

BRIDGE OWNERS FORUM

MINUTES OF MEETING BOF 59: TUESDAY 29 JANUARY 2019 AT THE BEVES ROOM, KING'S COLLEGE, CAMBRIDGE

PRESENT:

Nick Burgess	LUL
Rob Dean	Network Rail
Henry Dempsey	SCOTS
Liam Duffy	Transport Infrastructure Ireland
Richard Fish	Technical Secretary
Philip Gray	TfL
Jim Hall	CSS Wales
Keith Harwood	ADEPT
Daniel Healy	Department of Infrastructure – Roads and Rivers (NI)
Jason Hibbert	Welsh Government
Neil Loudon	Highways England
Hazel McDonald	Transport Scotland
Campbell Middleton	Cambridge University Engineering Department (Chairman)
Paul Thomas	Railway Paths

Paul Fidler	CUED
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Guests:

Bill Bryce	SSE
Alastair Soane	SCOSS (part)
Hideo Takano	Highways England
Mark Wheel	Network Rail (part)
Francis Hennigan	Network Rail (part)

NB: Error in agenda numbers. Abnormal Loads and Overloaded Vehicles item now referenced as Item 4a.

1. Welcome, Introduction and Apologies

The Chairman welcomed everyone to the meeting, especially Bill Bryce of SSE who was attending not only as a guest but also as a possible future BOF member.

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

Andy Featherby	C&RT
Tomas Garcia	HS2
Trish Johnson	Big Bridge Group

He noted that both C&RT and the Big Bridge Group were due to decide who their BOF representative was going to be. Richard also reported that Tomas Garcia was a late apology as he had had to return to Spain where his father had been taken ill; the meeting wished him well.

The Chairman invited Bill Bryce to introduce himself and his organisation. Bill explained that he was a Senior Structural Engineer with the Generation Division of SSE plc (formerly Scottish and Southern Electricity and Scottish Hydro Electric). He had been with SSE some 27 years after a career with a D&B contractor and consultants in the UK and abroad. SSE has over 450 bridges ranging in age from the early 1900s to 2016 and in size from one metre spans to a 167m three span bridge; most were privately trafficked and hence low volume and no de-icing salts. The motive for considering BOF membership was to appreciate best bridge management practice and to gain awareness of innovative techniques and developments.

The Chairman also welcomed Hideo Takano of Highways England who was an occasional attendee at BOF meetings.

2. BOF 58 Minutes

a) Accuracy

- i. Page 1, Title: Replace BOF “57” with “58”.
- ii. Page 1, Item 1: Replace “Transport Northern Ireland” with “Department of Infrastructure – Roads and Rivers (NI)”

The Chairman suggested that Richard Fish should be made aware of any sensitive wording before the minutes could be uploaded to the BOF website.

ACTION 1: All/Richard Fish/Paul Fidler
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b) Matters Arising

Action 1: Website Passwords for New Members

These were issued at the meeting.

Actions 3: BOF Website Photographs

Permission forms to be completed.

ACTION 2: All

Action 4: BOF Website

The Chairman acknowledged that this was becoming an important issue and resources needed to be identified for what would be a substantial exercise. He pointed out the importance of being able to access the BOF archives and the various reports and documents that had been uploaded over the years. Paul Fidler noted that the website was hindered by the fact it was running on obsolete hardware and suggested that it might be better to be mounted by an external provider. He also pointed out that he was the only person able to upload information as things currently stood. The Chairman asked for the meeting's views:

Jason Hibbert agreed that the website had an outdated look and feel and that an upgrade was essential. Neil Loudon suggested that opportunities to raise BOF's profile were being missed as the only users were probably BOF members at present.

It was agreed that all options should be explored, including BOF budget implications and the possible use of CUED admin staff to assist.

