

## **BRIDGE OWNERS FORUM**

### **MINUTES OF MEETING BOF 55: TUESDAY 16 JANUARY 2018 AT THE BEVES ROOM, KING'S COLLEGE, CAMBRIDGE**

#### **PRESENT:**

Nick Burgess	LUL
Graham Cole	ADEPT
Rob Dean	Network Rail
Liam Duffy	Transport Infrastructure Ireland
Andy Featherby	Canal and River Trust
Richard Fish	Technical Secretary
Jim Hall	CSS Wales
Keith Harwood	ADEPT
Nicola Head	TfL
Jason Hibbert	Welsh Government
Neil Loudon	Highways England
John McRobert	Department for Infrastructure - Northern Ireland
Campbell Middleton	Cambridge University Engineering Department (Chairman)
Paul Fidler	CUED

#### **Guests:**

Heva Bevan	Utterberry (Item 6 only)
Kasun Kariyawasam	CUED
Santosh Sansoa	Highways England
Alastair Soane	SCOSS (Items 6 to 8)

*N.B. Items are recorded here in the agenda order, not as they were taken during the meeting.*

## 1. Welcome, Introductions and Apologies

The Chairman welcomed everyone to the meeting and briefly outlined the key points on the agenda.

Richard Fish noted that apologies had been received from the following:

Tomas Garcia	HS2
David List	Big Bridge Group

Later in the meeting, word was received from Wayne Hindshaw (Transport Scotland) that a combination of aircraft malfunction and weather had delayed his departure to the extent that attendance was impracticable. Henry Dempsey (SCOTS) had also been due to attend and it was assumed that he had had similar problems.

The Chairman commented that those who were regular non-attendees but never replied to emails might have to have their BOF membership rescinded.

## 2. BOF 54 Minutes

### a. Accuracy

The minutes were agreed as an accurate record and could be uploaded to the BOF website.

ACTION 1: Paul Fidler
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The Chairman remarked on the comprehensive nature of the minutes which represented a robust record of discussions. He also commented on the success of last meeting's scour special and the importance of BOF engagement with industry; with this in mind, he had invited Kasun Kariyawasam to attend BOF 56. Neil Loudon suggested that more meetings of a specialist nature would be a good idea and Richard Fish noted that the May meeting would be an arch bridge special, following a similar format.

### b. Matters Arising

#### Action 5: BOF LinkedIn and Twitter Groups

Richard Fish reported that a BOF Twitter account had now been set up @BridgesForum which he ran. He explained that this was a useful way of responding to national and international bridge issues as and when they arose and would help to raise the BOF profile. A discussion followed on how a LinkedIn group/page should be established and Richard agreed to investigate options.

ACTION 2: Richard Fish
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The Chairman suggested that the BOF website might benefit from having photographs of BOF members. There being no objections to this idea, Kasun Kariyawasam was asked to take pictures during/after the meeting and these, together with those unable to attend, would be uploaded in due course.

ACTION 3: Chairman/Paul Fidler

**Action 6: CIRIA**

Rob Dean had been actioned to discuss research report pricing policy with CIRIA, especially when research projects had been paid for by contributing partners, meaning that some public bodies were effectively paying twice. This he had done but Rob suggested that any BOF representative on a CIRIA project steering group should continue to lobby the organisation to make their output freely available to funding bodies.

ACTION 4: ALL

It was also noted that many standards and reports could be freely accessed from the IHS website: [global.ihs.com/standards/engineering](http://global.ihs.com/standards/engineering)

**Action 8: Sheffield University Masonry Arch Assessment Guidance**

Graham Cole noted that there was still an opportunity for anyone who would like to join this project steering group. Graham reported that he would continue to act as a link between BOF and Matthew Gilbert at Sheffield.

ACTION 5: ALL/Graham Cole

**Action 9: 3-D Arch Behaviour EPSRC Project**

Graham Cole noted that this project was now to be a collaboration between Sheffield and Leeds Universities and it was hoped that the output would include a suite of arch analysis programs progressively becoming more rigorous and less conservative. Richard Fish will issue the project scope.

