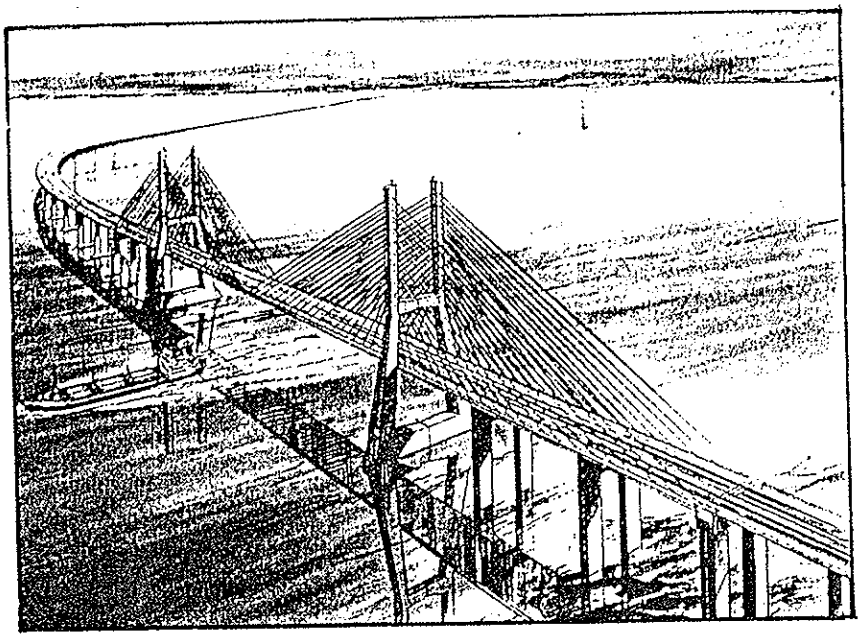
IABSE NEWS

BRITISH GROUP NEWSLETTER No 12 1997



New Tagus Bridge

CONTENTS.

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

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EDITORIAL

Durability is a topic which increasingly exercises the mind of the construction industry. Past performance has not been good. The subject was initially addressed in 1950 by BSCP 3 Chapter IX. Over forty years later BSI produced a Guide to durability of buildings and building elements, products and components [BS 7543 : 1992]. This has not been widely used. The campaign for better durability has now been taken up by ISO which, with support from BSI and others, is now producing a document entitled 'Buildings - Service Life Planning'. This document will rely heavily on two techniques

* Life Cycle costing [LCC]
* The factor method for estimating service life.

This would seem a good way forward. However each technique, in my view, must be treated with caution.

LCC requires an estimate of such highly volatile variables as interest and inflation rates. Both, in recent times, have climbed to double digit numbers although it is argued that the ratio between them remains sensibly constant. Calculations are particularly speculative in the case of a client who must finance his project over a long term span - say ten years. Furthermore, any assessment of component replacement cost must carry with it the vagaries of contractors/suppliers prices at the time of replacement. The industry may be overheated or it may not.

The factor method is based on work prepared by the Architectural Institute of Japan. Estimated service life modified by factors to take into account materials and components; design; workmanship; maintenance; operating characteristics and environment. Factors proposed for Japan vary between 0.8 and 3.0. For a reinforced concrete element and using the worst and best factors gives an estimated service life of between 2.28 years and 631.8 years respectively!

My concern is that we may suggest in these calculations a precision which is unachievable. Detailed back-analysis of completed projects would be informative.

THE ROLE OF THE BRITISH GROUP

This is still under active review by the Executive Committee. Any constructive suggestions that members may have will be welcomed and should be addressed to the Honorary Secretary. The relationship between the British Group and the Institution of Structural Engineers is also under active review and a paper will be circulated to members in due course.

MEMBERSHIP NEWS

Dr. Sam Thorburn OBE F.Eng. has accepted the role of President of the Institution of Structural Engineers for 1997-8 following the sad and untimely death of David Alsop [Oscar Faber and Partners]. We wish Sam every success in his task and hope his golf handicap does not suffer unduly.