ACTION 3: Chairman/Paul Fidler

Action 5: Data Management/Security

Arising from a discussion at BOF 58, the meeting considered expanding the subject of cyber security to the broader issues around resilience. Neil Loudon noted that Highways England had a Resilience Team who were working on a new standard. Neil also suggested that a future BOF themed meeting might be devoted to the subject. Hazel McDonald agreed, stating that it was better to take a holistic view on resilience issues. The Chairman suggested the Cambridge Centre of Digital Built Britain (CDBB) might assist with such a meeting.

ACTION 4: Chairman/Richard Fish

Action 6: QUB Project

Daniel Healy explained the background to this project: Queens University had approached the NI Department of Infrastructure – Roads and Rivers (DIRR) to use their bridge assets to examine changes to modal frequencies over a long term (five to ten year period: in order to mask out environmental effects) to attempt to detect potential deterioration. Five bridges had been identified and had been equipped with remote sensors providing continuous data. The project was being led by David Hester (who had presented on this topic at a previous BOF meeting and who was also speaking at this year's Bridge Conference in March). Neil Loudon noted that several Universities were developing this technique including Exeter and Cambridge. The Chairman acknowledged that he had originally been sceptical that the methodology was workable but had seen good outputs when combined with AI that the Alan Turing Institute had assisted with. It was discussed and agreed that a possible future themed BOF on sensor technology, at which Sakthy Selvakumaran (who used to attend BOF meetings when she was a PhD student) might also present on her work with satellite technology.

ACTION 5: Chairman/ Richard Fish

The Chairman noted, and Paul Fidler confirmed details, that the International Conference on Smart Infrastructure and Construction (ICSIC) was to be held at Churchill College, Cambridge in July 2019.

Action 7: Chloride Study

Liam Duffy advised that, whilst he had received this report, he was not yet happy to share it but would do so at a future meeting.

ACTION 6: Liam Duffy

Action 8: Bridge Inspections

Neil Loudon noted that the original Atkins scoping study was a pre-cursor to BICS commissioned by DfT and may no longer be relevant. It was agreed that Richard Fish should contact Stephen Pottle to see if it could be issued.

ACTION 7: Richard Fish

Actions 9 & 10: Papers on Environmental Pollution and Inspection Reliability

Richard Fish to check if these had been issued by Rob Dean.

ACTION 8: Richard Fish

Action 11: UAVs

Although the official DfT UAV trial had been abandoned due to concerns over public privacy, the Chairman noted the huge potential for the use of UAVs and recalled discussions at earlier BOF meetings and the number of trials already conducted by BOF members.

Rob Dean noted that Network Rail were planning to use UAVs for the Inspections for Assessment of major masonry viaducts but with the emphasis on identifying suspect areas so that hands-on, touching and tapping investigations could be targeted to those elements. Rob also noted the benefit that UAVs could offer in terms of producing rendered LIDAR images with excellent resolution, although with significant data storage issues. Neil Loudon had seen presentations using a similar approach for the inspection of off-shore oil rigs, including AI techniques to only report defects such as paint bubbling.

Henry Dempsey noted that Glasgow City Council were working with Aecom to use UAVs in a similar situation on a weight restricted Kingston Bridge approach viaduct. Additional data collected by thermal imaging could identify areas of weak or spalled concrete and this will be used to make comparisons with the previous Principal Inspection. Henry also noted that UAVs had been used in inspections in tunnels with limited lighting and produced good results. He agreed to provide feedback at the next meeting.

ACTION 9: Henry Dempsey

Rob Dean advised that Network Rail had also worked Aecom and their UAVs and also with Cyberhawk, who had worked in the North Sea and gave an excellent service.

Nick Burgess reported an application on the London Underground in which UAVs were being used to inspect the roofs of train sheds, also with thermal imaging and LIDAR. Jason Hibbert understood that some UAV thermal imaging had had problems with calibration. Hazel McDonald reported on a recent trial of a UAV inspection of Erskine Bridge, although the results had not been conclusive.