ACTION 6: Richard Fish

**Action 10: BOF Arch Bridge Special**

This was to be part of BOF 57 scheduled for 15<sup>th</sup> May 2018 and would follow a similar format to that adopted for the scour special last year. A number of names of experts to be invited had previously been considered or were proposed:

- Bill Harvey
- Matthew Gilbert
- Matt DeJong (CUED)
- Adrienne Tomor (UWE)

Richard Fish would contact the above but any other suggestion should be emailed to Richard as soon as possible.

ACTION 7: ALL/Richard Fish

The Chairman questioned whether any international expertise might be invited and agreed to discuss with his PhD students.

ACTION 8: Chairman

Referring to this and the previous item, Rob Dean offered a presentation on the Network Rail Level 0 arch assessment tool which was intended to give an early indication of any arch which might require a more rigorous assessment. The Chairman asked about the range of arch assessment programs that were being used. This was generally felt to be (in order of increasing complexity) MEXE, ARCHIE or ASSARC and RING. Liam Duffy reported that TII used either MEXE or ARCHIE but noted that occasionally it had been found that a bridge that passed a MEXE assessment would fail when analysed with a mechanism program.

Rob Dean also reported that Network Rail were working on a prioritisation tool to identify potential spandrel wall failures although, at present, this was very much work in progress.

**Action 11: Bridge Asset Management Systems**

Previously offered presentations on Asset Management systems used at the Forth Crossings and by Network Rail would be added to a future BOF meeting agenda.

ACTION 9: Richard Fish

**Action 16: UKBB**

Richard Fish reported that the new UKBB Chair, Liz Kirkham, had hoped to attend BOF 55 but had had to cancel due to a meeting with elected members in Gloucestershire CC. She was, however, hoping to join us for the BOF 56 meeting to be held on 13<sup>th</sup> March in Coventry, the day before the Annual Bridge Conference.

**Action 18: BICS**

It was gratefully noted that Transport Scotland had agreed to fund the BICS assessor standardisation day held in November 2017.

**Action 20: “Evaluation” of Bridges**

Rob Dean’s offer of a presentation on this Network Rail initiative would be added to a future BOF meeting agenda.

ACTION 10: Richard Fish/Rob Dean

**Action 21: European Railway Research Initiatives**

Rob Dean offered a presentation, possibly by one his colleagues, Mark Gaddes, on this topic at a future BOF meeting.

ACTION 11: Richard Fish/Rob Dean

**Action 22: Parapet Heights and Self Harming**

Richard Fish will add this topic to a future BOF meeting agenda.

ACTION 12: Richard Fish

**Action 23: Northern Ireland BOF Representative**

John McRobert noted that he had not yet retired and that, to date, no decisions on a replacement BOF representative had been made. He agreed to advise Richard Fish as and when this happened.

ACTION 13: John McRobert

### 3. BOF Grand Challenges – A Way Forward?

Richard Fish explained that the work to date on Grand Challenges had not been as productive as had been hoped with a mixed response from BOF members in terms of progress on their respective allocated tasks. Essentially some had been completed, others had not started and the rest were at various stages of work in progress. In order to try to resolve this impasse, Keith Harwood had proposed a possible solution and the Chairman invited Keith to present his suggestion.

Keith reported that he had done some limited research on Grand Challenges concepts in other sectors, including organisations such as NASA and the NHS as well those set out by AASHTO in 2005. He had also looked at the definition which is generally accepted as “Problems too big to solve”. Keith reiterated the six previously agreed BOF Grand Challenges which had been broken down into three “whats” and three “hows”:

What:

- Preventing structural failures
- Extending the life of existing structures
- Building bridges that will perform better

How:

- Embracing innovation and embedding technology
- Securing a competent, diverse workforce
- Sharing knowledge and best practice

Keith’s view was that BOF had attempted not only to define the Grand Challenges but also to come up with solutions. He argued that this was a step too far and proposed that we should review and elaborate each of these challenges in a side of A4 covering the challenge itself, the benefits of solving it and reasons why it had not been solved to date. Once this exercise was completed, BOF should publish the output as a Statement of Grand Challenges and any subsequent research proposal could be measured against its fit with one or more of the Challenges.

