



I.A.B.S.E. NEWS

**BRITISH GROUP
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GATESHEAD MILLENNIUM BRIDGE

Photograph by courtesy of Gifford and Partners

This newsletter is distributed to all members of the British Group and a single copy is sent to the secretariat of all overseas Groups.

CONTENTS

- Executive Committee
- Aims of IABSE
- Editorial
- Membership News
- New Award for Design Engineers
- Personalities
 - S Bailey
 - C Burgoyne
 - C Cockerton
- Cambridge Colloquia
- Young Engineers Conference
- Young Researchers Conference
- Reflections on the work of SCOSS
- Post-tensioned Concrete Bridges
- Spanning the years
- Melbourne 2002
- Structural Engineering International
- International Representation
- Calendar 2003
- Appendix 1 Index of Features
- Appendix 2 Index of Personality Columns

Mr S J Matthews *WSP Civils*
 Mr A J Pickett *Highways Agency*
 Dr G P Tilly *Gifford & Partners*
 Mr K R Wilson *Maunsell*

Dr C J Burgoyne *Cambridge University*
 Mr D K Doran *FCGI Consultant*
 Mr M C O'Flynn *Taywood*
 Mr W I Liddell *CBE FREng*
Buro Happold
 Mr M J Murray *Babtie*
 Dr J G M Wood *SD & S Ltd*

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 The Lord Hacking
 Mr D W Quinion *FREng*
 Mr A C E Sandberg *OBE FREng*

Members of Honour may attend meetings of the Executive Committee

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AIMS OF IABSE AND THE ROLE OF THE BRITISH GROUP

The International Association for Bridge and Structural Engineering (IABSE) comprises more than 4000 members in 132 countries. Founded in 1929, IABSE deals with all aspects of planning, design, execution, maintenance and repair of civil engineering structures. To fulfil its mission, IABSE organises conferences and publishes a quarterly journal, *Structural Engineering International*, as well as books and reports.

The role of the British Group in relation to IABSE is under regular review and any constructive suggestions that members may have should be addressed to the Honorary Secretary c/o the Institution of Structural Engineers.

EDITORIAL

As this will be my last Newsletter perhaps I may be permitted to reflect on an industry that has given me lasting pleasure and interest.

There is unease amongst engineering practitioners and I list below some sentiments of which I am aware:-

Status

Engineers are reluctant to assume the holistic approach to projects. As a consequence they are rarely the principal contact with the client and are therefore not in a position to influence the money flow.

Engineers too easily allow other professionals to lead on sub-disciplines such as Value Engineering, Risk Management, Project Management and Quality Management.

Should consultants be required to have a licence to practice? The joint IStructE/ICE proposals for Approved Persons and Bob McKittrick's Presidential address [1] come very close to this.

Litigation

Many professionals fear this. I am aware of engineers that decline to visit sites to give general advice for fear of being sued. It is well known that giving free advice will not exonerate an engineer from legal responsibilities.

The blame culture, inherited mainly from our American cousins, threatens to inhibit innovation.

Some engineers are finding it impossible or too expensive to obtain Professional Indemnity Insurance.

Our industry, has available to it, a cascade of dispute resolution techniques. In ascending order of cost and complexity they are; negotiation, mediation, adjudication, arbitration and litigation. Would it be helpful to have in place a single statute to compel would-be litigants to follow that cascade before ending up in court? Peter Campbell has pointed out that £1 of construction-related compensation generates £5 of costs, much of which are legal costs. In my time on site many disputes were resolved over a pint in the pub and a discussion between agent and resident engineer. In this way, quite unrelated issues could be equated and honour was restored all round. We used to call it equating apples and pears!

The recent legal decision in the Galliford/Hodgson case in which an errant, trespassing youngster was killed has led to a further clamour for the introduction of a charge of corporate manslaughter. If this happens who will take on the role of safety director in a contractor's organisation with the prospect of ending up in prison?

Education

Government suggests that 50% of the population should be educated to degree level. Is this realistic?

Was it sensible to give polytechnics university status?

Are university professors having to spend too much time chasing money and, therefore, too little time teaching or doing research?

Top-up fees [for degrees] in the order of £15000 per annum have been mooted. If applied to engineering will this further deter students from entering the engineering profession?

The number of students studying civil engineering is falling and, of those who are, about 50% do not pursue engineering careers.

Should degree courses receive state aid in relation to their perceived value to the community? In simple terms should, say, medicine, science and engineering receive more support than, say, media studies and leisure management?

In the 50 years since I graduated, the degree requirement for chartership has risen from 2 years to 4 years [or 3 plus matching sections]. Has SARTOR got it right or should we go back to first principles and re-assess what really needs to be taught at university?

Legislation

Construction professionals now operate within a stifling stockade of regulation. This arises from the Building Regulations, CDM, Health & Safety and other regulations. Have H&SE regulations reached the point of diminishing return or do we need more to lower the unacceptable rate of injury and death in our industry? Should we not emphasise that construction sites are dangerous places and suggest that workers [with employers assistance] take good care of themselves. Many accidents are caused by sheer stupidity on the part of the victim.

Designers' responsibilities for safety now extend on to the construction site where, perhaps, they have no contractual responsibilities. Is this fair or should we revert to the old maxim of limiting responsibilities to what you actually do? In other words designers *design* and constructors *construct*.

Quality plans proliferate from CDM but they seem to be dominated by

systems and tick boxes. Little emphasis is placed on improving the quality, training and experience of personnel. From the work of Les Clark [2,3,4] and others it would appear that whilst designers have become more sophisticated the skills of those on site have scarcely improved.

Many of the points I have raised above come from personal observations. Have I exaggerated? It would seem that the industry has many problems to address and will need a sharp dose of pragmatism with which to resolve them.

Finally may I thank all those who have helped me over the last 18 years with articles, advice and proof reading. My apologies to those very busy people who I have cajoled into impossible deadlines. Also, at the risk of being accused of nepotism, may I thank Maureen, my wife, for transposing my rough Newsletter drafts into a pleasing, final result.

With very best wishes for the future.

[1] TSE Vol 80 No:18

[2] TSE Vol 75 No:17: *How can we get the cover we need?*

[3] CRR394/2001: *Investigation into aspects of falsework*

[4] SC/T02/01: SCOSS Topic paper: *Falsework: Full circle?*

David Doran - Editor

MEMBERSHIP NEWS

We were saddened by the death of Bob Milne [Honorary Secretary] on 30 Aug 2002. A tribute to him follows this item. We are grateful to Tony Oakhill for temporarily filling the post of

Assistant Honorary Secretary until a final decision has been made on a successor to Bob.

Congratulations to:-

Ian Liddell FREng on his election to the 2002 Laureate of the International Award of Merit in Structural Engineering in recognition of his contribution to the field of structural engineering.

Dr Sam Thorburn OBE FREng on his award of a Gold Medal by the Institution of Structural Engineers.

