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The Institution of Civil Engineers' Panel for Historical Engineering Works

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Abstract

This paper outlines the role and activities of the Institution of Civil Engineers' Panel for Historical Engineering Works (PHEW) in the recording, assessment, promotion of knowledge, and encouragement of excellence in the conservation of historical engineering works in the United Kingdom and Republic of Ireland.

Introduction

The Panel for Historical Engineering Works, originally named the Engineering Monuments Panel, was formed by the Institution of Civil Engineers in 1968 and has operated as PHEW since 1973.(1) It was created by the Institution at a time of an increasing awareness and appreciation of the nation's technological inheritance "to foster a proper interest in civil engineering heritage".(2) The Panel has functioned primarily as a recording and knowledge promotion body but from the 1980s, as its record database and expertise grew, it has taken an increasing interest in the assessment of historical engineering works and their authentic conservation.

The Panel is now generally recognised as the leading authority on the civil engineering heritage of the United Kingdom and Republic of Ireland. Its objectives are, *to identify, record and promote knowledge of works illustrative of the history and development of civil engineering and to encourage excellence in the conservation of significant examples.*(3)

Organisation

A team of volunteers consisting of 20 Panel Members, including a Chairman, Vice-Chairman and Technical Secretary and any helpers they can enlist meets the above objectives. All Panel Members are corporate members of a recognised engineering body, mainly the Institution, and they cover, rather thinly, the whole of the land area of the United Kingdom (based on the Institution's Local Association areas) and, in association with the Institution of Engineers of Ireland, through Dr. R.C. Cox, the Irish Republic. These areas, with the names of the present Panel Members, are:

- LA 010 West of Scotland (Mr. J.S. Shipway)
- LA 020 East of Scotland (The Author - Chairman)

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- LA 030 Northern Counties of England (Dr. R.W. Rennison)
- LA 040 Yorkshire (vacant)
- LA 050 North West England and North Wales (Mr. P. Dunkerley)
- LA 060-2 East Midlands – Notts. & Derbyshire (Mr. J.K. Gardiner)
The Fens (Mr. P. Cross-Rudkin). Lincs. (Dr. B.M. Barton)
- LA 070 Midlands (Mr. R. Cragg)
- LA 080 South Wales (Mr. E. O'Leary)
- LA 090-1 South West England – Avon (Mr. D.J. Greenfield)
Devon & Cornwall (Mr. A.B. George)
- LA 100 Southern (Dr. R.A. Otter)
- LA 101 South East England (Mr. R.P. Adam)
- LA 110 Northern Ireland (Dr. M.H. Gould)
- LA 120 East Anglia (Mr. E.A. Labrum - Vice Chairman)
- LA 130 London (Dr. D. Smith)
- LA 140 Chiltern and Thames Valley (Mr. J.B. Powell)

The North West England and Scottish members are supported by active local groups. Non territorial members are the Chairman and Vice-Chairman (who at present exceptionally represent an area) and the Technical Secretary [Mr. P.D. Stephens] who co-ordinates all technical matters. Representatives of the Institution of Structural Engineers' History Group [Mr. L. Hurst] and the Science Museum, London, (Mr. R. McWilliam) attend meetings by invitation.

New Panel Members are generally selected by the Panel's officers, often in consultation with the appropriate Local Association of the Institution, for their historical engineering knowledge and willingness to meet the Panel's requirements. They receive a letter of appointment from the Chairman and serve for as long as they are able and willing to make a useful contribution.

The Panel is well served by a secretariat at 1 Great George St., London under the direction of Deputy Secretary and Director of Technical Affairs (Mr. A. Bhogal) and the Head Librarian (Mr. M. Chrimes). The latter is responsible for the curation and storage of records in the Institution's library and for advising on all matters relating to its records and publications. He also provides a Secretary (Ms. C. Delgal) and other staff support as necessary for minute-taking, organising meetings, general administration and preparing publications.

Meetings

The Panel meets formally twice a year. First, a one-day meeting in London in April, usually following a talk and mutually beneficial exchange of views with members of an external organisation with similar interests. For the past four years this external element has involved departments of English Heritage, a government agency.

The second annual meeting takes place each September in a different Panel Member's area as part of a two-day event. This includes an information exchange evening with slide-show, site visits to historical engineering works and a dinner to which local people who have given support to the Panel are invited, including

officials of the Institution's Local Association. At last year's visit to the University of Portsmouth, Dr. D. Smith addressed a large public audience on "Engineering and the Naval Dockyards". The Panel's September event constitutes an essential forum for the exchange and enhancement of knowledge and is considered vital to the Panel's efficient operation. Additionally, smaller group meetings on specific matters are held as necessary e.g. on book preparation and specialist sub-panel work.

