

## **BRIDGE OWNERS FORUM**

### **MINUTES OF MEETING BOF 49: TUESDAY 17 MAY 2016 AT THE SALTMARSH ROOMS, KING'S COLLEGE, CAMBRIDGE**

#### **PRESENT**

Campbell Middleton	Chairman & Cambridge University Engineering Department (CUED)
Nick Burgess	London Underground
Graham Cole	ADEPT
David List	Large Span Bridge Group
Rob Dean	Network Rail
Liam Duffy	Transport Infrastructure Ireland
Andy Featherby	Canal and River Trust
Richard Fish	Technical Secretary
Keith Harwood	ADEPT
Jason Hibbert	Welsh Government
Wayne Hindshaw	Transport Scotland
Neil Loudon	Highways England
John McRobert	Transport Northern Ireland
Stephen Pottle	Transport for London
Paul Thomas	Railway Paths Ltd.
Paul Fidler	CUED
Sakthy Selvakumaran	CUED (Part)

#### **Introduction**

The Chairman welcomed everyone to BOF 49 but especially Andy Featherby who, although he had attended previous meetings, had now succeeded Rod Howe as the official C&RT representative.

#### **1. Apologies**

Apologies had been received from the following:

Stephen Bateson	Irish Rail
Henry Dempsey	SCOTS (New representative)

Tomas Garcia      HS2  
Paul Monaghan    LoBEG  
Jacqueline Mynot   CSS Wales

## 2. Previous Minutes – BOF 48: 26<sup>th</sup> January 2016

- i) Item 3, Action 23, top of page 9: Replace “*increasing*” with “*reducing*”.
- ii) Item 10, page 14: Replace “*Queens*” with “*Ulster*”.
- iii) Item 10, page 14: Replace “*were about to start*” with “*had an ongoing*”.
- iv) Item 12a, page 14: Replace “*CISC*” with “*CSIC*”.

With these corrections it was agreed that the minutes could be uploaded to the BOF website.

ACTION 18: Paul Fidler
------------------------

## 3. Actions from BOF 48

*References in the text below refer to the numbered actions on the BOF 48 Action Sheet. Boxed reference numbers below relate to the BOF 49 Actions.*

*NB Although BOF 49 Actions were discussed at different times during the meeting, they are all recorded as one item as part of the minutes.*

### **Action 1, Temporary Bridge AIP Guidance:**

Neil Loudon gave a presentation that had been prepared by Highways England’s Terry Robinson which covered work that had been ongoing with the five suppliers: Retro, Beaver, Janssen, Mitchell and Mabey. One of the outputs was a spreadsheet with tabs covering issues such as suitability of use and contacts for the organisations as well as links to outline AIP documents, detailed product data, foundation options etc.

Neil noted that this was very much work-in-progress but he was due to meet with Steve Berry at DfT to discuss the procurement of a contract to develop this work, including possible Departures from Standard and the possibility of rapidly importing units from Europe. It would also be necessary to agree issues of ownership but in the meantime Highways England will keep the spreadsheet up to date. Neil agreed to provide a further update at BOF 50.

ACTION 1: Neil Loudon
-----------------------

**Action 3, Engineering Input into Bridge Design Competitions**

Keith Harwood reported that he had spoken to Arup’s Naheem Hussein who considered that the present IABSE competition guidance was suitable. It was agreed that all available guidance should be uploaded to the BOF website.

ACTION 2: Paul Fidler

**Action 6, “Scoring” of Reports on BOF website:**

Paul Fidler reported that he had researched this option and it would require a major overhaul of the BOF website in order to provide such a facility. It was agreed not to pursue this at present.

**Action 7, Hidden Defects in Bridges: Transport Scotland:**

Wayne Hindshaw briefly described Transport Scotland’s review and guidance document. He understood, however, that documents had been issued by email on 29<sup>th</sup> October 2015. Paul Fidler will check if they are already on the BOF website.

