin to demand more BIM-enabled projects to deliver efficiency savings through the elimination of waste.

Sustainable procurement
Sustainable procurement is a process whereby organisations meet their needs for goods, services, works or utilities in a way that achieves value for money on a whole-life basis in terms of generating benefits not only to the organisation, but also to society and the economy, while minimising damage to the environment (Sustainable Procurement Taskforce, 2006).

Most decisions around what to buy to deliver construction projects are made by professionals based off-site. These come from consideration of commercial factors, client requirements and organisational priorities, including sustainability.

Failing to procure sustainably can result in legal or statutory non-compliance, disappointed clients and financial loss.

Fairness, Inclusion and Respect (FIR)
FIR relates to how people are treated in the workplace. It supports achievement of the principles of equality, diversity and anti-discrimination. There are specific actions that site personnel can undertake, so FIR is demonstrated towards and within teams, colleagues, clients and contacts.

Failure to implement FIR can result in grievances and complaints from staff and the need to defend cases taken to industrial tribunal. It can result in reputational damage and potential loss of clients, particularly public sector organisations who have a legal obligation to promote equality.

Water footprinting
Water footprinting is about measuring the total volume of freshwater used to produce goods/products/services and looks at both the direct (ie drinking, showering) and indirect (ie used during product process) water use of a producer or consumer.

It is a form of life cycle analysis in that it requires water use across all stages of production to be considered, including the concept of embodied water, which is the amount of water used in the extraction, processing and manufacture and transportation of a product.

Many organisations have traditionally focused upon water use in their operations, however it should be more focused across the whole of the supply chain. Also a strategy has concentrated upon simply reducing water abstractions, so the water footprint indicates the amount of water that has been removed from available supplies without return to a water resources system, or the consumptive water use.

Water footprinting is quite an advanced topic, and while some footprint studies have been conducted on food and drink products, it is an emerging area in the construction sector.

Circular economy
The Ellen MacArthur Foundation set out the principles of circular economy in two business-focused reports in 2012, 2013. These reports suggest we need a step-change in how we source and manage resources. It advocates a systems-based approach, where the whole business cycle uses and reuses resources more efficiently, eliminating waste and instead using all by-products. The Circular Economy 100 is a global group of leading businesses, including contractors and clients, who collaborate to encourage the transition to a circular economy.

The speed of legislative change
Another aspect of the guide that ‘sparked’ lively discussion within the projects’ Steering Group supporting the update is that of legislative coverage. The environmental legislative framework across the regions of the UK continues to ‘evolve’, with in some instances each region likely to have now if not in the near future its own legislation.

This clearly presents a challenge for the guide, with the decision being made to reduce the direct coverage of legislation, which as we know can change in the short-term. The update of the now dated C692, allows replacing it with an overview of the important issues to which legislation applies with supporting relevant links (eg NetRegs).

The guide is about good practice, and in many aspects site practice has ‘moved’ beyond the legal minima. So, it should be supporting site personnel in striving to achieve continuous improvement, but not ‘forgetting’ the legislative framework that underpins the practice.

Current state of play
Preparation of the guide is well underway and it is anticipated that the fourth edition will be published in late 2014 and disseminated to industry in conjunction with the CIRIA Network.

The production of the new edition strengthens CIRIA’s portfolio of site-based environmental site-based good practice guidance that covers both the terrestrial and coastal and marine environments, and provides advice for different audiences within the construction supply chain. The portfolio is described here:
A number of industry stakeholders have been involved in the update of the site guide since 1999 (1st edition) including Arup, AMEC Civil Engineering, BAM Construct, Bureau Veritas, Brookfield Multiplex, CITB Construction Skills, Environment Agency, Skanska, Temple Group, Galliford Try, Kier Group, Mott MacDonald, NIEA, SEPA, WRAP, WSP Group to name a few.

References


Get involved in CIRIA projects and proposals

---

Green Infrastructure for the Built Environment (GH4BE) (P2925)
GHBE brings together a strong vision, a collective voice, a compelling web platform and associated networking events to improve the way the GI community interacts and collaborates.

Business improvement through Ecology (BITE) (P2865)
CIRIA will develop a website-based toolkit of practical resources for the enhancement of ecology using a range of business improvement techniques.