Rob Dean repeated a report from a previous meeting on trials that Network Rail were conducting with Huddersfield University which would eventually produce an accurate BIM model of an existing bridge and agreed to share the results at a future meeting.

ACTION 10: Rob Dean

Rob Dean suggested that a risk with UAV data collection was that the technology could outstretch the need, especially with issues of data storage and post-processing. The Chairman agreed with the data and time problem, quoting a rule of thumb that one hour of collection required ten hours of post-processing. He also warned against the hype from salesmen but considered that it could be a significant breakthrough in terms of effective bridge management. He suggested that a consistent specification and scope for UAV surveys might be beneficial. Rob Dean questioned whether the Cambridge CDBB could help in producing this and the Chairman agreed to investigate.

ACTION 11: Chairman

The Chairman also proposed, and the meeting agreed, that a future BOF themed meeting might consider the topics of UAV data collection and digital imaging.

ACTION 12: Chairman/Richard Fish

Action 14: Arch Bridges

Graham Cole's presentation was now on the BOF website.

Action 16: WiM Sites

Neil Loudon had previously emailed information on the WiM sites on Highways England's network:

- None currently managed by Highways England
- 10 operated by DVSA
- One being planned by Highways England
- Locations are not divulged
- Analysis from WIM sites cannot be circulated

Action 18: Portsmouth Bridge Fatigue Failure

It was not clear whether this paper had been issued and this would be checked.

ACTION 13: Rob Dean/Richard Fish

Action 19: Engineering Competencies

Rob Dean updated the meeting on this initiative covering knowledge and ability which was still work in progress but only within Network Rail at present. He agreed to share the outcome in due course.

ACTION 14: Rob Dean

The Chairman questioned whether there was something that BICS might learn from the concept and Neil Loudon reported that LANTRA were beginning to look at modularisation in the scheme.

Action 20: Spheron VR Trial

Rob Dean reminded the meeting that this trial was looking at Ultra High Definition Resolution (UHDR) and agreed to provide an update to be provided at a future meeting.

ACTION 15: Rob Dean

Action 21: Future BOF on Research Projects

To be considered in due course along with other themed meeting suggestions.

ACTION 16: Chairman/Richard Fish

Action 22: Information on Eastham Bridge Collapse

Still to be discussed with SCOSS.

ACTION 17: Richard Fish

3. Building a Safer Future – SCOSS/CROSS Update

The Chairman welcomed Alastair Soane, who had joined the meeting, and commented on the excellent work of SCOSS and CROSS

Alastair presented on his chosen topic - Building a Safer Future - which he summarised as the post-Grenfell attitude to safety in construction and the built environment. He agreed that his slides could be uploaded to the BOF website.

ACTION 18: Paul Fidler

Alastair began by reflecting on SCOSS's genesis: having been founded in 1976 with CROSS starting in 2005 and relying on voluntary submissions to publicise safety concerns. It was loosely based on the NASA initiative, the Aviation Safety Reporting System which adopted a no-blame culture. CROSS was now becoming multi-national with organisations in Germany, South Africa, Australia and the USA; the last under the auspices of the National Institute of Standards and Technology (NIST).

SCOSS and CROSS cover the whole breadth of construction activity from design to the end of life. The aim is to identify pre-cursors of potential problems and to

identify risks ahead of irreversible effects. Among the examples that Alastair referred were the City Gates collapse in Ilford in 2012 and the Edinburgh Schools but he concentrated on High Rise Residential Buildings (HRRB), starting with the Ronan Point collapse in 1968 that led to more robust design standards and Grenfell Tower in 2017. The latter had opened significant societal issues and would also lead to major changes in Building and Fire Regulations. Grenfell had also revealed a lax attitude to risk not only in design and construction but also in ownership responsibilities and the operation and management of the building.