ACTION 3: Paul Fidler

**Actions 8, Leadenhall Buiding Bolts:**

Not taken – action deferred to BOF 50.

ACTION4: Paul Monaghan

**Action 13, Parapet Research and Testing**

Not taken – action deferred to BOF 50.

ACTION5: Wayne Hindshaw

**Action 16, Scottish Road Research Board**

Not taken – action deferred to BOF 50.

ACTION 6: Wayne Hindshaw

**Action 17, BOF Subscriptions:**

Invoices were issued to members who had yet to pay their subscriptions.

**Action 26, Review of Bridge Inspections:**

Not taken – action deferred to BOF 50.

ACTION 7: Neil Loudon

**Action 28, Unit Costs:**

Although Rob Dean was awaiting final confirmation, he agreed that the unit cost information could be uploaded to the members’ area of the BOF website.

ACTION 8: Paul Fidler

Rob also asked that other organisations should share unit rates. He recalled discussions at BOF 48 that HS2 rates had been discussed. He suggested that, even if exact figures could not be made available, at least the methodologies through which rates were calculated could be shared.

The Chairman supported this suggestion and pointed out the benefits that could be seen by adopting a national bridge database. He also suggested that a good start could be made by gathering unit rates either for new-build or maintenance schemes.

Neil Loudon reported that the National Audit Office had looked into this issue but had concerns over different costs arising from different maintenance contract arrangements. Rob Dean agreed, noting additional costs to Network Rail for tenanted arches. Neil aired the concern that rates would soon become out of date and also suggested that there might be issues over what rates might be used for.

The Chairman referred to work being undertaken by Charlotte Murphy, a CUED PhD student, who was comparing prices from the A453 improvement in Nottinghamshire, especially the difference between precast and in-situ concrete bridge decks. Neil Loudon warned that this project had had a number of issues, including the need to demolish and replace a deck during construction.

John McRobert referred to Concrete Bridge Development Group's Technical Guide 14 which had much useful information. He also suggested that work by IUK could also be helpful.

Stephen Pottle thought that there had been earlier work by an independent party. He also noted that LoBEG had started to consider this matter but had recognised the problem of having to deal with a large number of variables.

Wayne Hindshaw referred to a program called BRIDGIT produced by Babbie in the 1990s: although this had initially been extended over time it had fallen into disrepair about ten years ago. Wayne offered to investigate if it still existed.

ACTION 9: Wayne Hindshaw

Liam Duffy questioned how contractors' pricing strategies, traffic management and rail possession costs could be taken into account.

Neil Loudon agreed to investigate if any figures could be released by Highways England.

ACTION 10: Neil Loudon

**Action 29, CIRIA Flood Impact Research:**

The Chairman reported that he had discussed CIRIA's work on learning lessons with their Owen Jenkins. Neil Loudon and Wayne Hindshaw noted that their organisations were represented on the project Steering Group by Mike Whitehead and Hazel McDonald respectively and agreed to provide an update at the next meeting.

ACTION 11: Neil Loudon/Wayne Hindshaw

Rob Dean also believed that a representative from Network Rail's Environmental Team was also involved.

**Action 30, Japan Rail East:**

The Chairman reported that he had been reviewing the option of Japan Rail East either presenting at, or joining, BOF. Rob Dean advised that JRE's London office was their European base. Regular meetings were held with Network Rail but it seemed that they their *raison d'être* was to gather information. Their team were more focussed on marketing than engineering. Rob suggested that a presentation might be appropriate but warned that there might be language issues.

Discussion extended to the topic of secondments between similar organisations in different countries. The Chairman suggested that this could work for the likes of Highways England and Network Rail. Neil Loudon noted that HE had Memoranda of Understanding with other countries which were largely aimed at information of exchange.

**Action 32, M4 Diversion:**

Jason Hibbert suggested that he had to wait for political decisions on this project before a possible presentation and he will discuss with the Chairman ahead of BOF 50.