Large landscape trees - a communication strategy (P2896)
CIRIA is keen to encourage communication with various stakeholders to explore ways to reverse the decline in large species trees in the urban environment.

Fit out environmental good practice guide (RP1011)
This project will develop an environmental good practice guide focused on the interiors sector reflecting current best practice and legislation to ensure effective design intent and delivery of good practice on site.

Environmental good practice on site guide update (RP996)
This project will produce an updated guide taking account of recent legislative and practice developments to continue to provide practical advice about managing construction on site to minimise environmental effects, and maintain its relevance to all concerned within the construction process.

To find out more and to get involved contact CIRIA on tel: +44 (0) 20 7549 3300 or email: enquiries@ciria.org
Terry Stocks, Head of Project Delivery at the Ministry of Justice, and lead for the Government Industrial Strategy: Construction 2025 BIM Level 2 programme, reflects on the learning gained from implementing BIM over a range of projects.
Looking back at the last few years, how far do you think the UK Government as a construction client has come in terms of its use of BIM?

The Government Construction Strategy was launched in May 2011, and in my view it has been a real catalyst for change. A major part of that change is the mandate for BIM in central government departments. The UK BIM Strategy for the first time articulated what BIM is, its evolution from paper-based practice, and by creating an approach through the articulation of maturity levels, has really achieved in making clear the importance of BIM in a change continuum. The work of the BIM Task Group has helped departments map the requirements of BIM Level 2 into their practice and process, which is ongoing but well advanced. The last two years has seen a major take up of BIM, its potential in supporting savings strategies, underpin collaborative working and supporting effective handover and operation also employing the Government’s Soft Landings (GSL) practice is well understood. I believe the Government has shown considerable leadership in supporting the implementation of BIM and departments are working to implement its use as ‘business as usual’.

...and the supply chain?

The recent NBS BIM Survey was very positive. It suggests a significant improvement in a number of key areas from 2013’s survey results. This is indicative of the pace of change within the industry and confirms my own experience that BIM is reaching a ‘tipping point’. The recent BIM Live Exhibition in Manchester gave an indication of how far, and fast, industry is moving to adopt BIM, from Tier 1 contractors through to material/component manufacturers. Some years ago there was a move to CAD, the move now is to BIM. There is growing evidence of smaller architectural practices committing to BIM and experiencing a significant return on their investment. Growing case studies and peer leaders will help to address concerns of entry and assist those practices/small businesses to make the decision. Having an agreed BIM adoption, as we have with Level 2, provides a standard which helps to ensure clients etc are requesting a standard approach, which means the supply chain can standardise their approach and share their investment cost across many projects.

The introduction of BIM inevitably involves changes – where have the greatest challenges been both in terms of technology and/or people?

BIM Level 2 seeks to make the transition from 2D drawings, written specifications etc into a data driven environment. Each of the disciplines still owns their information, they can use their chosen software to develop their designs, and in terms of IP, liability etc nothing has changed. However, their designs can now come together into one federated model using Industry Foundation Classes (IFC) files or by adopting common systems. This model is the overlay of architecture, structures and services, which allows clashes to be identified, it supports effective stakeholder engagement (they can see what they are going to get, which is difficult for non technical clients to understand properly in 2D) it helps reduce construction risks and has many other advantages. IFC files are currently not as reliable as we would really like in transferring data from different software packages. Software companies need to improve the portability of their data through IFC’s. The key difference of BIM is the way data is collected during the design and construction process.
BIM Level 2 requires data to be delivered using a data standard called COBie (Construction to Operation Information Exchange). COBie sets up a standard structure to gather data, becoming more data rich as the project progresses. Understanding COBie and how to complete the templates does require some training and is different from current practice. Further, BIM is only really effective if used within a collaborative delivery team. This requires the client to set up the right environment through the right contract practices (the Cabinet Offices’ new forms of construction procurement are being championed to drive better collaborative delivery behaviour). Also, the design team needs to work together to develop a model and dataset that can be passed to a constructor for the whole team who will then work together developing the design through the model, driving out waste, risk and time. It’s about focusing beyond the capex stage of a project and consider the subsequent operation. Adopting the GSL process to include the end user / the FM contractor, throughout the life cycle of the project is the real challenge. This means getting client organisations, design practices, FM providers and contractors to understand what collaborative delivery is, and how BIM Level 2 helps in achieving a better outcome. It’s certainly not about technology, the big thing that needs to change is behaviour.