The Chairman reviewed a previous BOF “Key Issues for Research” document from 2007/08 and noted that this had been drafted as a subsequent paper to the original Grand Challenges. He agreed that this was a similar approach in that it was effectively an invitation to submit research proposals.

Neil Loudon agreed with Keith’s proposal and suggested that the already completed work had almost reached that stage, other than to publish a Grand Challenges Statement. Rob Dean also agreed and accepted that the earlier objective had probably been too ambitious as an attempt to solve everything in a single document.

Rob also reported that Network Rail had also developed “Challenge Statements” across all aspects of the business and noted that those under the “Buildings and Civils” area are not dissimilar to the BOF proposal. Details of the Network Rail statements may be found at <https://www.networkrail.co.uk/industry-commercial-partners/research-development-technology/research-development-programmes/challenge-statements/> ). Of the 17 statements, one to five are bridge specific and the sixth relates to generic structural health monitoring. The remaining statements refer to other assets.

The discussion extended to cover the expectations of publishing such a document. The Chairman suggested that it could reach government levels if taken from BOF to UKBB to UKRLG to DfT and similar departments of other devolved administrations and therefore used to test any research initiatives whether bottom up from bridge owners or top down which was the occasional whim of Ministers. It was also agreed that the basis of such a Grand Challenges document would be ideal for presentation at conferences and in so doing would generate welcome debate.

As a way forward, Keith Harwood suggested that each of the six themes should be allocated to a BOF member and coordinated such that the style and format was consistent. Keith volunteered to act as the coordinator and to produce a template for the theme output.

ACTION 14: Keith Harwood
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The following agreed to work on the respective themes:

- |                                                  |               |
|--------------------------------------------------|---------------|
| 1. Preventing structural failures                | Chairman      |
| 2. Extending the life of existing structures     | Jim Hall      |
| 3. Building bridges that will perform better     | Jason Hibbert |
| 4. Embracing innovation and embedding technology | Nicola Head   |
| 5. Securing a competent, diverse workforce       | Neil Loudon   |
| 6. Sharing knowledge and best practice           | Rob Dean      |

The Chairman thanked everyone for the work that had been completed to date and noted that none of it would be wasted as it would be incorporated into this agreed

way forward. He also thanked Keith for initiating the idea and looked forward to discussing progress at subsequent BOF meetings.

#### **4. The State of Bridge Infrastructure**

Neil Loudon presented on this Highways England project undertaken by WSP which was designed to provide a benchmark for the state of the HE bridge stock. This was effectively a follow up on the Maunsell Report of the 1980s and one of the largest such studies ever undertaken. It considered 200 bridges of various forms, ages and geographical locations and attempted to demonstrate how the stock could be better understood and managed. WSP had produced a 50,000 word, evidence based report which had yet to be issued to HE managers. In fact, Neil's presentation to this meeting was the first time that it had been shown anywhere but this meant that it could *not* be made available for uploading to the BOF website.

A number of lessons had been learned during the study including difficulties in accessing information from the SMIS database and communication issues with HE's service providers. The report was based on the following themes:

- Design
- Construction
- Inspection
- Maintenance
- Technology
- Contractual

A number of the study's recommendations could be considered to be intuitive but Neil made the point that there was now evidence to support what bridge owners had long suspected. He hoped that it would be seen as a watershed in terms of how structures were managed and a confirmation of the need for an intelligent client. This was timely in view of the fact that by 2050 some 90% of the HE stock would be more than 50 years old.

Among the issues identified in the report, Neil noted that reliance on BCI scores to determine maintenance works should be treated with caution: it was possible that new metrics would be developed which might be seen as being more "customer facing".

The next steps were to develop a "Landing Plan" within HE and then to promulgate the output through conferences, the technical press and the HE website. He also intended to submit a bid in the next HE Control Period for a proactive element replacement budget.

The Chairman thanked Neil for his presentation and invited questions and/or comments.