ACTION 12: Chairman/Jason Hibbert

**Action 33, CSIC and UKRIC:**

The Chairman will consider a possible presentation at BOF 50.

ACTION 13: Chairman

**Action 34, CUED Report on Structural Health Monitoring**

Paul Fidler will issue this as a pdf for comment, although there was only limited time for further changes. The Chairman confirmed that it will be published by TTL as a "practical" guide rather than stated best practice.

ACTION 14: Paul Fidler/All

**Action 35, Southampton University Scour Detection Project**

The Chairman stated that he was still considering options for how BOF should review scour research.

Wayne Hindshaw referred by a project on embedded scour detection sensors being led by Strathclyde University. The Chairman noted that CUED were working on underwater drone technology and asked others for any recent developments:

- Rob Dean reported that Network Rail had visited their counterpart, Irish Rail, who were working on a review of whether it was more effective to invest in removing scour risk or continued monitoring. Network Rail were also looking at affordable sonar technology.

- John McRobert reported on a technique based on acoustic monitoring and agreed to try to find more information.

ACTION 15: John McRobert

- Andy Featherby noted that C&RT had commissioned an underwater survey in Sheffield and agreed to find details.

ACTION 16: Andy Featherby

It was proposed and agreed that the Chairman should consider the option of a specific BOF half day to review scour detection systems.

ACTION 17: Chairman

#### **Action 36, Vehicle Incursions**

There had been no recent developments in the reportedly renewed interest by DfT in this topic.

**All unrecorded actions from BOF 48 had either been completed or were discussed as part of the BOF 49 agenda.**

## **4. Membership Update**

Not taken.

## **5. Technical presentation: Ultra High Performance Reinforced Concrete Bridges**

The Chairman introduced a double-Skype presentation on developments of UHPRC by Professor Stephen Foster at the University of New South Wales and Dr. “Jackie” Voo of Dura Tech in Malaysia.

Steve Foster explained that Jackie Voo had undertaken a PhD at UNSW in the early 2000s, focussing on high strength concrete with support from VSL Australia. The use of high carbon steel fibres had been found to remove the need for conventional shear reinforcement and with concrete compressive stresses in the order of 150 MPa, additional prestress loads could easily be accommodated.

Jackie Voo then gave a presentation on his company, Dura Tech, whose factory to date had produced beams for over 80 bridges in Malaysia ranging in span from 12 to 100m. A first bridge in Vietnam was planned for 2017. The concrete had a very low w/c ration (<0.2) which, together with the careful addition of steel fibres, produced concrete between 4 and 6 times stronger than conventional mixes, where durability was increased by a factor of 100 and with a reduced carbon footprint. Quality control was also important with maximum batches of 7 m<sup>3</sup> and

only under factory conditions. Full scale tests had been undertaken in both shear and flexure. Jackie had written a paper for the IStructE which had been published in The Structural Engineer in 2011 and he advised that the Swiss had now produced a Design Standard relating to the use of UHPRC.

The Chairman thanked Steve and Jackie for their presentation and invited questions as recorded below:

- Q: Cost? The UK view was that UHPRC was very expensive. A: As most of the Malaysian bridges had been alternative designs, there had to have been a cost saving, generally of 5 to 10% over conventional designs.
- Q: Fibres and Safety? A: Whilst fibres could protrude from unformed faces, a smooth finish would be achieved on shuttered faces. It was likely that minor rust staining would appear but, at locations where visual appearance was important, the beams could be coated with a polyurethane paint.
- Q: Longest span with no post-tensioning? A: Likely to be limited by transportation issues but probably up to 24m.
- Q: Bridges composite with a deck slab: noted that this was typically lower strength concrete – why? A: Purely to reduce total cost.
- Q: Was cost saving just based on Capex or Whole Life Costing (WLC)? A: Both; although WLC issues were not normally taken into account in Malaysia.
- Q: Any long term testing programme? A: Only by monitoring early bridges; one in South Korea dating from 2002 and the Shepherds Gully Creek Bridge in Australia built in 2005. There was no evidence of deterioration in either.