Professor Patrick Dowling FREng FRS on his becoming the winner of the 2002 Charles Massonet Award for his contribution to the advancement of scientific and technical support to constructional steelwork

Peter Head FREng and Professor **David Nethercot** FREng on their award[s] of Fellowships of the City & Guilds Institute in 2002.

Dr John Menzies FREng for his Lewis Kent award from the Institution of Structural Engineers

R [Bob] J W MILNE 1929-2002

Bob Milne died on 30 August 2002. His eventful life was celebrated at a funeral service movingly conducted by Rev Ian Gilmour at the Holy Redeemer Church, Streatham on 17 September 2002. Many members of his family, professional colleagues and friends met to pay tribute to a remarkable man. Alain Golay, Executive Director of IABSE Zurich was among the mourners.

Following National Service in the RAF [1947-1949] he graduated with a degree in Physics and Mathematics

and, for eight years, worked as an electrical engineer. In 1960 he was appointed Assistant Editor of the Journal for the Institution of Electrical Engineers, followed in 1963 by becoming Secretary of the Plant & Energy Division of the British Iron & Steel Research Association. In 1967 he joined the Institution of Electrical & Electronic Engineers as Journal Editor and Assistant Secretary.

In 1969 he joined IStructE and became Assistant Director of Engineering combining this post with that of Managing Editor of *The Structural Engineer*. A further appointment followed in 1970 when he became Honorary Secretary to the British Group of the International Association for Bridge & Structural Engineering [IABSE] attending an Executive meeting just a few days before his death. He retired from IStructE in 1994 having served under successive Institution Secretaries, Cyril Morgan, Derek Clark and John Dougill. He was also an enthusiastic supporter of the IStructE History Study Group.

Bob was a warm-hearted man, slightly eccentric but immensely popular with the membership. He held the Institution and its senior members in high esteem. The standard he set for the Journal remains unsurpassed [he must have been one of the best proof readers in the business]. Often overworked, he tended to set his own agenda – sometimes to the annoyance of others - but always with the welfare of the Institution and its membership at heart.

A visit to Bob's office was interesting. It had the appearance of that of a Dickensian solicitor – no filing cabinets but piles of documents on the desk, the chairs, the bookcase and the floor. However, like many apparently

untidy professionals, Bob could always put his finger on the required paper. Obscure documents were scrutinised through a magnifying glass or with spectacles held at a distance. Beryl Hixon [now PA to Dr Eaton] his constant and efficient secretary always referred to him as Mr Milne [he liked that]; her filing was conventional and immaculate.

He enjoyed the respect of IABSE members at home and abroad and was dismayed not to be able to join us in 1978 for the Moscow Conference because of a visa delay. His particular pleasure was to help organise the annual Henderson Colloquia at Pembroke College, Cambridge in his capacity as secretary to many organising committees. Bob also played a leading role in organising two International Symposia – *Development of structural form* [London 1981] and *Places of assembly and long-span buildings* [Birmingham 1994]. He served under British Group Chairmen, Bill Henderson, Bernard Wex, David Quinion and David Nethercot.

I remember many acts of kindness from Bob and here quote but two:-

When first elected to Council of IStructE in 1983 I entered the Council Chamber for my first Council meeting and inadvertently sat on the bench reserved for past Presidents. Fortunately Bob was there to steer me to quieter waters. Secondly, in 1987, the membership had voted by 2366 votes to 650 in favour of retention of permissible stress codes and the late, past President, Clifford Evans, asked me to chair the Task Group to produce the Reinforced Concrete Guide. Bob was secretary to the Group and helped me enormously with the difficult political situation surrounding that exercise. A good man to have on your

team in a crisis. He was, of course, secretary to many other technical Task Groups

One of his proudest moments was in 1995 when he received, from Anne Lazenby [nee Kent], a Lewis Kent award for services to the Institution.

Away from the office [and sometimes within it] Bob's great passion was for cricket. His retirement gifts included a painting from the Lancashire & Cheshire Branch of the Old Trafford cricket ground and, from HQ, a membership subscription to Surrey County Cricket Club. He was very active in the West Indian community in S London and well known for his services as umpire, scorer and team manager for over 20 years with the Old Rutlishians, Mitcham Cricket Club and the Carnegie Club. He leaves a wife, 2 sons, 2 daughters and several grandchildren.

Bob was a *one-off* and will be greatly missed by all those who were privileged to know him. I am indebted to past and present members of Institution staff for their assistance with this obituary. As a tribute to Bob the proposed British Group's New Award for Design Engineers will bear his name.

Editor

This is a slightly edited version of the obituary that appeared in the 3 Dec 2002 edition of The Structural Engineer and is reproduced by kind permission of the Editor Kathy Stansfield.

NEW AWARD FOR DESIGN ENGINEERS

The British Group of IABSE (International Association for Bridge and Structural Engineering) has

announced a new award, The Milne Medal for Design, to an individual engineer for excellence in structural design. The award is named after the late Bob Milne, the long serving Honorary Secretary to the British Group. It is to be awarded annually and is open to Chartered Members of British Engineering Institutions. It fills a gap in the current range of awards and is intended to raise the profile of individual design engineers. The winner will receive the silver medal and certificate plus a contribution towards travel and registration to a relevant IABSE conference or seminar to present a paper on their design(s). Short listed candidates will each receive a Certificate of Commendation. The closure date for submissions for the first award is 1 May 2003.

For further information candidates should write to: Hon Sec IABSE, 11 Upper Belgrave St, London, SW1X 8BH.
or, Email: iabse@istructe.org.uk

PERSONALITIES

SIMON F. BAILEY

I was born in Buckinghamshire in 1963. My interest in Structural Engineering began at an early age with wooden building blocks, Lego and tree houses. I also became interested in Architecture, but it later became apparent that my strengths lay in the sciences rather than art and I was therefore guided to a degree in Civil Engineering. In 1980 I began my studies at Southampton University and transferred to their 4 year course when it was created two years later. During my studies, I gained experience as a student site engineer on motorway and bridge construction projects with John Laing Services and Rendel Palmer &

Tritton (RPT), who I eventually joined upon graduating in 1984.

I spent six years with RPT, on site and in the design office, beginning in the water resources department and then in structures. My work in water resources ranged from feasibility studies for hydroelectric schemes in Sumatra to carrying out tracer studies for surveying beach movement (using ultraviolet lamps on cold and windy winter nights to map the movement of pebbles painted with UV sensitive paint), wave predictions and sea wall design for Hinkley Point Nuclear Power Station in Somerset. I moved about a lot between head office in London and sites in South Wales and Yorkshire during the early years, but by far my most glamorous posting was for a year in Tanzania, supervising the construction of 6 km of road embankment, culverts and reinforced concrete ferry ramps for the Kilombero River Crossing. I learned a great deal from the challenge of working in a less-developed country and also met my future wife, a Swiss tourist who was well impressed by my white landrover, suntan and slim figure induced by eating nothing but bananas and rice for ten months !