Rob Dean noted the similarity in terms of recommendations from the report into the Stewarton bridge collapse in 2009 which had had to be presented to the ORR. He asked how HE would be measured in this context to which Neil replied that a decision had yet to be taken on how much of this study would be shared with the ORRR. Rob also noted the problems of evidencing trends in deterioration, especially when Detailed Examinations were on a fixed frequency of six years. Rob also reflected on the potential asset management time bomb and the problems of convincing senior executives of the escalating risk of failure, not least in his case in a culture of an over-riding objective of uninterrupted operations which precluded examinations of his own bridges. Requests for maintenance interventions were often met with an attitude of “does it really matter?”

Discussion extended into the need to design new bridges with maintenance in mind.

Nick Burgess noted the emphasis on project capital costs and it was not unusual that perceived extra costs to cover longer term maintenance were removed in order to meet budgetary constraints.

On the subject of retrieving or accessing records, Neil Loudon noted the issues of time, cost and lack of accountability were often presented as excuses by service providers. Rob Dean recognised the complicated ownership issues regarding data and records.

Turning to the quality of inspections, the Chairman asked if owners had an audit policy. Neil Loudon recalled his presentation at the previous BOF meeting in which he described the HE audit of 700 inspections (out of 10,000 per year). Nicola Head reported that TfL engineers review or audit 10% of the inspections submitted by their agents on a random basis. Andy Featherby noted that Canal and River Trust reviewed all consultants’ inspection reports but that did not extend to checks on site. Rob Dean commented that Network Rail received 200,000 Examination reports each year and a budget for audits was not supported as it was not seen as a justifiable expense by senior management as per his earlier comment.

The Chairman applauded the Highways England work but noted that it reflected a huge indictment on the inadequacies of the current systems of record management and data capture by providers. He questioned whether the use of fee retention might be used to ensure better contract compliance. Jason Hibbert noted that there was a culture within the industry for contractors to sacrifice retention monies rather than meet their contractual obligations, citing a specific case in South Wales. John McRobert noted a similar situation in Northern Ireland with a contractor choosing to pursue a Judicial Review route rather than resolve matters within the contract. Rob Dean noted that there were numerous examples of measuring contractors against KPIs but contractors tended to play the system. Nicola Head noted ongoing problems of even getting as-built records, including

the Health and Safety File, from contractors. This tended to be seen as an after-thought by which time key site people had moved on to other projects. Liam Duffy noted that in Ireland many public works contracts ended in Dispute Resolution with as-built records often being abandoned in the process. Liam believed these problems all derived from ineffective procurement processes. John McRobert echoed this view, noting the various additional requirements from the OGC and the EU.

By this point, Alastair Soane of SCOSS had joined the meeting and reported on an IStructE initiative to improve the process of capturing as-built information, especially for buildings. He offered to give a contact name to Richard Fish.

ACTION 15: Richard Fish
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The Chairman concluded this item by reiterating the value of the HE work and suggested that the issues identified plus the recommendations needed to be escalated to a higher level.

## 5. Safety Critical Fixings

The Chairman invited Highways England's Santosh Sansoa to give her presentation on this project which had originated with BOF and UKBB and had been completed in December 2017.

Santosh repeated the origins of this work but noted that, in parallel, the New Civil Engineer magazine had undertaken a survey into the effectiveness of fixings which had exposed a lack of knowledge in terms of how fixings are managed in service as well as the fact there was very little guidance available.

Santosh cited three case studies in which fixings had failed: Boston tunnel (2006), Sasago tunnel in Japan (2012) and the Balcombe rail tunnel (2011) all of which had first triggered the BOF interest in November 2015. Highways England had commissioned WSP/Parsons Brinckerhoff to carry out the work, working closely with CIRIA who were already working on their fixings project, albeit largely non-structural, and whose report was expected in the late spring of 2018.

The key aspects of the study were as follows:

- It aimed to ensure the competence of practitioners responsible for managing the assets.
- Management of fixings should adopt a risk based approach with a view to remove uncertainty over the integrity of the fixings.
- Lessons for the design process (an extension of the original scope) including guidance on how to design out the risk, design in robustness and the importance of providing access for inspection.