Some projects have ‘had their moments’, but what have been the main learning points?

The first BIM Level 2 pilot project was at HMP Cookham Wood, procured through my team at the Ministry of Justice (MOJ). The initial results are really good for Cookham, and we achieved savings of around 20 per cent. Within the MOJ we have been adopting Lean approaches for delivery for some time. We work through professional service and constructor frameworks, which allows us to improve relationships with our supply chains both within and outside of project environments. In terms of a collaborative working ethos – we already had it. A client that does not have those relationships will have to select their delivery partners carefully and take time to ensure all parties understand what working collaboratively means. We learned not to overwork the model before tender, providing just enough information for the contractors to be able to gain an in-depth understanding of the requirements. Too much information at tender can add unnecessary time to the tender process. File sizes were large, we needed to change our ‘e-tendering’ process. We needed to consult with our IT team to gain agreement to use viewing tools and other free to use software. These were not huge problems, but they could become frustrating if not sorted out at the start. Once you have a model, use it at every stage. It’s easy to use it for the design/office based activities and not use it with those actually building the project. The data and 3D cuts from a model are invaluable in a collaborative/Lean site delivery environment. At Cookham we did experience some issues that could have been avoided. But it was our first project. Our professional service teams and contractors worked really well together, supporting each other through the process. So it goes to show we didn’t get it all right but we still delivered a project on time and under budget. We are now using our lessons learned on the projects we are procuring and delivering, so nothing really wasted.

What are the expected benefits of BIM

The benefits of BIM at capex as measured across a sample of circa seven projects are of the order of 15% to 20 per cent. Once the practice of BIM becomes increasingly embedded in delivery, practice forecasts of circa 40 per cent plus have been stated. This is in-line with Construction 2025 targets of 50 per cent quicker and 33 per cent whole life cycle cost benefits. This return will depend on the right environment being created by clients, and delivery partners playing their part in growing maturity to deliver the benefits. There has also been evidence of design teams growing a fee turnover well in excess of the
rate of investment in BIM. Whatever the hard figures are that are starting to emerge, delivering in a collaborative environment that works to drive out waste and therefore cost at all stages and to all involved must be a goal.

What do you say to those who believe that BIM is really only for serial construction ‘large project’ clients and has less to offer occasional or ‘small project’ clients?

If you are a client that is also the end user/ operator of the asset it should make no difference. BIM is about the gathering and use of data. Data about delivery compliance, and data about how to use the asset. BIM also provides a 3D intelligent image of what a client is purchasing. If the client is not technical, being able to see a rendered image of exactly what you are agreeing to fund is a massive positive. The opex cost of a building over its lifecycle is far greater than its capex. If a client is advised correctly by their professional services teams and the constructor it should be an easy decision for a client, and help reduce their resource expenditure in the future.

To what extent is practice spreading from design into construction and operation?

BIM is still in its infancy, albeit gaining significant momentum. So there are not that many completed Level 2 projects that have completed the delivery-to-operation cycle. However, with the publication of PAS 1192-3 in March, and with a growing number of BIM delivered projects now entering operation, there are increasing case studies and support documentation to aid that transition. The Soft Landings initiative is an essential aid to an effective capex to opex transition. Work is ongoing in drafting the digital plan of work document and asset classification standards, which will further ease the adoption of BIM and GSL and the transition from build to operate. The business area I lead within the MOJ has completed a number of BIM projects. Our experience has been very positive. We are automatically migrating the BIM data to populate the CAFM (Computer-Aided Facilities Management) system, with all the asset information being easily available and accessible before formal operational handover. The days of receiving numerous boxes of paper, CDs etc at various points past handover will hopefully be a thing of the past for everyone.

Is the industry on track to achieve the 2016 target?