Upon returning to the RPT office in London in 1988 I became involved in the inspection, assessment and design of bridges. Two notable projects were the design of the post-tensioned concrete box girder superstructure for the 5km long Jamuna Bridge, Bangladesh and leading a team of engineers to inspect and create records for London's trunk road structures. This involved the superficial inspection of more than 300 structures, with full principal inspections on more than 200 structures.

Two years later, I began to have the feeling that my hair was not grey enough to be able to progress further and take on more responsibility with a firm of consulting engineers and I began to look around for a change. And so it was that after six years with RPT I went to work in Switzerland in 1990, with a view to broadening my horizons, learning French and being a bit closer to my girlfriend. I joined the Steel Structures group at the Swiss Federal Institute of Technology in Lausanne. Initially, I spent two years working with a focus on the application of Artificial Intelligence techniques to Structural Engineering, developing amongst others an expert system for the fatigue evaluation of steel structures. I then began research for a doctorate, entitled "Basic principles and load models for the structural safety evaluation of existing road bridges" which I completed in 1996. The thesis proposes two new methods for considering traffic actions during the evaluation of an existing road bridge. As a function of certain site characteristics, the two methods allow an engineer to model the maximum traffic action effects for probabilistic and semi-probabilistic analyses of structural safety. These methods now form the basis for Swiss Federal Highway Authority Recommendations for evaluating existing road bridges and were particularly useful since Switzerland recently raised the maximum legal heavy vehicle weight from 25 to 40 tonnes.

After completing my doctoral thesis I joined a newly created group at EPFL that treats the Maintenance, Construction and Safety of Structures. I began to teach a little more and headed research projects covering the use of probabilistic methods for the structural evaluation of existing

structures. At this time, I became involved in a number of European research projects, which allowed me to travel regularly and to create links with other engineers around Europe. I also became Swiss National Technical Contact for Traffic Load Models on Road Bridges, Eurocode 1, which allowed me to keep track of the development of the Eurocodes. At the same time I became more involved in IABSE joining Working Commission 8 (Operation, Maintenance and Repair of Structures) as well as the Publications Committee which has responsibility for the IABSE journal "Structural Engineering International". I was also heavily involved as Technical Secretary of the Scientific Committee of the IABSE Congress Lucerne 2000 "Structural Engineering for Meeting Urban Transportation Challenges". Again, this involvement allowed me to interact with engineers from around the world, which I continue to enjoy to this day.

In September 2001 I moved back to the UK (dragging my family with me !) and joined Andrews Associates with a view to returning to structural engineering practice now that my hair is a little greyer. Andrews Associates is a small, friendly and busy firm of consulting engineers with a good base of interesting clients and projects covering small to medium size buildings. The last sixteen months have been very rewarding, in terms of reacquainting myself with the British Standards, adapting to the pressures of working in the public sector and forging new working relationships with fellow professionals. Eventually, I would like to look for projects in the field of evaluating existing structures. However, we are currently very occupied with our existing clients and I have not had the time or resources to seek out new ones. Perhaps this should

become one of my many New Year's resolutions.

CHRIS BURGOWNE

After graduating from Cambridge, and taking a Master's degree at Imperial College, I joined Cheshire County Council as a trainee bridge engineer in 1972. At the time there was considerable road-building in the county; my first design was for a prestressed concrete high-level motorway standard bridge across the Manchester Ship Canal in Warrington. Given my knowledge at the time it is probably as well it was never built, although I understand the route is still safeguarded! There are though examples of my designs in various places around the county.

I had enjoyed the research element of my study, so returned to Imperial College "for 3 years", to do a PhD on the stability of beams and columns, using direction cosines to allow the derivation of exact equilibrium equations for complicated displaced shapes. My intention had always been to go back to industry but university research and teaching always seemed a more interesting alternative, and I am still in academia.

My research, first at Imperial, and since 1989 at Cambridge, has concentrated on matters of interest to practising bridge engineers. I was fortunate to be one of the first to study the use of new materials to replace steel prestressing tendons. Aramid fibres, in the form of parallel-lay ropes, offer high-strength, high stiffness and high durability, which make them ideal alternatives. The work I, and others, have done over the years has shown that the technical problems have been largely overcome, but at the moment the high cost means that they are not

yet a commercial success. Sadly, it will take a major failure to persuade clients. The arguments for FRP as reinforcement are much less clear-cut, other than in special applications, because of the lower stiffness.

Other work has looked at the use of expert systems for prestressed concrete bridge design, which persuaded me that teaching humans to understand better the design process would be more fruitful. More recently we have studied the stability problems associated with large precast concrete beams, which can approach their stability limit while being transported or erected. We are also starting to work on biomedical problems, where a sound understanding of structural mechanics should be able to revolutionise orthopaedics.

I count myself as fortunate to be able to teach some of the brightest students in the country. Our profession is in good hands while we manage to attract young people who are inspired by the achievements of great engineers and architects. My biggest fear is whether they will have anywhere to study structural engineering in the future, since the high cost of running structural laboratories is seen by vice-chancellors as being wasteful. Our profession must be aware that it is under threat.

CLIVE COCKERTON

Clive was born at the end of WW2 in Witney Oxfordshire. His early education was at Christ's College, Finchley from where he went to Queen Mary College, London, graduating in Civil Engineering in 1966. He was Chartered in 1971 and later became a member of the Institution of Water & Environmental Management and also the Society for the Chemical Industry.

He has played a considerable role in the Concrete Society [CS], chairing the Hertfordshire Club and being co-opted on to Council. He has had a consuming interest in concrete, its performance and durability. This was demonstrated by his membership of the CS Committee on *Cement properties and concrete durability* which produced CSTR No: 29. His wider expertise was also brought to bear as a member of the IStructE Task Group which, in 1995, produced the report entitled *Aspects of Cladding*.

Clive's early professional work was with Contractor's Holst and then with leading consultant Binnie & Partners where he gained experience on a wide range of water related projects including the vast Mangla Hydro-electric Power Station, Pakistan and then as Assistant Resident Engineer at the Daer Reservoir scheme in Lanarkshire.

The 1970s showed a career shift in which he became Director [then Managing Director] of St Albans Testing Services [STATS]. In 1983, with Steve Kemp and others, he set up independent Test House, TECHNOtrade in Harpenden. Clive is currently Marketing and Technical Director of TECHNOtrade Structural Services Ltd based at Garston, Watford. His forte is investigation into construction failures and he has been commissioned as an expert witness.

In his spare time Clive likes to sail, travel abroad and, in particular, to walk the levadas of Madeira with his wife Jackie.

Clive Cockerton has been a member of the Executive Committee of the British Group since 1995.

CAMBRIDGE COLLOQUIA

2001 Achieving design quality

Copies of papers and discussion thereon have been circulated to participants for comment. It is hoped to have copies of proceedings available to members in due course.