Our congratulations to **David Lee F.Eng.,** a long time member of our Executive Committee, on becoming an honorary Member of the British Group. This award was made by our Chairman David Quinion F.Eng. on the occasion of the Annual Lecture on 28th November 1996. David Lee continues to make a gradual recovery from serious illness.

Congratulations are also due to Executive Committee member **Terry Rochester** for his appearance in the Queen's Birthday Honours List and to **Ian Liddell** on election to the Fellowship of Engineering.

The ever popular **Bob Milne** has now fully retired from his post at the Institution of Structural Engineers but will continue as Honorary Secretary of the British group. We wish Bob many happy years of retirement.

PERSONALITY

DAVID DORAN. FGGI.

David Doran spent his early career on site gaining construction experience of process plants; jetties and a large steel framed office block with basement. After a year with Wimpey Laboratories and a further post-graduate year at Imperial College studying Concrete Technology he spent his National Service with the Royal Engineers, mainly in Malaya.

He took early retirement after 35 years with George Wimpey. For the last 20 years he was Chief Structural Engineer and during that time he became a Director of Wimpey Group Services; Wimpey Construction U.K.; and Wimpey Laboratories. He was responsible for Quality Assurance in Wimpey Construction U.K, Wimpey Homes Holdings and Chairman of W.C.U.K./W.L.L. Research Liaison Committee, He was also a member of the Technology Board and advised the Wimpey Group on technical litigation.

Since July 1985 he has been practising as a Consulting Engineer and is retained by Technotrade Ltd. [an Independent Testing House] and Bates & Gillibrand [Consultants].

He has been active in Institution affairs being a member of I.Struct.E. Council 1983-86; 1987-89 and Honorary Secretary 1988-9. He has chaired Task Groups dealing with Alkali-Silica Reaction, Permissible Stress Design of Reinforced Concrete; Cladding and Bridge Access Gantries. In 1993 he received the Lewis Kent Award.

He has been a member of the IABSE Executive Committee for many years and has edited all the annual newsletters.

He has retained his links with Imperial College through the Concrete Structures Advisory Committee and, more recently, on the Concrete Research and Innovation Centre Advisory Group. He became a Fellow of the City and Guilds Institute in 1988.

David has edited two books on Construction Materials and now acts as Building and Civil Engineering advisor to Whittles Publishing. His hobbies include philately and golf; he is a Freeman of the City of London and a Deacon of his local Baptist Church

CAMBRIDGE COLLOQUIA.

A colloquium 'Structural engineering knowledge - the roles of research, education, publications and practice' was held at Pembroke College, Cambridge on 9-10 July 1996. We are grateful to Angus Low [ARUP] and his committee for organising this successful event. Concern was expressed at the colloquium on the state of education.

As a result an 'accord' has been prepared [see below] and sent as advice to ICE, I.Struct.E.; SCOSS; Engineering Council; the Fellowship of Engineering and the Joint Board of Moderators.

The next Colloquium will be at Churchill College, Cambridge [note change of venue] on 21/23 July 1997. The topics 'Behaviour and design of structures for serviceability conditions'. Professor David Nethercot [Nottingham University] is Chairman of the Organising Committee.

These Colloquia which commerate Bill Henderson the founding chairman of the British Group have developed a good international reputation . If any member has a topic which may be appropriate for such consideration please write to Bob Milne about it.

THE CAMBRIDGE ACCORD

There is now serious concern that the engineering profession is not being replenished on a basis that will provide the in-depth skills and qualities of structural engineers to meet future needs.

This statement was prepared by a group of practising engineers and professors at the IABSE colloquium on 'Structural engineering knowledge' held in Cambridge in July 1996. A recurring concern emerged and was strongly expressed in different ways by those present. The unity and clarity of the message was striking, and it was agreed it should be expressed in an Accord which could be passed to the Institutions of Civil and Structural Engineers for action.