Steve and Jackie gave a second presentation on the use of UHPRC for very slender precast retaining wall units. It was agreed that both presentations could be uploaded to the BOF website.

ACTION 19: Paul Fidler
------------------------

After the Skype sign-off, the Chairman suggested possible links with the Laing O'Rourke precasting facility in the UK as well as opportunities for innovation within major projects such as HS2, Crossrail and the Thames Tideway. He also reported that he was due to visit the FHWA in Washington DC to view their concrete durability testing facility and would seek the US view on UHPRC. He agreed to report on this trip at BOF 50.

ACTION 20: Chairman
---------------------

## 6. Forth Road Bridge Closure and Repair

Wayne Hindshaw gave a presentation on the failure of a truss end post at a lower pintle connection, which resulted in the closure of the Forth Road Bridge (FRB) in December 2015, and subsequent urgent repair works. Photographs used in Wayne's presentation may be found on the FRB website.

The Chairman invited discussion and the main issue raised was that of overweight HGVs, a case confirmed by the FRB's Weigh-in-Motion system. Wayne noted that the seriousness of this issue on a bridge such as Forth is considerable bearing in mind the loading codes at the time of its design in the late 1950s and the consequences of bunched overweight vehicles in the event of a traffic jam. Neil Loudon noted that Highways England were investigating this issue. The Chairman asked if TRL were involved but it was noted that this was more of a legal issue under the responsibility of DVLA or VOSA although there was little evidence of any prosecutions. Wayne noted, however, that Scotland's Traffic Commissioner had powers to remove licenses but warned that there was no hard evidence that damage to bridges could be attributed to overweight vehicles. The Chairman reflected that this issue would have been gone straight to TRL for investigation in the past and questioned what would happen now. Neil Loudon replied that any investigation would now be commissioned through the DfT/Highways England Framework Contracts with consultants.

John McRobert questioned if the overloaded vehicles tended to travel in the early hours as research in Northern Ireland had identified that most such movements were between 0100 and 0400. Wayne said that these vehicles seemed to travel at any time of the day or night. The Chairman asked if they were predominantly foreign drivers but again there was no such trend.

## 7. BOF Fact Sheet and Grand Challenges

Richard Fish apologised for the fact that an early version of the BOF Fact Sheet had been issued and he agreed to update it and reissue.

ACTION 21: Richard Fish

Also issued prior to this meeting was a document outlining proposals for a revision to the BOF Grand Challenges document. A discussion took place on the purpose and form of the proposed re-write and it was agreed that Rob Dean, Neil Loudon and Stephen Pottle would either arrange to meet or exchange ideas to agree high level objectives which could be considered as end points into which all opportunities, needs or proposals could be mapped.

ACTION 22: Rob Dean, Neil Loudon and Stephen Pottle

Any other BOF member was welcome to add their observations and Richard Fish will produce a document with all inputs for discussion at BOF 50.

ACTION 23: All/Richard Fish

## 8. Feedback from Bridges Board and UKRLG

Richard Fish had been unable to attend the last meeting of UKBB due to winter storm Imogen causing travel disruption.

Rob Dean noted that most of the meeting had been a workshop on access planning in which Network Rail had been challenged on their procedures and reasons for cancelled possessions.

The Chairman asked if he could be included on the circulation list for UKRLG and UKBB minutes as well as any newsletters etc. Richard Fish will check with the secretariat.

ACTION 24: Richard Fish

## 9. BOF Initiated Research Projects - Update

### 9a. Bridge Inspector Certification Scheme

Neil Loudon reported that LANTRA had now standardised 20 Assessors and some 160 applications had been received to date. He also noted that Highways England had published an IAN which required bridge inspectors to work towards certification. He had also seen a job advertisement for a bridge inspector in which LANTRA certification was a requirement.