2002 Risk and reliability

An executive summary of the event is being prepared and will be widely circulated to decision-makers. The proceedings will be published in hard copy and also be made available on the Web. Please see below an appreciation of this event by Professor Ian McLeod.

2003 Structural Engineering for climate change

An organising committee under the chairmanship of Dr John Menzies FREng is arranging the programme for this event which will be held at Magdelene College on 8th & 9th July.

Topics under consideration for future Colloquia include:-

- Life-cycle management of railway bridges [this may become a joint meeting with the Railway Civil Engineers Association]
- Designing for the consequences of hazards.
- The management and control of engineering projects

REFLECTIONS ON THE HENDERSON COLLOQUIUM JULY 2002

33 delegates attended the Henderson Colloquium at Magdalene College Cambridge 16,17 July 2002 to discuss issues relating to *Risk and Liability*

There is a general trend towards more explicit treatment of risk in structural engineering reflecting a societal trend in this direction. A view was expressed that emphasis should be on *safety*, which is what is intended to be achieved, rather than on *risk*, which is what is to be avoided. Excessive attention to bureaucratic procedures for risk assessment may be counter productive but the need for people in the construction industry to address risk issues in a professional way was the fundamental issue for discussion.

The definition of risk as the combination of likelihood and consequence of an event in relation to a hazard is becoming accepted. It was pointed out that risk arose from opportunities as well as from hazards.

Risk Management processes are being implemented. A risk register approach is becoming widely used incorporating the definition of risks, the definition of control strategies and ensuring that the control strategies are implemented. This provides a universal strategy for dealing with risk but does not guarantee that that risk will be adequately treated

It was agreed that there is a significant need for more risk data - records of performance monitoring, accidents, near misses. This would help to inform understanding and decisions in relation to risk issues. The potential role of SCOSS in this was emphasised

Clients would like to have structures which are 'safe' but safety comes with a price and we have to accept that the price is negotiable. The level of risk tends to be low for conventional structures but there tends to be a direct relationship between risk and the degree of innovation in a project. It is

important that clients understand the residual risks that they are accepting.

Structural engineers tend not to treat risk other than via codified approaches; there is a need for them to be better educated in risk issues. While risk can be included in undergraduate curricula it is not realistic to rely on this as the main source of education for risk. The development of good case information could be a major contribution to such education

In relation to liability the degree of risk taken by structural engineers when they go beyond conventional boundaries tends to be much higher than in other professions but the remuneration for this is not commensurate.

A document which summarises the papers and discussion is being prepared by the Highways Agency.

Professor Ian McLeod

LECTURES

The latter part of 2002 saw some excellent public lectures in engineering. I have been privileged to be present at the following:-

- Inaugural lecture by Professor Nick Buenfeld at Imperial College
- IStructE Maitland lecture by Sir Neil Cossons at IEE [1]
- Lecture by Professor M Ito at Imperial College [see report that follows]
- IABSE Annual Lecture by Aad van der Horst [see report in TSE of 18 Feb 2003]

[1] See report in The Structural Engineer of 21 Jan 2003.

LECTURE BY PROFESSOR M. ITO - NOVEMBER 2002

On 25 Nov 2002 Professor Manabu Ito of Japan, the President of IABSE, presented a lecture at Imperial College entitled *Wind-induced vibrations and their cure*. The lecture was hosted by Professor David Nethercot, Chairman of the British Group and attended by members of the Group, College staff and students.

Professor Ito gave a comprehensive summary of the topic starting with the dramatic failure under moderate winds of the Tacoma Narrows [USA] suspension bridge in 1940. Although concentrating on bridges he also highlighted the failure of many panes of glass in the Hancock high-rise [USA] building in 1974. He stressed the sensitivity of wind effects to small changes in structural profiles and emphasised the need to recognise the variability of the problem. This he illustrated by highlighting problems on one bridge where cables to one side of the supporting tower were affected but those on the far side were relatively untroubled. There was also the need to consider structures in the [temporary] construction phase.

Manabu then presented a number of ways of controlling wind-excitation using structural and/or mechanical means. These included:-

- Aerodynamically shaped bridge decks [eg Severn]
- Open truss girders in place of solid
- Deck edge treatments
- Secondary cables coupling together main support cables
- Modifications to cable surfaces including helical beads to cables [eg Normandy]
- Tuned/controlled mass dampers [eg Kessock & Thames Millennium]
- Viscous shear or hydraulic dampers.

During the course of his lecture Professor Ito stressed the need to check the validity of solutions by extensive wind tunnel testing and showed examples. He said that some testing required very large tunnel facilities to adequately model real-life conditions.

Professor Nethercot brought the proceedings to a close with a vote of thanks to Manabu who was visiting Imperial College for the first time.

Editor

YOUNG ENGINEERS CONFERENCE

Under the guidance of Ian Liddell FREng a very successful conference was held last December in Cambridge. It is proposed to hold another in the near future. Ian has undertaken to examine other possible venues for this event.

YOUNG RESEARCHERS CONFERENCE

A very successful Conference was held on 20 March 2002. This an IStructE event supported by the British Group and is held at 11 Upper Belgrave Street. The next event will be on 19 March 2003 when the keynote address will be given by Ian Liddell FREng.

REFLECTIONS ON THE WORK OF SCOSS

I became the Secretary of SCOSS (The Standing Committee on Structural Safety) in 1991 following a period as a member of the Committee. The

Committee was originally established in 1976 'to keep under review questions of structural safety and to make recommendations for action as seem desirable'. The impetus for its establishment sprang from the widespread concern following a few structural collapses of buildings and bridges that occurred in the 1960s and 1970s.

From the outset, SCOSS worked on a confidential basis in order to encourage those who have concerns about structural safety or experiences of unsafe practice to share them with the Committee. In the early days the Committee's Reports were not placed in the public domain but were made to the Presidents of the Institutions of Civil, of Structural and of Municipal Engineers. It was then seen as the task of the Presidents to warn and draw attention of government, professional and industry bodies to the Committee's recommendations and conclusions as they considered necessary.

Confidentiality has remained an important and essential feature in SCOSS interactions with professional engineers and institutions, and government and industry bodies. From 1991, however, an additional route for dissemination of the Committee's findings was adopted. Outputs directly into the public domain began aimed particularly at assisting professional engineers to maintain awareness of emerging structural safety issues and to alert owners and operators of structures to trends that might jeopardise structural safety. Publication of the reports of the Committee began in 1992 (Ninth Report). Papers and articles were also published from time to time in the technical press. Subsequently in 1997, the first SCOSS Bulletin drawing attention to current structural safety issues was published

and distributed widely in the construction industry.