Contributing factors

Many contributing factors were identified:

> University engineering courses are failing to attract a sufficient proportion of the high potential school leavers.
>
> Because of the diversity of school curricula much of the first year at university is spent bringing students to a common starting standard. Past complaints from the profession that universities produce incomplete engineers have been addressed by adding many extra topics to the curriculum. This has overstretched the resources and capabilities of the universities since the increased coverage with the first-year problems noted above has resulted in a reduction of the depth of treatment of the basic concepts.
>
> Students do not learn much from brief introductions to topics at university and often do not perceive the relevance of or retain what is described to them.
>
> Traditionally much, perhaps most, of an engineer's knowledge was learnt on the job. Current commercial pressures have eroded the 'thinking space' of young engineers and the tutoring time of their seniors.

In the modern design office the learning opportunities from past experiences are being lost because so much of the fundamental technology is embodied in software and hidden from view.

Much teaching of design relates to closed-form problems while in practice engineers deal with a sequence of open-ended problems requiring a flexible approach.

The proportion of structural engineers who have good ability to understand structural behaviour and to use engineering mechanics competently appears to be declining.

At the same time the needs of the profession are changing. The changing design (and construction) culture puts a high premium on the most able engineers who can deliver creativity backed by profound insight, sound experience and youthful energy. The need for such engineers is crucial but not universal. This suggests a two-tiered profession.

Recommendations

There was consensus on what needs to be done to correct the situation. The roles of education and of practice both need to be more clearly focused on the topics that they are each best able to deliver.

Education needs:

To teach some basic concepts and skills to a level at which they are thoroughly mastered and to provide a good foundation for the understanding of structural behaviour.

To inspire and excite the young mind with insights into the realities of practice and the wider context in which the profession operates.

To marry these two threads together with critical analyses of designs and the design and construction processes.

The foundations established in education need to be built on in practice and strengthened by experience. The development of knowledge and skills needs to be seen as an intrinsic activity in the work of a practising structural engineer.

Employers need:

To assume and exercise more responsibility for the development of core skills by young engineers rather than merely providing training for them to undertake broader roles. There should be continuity of purpose from university education to continuing professional development.

To provide training and tutoring to develop their engineers so that they can anticipate and be equipped for the future challenges facing the industry.

Employers could involve universities in their CPD activities and provide the structure and monitoring for them to be recognized as contributing to the award of higher degrees. This would allow recognition and status for both employer and engineer. A better partnership between university and employer can develop complete engineers but neither party can compensate for what the other neglects.

None of this is likely to happen without the encouragement and coordination of the two Institutions.

IABSE ANNUAL MEETINGS. COPENHAGEN, - JUNE 1996

It was Congress time with a difference. Instead of the usual arrangement with the annual meetings clustered together before the Congress or Symposium, the meetings were spread through the same timescale of the Congress. It was not judged to be a success as many committee members found they had a conflict of interests quite apart from the parallel sessions in the Congress. The meetings spread from Sunday to Friday. Some topics such as the revision of the Long Range Plan passed from the Review Committee to the Executive to the Permanent Committee. Fortunately with some amendments, it was finally adopted despite some calls for it to go to membership at large for endorsement. You will have received sight of it in SEI. Proposals for some new committees are intended to involve more members in the details of the Association and to enable faster progress in developing and implementing the proposals.

The Report for 1995 shows a further increase in membership to 3,700 with some lowering of the average age of members. The accounts show a surplus of some 78,000 CHF. The Symposium in San Francisco, although much better attended than that in Birmingham, showed a greater cost to IABSE than did Birmingham but much is a function of times charged by Zurich against these events. Arguments continue. This year predicted to break even.