Finance and Business Plan

Panel Members and their helpers are all honorary posts and the only payments made to them by the Institution are for authorised travel and subsistence. The Panel's annual budget is usually of the order of £30,000. Last year it was £27,000 of which £17,000 was allocated to staff salaries. The cost of meetings was £5,000, and £5000 was spent on publications. Of the latter about £2,000 was spent on printing and distributing the Newsletter and the remainder on heritage leaflets and event posters.

The Panel's activities are included in the Institution's Corporate Plan under the Engineering Division, Library and Information Services and its five-year programme of work is set out in the Business Plan. The entry for 2001 reads:

- *Civil Engineering Heritage: Ireland* reprint of book
- *Quarterly Newsletter*
- Bridge Conservation Awards
- Produce two civil engineering trail leaflets
- Smeaton Lecture: Development of Standards
- Report on Concrete Bridge Assessment
- Annual Meeting (to be held in Limerick, Republic of Ireland)
- Comment on English Heritage Monuments Protection Programme.
- Advice to Central and Local Government, Heritage Lottery Fund.

Further details of these and other activities since the Panel's inception are:-

Activities – Recording and Assessment

- Recording as per the handbook(4) of significant historical engineering works, a process that has also been described by Otter(5) and in an international context, with other activities, by Allsop.(6) Priority is given to works threatened by demolition. There are now more than 2500 records and the system is being computerised to facilitate the accessibility and the very necessary regular updating of data. The record forms e.g. HEW 2182 Sonning Cutting engineered by I.K. Brunel, are kept at the Institution's library together with photographic and other supporting data. These forms are usually available for inspection to members of the Institution and the public on request.
- Assessment of historical engineering works according to their degree of significance. Separate Sub-Panels in respect of water towers, waterways, dry

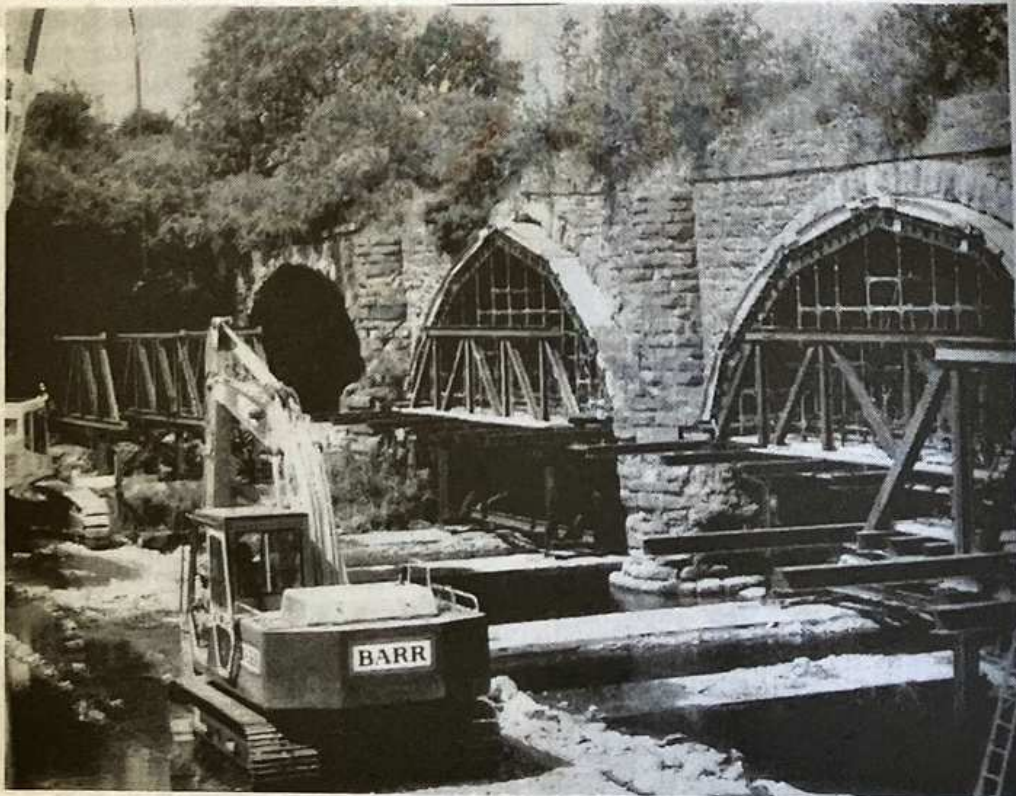
docks, windmills, seaside piers, concrete bridges, arch bridges and cast iron bridges are currently undertaking this important exercise. The painstaking evolution of this work has been described in detail in papers by Otter, Cross-Rudkin, Cragg, Dunkerley and Gould.(5,7,8) Good progress is being made. Each Sub-Panel grades each of its works, at present ranging in number from <100 to >1000, A – D (from best to lowest) against the following criteria: innovation, rarity, age, size, association with an eminent engineer or contractor, ancillary equipment, aesthetics and condition. These grades are then combined to give an overall grading of 1 – 4 (from best to lowest) which have the beneficial assessment attribute that they are comparable across the different classes of works. An idea of the number of works by percentage in each class averaged across five categories can be obtained from a recently published sample, Grade 1 - 6.6%, Grade 2 - 11.2%, Grade 3 - 19.2% Grade 4 - 63%.(9)