During the early 1990s, the Committee's role was sharpened by amendment of its terms of reference from 'to make recommendations for action as seem desirable' to include the more direct 'to give warning to relevant bodies [where unacceptable risk is believed to exist]'. This change was very much in keeping with the general trend towards more explicit perceptions and definitions of responsibilities for safety of professional engineers and owners/operators of structures and facilities. The use of the acronym 'SCOSS' was adopted in 1995 and was part of the effort to increase amongst professional engineers and the construction industry generally awareness of the Committee and its work. During that year also closer working relationships with the Health and Safety Executive were established, the Executive adding resources to those provided by the Institutions of Civil Engineers and of Structural Engineers. The independence of the Committee remained unchanged. The provision of some government support to facilitate the administration of the Committee was a return to the 1976 arrangements in which the then Ministry of Public Buildings and Works gave some financial support.

When SCOSS was formed in 1976 it was seen mainly as a body for considering particular technical 'hardware' issues, eg resin-bonded plates, cavity wall ties. Such issues have continued to be part of the 'menu' of SCOSS deliberations. However, over the 1990s in particular, SCOSS became more concerned also with wider topics involving organisational and regulatory aspects of structural safety. Inevitably, after the first

questions concerning the 'hardware' on any topic had been defined, questions about the organisational background always arose. Rightly SCOSS believed that the root of problems of inadequate safety generally lay in the background. The most recent SCOSS Report (the Thirteenth) was concerned largely with such matters, eg codes of practice.

For me, work as the Secretary of SCOSS was always open-ended, stimulating and challenging. The Committee always had suggestions for topics to be looked at and had much comment and suggestions for lines of enquiry on issues under consideration and on implications. The Committee's tremendous depth and breadth of collective experience provided the basis for reaching sound conclusions.

From time to time during the 1990s, questions were raised, understandably, by the sponsors of SCOSS about its effectiveness – Is it 'improving' structural safety? Can the effort (and cost) be justified by results? It is not possible to prove that the work of SCOSS has prevented structural failures. It is rather like having a 'flu jab' in October each year – if you do not get the flu during the coming winter, you cannot be certain that that is due to the 'jab'.

I personally have no doubt that SCOSS has had a positive effect on structural safety. SCOSS 'made a difference' in the 1990s. The 'profile' of the Committee was successfully raised with the result that publicity of its warnings and recommendations increased considerably. It drew attention to many structural safety issues, eg relating to disproportionate collapse; multi-purpose buildings; multi-storey car parks. Actions by others followed. The institutions, for

example, prepared engineering guidance on some of the identified issues, eg structural use of glass; aspects of cladding; multi-storey car parks. The published Reports and Bulletins also were an influential stimulus to actions that improved safety standards in parts of industry and had impact on the teaching of structural safety in universities. I also believe that SCOSS had a considerable positive influence on individual engineers who I have always found to be appreciative of the greater awareness of safety issues that they acquired from SCOSS work.

There were, of course, disappointments. The work was always resource limited and had to be prioritised. It was not possible therefore to pursue some topics with the vigour they merited. It was also disappointing when SCOSS recommendations were not acted upon and further effort was needed to draw attention to and explain the SCOSS concern. Topics of this type included codes of practice and confidential reporting. I hope SCOSS will be able to make progress with these in the near future.

There is much further work and a continuing role for SCOSS. Innovation and development in structural engineering technologies and in the ways they are implemented continue. Clients and engineers strive for more ambitious eye-catching structures built more efficiently and cost effectively. Experienced engineers retire and their places are taken by the less experienced. Past lessons from structural failures and successes are lost through collective amnesia. Human fallibility will ensure that not all collapses will be prevented in the future. Reminders are needed from time to time that gravity is unrelenting.

The independent voice of SCOSS is needed to assist professional engineers and those they serve to keep risks to structural safety acceptably low. In continuing the work, I am sure the new SCOSS Secretary, John Carpenter, would welcome indications of current structural safety concerns from IABSE British Group members (tel 0161 973 6928; email jzcarpenter@aol.com)

John Menzies December 2002

POST-TENSIONED CONCRETE BRIDGES: THE MORATORIUM 1992-2002

Introduction

In September 1992, following a series of problems due to inadequate grouting and consequential corrosion of tendons, the then Department of Transport placed a moratorium on design of new bridges having grouted internal post-tensioning. It was felt that there was room for improvement in standards and quality of site work. At the time, the moratorium was widely criticised as being an over-reaction; it was argued that the standard and quality of grouting may have been inadequate in the past but the position in the 1990's was much improved and therefore quite different. Spokesmen in other countries took the same line viewing the problem as being due to poor British workmanship and design.

Ten years later it is instructive to consider effects of the moratorium and the steps taken by industry and academe in responding to the challenge.

Response to the Moratorium

The initial hostility to the moratorium was replaced by a more constructive

attitude and leading consultants and members of the post-tensioning industry collaborated with The Department in developing improved standards and practices. The Department produced BA 50/93 'Post-tensioned Concrete Bridges, Planning, Organisation and Methods for carrying out Special Inspections' and initiated a programme of inspections of bridges on trunk roads and motorways. The Department also placed a contract to monitor a number of grouting trials and operations in the field. The latter related to bridges in the pipeline at the time of the moratorium. In this project suspicions about the quality of site work were confirmed as it was found that there were various instances of shortfalls; grout failed to meet the required performance tests, blockages in ducts prevented continuous grouting, equipment failed prior to grouting and had to be replaced at short notice, the supply of cement ran out during a grouting operation, and a bleed valve failed under pressure permitting grout to fountain over the operatives. Mixing of the grout was rudimentary at best and there was no effort to measure rate of flow or quantities of injected grout.

A research project jointly funded by industry and The Department under the LINK programme was carried out with the objectives of investigating and improving the processes of grouting. One of the outcomes of the work was the recognition that properties of cement can vary from batch to batch and there can be inaccuracies in mixing grout on site. To overcome these problems, a pre-mixed grout having improved properties was developed and tested against other formulations in ducts of a specially constructed 60m beam. It is now marketed as 'SBD Duct Grout'

A pan-European research project was carried out under the EC's Brite Euram programme, led by the UK and involving Belgium, Denmark and France. One of the principal findings was the importance of grout stability; the standard bleed test, BS EN 447, was found to be wholly inadequate as it failed to identify unstable grout formulations. A new test was developed 'The 1.5m vertical strand test', which is altogether more stringent and has now been adopted in codes. Another output of the work was to demonstrate that it is practical to use a commercial flowmeter to measure flow rate, volumes of grout injected into the ducts, and to provide QA records.

Meanwhile, National Authorities in other countries, despite their stated scepticism, carried out inspections of post-tensioned bridges and a picture emerged that was little different from the UK with a going rate of 50 per cent of inspected ducts having voids of various sizes and 2 per cent having corrosion sufficiently serious that it was necessary to carry out major strengthening or demolition. It should be added that 2 per cent represents a large number of bridges and is a serious situation as collapse can occur in a brittle manner without prior evidence. This led to updating of standards and in some countries limitations were placed on the use of post-tensioning in design.

In 1996 The Concrete Society published Technical Report TR47 'Durable Bonded Post-tensioned Concrete Bridges' setting out improved procedures for grouting. This was based on lessons learned from the various investigations up to that time and became a best seller, translated into several other languages and adopted internationally.