In terms of fire safety, Alastair also drew on examples of the Liverpool Echo Arena car park fire which destroyed 1400 vehicles in 2018, the Chicago tower (2015) and the M1 bridge fire (2017).

As well as the ongoing inquiry, two reports had been released post-Grenfell: the Review by Dame Judith Hackett and the “In Plain Sight” report from the ICE, led by past-president, Peter Hansford. Both contain a number of outcomes and recommendations which hopefully will lead from a blame culture to a learning culture and increased responsibilities for building owners who will have to demonstrate their competence. Alastair noted that the Dutch Safety Board had investigated the collapse of a car park at Eindhoven airport in 2017 and had reached similar conclusions to Hackett.

Finally, Alastair returned to the subject of high-rise buildings, citing several examples of progressive collapse in Russia and the very recent problems that had been identified in the Opal Tower in Sydney which had led to its evacuation just before Christmas 2018 (a subject which CROSS -AUS was closely following).

The Chairman thanked Alastair for his presentation and, before inviting questions or comments, suggested that Governments were taking little action in terms of procurement as the tendency to accept the lowest price still seemed to prevail. He also reprised a point often made at BOF that the decline in site supervision and the rise in self certification had also reduced the quality of the finished product. Asked by Keith Harwood, Neil Loudon, whilst unable to quote from the unpublished state of bridge infrastructure, implied that a perceived reduction in supervision levels had been identified as an issue. Jason Hibbert suggested that changes in procurement had influenced reduced supervision. A wide-ranging discussion followed:

- **Maintenance budgets:** recognised that these are the most vulnerable and that this should be a consistent message from all owners at every opportunity. It was also agreed that governments should be lobbied to try to ensure these are protected.
- **Consistency of inspections:** Mark Wheel outlined his “normalisation of deviance” theory in that subsequent inspections failed to recognise progressive deterioration. Rob Dean used the term “wobble-meter”; all inspectors have different thresholds of concern and achieving consistency was problematic.

- **Private owners' responsibilities:** noted that issues with a private asset adjacent to one owned by a competent body may still be the responsibility of the technical client. Rob Dean advised that the ORR were working on arrangements with outside parties.
- **Safety requirements in tenders:** Liam Duffy questioned whether this was becoming more prevalent, especially since the Eindhoven Airport Carpark incident. Alastair Soane reported that he had not yet seen an improvement.

The Chairman suggested that BOF should be more responsive in terms of giving evidence to inquiries such as Hackett or Hansford, or to the ORR. He and Richard Fish agreed to discuss.

ACTION 19: Chairman/Richard Fish

4. Bridge Bashing

The Chairman welcomed Network Rail's Mark Wheel to his first BOF meeting. Mark gave a presentation which demonstrated Network Rail's objective of raising the profile of bridge strikes. He agreed that this could be uploaded to the BOF website.

ACTION 20: Paul Fidler

Mark's presentation included video recordings of bridge strikes (which now had the potential to be used as evidence in subsequent prosecutions) and a number of facts and statistics:

- There was an average of five strikes per day (about 2000 per year).
- Additionally, there were about 40 strikes by double decker buses.
- 2017/18 was the worst year for strikes in the last decade.
- There were two annual spikes in bridge strikes: March (thought to be attributable to the clock change) and December (additional pre-Christmas deliveries).
- Network Rail were now able to claim consequential costs from train/passenger delays in prosecutions or insurance cases.
- All bridges were now categorised in terms of risk of a strike.
- The Network Rail campaign centred on the four Es: Engineering, Education, Enforcement and Enablement (including improved use of SatNavs).

Discussion centred around the link between Network Rail and the Highway Authority. Mark Wheel noted that ADEPT representation/attendance on the Bridge Strike Prevention Group could be better. Keith Harwood will raise this with Kevin Dentith, Chair of the ADEPT Bridges Committee. It was also noted that the measurement of headroom and signage was the Highway Authority's responsibility. Mark noted that prevention documents will be rolled out to relevant local authorities.