Although the recommendations were focussed on safety *critical* fixings, they could equally be applied to those of a non-critical nature.

Highways England acknowledge that as yet they do not know the extent of the issues on their network but this report will help to understand that and to establish priority structures. An action plan was to be prepared in order to implement the recommendations and to provide guidance for service providers.

The Chairman thanked Santosh for her presentation and suggested that BOF should review the project delivery process. Neil Loudon suggested that this was implicit in that BOF was well represented on the project steering group. The Chairman then invited questions and comments and especially asked how smaller bridge owners would consider the guidance.

Graham Cole confirmed that ADEPT would promote the use of the guidance among its members and commented that this would be easier to achieve due to the fact that the document was freely available as opposed to the Hidden Defects report.

Liam Duffy suggested that the guidance should influence the inspection regimes of all bridge owners and Rob Dean agreed, noting that the work would be invaluable as owners move to risk based inspections. Neil Loudon suggested that both this guidance and that for hidden defects should lead to a step change in inspection processes. The Chairman proposed that implementation of both studies should be monitored by BOF. SCOSS's Alastair Soane considered that there were strong links with SCOSS and CROSS and that the former would help to ensure that it was applied across the industry.

Neil Loudon noted that there needed to be well defined demarcations and responsibilities when it came to ownership citing the example of a CCTV camera fixed to a bridge: should the owner or the CCTV company be responsible for inspecting the fixing? Or both?

The Chairman thanked Santosh for presenting on the guidance and the meeting for the subsequent discussion. It was agreed that the presentation could be uploaded to the BOF website.

ACTION 16: Paul Fidler
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## 6. UtterBerry – Presentation and Discussion

The Chairman introduced Heba Bevan who was the founder and CEO of the UtterBerry Company which manufactures and installs multi-purpose wireless sensors. Heba had been a PhD student at CUED before starting her company in 2013. *(Post meeting note: Read more on Heba and UtterBerry in the February edition of NCE).*

Heba gave a detailed presentation on the development and variety of roles in which UtterBerry sensors could be used as well as specific case studies of their use in major projects including Cross Rail, Thames Tideway and Birmingham

New Street Station. She also described the wide range of information which the sensors could detect from traditional 3-D movements and rotations to crowd loading, traffic speeds and environmental effects. Heba agreed that her presentation could be uploaded to the BOF website.

ACTION 17: Paul Fidler

The Chairman invited questions from the meeting. Neil Loudon asked whether UtterBerry sensors needed any calibration. Heba replied that whilst that was the case with early units, current sensors had built-in AI and would self-calibrate after a 24 hour settling down period. Responding to a question from Alastair Soane on fire detection capabilities, Heba explained that sensors would detect rapid heat changes and also indicate the safest exit routes. Jim Hall asked about battery life and whether this governed the working life of a sensor. Heba noted that guaranteed battery life was 2 years but life beyond that depended of the work the sensor was being asked to do. Other options included hard wiring, solar or bio-thermal power generation. Although pressed on cost, Heba stated that this was very site specific as it depended greatly on the accuracy and extent of the data being collected and how the array of sensors was deployed.

The Chairman thanked Heba for her presentation.

## 7. SCOSS and CROSS Update: Presentation and Discussion

The Chairman noted that BOF had always kept a close interest in the work of SCOSS and CROSS although conceded that it had been several years since a formal exchange of ideas had been scheduled. He welcomed Alastair Soane to the meeting and invited him to give his presentation.