In response to the publication of TR47, with its tighter standards, The Department lifted the moratorium on internal grouted post-tensioning, but it remains in place for segmental construction to this day.

Earlier this year (2002) The Concrete Society revised TR47 taking account of the more recent research and international experience published since 1996.

Concluding remarks

In hindsight it is evident that in 1992 there was an ill-founded complacency on all sides of the industry, both in the UK and other countries. Standards and procedures of grouting were inadequate and it is not surprising that voids and other defects occurred. The processes of grouting are now better understood but it remains difficult to explain how some ducts have been found exhibiting evidence of the passage of grout but otherwise empty.

The Department's decision to place an embargo on design can now be seen to be correct as it has resulted in an industry led tightening of standards and a more realistic understanding of grouting processes.

Dr Graham Tilly

SPANNING THE YEARS

Childhood dreams

The first bridge I ever saw as a child was from my bedroom window in Palmers Green, North London. The fact that it crossed the Hertford North railway line, away in the distance beyond our back garden – and it was all steam in those days after the war – was not a matter of any great concern. What really stirred my interest in those

days were the steam trains passing by rather than the inanimate brick arch bridge which allowed traffic to cross over the line without the need of car drivers having to resort to using the rapidly developing traffic route of the North Circular Road, half a mile away.

Then of course my daily journeys into London for many years to attend grammar school and later university allowed the railways and all that is associated with that mode of transport to become so ingrained within me that travelling today by train anywhere in the world is such a welcoming event.

When it came to making a career decision I suspect that it was my deep interest in trains that led me to consider rail orientated work. However, life can work in other ways. As part of a trip to Scotland in the early 1960s to receive my Queens Scout Award, I was fortunate to visit the construction site of the Forth Road bridge. An ascent to the tower top saddles and view the cable spinning process was an event beyond my wildest dreams. Standing at a height of over 500 ft above the Forth, being buffeted by the easterly winds, caused such a mind blowing experience which has remained with me ever since. I had no doubt then that I wanted to be involved with bridges. The actual mechanics and logistics of bridge design and construction did not seem to particularly matter at that time. I just knew that my career had to embrace bridges in some way or another.

Bridge construction

There has always been an inextricable link between bridges and railways. I found this was especially true during my years working at Dorman Long Bridge and Engineering. The design and construction of bridge D29 at

Ealing in west London was one project which demanded a great deal of ingenuity and planning to achieve a successful conclusion. The bridge was designed to replace the existing two span girder bridge carrying the District Line over the Western region main railway line.

The scheme involved building the 50m span truss girder bridge in the adjacent playing fields of a girls school, and then launch the completed bridge (together with cast reinforced concrete deck and ballasted track in place) out over the main line during a weekend possession. Then, in a subsequent weekend possession, the old bridge would be lifted out, span by span, and the new single span bridge rolled into final position. It was inevitable that the site arrangements and early requests to the railway authorities for track possessions would eventually result in the work taking place during the winter months. On this occasion the winter was exceptionally cold and deep frosts and threats of snowfall fuelled the trepidation and excitement prior to the operation. The design of the temporary works was enthralling work, and the opportunity to be at the site possessions to see several hundreds of tonnes of bridge being manoeuvred gently and surprisingly quietly into place was an experience that I certainly would not have missed.

Some years later Dorman Long won the contract to dismantle the old Blackfriars railway bridge over the river Thames. We investigated several different schemes in order to achieve the most economical solution to safely remove the spans. However, our ingenuity was tested to the limit when we struggled to strengthen an existing gantry which had been ear-marked to undertake the work. With the programme becoming absolutely

critical and our efforts proving to be of no avail we were almost at a loss to propose an alternative scheme. At the eleventh hour we found the solution which was to divert one of the large Dutch floating cranes from its work on another east coast contract to venture up the Thames and moor downstream of Blackfriars railway bridge. Its huge lifting jib towered over the working rail spans and the crane was able to pick up each span in quick succession, lifting them clear over the Thameslink rail bridge and land them onto pontoons, which were then taken down the Thames to the docks for cutting up. The use of the floating crane brought much needed relief principally because it considerably reduced the programme time for dismantlement. This period in my career brought home very clearly the message that lateral thinking should always be present during any contract. In this instance a higher initial cost outlay (the hire of a large crane) was more than compensated for by the drastic cuts in programme time and the consequential cost savings.

Railway bridge design

During the mid 1990s I was fortunate to gain a Research Fellowship in the Engineering Department at the University of Warwick to assist Professor Roger Johnson with the writing and checking of technical clauses for Eurocode 4, Part 2, the composite bridge design code. Whilst the major part of the new code was concerned with road trafficked bridges, one very important section was retained for composite rail type bridges. I recall a number of interesting technical discussions at Warwick with both Roger and Peter Wigley concerning our study of the form of transverse spanning bridge deck construction depicted in the two

types of railway bridges commonly used in the UK.

UK railway practice in recent decades had made considerable use of half-through type underbridges with composite decks, usually described as filler beam construction. The basic principles of the deck construction were that they consisted of rolled steel UCs to British Standards or the continental HEM cross girders, attached to main girder webs with a concrete deck cast round the cross girders. Every second or third cross girder was located at an intermediate main girder stiffener location, so that U-frame restraint to the main girder compression flange was provided.

The decks were reinforced both longitudinally and laterally for reasons of distribution, crack control and strength. Because decks were slung between the bottoms of the main longitudinal girders, decks generally fell entirely into the tension zone under global longitudinal loading. The subsequent study of deck composite action, tension stiffening and bond stress requirements provided me with a much rewarding experience. As a Chartered Engineer brought up with a strong steel bias the involvement of concrete was somewhat alien to my thought processes, and I well remember having to study afresh the basic principles of concrete design, learnt during my university and graduate days.

Hither and thither

This experience clearly showed me that very few engineers, whether they be designers or constructors, can actually aspire to sufficiently high levels to become experts in several material fields. The saying 'Jack of all trades – master of none' sums it all up

to me. I have always found it better (and in some ways more satisfying) to achieve a comprehensive understanding of one engineering subject. When it does become necessary one can seek information about other materials and technical subjects from experts practising in those particular fields. The benefit of this arrangement is of course the fact that any technical discussion about these matters should always permit either of the parties to learn some facets about the other's expertise.

I have been fortunate enough to have gained a considerable amount of experience in several sections of the construction industry. As such I have a wide horizon. But I would never claim to know everything about a particular subject. When, as I occasionally do, reflect back on my earlier career I am very conscious about the engineers in the firms where I worked who inspired my enthusiasm to learn and to develop my interest in so many engineering matters. Those who gave their time unreservedly to help me solve technical problems receive my greatest admiration. Now, today, I do my very best to pass on my own experience to the younger members of our firm. Given the right circumstances this can be most rewarding. It is not always easy and it can often lapse into a state of boring anecdotes. But so long as sufficient trust can be found, and one leads by example, it can become a most rewarding experience.