Rob Dean stated that, whilst Network Rail had yet to formally adopt BICS, a trial in the North West was underway which would be reviewed early in 2017. Nick Burgess confirmed that LUL were investigating how they might link to the scheme. Graham Cole noted that ADEPT members were generally supportive but suggested that a key step would be the publication of the revised Code of Practice.

From the devolved nations, Jason Hibbert reported that the Welsh Government will publish their own version of the IAN and Wayne Hindshaw confirmed that Transport Scotland will also review their position. Jason also noted that he had found it difficult to find details of the scheme on the LANTRA website; Graham Cole agreed to send the link to Paul Fidler for inclusion on the BOF website.

ACTION 25: Graham Cole/Paul Fidler

Liam Duffy noted that TII were also on the way to adopting the scheme and he was also in discussions with Irish Rail and Waterways Ireland.

### **9b. Hidden Defects in Critical Bridge Components**

Firstly, it was noted that Andy Featherby had not replaced Rod Howe as the C&RT representative on the Steering Group: Neil Loudon was now the only BOF member.

Neil reported that a final draft of the report had been tabled at the recent meeting of the Steering Group but concerns remained that Arup/Aecom had not fully met the requirements of the brief and there was only a limited approach to risk management. It had been proposed that publication should be delayed to allow another review by the Steering Group before final editing by CIRIA and then publication in the Autumn. Neil will update at BOF 50.

ACTION 26: Neil Loudon

### **9c. Safety Critical Fixings**

Neil Loudon reported on the progress of this project which had followed the route from BOF to UKBB and was being procured through the Highways England call-off contract. The scope had been refined as part of a workshop process and options for publication were being considered. Whilst the publisher might be CIRIA, it had been a requirement that the report should be freely available. Neil emphasised that the report would concentrate on the *management* of safety critical fixings and would therefore focus mainly on in-service issues rather than design and construction specification.

### **9d. Deterioration Modelling**

Keith Harwood noted that a second draft of the scope was about to be circulated following recent input from Network Rail. Neil Loudon understood that there remained questions about funding as it appeared that DfT were asking for more justification of costs despite the proposal having been through the agreed process. It was agreed that confirmation should be sought at next month's UKBB.

ACTION 27: Richard Fish

The Chairman understood that CIRIA were also working on deterioration modelling and wondered if the two projects might be combined.

## **10. Other Bridge Research Update**

### **10a. Highways England**

Neil Loudon had already covered BICS earlier in the meeting.

### **10b. TfL**

Stephen Pottle gave a short presentation and noted that there was a shortfall in the TfL budget which would impact on research issues. A reorganisation was also in progress. TfL have five major Thames crossing refurbishments being planned: Lambeth, Vauxhall and Westway bridges and Blackwall and Rotherhithe tunnels.

Other maintenance works were planned for the Brent Cross structures. TfL were now taking a risk based approach in order to prioritise projects and were considering the implications of deferrals. Stephen agreed that his presentation could be uploaded to the members' area of the BOF website.

ACTION 28: Paul Fidler

### 10c. Network Rail

Rob presented on five topics:

#### i. Abnormal Loads Liaison Group

There were now 15 organisations engaged in the management of AILs. Network Rail had recently appointed Cleone Couch-Percival who used to work in the haulage sector and was now looking at improving the process. Rob suggested that any issues from BOF members should be sent to [abnormalloadsliaisongroup@networkrail.co.uk](mailto:abnormalloadsliaisongroup@networkrail.co.uk).

The Chairman questioned the connection with ESDAL<sup>2</sup>. Neil Loudon noted that this had been part of his presentation at BOF 48 and Highways England's Sam Twyning was part of the Network Rail Group. Other systems and processes were discussed, including the IAP (Intelligent Access Program) in use in Australia.