The Chairman thanked Mark for his presentation and asked what would make the biggest change to the bridge bashing problem. Mark suggested that responsibility should be shifted from drivers to haulage companies and the DVSA should carry out more checks on vehicle heights.

The second part of this item was a presentation from Hideo Takeo on Highways England's campaign, "Don't knock it". Neil Loudon requested that Hideo's slides should be placed on the members' only area of the BOF website.

ACTION 21: Paul Fidler

Hideo reported that Highways England recorded about 20 – 30 strikes a year with the majority of these being on bridges that were not sub-standard in terms of headroom: the main culprit was construction plant on the back of low-loaders which were inadequately secured, allowing the booms to ride up. In the last ten years, three structures have had to be replaced as a result of strikes, including that in 2016 of the M20 footbridge (built in 1971) which had had its deck removed by the strike. Although the footbridge had been compliant with contemporary headroom standards, the question was whether to retrofit older footbridges to the current standard of 5.7m.

Of these strikes, about 60% were reported and the vehicle identified with the remainder only noted at subsequent planned inspections. Hideo also noted that abnormal loads due to height did not require prior notification as opposed to weight and width. Highways England were attempting to ensure consistency among their managing agents in terms of risk management and reporting.

Finally, Hideo noted that there was no budget for this campaign but it was to be launched at the Commercial Vehicle Show in April.

The Chairman suggested that simple fail-safe device that warned the driver when the plant boom was moving should be an easy solution but Neil Loudon pointed out that the majority of big earth moving plant is quite old.

4a. Abnormal Loads and Overloaded Vehicles

The Chairman introduced Francis Hennigan who was the Network Rail representative on the Abnormal Load Liaison Group (ALLG) which had been established in 2015.

Francis explained that some 120,000 AIL notifications were received each year by Network Rail. Most of these were in the range of 60 to 80t and construction related. Some mobile cranes were only 40t but were considered as AIL due to high (16t) axle loads. That was not the full picture, however, as it was estimated that probably only half the total movements were notified. Records from 2013 showed that 49%

of those notified were compliant, 33% of movements had only been given at one day's notice and 18% were inaccurate.

Francis outlined some possible reasons for these figures:

- There was a lack of awareness of responsibilities with hauliers and clients.
- There was a lack of forward planning by hauliers and clients.
- Hauliers were aware that the chance of being caught was minimal.
- The consequences of being prosecuted were minimal.
- Police no longer escort AILs and are reluctant to stop and challenge (in part due to the absence of hard shoulders on smart motorways)
- Inconsistency of managing AIL movement within and between local authorities.

The ALLG were seeking to address some of these issues through the production of guidance documents and establishing regional hubs. They were also adopting a free operators' registration scheme following the initiative developed by TfL. In terms of the impact on structures, the concern was not single isolated movements but the cumulative effect of regular AIL movements on a particular route, although it was recognised that this was very difficult to assess and measure.

The Chairman thanked Francis for his presentation who agreed that his slides could be uploaded to the BOF website.

ACTION 22: Paul Fidler

In response to questions being invited, Paul Thomas asked about the commonly held belief that weight restrictions were widely disregarded. Francis noted that, in theory, hauliers were obliged to recce the route in advance so this should not happen. He was aware, however, of the level of abuse in this respect. Liam Duffy questioned the use of weigh bridges for prosecution. Neil Loudon reprised his point under matters arising of the very few sites in the UK as well as the fact that they were managed by the DVSA.

The Chairman asked about the use of ESDAL. Francis noted that only about one third of notifications are through ESDAL and, although some police forces have mandated the use of ESDAL, no local authority had done so. It was also generally unpopular with hauliers who found it somewhat clunky. The pressure remains on the ALLG to provide evidence of AIL notification abuse and to establish where the liability lies.