This improved system represents a more objective approach to assessment than the methods currently adopted by government agencies and by the Panel in the past. It is increasingly enabling the Panel to speak with authority on the relative merits of works and has enabled the nation's scarce financial resources for preservation to be channelled to the best candidates. For example, in 1998 a 93-page report by the seaside piers sub-panel (Mr. P. Dunkerley) was prepared for the Heritage Lottery Fund which resulted in funding being directed to the preservation of Grade 1 piers at Southport and Hastings.

Activities – Conservation

- From 1982-93 the author advised on the preservation of iron and masonry structures on the former Edinburgh & Dalkeith Railway which were conserved as part of a cycleway/footpath project.(10-13) In 1991-2 various actions were taken by Panel Members to try to preserve Carron and Gattonside bridges, Bridge of Oich, Laigh Milton Viaduct near Kilmarnock and a retractable iron footbridge at St. Katharine's Dock(14-16) with varying degrees of success. From 1996 the Panel played a leading role in a successful campaign to ensure the preservation of the Forth Bridge(17) and strongly supported the now ongoing Anderton boat lift (Weaver Navigation) and Standedge Tunnel (Huddersfield Canal) canal projects.
- In March 1995 the Panel and others took a lead in opposing London Underground's proposed "shotcreting" of the world's first successful sub-aqueous tunnel for public transport, the Thames Tunnel (1825-43. Engineer Sir M.I. Brunel) and called for the tunnel to be listed(18) (which surprisingly it had not been) and arranged for letters of support for this view. The Panel also liaised with the Newcomen Society and English Heritage (Chief Conservation Engineer Mr. Ian Hume) on the setting up of an independent panel of leading engineers (Sir A. Muir Wood, Mr. J. Sutherland and Dr D. Smith for the Panel), to consider practicable solutions "minimising irreversible intervention without compromising safety". The tunnel was listed just before work was due to begin(19,20) and the independent panel set to work, reporting that shotcreting was unnecessary and might cause erosion of the brickwork.(21) Regrettably this advice was not even

- considered(22), but positive outcomes were the preservation of four original bays at the tunnel's south end, a Panel check that other major historical engineering works were listed(23,24) and the introduction of radar specialist Dr. C. Stove to London Underground which led to the first accurate survey of the tunnel's state.
- In 1992, initiating the Laigh Milton Viaduct Conservation Trust to preserve the world's oldest multi-span viaduct on a public railway, the Kilmarnock & Troon in Scotland, engineered by W. Jessop (1745-1814), and operational from 1811. A Stephenson "Killingworth" type locomotive ran on the railway in 1816, nine years before the Stockton & Darlington Railway was opened. Between 1992-96 the Trust, with the Author acting as its Secretary, preliminary works engineer and conservation adviser, raised £1.1m, bought the viaduct for £2.00, and completed the necessary work within budget.(25-27) It is now maintained by East Ayrshire Council Roads Department. This project, which recognised the Panel's role on iron plaques on site and at Heriot-Watt University, shed new light on historic bridge building and iron plate-rail practice(28) and attracted a Saltire Society commendation "for skill in conserving a structure on the verge of collapse".(29)



The 4-span Laigh Milton Viaduct undergoing conservation - 3 August 1995.

Activities – Other

- Attendance at and reporting to Panel meetings.