Alastair explained the history of SCOSS and CROSS: the former founded in 1976 and constituted through the ICE, IStructE and HSE and utilising publicly available sources of information whereas the latter was initiated in 2005 and dealt with real time issues. A confidential report to CROSS is seen by Alastair alone; he then de-personalises the text with the aim of minimising future risk and helping to establish a cultural change. Such reports are published either in newsletters or as an alert. CROSS reports arrive from across the industry, with the current split as below:

- Construction 38%
- Design 34%
- Operations 26%
- Demolition 2%

Alastair noted a trend in over reliance on computer software: CAD in his view standing for Computer Aided Disasters! The largest category of issues was fixings, very apposite in view of agenda item 5 in today's meeting. Alastair cited a number of case studies from recent years in areas including collapses of

balconies, temporary staging and steel frame buildings (notably City Gates). He mentioned the well-reported issues with gable facing collapses in newly built Edinburgh schools due to missing ties and, later identified, missing wind posts. Causes here flowed back to procurement issues and lack of site supervision and it was highly probable that legal action would follow. Alastair also referred to tower blocks from Ronan Point in 1968 to the Grenfell fire tragedy from 2017.

In all of the cases: Edinburgh schools, City Gates and Grenfell tower, there were similar issues relating to the role of the client, detailing, procuring and managing subcontractors, site supervision and building regulation.

Alastair gave a detailed appraisal of the Grenfell cladding fire, noting similar cases in Melbourne and Dubai which should have raised concerns. He reported on the BRE fire tests as directed by DCLG in which the Grenfell cladding had lasted 395 seconds against a minimum requirement of one hour. He recommended a read of the summary from Dame Judith Hackitt's Interim Report on her review of Building Regulations and Fire Safety which examined not only the regulatory regime but also cultural issues. The full report is to be found at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/668831/Independent\\_Review\\_of\\_Building\\_Regulations\\_and\\_Fire\\_Safety\\_web\\_accessible.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/668831/Independent_Review_of_Building_Regulations_and_Fire_Safety_web_accessible.pdf)

In summary, Alastair identified the following issues from Grenfell and similar cases:

- Lack of leadership and clarity of roles
- Lack of competency throughout the delivery process
- A tendency towards cost cutting
- Poor design and detailing
- Failure to learn lessons from precursors

Alastair then turned to recent bridge collapses but specifically those in which fire had been a contributory factor including the I-85 bridge collapse in Atlanta in March 2017 which had been exacerbated by flammable material stored under the bridge: a similar scenario to the M1 Mill Hill fire in 2011. Alastair spoke from personal experience when he went on to describe the fire in the Liverpool Arena car park on New Year's Eve 2017 in which 1400 cars had been destroyed despite the fire brigade arriving within eight minutes. This had be due initially to a single spontaneous car fire which then became a chain reaction. (Alastair noted that in 2017 there had been 250 incidents of spontaneous combustion of cars in car parks.) The car park itself had not collapsed but there were signs of severe cracking and spalling. A full inspection was to be arranged using a collision-tolerant done.

Lastly, Alastair cited some of the ongoing work to attempt to prevent or minimise significant failures, including:

- A proposed database of failures
- An IABSE group on forensic engineering
- An ICE/IStructE repository of case knowledge
- The ICE In Plain Sight Report
- Cross working between SCOSS and NIST (US National Institute of Standards and Technology)

Alastair also reported that CROSS was becoming international with organisations in the USA, Australia, Germany and South Africa as well as the UK. He urged ongoing support of CROSS and endorsed a policy of reflective thinking in the whole process of design, construction, maintenance and operation based on consideration of risk of unforeseen events and unexpected consequences. In terms of Ireland, Liam Duffy reported that TII have mostly internal reported procedures but there might be interest in a CROSS Ireland.

The Chairman thanked Alastair for his extremely thoughtful presentation and invited questions. Alastair confirmed that his presentation could be uploaded to the BOF website.

ACTION 18: Paul Fidler
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Rob Dean asked about the definition of “failure” noting that Network Rail have many reportable events but only a few could be termed catastrophic. Alastair replied that his definition was a structure not performing in the way it was originally intended to perform.

The Chairman expressed concern that there might be an over-reliance on databases which to be effective had to be kept up to date and promulgated to others. For example, how could BOF ensure that it was keeping up to date with US issues? Alastair agreed to email a link to Richard Fish from CROSS USA.

ACTION 19: Richard Fish
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Neil Loudon and Rob Dean noted that their respective organisations already had processes in place for issuing safety alerts to SCOSS and agreed to issue to BOF.