A Task Group, of which I was a member, agreed recommendations for improvement of the technical activities within IABSE and these were pubished in SEI. The Technical Committee has an active programme quite apart from considering these recommendations. It is also considering the use of the Internet within the Association to speed up the dissemination of information and the receipt of questions and answers.

The Publications Committee are now receiving 60 papers a year for SEI - up from 30. Last issue in colour added 10,000 CHF to cost. 4,200 copies now distributed. Will include more information about IABSE activities and work in future. Themes for next issues are 2/97 Containment structures, 3/97 Structures in Berlin, 4/97 Structures using advanced materials.

WCI and WCIV reported on their activities. WCI on the achievement of structural quality and the problems of assessment of existing structures, study of applied loads, and a booklet on 'History of structural design' about the influences of different people of various disciplines. WCIV on the interfaces of construction with the work of the

structural engineer, the analysis of design and construct concerns and methods of their implementation from different viewpoints leading to recommendations.

There are 7 nominations of Vice-Presidents for 4 places so a postal ballot of the members of the Permanent Committee will be held in May 1997. Those elected must secure 50% of the votes cast.

The annual symposium at Innsbruck in September 1997 will be jointly with the other international bodies on the Liaison Committee and will have three sessions in parallel. Over 340 abstracts received. The annual meetings will be over 2½ days before the symposium on composite construction. In 1998 the meetings will be in Kobe, Japan, in 1999 Brazil is under consideration, in 2000 in Lucerne. A symposium in July 1997 is being organised by the Portuguese Group in Lisbon on 'New technologies in structural engineering' and they have received over 200 abstracts.

I raised the matter of fees for collecting subscriptions again. The initial response of Zurich was unhelpful and the President said it should be reconsidered. Other national groups share our views. Mr A Golay, in September 1996, will have served IABSE for 25 years and was congratulated.

Mr R Silman (USA) continued to raise the subject of a 'Code of ethics for sustainable development' and it had several debates. In the end it was agreed to adopt a variation of the proposal he suggested in SEI 1/96. The principle is sound but the implementation complex.

Representatives of the 36 national groups, some embryonic, met for a useful discussion for the first time. Their reports are summarised below.

The Copenhagen meetings were well organised and well supported by the Danes. They were disappointed at 600 participants and had planned for 800. The UK had 22 people plus several wives there and it was a reasonable representation as most had some active participation. I had the impression that the events were enjoyed by the participants.

The National Groups of IABSE
As reported from representatives around the table in Copenhagen in 1996

Australia: are forming a national group

Russia: trying to grow in numbers and activities
affected by changing conditions in their country

Sweden: their Chairman appointed by Government
have an annual report to members
complain that members only receive SEI for high fees!
started in 1938

Finland: started in 1948
losing members because of the high fees

Canada:	no national group as such - due to dispersion of members over large distances
Austria:	have an annual meeting and seminars with national bodies
Italy:	long established collect fees for their own funds regular meetings
France:	started in 1934 act in a collective group with most of the liaison group members and it is effective with many activities large firms are losing interest
Belgium:	annual meetings with overseas speaker visit sites have competitions with other organisations
Yugoslavia:	have seminars the fees are far too high for young engineers in poor countries
Poland:	formed 1950 organise symposia open to overseas engineers
Bulgaria:	17 members have organisational problems financial difficulties due to 30% inflation
Egypt:	few members due to organisational and financial problems
Czech:	is under a national engineering organisation members increasing have national meetings
Slovakia:	membership increasing from low numbers national meetings
Hong Kong:	have informal meetings of members future sovereignty uncertainties
USA:	too many organisations make it very competitive starting a newsletter
Spain:	about 50 members with low activity compared to other national bodies
Thailand:	formed 1985 under Engineering Institute of Thailand annual meeting

regular discussions

Korea:
formed in 1984
34 members increasing to 100 by year end!
intend to hold an international symposium each year