- Advice and support to public and private bodies, e.g. government agencies, Industrial Archaeology Panels, Scottish, English & Welsh Viaducts Committees (Rail Property Ltd.), British Waterways &c.
- Maintaining contacts with, and lecturing by invitation to, the Panel's equivalent bodies in the USA, Japan, Denmark and Australia e.g. Dr. Otter and Mr. Cross-Rudkin in Australia(5,7) and the Author in Japan(25), the USA (Association for Preservation Technology International & Wheeling Bridge Conference) and Denmark.(30) Informal corresponding members of the Panel, via the Chairman, include Drs. E. Kemp, H. Isohata and S. Onoda.
- Organising events and presenting lectures to public bodies and the Institution's Local Associations – estimated at more than 2,000 lectures since 1968.
- Initiating and organising competitions to encourage high quality conservation of historical engineering works. The first, in association with the Saltire Society's Civil Engineering Awards Panel in 1993(31), covered Scotland, an arrangement now in its ninth year. In 1998 coverage of England and Wales for bridges was achieved by initiating an annual Historic Bridge Award. This important venture now in its fourth year, is organised jointly with The County Surveyors' Society (by Panel Member Mr. D. Greenfield) and sponsored by English Heritage, Railtrack and British Waterways. The competition recognises excellence in achievements that have enabled historic structures to continue to function as useful pieces of infrastructure with minimal intervention. So far the competition has attracted 70 entries, many notable, e.g. Westminster Bridge. Awards are presented by the Institution's President each November and reported fully in the Panel *Newsletter*(32) and in the *New Civil Engineer*.
- Initiating and supporting the Forth Bridges Visitor Centre Trust (Chairman – The Author) details of which, including its Scottish Tourist Board award-winning free exhibition which attracts thousands of visitors annually at North Queensferry, are available on web at www.forthbridges.org.uk.
- Organising numerous information and landmark plaques recognising engineering achievement. Recent examples include, jointly with ASCE, a landmark plaque for the Millennium Link Forth & Clyde and Union Canal Regeneration, and commemorative plaques at Laign Milton viaduct, and at Glenfinnan Viaduct. Previous joint plaques with ASCE were for the Iron Bridge 1979, Forth Bridge 1985, Tay Bridge 1987, Eddystone Lighthouse 1992, and Thames Tunnel 1993.
- Organising the Institution's annual Smeaton Lecture at London in July which, this year will commemorate the centenary of the British Standards Institution (Mr. R. McWilliam). This subject is also the theme of a major exhibition at the Institution. The idea of the lecture was first promoted by the Institution's then Director-General (Mr. R. Dobson) in 1991 and its title was suggested by the Author. The topic is required to be historical engineering but with present-day relevance. The first lecture was on Sir J.W. Bazalgette and London's main drainage (Dr. D. Smith).
- Writing, managing and updating of Panel publications, the income from which is retained by the Institution's publisher Thomas Telford Ltd. (TTL) to help finance future publications. No fees or royalties are paid to the authors.

• Printed Output

- Civil Engineering Heritage books – Five titles in nine printings of 1,500 copies each to date. Volumes for London & Thames Valley and Scotland are in preparation to complete the series. The titles, all published by TTL, are:
- *Northern England*, 1981. 2nd ed. 1996 [Ed. Dr. R. Rennison. ISBN 0-7277-2518-1]. *Wales and West Central England*, 1986. 2nd ed. 1997 [Mr. R. Cragg. ISBN 0-7277-2576-9]. *Eastern & Central England*, 1994 [Mr. T. Labrum. ISBN 0-7277-1970-X]. *Southern England*, 1994. Reprinted 1997 [Dr. R.A. Otter. ISBN 0-7277-1971-8]. *Ireland*, 1998 [Drs. R.C. Cox & M.H. Gould. ISBN 0-7277-2627-7]. Thematic books are at present under consideration by the Panel and one on *Watertowers* [Dr. B.M.J. Barton] is ready for publication.
- Heritage booklets – several on a local basis, mainly in Scotland.
- Heritage leaflets – about 12, e.g. Exeter (1993), Jessop Trail (1995), &c.(33)
- Learned society papers on historical engineering topics – numerous.
- Newsletter (Editor Dr. Otter) – Issued quarterly in March, June, September and December. Printing – 500 copies. Includes short articles as well as news. Issued free on request. On web at www.ice.org.uk under Library – Archives.
- ICE Local Association newsletter coverage of Panel organised events.

The Future

Even though most of the historical engineering works coming within the remit of the Panel have now been recorded, much still remains to be done on completing, updating, consolidating and developing the above-mentioned activities. This work will fully occupy the available capacity of Panel Members and funding for the foreseeable future. There are no plans to increase the size of the Panel which, since September 1990, has reduced by 20% in terms of the number of Panel Members.

The Panel's success to date in meeting its objectives is founded on outstanding support from dedicated and effective members past and present and the Institution's directorate. As long as this support is maintained the Panel expects to continue to make a valuable contribution to the profession and society as the leading national authority in its field.