It is often said that people should always give back to the community in which they live, sufficient time and energy to somehow repay the many chances which they themselves might have received from that community as a younger person. In my particular case, it was the love of Scouting that

prompted me to continue in later life to become a leader and more recently a member of our District Scout Committee. I suppose it all means that we are keeping up the tradition of our previous generations.

We have to keep learning

Engineering practice is much different today compared to what we thought we knew in those far off dreamy days of ones' career beginnings. The everyday jargon we use nowadays is different, especially in the fields of IT, QA, CDM and PPF. Our lives are controlled by acronyms, often in the form of initials as indicated above. What a relief occasionally it is to pick up a biography of one of our famous engineers and read of many of their exploits. When the Sydney Harbour Bridge was being built on the other side of the world the British engineers who left these shores did not have the benefit of computers, the internet, mobile phones, faxes or telexes. During construction of the bridge and after the steel had arrived from Middlesbrough, if any problems arose, then almost without exception they had to be solved on the site by the expat staff.

It still is one of my great concerns that once a large structural project is completed anywhere in the world, whether it be an important bridge or a much needed power station, these large site teams of well trained engineers and technicians that have been crafted together over several years should then have to be disbanded and seek other work. During my career I have been fortunate to have seen, and in some cases been associated with, some of the major infrastructure projects which have been built in the UK. It is still one of my great concerns, however, that once a large structural project is

completed anywhere in the world, whether it be an important bridge or a much needed power station, these large site teams of well trained engineers and technicians that have been crafted together over several years should then have to be disbanded and seek other work. This is considered wasteful of time, planning and resource. But it is a timely reminder that engineers serve the community, and as such are usually constrained by governmental and public authority requirements and funding.

We are all aware of structures that do not fulfill their life expectancy. Some of the motorway bridges have already been demolished, and many others have been strengthened for one reason or another. But structural life can come full circle. The majority of the railway bridges built by our Victorian ancestors, and also subsequently, have been assessed in recent years for their continued ability to carry increased vehicle loadings. Many, surprisingly, have an adequate capacity. Others are not so fortunate and here we have to resort to innovative strengthening techniques, using modern materials and connection techniques. Our studies into more rigorous analytical processes can often produce surprises for us when we discover that an entirely adequate distribution of load into a structure can be obtained by the use of modern non-linear structural analysis. The assessment of old bridges using principles contained in today's design codes can often lead to complication and mistrust of limit state methods.

The very first bridge I ever saw from my bedroom window has recently been assessed. The fact that it can only currently carry 17 tonne vehicles hardly surprises me. When it was built in 1880, the largest single loads it then

carried were the locally driven horse drawn delivery vehicles. It is true that we have to keep learning in order to progress. But we must not forget the past since our careers were grounded and formed in those far off days. We must be reminded that everything we learn has been as a direct result of some previous experience. The past is important.

Tony Oakhill

IABSE SYMPOSIUM

**Melbourne, Australia, 11th to 13th
September, 2002**

I arrived in Melbourne early so as to join one of the pre-symposium tours to the West Gate bridge and to participate in some of the IABSE annual meetings. I always find it strangely reassuring to travel thousands of miles and immediately bump into a colleague from back home, but such is the stuff of IABSE Symposia! After chatting in the hotel foyer and sharing some long distance travel stories, we headed off to West Gate where we were shown the recently completed works to strengthen the concrete approach viaducts each side of the famous cable stayed steel box girder main span. Designed in the late 1960's, the concrete box was very advanced for its time and used pre-casting techniques more akin to today's technology. But the bridge now carries considerably more traffic than it was designed for, and recent widening to introduce a slip road and extra lane at one end has created the opportunity to strengthen the girder using carbon fibre strips to reinforce the concrete deck and box soffit. The visit was very interesting, but it was very cold on the site, and we were all relieved to get back in the bus and head back to the hotel.

Following the now familiar pattern, the annual meetings of IABSE took place over the two days immediately preceding the Symposium itself which got under way on the Wednesday. I attended several meetings, including the Permanent Committee meeting. This was followed by the annual Awards Presentation at which the International Award of Merit was presented to Ian Liddell. This is one of the highest awards that can be bestowed by the Association on any of its members and this honour recognises the considerable contribution that Ian has made to the science and art of structural engineering over many years.

The theme for the Symposium was "Towards a Better Built Environment – Innovation, Sustainability, Information Technology" which was a wide enough title to attract the usual variety of papers and posters on a broad range of subjects. Nearly 400 delegates from 38 countries attended, and a total of 220 papers and posters were presented. It would be difficult to single out any particular papers of merit, as most were of a very high standard, but the following keynote lectures caught my imagination and are worthy of a special mention:

- Peter Lundhus: "*Oresund Link – not just a bridge.*"

The efficient implementation and management of major infrastructure projects presents major challenges, and the way this was handled on Oresund has been recognised as a highly successful model.

- Ron Klemencic: "*How do we solve this problem? The aftermath of 9/11.*"

This was a thought-provoking discussion of some of the many issues surrounding the Twin Towers disaster

from someone directly involved in the relief effort and subsequent studies.

- John Nutt: "*Capturing innovation and living with risk.*"

This was a wide ranging and well presented examination of some of the fundamental issues that lie behind everything we try to do and was as relevant to clients as to engineers and other professionals.

There was quite a lot of emphasis on new materials and new technologies, in common with other recent conferences, and as always on these occasions this provided a valuable opportunity to learn how others around the world are facing and solving the same challenges that we are meeting in the UK.

The Symposium included a programme for young engineers who were encouraged to attend through a 50% discount on their registration fee and by the presentation of two special prizes for papers presented by young authors. There was also a series of three Workshops in which participants met early in the week to consider a particular topic and then give a presentation and lead a discussion towards the end of the Symposium. This was a popular event and one well worth repeating on future occasions.

At the opening ceremony we were treated to a traditional Aborigine welcome, complete with didgeridoos and colourful costumes. Having been to a conference earlier in the year in Vancouver where delegates were similarly welcomed by a group of First Nations people in traditional Inuit costume, I found myself wondering how we could match this next time the UK plays host to one of these events. I'm not sure whether it should be a display by Morris Dancers or a re-enactment of Queen Boadicea

welcoming the Romans! Suggestions on a postcard please....!

I wouldn't say it was the highlight of the event, but feeding the possums in the park at midnight after the Symposium dinner was certainly memorable! Armed only with some bread from the hotel kitchen a group of us intrepid explorers went into the park across the road in search of these cuddly creatures. We didn't have to look very hard because the local possums have clearly learnt that European tourists are given to this kind of strange behaviour, so they just sort of hang around outside the hotel! Although considered by Australians to be vermin and a real pest, to us they certainly seemed very cute and very friendly (certainly worth a photo for the children back home) although I don't think I would like to try cuddling one!