The recent NBS survey was certainly very encouraging. Central Government have been mandated to use it. The BIM Task Group has been working hard to raise the profile of BIM, engage with industry, provide a cohesive BIM approach through the PAS 1192 series etc supported the setting up and operation of BIM 4 industry groups and much more. If we look back over the last two years we have achieved a huge amount. If we maintain that momentum as an industry over the next two years things are certainly positive. BIM is new but has the potential to be a game changer in achieving the UK Government Construction Strategy and Construction 2025 objectives. The UK market currently has the lead on other countries, but they are catching on fast. France has recently actively supported its use. The new European Procurement Directive includes the use of BIM and this will again see its take up spread beyond the UK even more. There is a clear client requirement for BIM, the industry needs to respond quickly and positively to ensure that requirement is met.

Can you imagine life without BIM!

We can all imagine a life without BIM, we are in it! Can you imagine a life without the Internet? I think BIM has the potential to change our industry in the same way the Internet has changed our lives.

References


CIRIA delivers a range of informative and engaging training courses, covering topics such as sustainable drainage, environmental good practice on site, culvert design and operation, control of water pollution from construction sites and much more.

Training is delivered by industry experts either as open courses or in-house, where courses can be customised to suit specific needs. Course content includes up-to-date experience with practical examples and group work to deliver first class learning outcomes.

Benefits of training with CIRIA
- CIRIA is a not-for-profit, independent and authoritative organisation.
- True to our mission, CIRIA training aims to help improve performance in the modern built environment.
- Course content is developed from CIRIA’s good practice guidance and reviewed and updated regularly.
- Training is delivered by industry experts.

Courses available
- Environmental good practice on site – IEMA approved
- SuDS foundation
- Designing SuDS
- SABs facilitation workshop for local authorities
- Culvert design and operation
- Control of water pollution from construction sites
- Working with wildlife
- BIM strategy for clients and consultants
- Lean in construction
- Sustainable procurement for construction

In-house training
All above training courses can be delivered in-house at your offices. Courses are based on tried and tested approaches or can be adapted to develop more bespoke training. They are engaging, interactive, combining up-to-date experience with practical examples to create the ideal learning environment.

Online training
CIRIA developed the first authoritative online course in contaminated land in 2010. The course provides useful information built on CIRIA’s extensive contaminated land guidance. Delegates will gain a foundation level understanding of brownfield and contaminated land legislation, liabilities and technical details. The online format provides a flexible approach to learning, allowing you to learn at your own pace and at a time that suits you.
What delegates say about CIRIA training

SuDS training
“A really good course. Steve inspired a very lively and interesting group discussion.”
Leicestershire County Council

“Really useful to bounce ideas of fellow practitioners and to learn from someone (Steve) who has applied the course content to real life sites.”
Central Beds Council

“Both trainers were very knowledgeable and passionate about the subject, whilst still remaining realistic about the challenges.”
London Borough of Redbridge

SuDS and SABS facilitation
“The course was very productive and encouraged multi team working.”
Shropshire Council

Environmental good practice on site
“Informative and interesting course that is well taught.”
Brookfield Multiplex

“A very well run course with lots of useful information. I think this sort of course should be run for all site personnel.”
Shepherd Construction Ltd

“[I found the workshop very interesting and it highlighted the need to be on the ball for all aspects in relation to the environment and ecology.]”
Kier Homes

Culvert design and operation
“This course has surpassed my expectations and given me a good grounding in which to progress with my career personally and in my current local authority position. I am also now much more confident in addressing the subject as a whole.”
Milton Keynes Service Partnership

“It is a very good introduction into the subject area and I now feel more confident with our consenting role around culverts”. Leicestershire County Council

“Good course with practical exercises and the arrangement of the two days was very good. Thanks to all involved in the course I found it very worthwhile.”
Waterways Ireland

CIRIA TRAINING CALENDAR

Forthcoming courses in 2014

Environmental good practice on site
4 September, London
15 October, Manchester

SuDS Foundation
2 September, London
30 September, Manchester

Designing SuDS
9-10 September, London
7-8 October, Manchester

Culvert design and operation
7-8 October, Birmingham

Control of water pollution from construction sites
16 September, London

How to book:
Visit: www.ciria.org/training
Tel: +44 (0) 20 7549 3300
Email: enquiries@ciria.org