References and notes

1. Paxton, R. (2000). "Chairman's Column." *PHEW Newsletter*, Mar., 85.
2. ICE Council Minutes, 1968, 440-443.
3. Updated from the wording in "The Institution of Civil Engineers' Panel for Historical Engineering Works Handbook." Apr. 1992, 1.
4. PHEW. (1992) "The Institution of Civil Engineers' Panel for Historical Engineering Works Handbook." (1997 revision).
5. Otter, R. A. (1997). "Recording civil engineering history: The work of the Institution of Civil Engineers' Panel for Historical Engineering Works." *Trans. Multi-disciplinary Engrg. Australia*, GE 23 (1999).

6. Allsop, E. A. (1999). "The Institution of Civil Engineers (UK) Approach to the recording and conservation of historic engineering infrastructure and comparison with the approach of similar institutions in America, Australia and Ireland." MA Dissertation (Archaeological Studies), Univ. of Leicester.
7. Otter, R.A. & Cross-Rudkin, P.S.M. (1996). "Issues regarding the assessment of the historical value of civil engineering works." *Trans. Multi-disciplinary Engrg., Australia*, GE 23. (1999).
8. Cross-Rudkin, P.S.M. *et al.* (2000). "The Assessment of Engineering Heritage." *Proc. Instn. Civ. Engrs. Mun. Eng.*, 2000, 139, 211-216.
9. *ibid.* The figures quoted are an average of the %s in Tables 2-6.
10. Paxton, R. (1983). "The evolution of bridge building in Scotland to 1900." *Civil Engineering Technology*, 8 Aug., No.4, 10-11. PHEW inspected Braid Burn Bridge in 1981. The author advised on the conservation of this bridge, Holyrood Tunnel (reopened 1989) and Glenesk Bridge (reopened 1993).
11. Art. (1982). *New Civil Engineer*. 1 Jul., 27.
12. Lothian Highways Dept. (1990) *The Innocent Railway*, 1990. Broadsheet.
13. Paxton, R.A. (1993) *Edinburgh & Dalkeith Railway: Glenesk Bridge*. Heriot-Watt University Civil & Offshore Engineering Dept.
14. Art. (1991). *PHEW Newsletter*. Jun., 50, 5.
15. *ibid.* (1993). Jun., 58, 4-5 (Carron Bridge).
16. *ibid.* (1992). Jun., 54, 1.
17. *ibid.* (1995). Dec., 68, 3-4.
18. Paxton, R. (1995). "Tunnel channels." *NCE*, 16 Mar.
19. Art. (1995). "Last minute listing for Thames Tunnel." *NCE*, 9 Mar.
20. Art. (1995). *PHEW Newsletter*. Jun., 66, 2.
21. "The Thames Tunnel. Report by the Independent Engineering Consultants appointed by English Heritage. July 1995." Copy at ICE Library.
22. Art. (1995). *NCE*. 27 Jul., 3.
23. Paxton, R. (1995). "Chairman's Column." *PHEW Newsletter*. Sep., 67, 4.
24. *ibid.* (1995). Dec., 68, 2.
25. Paxton, R. (1996). "Conservation of the 1811 Railway Viaduct at Laigh Milton, Scotland." *JSCE Historical Studies in Civ. Engrg.*, 16, 1996, 1-16.
26. Paxton, R.A. (1998). "Conservation of Laigh Milton Viaduct, Ayrshire." *Proc. Instn. Civ. Engrs, Civ. Engrg.*, 126, 73-85.
27. Art. (1996). *PHEW Newsletter*. Dec., 72, 1.
28. Paxton, R. (1998). "An engineering assessment of the Kilmarnock & Troon Railway (1807-46)." *Early Railways*. Newcomen Soc., 2001, 82-102.
29. Art. (2000). *PHEW Newsletter*. Mar., 85, 1.
30. An unpublished version of the present paper given by invitation to HITEK [History of Technology] and V&B [Roads & City Planning] Societies of the Association of Engineers in Denmark [IDA] at Copenhagen 21 March 2001.
31. Paxton, R. (1994). "Chairman's Column." *PHEW Newsletter*. Sep., 67, 4-5.
32. Greenfield, D. (1998-2000). "Historic Bridge Awards 1998 [1999, 2000]." *PHEW Newsletter*. Dec., 80, 1-5; Dec., 84, 1-4; Dec., 88, 1-4.
33. Otter, R.A. (2000). *PHEW Newsletter*. Dec., 88, 5. Illustrations of 3 leaflets.