5. Technical Approval of Temporary Bridges

Neil Loudon summarised the background to this initiative which the, then, Highways Agency had instigated in 2012 in association with the London Olympics in order to have a knowledge of the availability of temporary bridges in the event of terrorist or similar actions. Fast forward to 2018 and HE were continuing to work

on a database website concept with DfT and suppliers which would list details of all companies, their available stock and outline Technical Approval documents. This had been procured via DfT and would be hosted either on their website or that of the UKBB. It was expected that the site would be up and running in 2019/20. It was intended only for unplanned situations and any highway authority wishing to use it would have to go through their own procurement process with the chosen supplier.

Alastair Soane drew the meeting's attention to the Advisory Group on Temporary Structures (AGOTS) which might provide additional information.

6. RAC Report on Cost of Clearing Bridge Maintenance Backlog

This item was mostly for information and, although some of the questions could have been better phrased, it was generally agreed that the RAC report could do no harm. Hazel McDonald noted that incorrect information from Transport Scotland had been published in the report.

Of most concern were the questions about post-tensioned bridges, arising as a result of the Genoa collapse, and the fact that there appeared to be a large number of bridges that had never had a Post-Tensioned Special Inspection (PTSI). It was agreed that upping the game with respect to lobbying for funding might be worth a discussion with a marketing specialist. Richard Fish agreed to discuss with Helena Russell at the March Bridge Conference.

ACTION 23: Richard Fish

7. BOF Grand Challenges - Update

Keith Harwood reminded the meeting of the previously agreed Grand Challenges:

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

He also reported on a recent conversation with Stephen Pottle in which they had concluded that the last two of the list might technically not be challenges. After discussion, also related to the competence issues that Alastair Soane had raised, it was agreed that the penultimate challenge was essential and that the six should remain.

Keith then reported that drafts of the six proformas were now in place but agreed to review and polish for discussion at BOF 60.

ACTION 24: Keith Harwood

The Chairman suggested that a review of the BOF Grand Challenges against those being developed by Network Rail might prove interesting. Rob Dean accepted that there were similarities but, by definition, the latter were geared specifically to rail issues.

A further discussion ensued on the purpose of the Grand Challenges with the Chairman reminding the meeting of the original initiative which was to direct research into areas in which there was demand. It was agreed that they were central to BOF's work especially in terms of influencing and lobbying but should be reactive to events as well as proactive in terms of driving R&D. Neil Loudon noted that the current five-year funding cycles for road and rail were based on the assumption that all was well with the bridge stocks. He described a recent exercise that Highways England had held with WSP, using power and influence diagrams and agreed to issue an example for possible use at a future BOF meeting.

ACTION 25: Neil Loudon

Alastair Soane offered to act as an intermediary for BOF to contact the ICE to discuss enhanced competence requirements post-Grenfell.

8. Topics for future Bridge Related Research and Prioritisation for UKBB

Richard Fish referred to the email from Liz Kirkham, UKBB chair, and the request for BOF to develop a list of potential projects.

After much discussion the following list was agreed (albeit slightly modified subsequent to the meeting) for presentation to UKBB on 13th February:

1. Guidance for Road Restraint Systems on Local Roads.
2. Gap analysis for Strategic Bridge Management (based on the previously discussed "Cradle to Grave" concept).
3. Human factors in Asset Management Decision Making (Could be linked to 2 above).
4. Research into the extent and consequences of overloaded HGVs (including data collection of data from existing WiM sites and potential impact on fatigue susceptible structures).
5. Review of state-of-the-art Sensors for corrosion detection in Reinforced Concrete.
6. Improved understanding of Deterioration of Concrete Bridges.

It was agreed that further suggestions or modifications could be sent to Richard Fish by 8th February.

ACTION 26: All

Richard will then compile a final list to be issued in advance of, and for consideration at, UKBB.