India:
formed in 1957
under Ministry of Transport with government appointees
monthly committee
quarterly journal
annual symposium
need international speakers

Brazil:
formed in 1956
130 members
committee meetings monthly
consider cost of events is too high on top of travelling

Switzerland:
570 members
closely tied to Association of Civil Engineers
have an annual event

Denmark:
5 international events over recent years
organise technical visits
encourage young members by subsidies
work closely with national institutions

Japan:
over 300 members
not very active in Japan as so many organised events
always among two highest national attendances at annual symposia

UK:
about 120 members
formed in 1931
annual lecture/meeting/dinner
annual colloquium at Cambridge
works closely with IStructE
committee meets 4 times a year
annual newsletter

Germany:
434 members
no activities on its own
no chairman
secretary for concrete activities and another for steel
Austrian group collects their fees
suffering from recession and high costs

Other groups: 10 not represented at the meeting.

DAVID QUINION

REPORT ON 15th CONGRESS

The 15th Congress, entitled 'Structural engineering in construction of economy environment energy' was held on 16 to 20 June in Copenhagen. Some 620 delegates attended with particularly strong representations from Japan, Eastern Europe and, of course, Denmark. There were 21 from the UK which was higher than some of the recent representations. The Organizing Committee had expected more and were disappointed. It was felt that the high cost of the Congress, due partly to the strong Danish currency, had been a problem for some countries.

The format of the Congress was to have common first sessions, daily, followed by up to four sessions and workshops held in parallel. Visits to construction sites were arranged as another alternative for the afternoons. This multi-choice was quite successful although, inevitably, some delegates were frustrated by the parallel sessions.

The main themes of the Congress were addressed by papers on the Hanshin earthquake in Japan and by the environmental impact of very large projects such as the Aswan Dam, Kausal International airport and The Great Belt Link. It was evident that there is room for improvement in the methods and analysis of environmental impact, especially in relation to the collection of data after schemes have been completed.

The proceedings of the Congress were published beforehand in an unusually large volume of 1220 pages containing 153 papers. Many of the papers were interesting and informative but, regrettably, many failed to address the themes of the Congress and there were some composed of recycled material and containing no new information. Nevertheless those unable to attend the Congress, and having an interest in economy, environment and energy, will find the proceedings a worthwhile read.

DR. GRAHAM TILLY.

ANNUAL LECTURE 1996

Chris Davis [Mott McDonald] a member of the Executive Committee gave the IABSE Annual Lecture on 28th November 1996. His subject was the Lantau Fixed crossing on which he enthralled a packed audience at Upper Belgrave Street.

The Lantau Fixed Crossing is the key element of Hong Kong's Airport Core Programme. Now completed, it will carry the transport links between downtown Hong Kong and the new International Airport at Chek Lap Kok on Lantau island.

The crossing will carry eight highway traffic lanes and twin rail tracks for the Airport Railway from Tsing Yi, which is North West of Kowloon and downtown Hong Kong, to Lantau Island. It is designed to carry rail and restricted road traffic even in typhoon conditions. The crossing has two cable supported bridges linked on Ma Wan Island by post tensioned concrete viaducts.

The Tsing Ma bridge spans the deep channel between Ma Wan and Tsing Yi which is the only access route for ocean going shipping serving the Wlargest span to carry both road and rail traffic.

The Kap Shui Mun bridge is a 430m main span cable stayed bridge. It spans another busy shipping channel between Ma Wan Island and Lantau.

Mott McDonald has served as engineering Consultant for the project from its early feasibility study through preparation of design, tender and contract documents to the current construction stage.

The 1997 Annual Lecture will be given by Mr. R.O. Snell [BP Exploration] on Thursday 27 November at 6PM. His subject will be 'Developing oil fields in up to 3000m water depth - the engineering challenge. The lecture will be preceded by the Annual General meeting and followed by supper at the Institution.. Members will be advised of booking arrangements in due course.