The Symposium was held at the Hilton on the Park hotel which was an excellent venue. The organisation of the whole event was among the best I have experienced anywhere, and the Australian Group under Paul Grundy and the Organising Committee under Leigh Appleyard are to be congratulated for an excellent Symposium which was thoroughly enjoyable and well worth the long trip to the other side of the world. As always, I found it to be valuable not only for some of the technical material which was, as ever, of the highest calibre, but also for the contacts made and re-established and the friendships renewed. These annual IABSE events attract like-minded souls from all over the globe, and I commend them to all British members as thoroughly worthwhile opportunities not to be missed.

Ian Firth

STRUCTURAL ENGINEERING INTERNATIONAL

May I remind all members of the ongoing opportunity to have articles published in *SEI*. The journal continues to grow in stature and is an excellent show-case for British engineering.

The rules for publishing a paper are relatively simple and I would be pleased to hear from anyone who may wish to provide such material. Many articles, such as project profiles, are only two to four pages in length so the demand on authors is not all that great.

House rules for potential authors may be found in the IABSE Website www.iabse.ethz.ch

Before embarking on an article it is prudent to submit to Zurich, for consideration, a 100/200 word synopsis.

If I can help in any way please contact me as below.

David Doran *SEI, UK Correspondent*

Tel/Fax 020 8989 9082;
Email: David.Doran@btinternet.com

INTERNATIONAL REPRESENTATION

Largely due to the efforts of our Chairman the British Group is now better represented on IABSE Working Commissions. Please see *SEI* for details. It has been noted by the Executive Committee that the productivity of WCs is very dependent on the energy of individual chairmen – some produce a great deal of useful information whilst others are relatively unproductive.

CALENDAR 2003

- **6/7/9 May 2003**
- *fib* Symposium. Concrete Structures in Seismic Regions. Athens
- **8/9 July 2003**
- Henderson Colloquium at Magdalene College, Cambridge – Structural Engineering for Climate Change
- **27/28/29 August 2003**
- IABSE Symposium. Structures for High-Speed Railway Transportation – Antwerp, Belgium
- **1/2/3 December 2003**
- ILCDES Symposium. Integrated Lifetime Engineering Structures & Civil Infrastructures - Kuopio Finland

PLEASE NOTE

The Newsletter is now 'On the Web' and can be accessed through:-

<http://www.istructe.org.uk/About/index.asp?page=108>

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Whereas every effort has been made to ensure the accuracy of statements and acknowledgements, we reserve the right to be as wrong as everyone else.

[The British Group is indebted to Sandberg's for the wording of this disclaimer.]

Please pass this newsletter on to a colleague when you have finished with it.

APPENDIX 1 - INDEX OF FEATURES.

<u>AUTHOR</u>	<u>TITLE</u>	<u>NEWSLETTER</u>	
Arch H	Site safety	2	1986
Beales C	Fatigue assessment of orthotropic steel bridge decks	6	1991
Billington Dr. C J	Steel for tidal power barages	4	1988
Brown Dr. W C	Is it time to wake up our 'Sleeping Britannia'?	11	1995
Campion R	The use of strengthened soil in British Rail	6	1991
Chakraborty S S	Indian heritage of structures	8	1993
Chapman Dr. J C	Construction 1992	4	1988
Clancy B	Construction aggro	14	1999
Clarke N	SCOSS Report No.11	12	1997
Curtin W	Structural Brickwork	7	1992
Cusens Prof. A	Engineering manpower [and women power]	4	1988
Daly A F	Collapse test on a half-scale composite steel and concrete bridge deck	8	1993
Evans R	Whose Environment?	15	2000
Finn E	Great Grimbsy sewerage scheme	3	1987
Godfrey G B	Jointless multi-span bridges	5	1990
Goldstein A	The numbers game	3	1987
Head P R	Use of advanced composites in bridges	9	1994
Manning M	Castings in steel structures	4	1988
Matthews S	Current and future trends in bridgework	14	1999
Menzies Dr. J R	Structural reliability in bridge engineering	12	1997
Menzies Dr. J R	Reflections on the work of SCOSS	18	2003
Morris Dr. D R	A new approach to aesthetic bridge design	15	2000
Morris Dr. D R	A new aluminium highway gantry	16	2001
Morris Dr. D R	An introduction to the engineering of historic structures	17	2002
Oakhill A C	Integrating for a competitive steelwork industry	6	1991
Oakhill A C	Computer failure: a terminal issue	9	1994
Oakhill A C	Steel in construction	12	1997
Oakhill A C	A Korean venture	15	2000
Oakhill A C	Spanning the years	18	2003
Page J	The load bearing capacity of arch bridges	3	1987
Pritchard B	Bridge strengthening without traffic disruption	7	1992
Pritchard B	Travels with an engineer	13	1998
Quinion D	The Motorway Archive	14	1999
Quinion D	The Fonthill Museum	17	2002
Roberts J	The Ravenspurn [North] concrete gravity structure	5	1990
Rochester T A	The bridge owner's requirements	9	1994
Sandberg A C E	The Royal Academy of Engineering	11	1996
SCOSS	Structural appraisals of multi-storey car parks	13	1998

Somerville Dr. G	Design life of structures	2	1986
Somerville Dr. G	Concrete Research and Innovation Centre [CRIC]	9	1994
Somerville Dr. G	Grouted post-tensioned concrete bridges	14	1999
Spindel J E	International committees	2	1986
Spring R O	Salisbury Cathedral - the need for repair	10	1995
Sutherland R J M	Criteria for structural appraisal	3	1987
Temporal J	Loading tests on corrugated steel culverts	4	1988
Tilly Dr. G	Whole life costing	10	1995
Tilly Dr. G	The conservation of bridges	17	2002
Tilly Dr. G	Post-tensioned concrete bridges	18	2003
Thorburn Dr. S	Soil-structure interaction. Imaginary or real	3	1987
Tordoff Dr.D	Computer-integrated manufacturing	3	1987
Trickett D S	QA scheme for steel	2	1986
Winfield S	Cambrian line upgrade [Railtrack]	16	2001

APPENDIX 2 – INDEX OF PERSONALITY ARTICLES

<u>NAME</u>	<u>NEWSLETTER</u>
Bakhoum Mourad	14
Burgoyne Christopher	18
Clark Leslie	9
Cockerton Clive	18
Cusens Tony	1
Doran David	12
Eaton Keith	6
Happold Ted	2
Head Peter	14
Henderson Bill	16
Holland David	7
Ito Manabu	14
Kuhlmann Ulrike	13
Lee David	1
Liddell Ian	13
Matthews Steve	14
Milne Bob	11
Menzies John	3
Nethercot David	16
Ostenfeld Klaus	13
Oakhill Tony	8
Quinion David	3
Smyth Bill	4
Somerville George	2 & 14
Springett Michael	10
Sriskandan Sri	7
Thürmann Bruno	13
Wex Bernard	1 & 17
Wigley Peter	15