ACTION 27: Richard Fish

[Post meeting note: actual list as taken at UKBB was as above but with an additional item: "On-line Training modules for the improved understanding of the behaviour of arch bridges", as proposed by Philip Gray (TfL) and supported by Graham Cole and CIRIA.]

Neil Loudon suggested another possible BOF themed meeting in which various sensor manufacturers could be invited to demonstrate their devices.

ACTION 28: Chairman/Richard Fish

9. Bridge Research Update

a. TfL

Philip Gray noted the second meeting of the CIRIA arch bridge guidance steering group was to be held on 7th March and a summer publication was anticipated.

b. ADEPT

Keith Harwood reported that the Structures Toolkit work was due to be completed by the end of March. He also noted that work to update BCI guidance was being undertaken by Herts CC, WSP and Arup, funded by DfT.

c. Railway Paths

Paul Thomas will advise future meetings of any further developments on the use of linseed oil to protect wrought iron.

d. Network Rail

Rob Dean advised on the following:

i. Huddersfield University

Ongoing project on machine learning defect identification and BIM model generation.

ii. Masonry Arches

Ongoing work with Bill Harvey and Imperial College.

iii. EU Research

Investigation into the use of drones to survey network issues in the event of an incident.

e. Highways England

Neil Loudon reported as follows:

i. DMRB Review

60% complete; must finish by September 2019

ii. Boundary Issues

Ongoing discussions between Highways England and ADEPT have now been extended to cover land ownership and embankment responsibilities.

iii. Safety Critical Fixings

The new guidance will be launched at WSP on 18th March and Highways England are working on a draft document for implementation.

iv. Hidden Defects

Standards will be developed for implementing this project, especially for critical fatigue details.

v. Next Control Period

Funding had been identified for research in the next five year period, including trials on the network.

f. Transport Scotland

Hazel McDonald noted that the Scottish Road Research Board had issued a call for research topics which were due to be discussed at a meeting on 21st March. She also noted that a review was underway on wind related behaviour on the Queensferry Crossing with a view to raising the thresholds at which control measures had to be introduced.

g. Welsh Government

Jason Hibbert raised the issue of the recent request for BOF support for an EPSRC funded project. The Chairman had declined to write a supporting letter, expressing the preference that letters of support should come from BOF member organisations. Jason noted that EPSRC at a recent meeting had referred to the value of organisations such as BOF, even to the extent that we were mentioned on their website. After discussion, it was agreed that all requests for support should go through Richard Fish.

ACTION 29: All

10. Bridge Collapses

Richard Fish noted that there had been no significant collapses since the last meeting but he was giving the keynote address on the topic at the UK Bridge Conference on March 14th.

11. BOF 60: Coventry, 13th March and Annual Bridge Conference, 14th March

To be noted. Details of the BOF 60 arrangements and agenda to follow.

ACTION 30: Richard Fish

12. BOF 61: Edinburgh, 14th and 15th May

Richard Fish outlined an inductive programme for two full days, including presentations, bridge tours and a BOF business meeting. Details will be prepared and circulated.

ACTION 31: Richard Fish

13. Any Other Business

a. State of Bridge Infrastructure Report

Keith Harwood asked if this could be made available. Neil Loudon replied that the report could not be circulated as yet and that it was a low priority within the HE in the context of the DMRB review.

b. Portsmouth Bridge Fatigue Failure

Rob Dean gave additional information on the Portsmouth failure, mentioned under matters arising above. The bridge had been strengthened in the 1950s and it was this detail that had failed. The whole deck had been replaced and Mott MacDonald were analysing the failure. Rob also noted that there was an ongoing EU study into the use of carbon fibre wrap to reduce fatigue failure risk at critical locations.

c. Structures Toolkit

Hazel McDonald advised that SCOTS had also been working on this. Keith Harwood agreed to follow up.

ACTION 32: Keith Harwood

14. Close

The Chairman thanked everyone for attending and closed the meeting.

Richard Fish, BOF Technical Secretary,
26th February 2019