BRIDGE ACCESS GANTRIES AND RUNWAYS.

The report prepared by a Task group of the Institution of Structural Engineers entitled 'The operation and maintenance of bridge access gantries and runways' has now been published. It is available from the Institution priced at £25.00.

The British Group was well represented on the Task Group with David Doran [Chairman]; Brian Simpson OBE [Vice Chairman] and John Menzies F.Eng. as consultant. The Institution is grateful for financial sponsorship from the following organisations in helping to produce the report.

* Highways Agency
* Severn River Crossing
* Dartford River Crossing
* Humber Bridge Board
* Tay Road Bridge Joint Board
* Railtrack Civil Engineering Technical Support Group
* London Underground Ltd.
* Forth Road Bridge Joint Board.

CONCRETE RESEARCH AND INNOVATION CENTRE.

Bridges have become a hot topic at the Concrete Research and Innovation Centre at Imperial College since one of their researchers, Colette McFadden, began work on a computer-based learning module about bridges for undergraduate civil engineers. Colette likens working on the module to the making of movies. "This is not like putting a textbook on computer," she says, "Everything seen on the computer screen needs to be scripted, visual and as interactive as possible whilst maintaining its academic integrity".

The Bridge Learning Module is one of the varied projects in the CRIC portfolio at the moment. CRIC was formed in 1993 as part of the Concrete Structures Section of Imperial College's Department of Civil Engineering. It has its own core team of researchers who interact with the Section's other researchers and lecturers. Dr Pal Chana is a director of CRIC along with the Head of the Concrete Structures Section, Dr John Newman. Dr Chana regards CRIC "as an industry-academia bridge with two-way traffic of ideas and information". To that end, close ties are maintained with the BCA, through Visiting Professor George Somerville and the BRE, through Visiting Professor Haig Gulvanessian. Prof. Somerville and his colleague, Mike Webster, have provided invaluable assistance on the Bridge Module, for instance, donating visual material and giving techical advice on the theoretical content.

The diversity of CRIC's projects can be seen from a selection of its core staff's repertoire: the Technical Manager, Andy Pullen, balances hands-on testwork in the concrete labs with theoretical research for the DRA, the modelling of volcanoes for the Open University's vulcanology team and work on CONSPEC, a computerised concrete specification package for industry. His bridge work involves the long-term monitoring of strains due to ASR and recording transient strains due to vehicle loads on bridges undergoing repair. Alison Ahearn handles CRIC's admin, public events and shortcourses, teaches the undergraduate MEng communications course and leads an IT project on construction law for barristers. Pal Chana, meanwhile, maintains his strong interest in practical structural engineering, policy, strategy and, now, the Cardington Large Building Test Facility in tandem with growing postgraduate and undergraduate teaching commitments.

As an innovative way of delivering concrete knowledge to future engineers, the Bridge Learning Module fits well within the philosophy of CRIC. The Bridge learning module is just one of many being created by the "Compact" consortium (Nottingham and Leeds Universities plus Imperial College) under a governnment programme to bring I.T. into the university teaching system. Generally, the module targets basic bridge design by introducing the student to everything from the history of bridges, on through the fundamentals of conceptual design, thence onto loading, analysis and detailed design and polishing off with management and methods of construction. Dr Chana described the module as relevant, educational, innovative, serving industry's needs and exploiting academia's strengths. "In fact", he said, "it exemplifies what CRIC is all about".

SCOSS REPORT No. 11 STRUCTURAL SAFETY 1994–96

In its Eleventh Report, *Structural Safety 1994–96: Review and Recommendations,* SCOSS - the Standing Committee on Structural Safety - highlights the need for better communication between the parties with responsibility for the safety of structures in order to maintain structural safety. Eight immediate priority recommendations in the Report cover multi-storey car parks, pin connections, fatigue in steel structures, disproportionate collapse, and flood damage to bridges. Five strong recommendations

deal with hazard identification and risk assessment in design, design and build, codes of practice and air-supported structures.