ACTION 20: Neil Loudon/Rob Dean
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Graham Cole reprised a point made at previous meetings that, apart from railway structures, UK bridge failures were only rarely investigated and reported. He cited the collapse of Eastham Bridge in Tenbury Wells, Worcestershire, in May 2016 and the wider bridge community remained unaware of any lessons that might be learned from the event. This lack of transparency and the need for independent investigation (similar to RAIB) had been raised at UKBB and it was hoped that DfT might take action. The Chairman agreed that pressure should continue to be applied to DfT especially in view of the fact that SCOSS was supported by HSE and DCLG. Returning to Rail Bridges, Rob Dean agreed to issue the Network

Rail reporting mechanism but asked that it should be for BOF members only at present.

ACTION 21: Rob Dean/Richard Fish

The Chairman noted that he relied on a Google alert signal to advise him of news of bridge collapses but asked all BOF organisations to check what reporting mechanisms were in place.

ACTION 22: All

The Chairman also suggested that BOF should collect reports of failures on an annual basis and issue to SCOSS. Rob Dean asked if the SCOSS database was accessible by others. Alastair replied that this was the case and access was via the SCOSS website.

## **8. Annual Bridges Conference Presentation on Innovation in Bridge Management**

Keith Harwood introduced an idea he had shared with Helena Russell of Hemming Group, the conference organiser, which would see exhibitors submitting an outline of an innovation brought about by their product. A slot on the programme had been agreed and an invitation to enter issued to exhibitors. A review team was agreed: Keith Harwood, Nicola Head, Cam Middleton and ADEPT Bridge Committee Secretary, Kevin Dentith. The Chairman suggested that a Pechakucha type of presentation could be used (20 slides in 20 seconds) but warned that it was important that BOF must not be seen to be endorsing a particular product. It was agreed that Keith Harwood should be empowered to act on behalf of BOF to work with the conference organisers.

ACTION 23: Keith Harwood

Richard Fish reported that there was no specific opportunity for BOF to present this year but noted that he had been asked to chair a session and would ask for BOF to be featured in his introductory slide.

ACTION 24: Richard Fish

## **9. Research Updates**

### **a. TfL**

Nicola Head reported that Sakthy Selvakumaran was monitoring Waterloo Bridge based on historic data but with satellite reflectors. The Chairman confirmed that Sakthy was also working on a bridge in North Yorkshire with John Smith. She is also looking for a bridge which has failed following significant movement since 2000 so that cross checks can be made with satellite image databases. The Chairman will arrange for Sakthy to present at a future BOF meeting.

ACTION 25: Chairman

**b. Welsh Government**

**i. Resilient Materials for Life (M4L)**

Jason Hibbert reported on this project being undertaken at Cardiff and Bath Universities which was investigating self healing materials. Jason sat on the steering group and questioned whether he might formally represent BOF as well as the Welsh Government: this was agreed. Although there was a five year programme, Jason suggested that a presentation to a BOF meeting in a year or so would be appropriate.

ACTION 26: Jason Hibbert

Jason noted that BOF did not feature on the EPSRC website for this project and seemed only to be associated with the Exeter University Scour/debris project. Richard Fish advised that this was because he had written a formal BOF letter of support to EPSRC for the Exeter project but could arrange to do so for other research if requested.

**ii. Future Manufacturing Research Hub**

Jason also referred to this project which would also benefit from formal BOF endorsement. It was agreed that Jason should draft a letter for Richard Fish to issue on BOF headed paper.

ACTION 27: Jason Hibbert/Richard Fish

**c. DfI Northern Ireland**

John McRobert referred to Abercorn bridge, an early RC bridge, which had undergone a refurbishment which had included the installation of sensors being monitored by Queens University, Belfast. He agreed to forward a paper on the subject to Richard Fish for circulation.

ACTION 28: John McRobert

**d. LUL**

Nick Burgess reported briefly on trials of different systems of laser scanning of tunnel profiles.

**e. C&RT**

Andy Featherby reported that C&RT were reviewing and redrafting their Asset Management strategies and procedures, for all asset types, with a view to moving towards a more risk-based approach.