Rob offered to have Cleone present at a future BOF.

ACTION 29: Rob Dean/Chairman

Rob's presentation can be uploaded to the BOF website.

ACTION 30: Paul Fidler

#### ii. Scour

Rob gave a follow up presentation on the additional scour issues that arose during the works at Lamington Viaduct. He then referred to recent progress on wider scour issues such as discrepancies in the knowledge of the flood plain or the bridge layout, historic responses and extreme weather planning. Rob offered a final presentation on the subject at BOF 50, possibly from a Network Rail PhD student who had been working on it.

ACTION 31: Rob Dean/Chairman

#### iii. Bridge Strikes

Rob described Network Rail's Bridge Strike ALARP project which had been awarded to Mott MacDonald. One of the issues was that data was only available for reported incidents whereas many others went unreported. The indications were that risk was not being managed to ALARP principles at about 60% of the bridge stock.

Rob also noted that the Abnormal Load Liaison Group (as 10c i above) were also looking at height and headroom issues. Rob agreed to provide an update at BOF 50.

ACTION 32: Rob Dean

Paul Thomas advised that Rail Paths Ltd. were keen to join the Bridge Strike Prevention Group. Rob Dean said any interested party was welcome to join.

**iv. Main Girder Buckling**

Rob described a study which was reviewing seven beam “failures”, although it had established that only one of these was a true failure as at least two others were considered to be maintenance issues whereby deterioration had reduced structural capacity.

**v. Midlands Mainline Electrification Project**

Rob gave a brief summary of this project to the north of Bedford.

Rob agreed that his presentation material could be uploaded to the members’ area of the BOF website.

ACTION 33: Rob Dean/Paul Fidler

**10d. LUL**

Nick Burgess had nothing to report other than the fact a reorganisation of LUL was pending.

**10e. Other**

**i. Rail Paths Ltd.**

Paul Thomas noted that RPL had recently reopened two ex-BRB viaducts as cycle paths. At the Chairman’s request, Paul agreed to provide photographs.

ACTION 34: Paul Thomas

**ii. ADEPT**

Graham Cole noted that Matthew Gilbert’s ongoing arch bridge research guidance was due to be published in the Autumn which may lead to the need to revise BA 16. He suggested that a presentation at BOF 51 would be appropriate.

ACTION 35: Graham Cole/Chairman

**iii. Nottingham University**

Rob Dean noted that Nottingham University were investigating the impact of environmental effects on bridge degradation, especially in salt laden coastal areas, and had produced a map showing contours of aggressive

impacts on zinc. Not only was this useful for bridges but also other metallic assets.

## 11. New Bridges and Major Projects Update

Issues under this item had been covered in Item 10 above.

## 12. Any Other Business.

### 12a. SCOSS:

Rob Dean suggested that SCOSS input into the BOF Grand Challenges document would be helpful. Neil Loudon proposed a themed BOF on bridge failures and that Alastair Soane should be invited to attend.

ACTION 36: Chairman

### 12b. International Cable Supported Bridge Operators Conference:

David List and Richard Fish advised that they would be attending this conference in Halifax, Nova Scotia in June.

### 12c. Peace Bridge, Derry/Londonderry:

John McRobert reported that Transport NI were investigating vibration effects under certain combinations of wind and live loading with the help James Brownjohn's team from Exeter University.

## 13. Proposed Dates for Future BOF Meetings

BOF 50: 1<sup>st</sup> November 2016. The Chairman will consider how the half-century of BOF meetings should be celebrated, possibly with a dinner on the previous evening with a guest speaker

ACTION 37: Chairman

BOF 51: Provisionally set as 17<sup>th</sup> January 2017.

## 14. Closing/Summing Up

The Chairman thanked everyone for attending and their contribution to the meeting.

Richard Fish, Technical Secretary  
14th June 2016