SCOSS believes that the very good record of structural safety in the United Kingdom can only be maintained through the constant vigilance of engineers and others responsible for safety and that effective communication is a major factor in maintaining vigilance and awareness of adverse trends and events affecting structural safety. To assist this process, comment on the Report and feedback to SCOSS of experience relating to structural safety are invited.

SCOSS recommends as an immediate priority:

> Owners and operators of **existing multi-storey car parks** should commission periodical inspections and structural appraisals of their structures, including the edge barriers, as recommended previously. If necessary, the edge barriers should be modified, strengthened or replaced. Guidance on assessment and strengthening of existing edge barriers in multi-storey car parks is urgently needed.
>
> Guidance on design, inspection and maintenance of **pin connections in bridges and buildings** should be reviewed. Design of pin connections should be overseen by experienced engineers who are responsible for design, detailing, installation, inspection and maintenance.
>
> Standards and codes of practice relating to design against **fatigue in steel structures** should be reviewed from a safety standpoint as a basis for achieving convergence towards a compatible set of fatigue rules.
>
> Design guidance should be prepared for engineers on structural concepts and forms which have a low sensitivity to damage and an appropriate capacity to resist **disproportionate collapse**.
>
> Continuing collaboration between highways authorities, Railtrack and other owners of bridges over water should be established to keep **flood damage to bridges** under review and to develop consistent best practice.

Strong recommendations made by SCOSS are:

Designers should apply an explicit risk management process of **hazard identification and risk assessment** starting at the design stage of projects.

Standard forms of contract for **design and build** should clearly state the responsibility of the designer for investigating, checking and evaluating site conditions, and protect against unjustified reliance on or over-optimistic interpretation of client-supplied data.

The British Standards Institution should publicise its policy for the development of **structural codes of practice** and should aim to achieve a single set of codes through positive coordination and support of their development.

British Standard BS 6661: 1986 *Guide for the design, construction and maintenance of single-skin air-supported structures* should be withdrawn, and new guidance on design, specification, construction and use of **air-supported and fabric structures** should be prepared.

The Report discusses a total of 30 topics which SCOSS has reviewed and investigated over the past two years. Additional topics covered include explosion resistance, bridge assessment, bridge strikes and hidden tension members. Extensive references are included throughout the Report to help engineers and others concerned with structural safety to find more information on each topic.

The Eleventh SCOSS Report was published in January 1997 by SETO, 11 Upper Belgrave Street, London SW1X 8BH, price £25.00. ISBN 1 874266 31 X. The report is 48 pages long. A Bulletin summarising the Report is available free of charge.

For further information, contact Dr John Menzies (Secretary) or Mr Nick Clarke (Technical Officer), Standing Committee on Structural Safety, 11 Upper Belgrave Street, London SW1X 8BH. Telephone: 0171-235 4535, Fax: 0171-235 4294. E-mail istructe.lon@mail.bogo.co.uk

N. CLARKE.

STEEL IN CONSTRUCTION.

The UK steel industry is a national and international success story. Over the past 20 years it has changed dramatically and it now operates, without government subsidy, in a fiercely competitive international market. Highly innovative and dynamic, it responds

swiftly to meet increasingly challenging customer demands for materials offering strength, easy maintenance, advanced design opportunities and low costs.

UK steel : a positive contribution to UK plc.

* In 1996 the UK steel industry produced 17.5 million tonnes of steel enough to build a railway line round the equator.
* It provides 60,000 direct jobs - and many more indirect jobs - in the UK.
* It contributes £2,7 billion to the UK's balance of payments.
* Steel employees are now four times more productive than 20 years ago.

UK steel : successful internationally.

* The steel industry exports about half the steel it produces to 194 countries.
* The value of UK steel exports exceeds £4 billion.
* The UK steel industry operates in an increasingly competitive international market, without subsidy.