**f. TII**

Liam Duffy reported on an internal review of chloride ingress in a number of structures against a perception that there had been an increase in road salting applications. The study was to be benchmarked against similar work undertaken in 2003. Liam agreed to consider sharing the report at BOF 57.

ACTION 29: Liam Duffy

g. **Highways England**

Neil Loudon reported that the rewrite of the DMRB was dominating other activities. He also mentioned the ongoing issues with BICS and LANTRA who were looking for support and endorsement from UKBB and BOF and the constituent organisations. Most present echoed their commitment to BICS and it was agreed that all should write letters confirming this.

ACTION 30: All

h. **Network Rail**

Rob Dean reported on six projects on which Network Rail were working with CIRIA:

- (a) **FRP Bridge Design Guidance:** as developed at Warwick University.
- (b) **Deterioration Modelling:** this was a state-of-the-nation type report on the various methods available.
- (c) **Structural Health Monitoring:** this is an extension of the CSIC work, including design verification.
- (d) **UAVs “in construction”:** mainly for the use in asset management.
- (e) **Grouted Anchors:** a best practice guide.
- (f) **Culvert Trash Screen Management.**

Rob also reported briefly on the following:

- (g) **SEEBridge (Semantic Enrichment Engine for Bridges)**
- (h) **Data Interpretation of the Staffordshire Alliance Bridges**
- (i) **Visual Modelling from Video:** the production of a virtual model of a bridge from video footage which NR are funding.
- (j) **Cyberhawk:** as presented at a recent UKBB meeting, this is an engineering based drone company, the output from such a survey is considered equivalent to a Visual Examination as well as producing a 3-D model. For example, a nine span viaduct has been inspected in this way taking six days and costing £20,000. Rob thought that this might be worth a presentation at a future BOF.

ACTION 31: Rob Dean

- (k) **CBDG:** new guidance is to be published.
- (l) **In2Rail:** Rob will issue this document to Richard Fish for issue to BOF members only.

ACTION 32: Rob Dean/Richard Fish

- (m) **Masonry Assets:** NR are looking at a more granular approach to managing masonry assets. Of particular use is an old gazetteer of railway contractors covering the period 1856 to 1901. This is being digitised for wider use.
- (n) **UKRRIN:** UK Railway Research and Innovation Network – a new partnership recently signed with Universities (Birmingham, Huddersfield and Southampton)

## 10. Any Other Business

### a. Brexit

The Chairman questioned the impact of Brexit in the context of Eurocodes. Neil Loudon reported that the use of Eurocodes will continue and are being incorporated into the rewrite of the DMRB.

### b. Carillion

The Chairman noted the announcement earlier on the day of the meeting that Carillion had gone into receivership. It was agreed that it was too early to comment on any possible consequences.

### c. HAC Structures

Rob Dean reported on a recent concern within Network Rail of an emerging problem of HAC identified concrete in up to 50 rail bridges in Scotland. Cores had been taken which showed that compressive strengths had dropped to only 2 or 3 N/mm<sup>2</sup>. The source was thought to be old British Rail pre-casting yard so the issue was likely to be confined to railway assets. Rob confirmed that SCOSS had already been advised. Rob agreed to issue a fact sheet for issue to BOF members.

ACTION 33: Rob Dean/Richard Fish

### d. Transport Scotland BOF Representative

Richard Fish reported that this was to have been Wayne Hindshaw's last full BOF meeting as he planned to retire in March. Wayne will be asked to advise of his replacement.

ACTION 34: Wayne Hindshaw

## 11. Next Meetings

Richard Fish explained that, as last year, there was to be an additional meeting (BOF 56) on 13<sup>th</sup> March at the Ricoh Arena, Coventry. He would issue an agenda and confirm arrangements in due course.

ACTION 35: Richard Fish

BOF 57 will be held on 15<sup>th</sup> May 2018, at Kings College, Cambridge.

## 12. Close

The Chairman thanked everyone for attending and closed the meeting.

Richard Fish,  
BOF Technical Secretary,  
14th February 2018