UK steel : the environment friendly material.

* Steel is eminently recyclable. Forty per cent of UK steel is made from recycled material from domestic and industrial products which are discarded at the end of their useful lives.
* Seven million tonnes of scrap were used in the production of 17.6 million tonnes of steel in 1995.

Structural steelwork a significant success story.

The historical development of steelwork in construction is a subject which has never been precisely recorded because it came about as part of the general development in building techniques dating back before the industrial revolution. Cast iron beams and columns are recorded as having been incorporated in the building of a five storey mill in Shrewsbury as far back as 1797 and, by the middle of the 19th century, developments in the use of wrought iron made it acceptable to Brunel and Stephenson in the construction of many famous railway bridges still in use today.

The demand for ironwork in buildings grew very quickly and technical developments soon made supplies of the new Bessemer and Open Hearth steels available. The first rolled sections in this new stronger material became available in this country in 1883 and the first completely steel-framed building in the British isles was a furniture emporium in County Durham, erected in 1900.

The British Constructional Steelwork Association - BCSA - was formed in 1906 and the growth of steel in construction has gone hand in hand with the development of the Association and the industry over the past 90 years.

Following the boom of the late 1980s the industry entered a period of severe recession, but recent years have seen solid growth due to rationalisation within the industry and investment in new plant and the techniques of design, fabrication and

erection. Last year the constructional steelwork industry's output exceeded £2,000 million, with steady growth expected.

BCSA.

BCSA Limited is a national organisation for the constructional steelwork industry: its member companies undertake design, fabrication and erection of steelwork for all forms of construction in building and civil engineering. Associate members are those principal companies involved in the purchase, design or supply of components, materials, services etc, related to the industry. Corporate members are clients, professional offices, educational establishments etc, which support the development of national specifications, quality, fabrication and erection techniques, overall industry efficiency and good practice.

The Association's aim is to influence the trading environment in which member companies have to operate in order to improve their profitability.

Recently the Association has been involved with a number of important industry initiatives which have had the support of several government departments. In 1989 The Association launched the National Structural Steelwork Specification for Building Construction [the 'Black' Book] with the aim of achieving greater uniformity in contract documents and eliminating the plethora of conflicting requirements which were faced by the industry. The 'Black' Book has been one of the great success stories of BCSA and is used by the majority of specifiers for their projects.

The early 1990's saw the industry in recession again. But by 1994 it was generally felt that an improvement in the industry's fortunes was on its way. Sir Michael Latham's review of procurement and contractual arrangements had commenced and promised to be a watershed for the entire construction industry - starting a return back to good practices which could only bring significant benefits to the industry.

Exports saw a dramatic leap in the early 1990's with BCSA member companies proving that the UK has the world's best steel construction industry by winning orders all around the globe.

New Initiatives.

1995 saw the launch of the Register of Qualified Steelwork Contractors Scheme which was set up with the aim of improving competitiveness and efficiency in the industry by ensuring satisfaction. The Scheme, endorsed by the government, readily enables identification of appropriate steelwork contractors and ensures that competition takes place within a set level of competence and experience.

BCSA has also registered an agreement with the Office of Fair Trading whereby members will agree that they will not accept deduction of retention on contracts above a certain value, offering instead a bond. Negotiations have been taking place with underwriters to develop a standard BCSA bonding system and premium.

The industry firmly believes that its future lies with children. BCSA administers the Steel Construction Challenge for Schools competition which aims to improve industry/school links, and requires teams of students, supported by local member companies, to design, cost and construct a framework to support a number of objects.

Technical Activities.

One of the most fundamental functions of any Trade Association is the dissemination of information which is of relevance to the business and well-being of its members. BCSA provides its member companies with such support on a continual basis, through publications, regional meetings, courses and a weekly postbag.

BCSA has been involved in a number of research and development projects with government departments. One of these currently is the DTI project Steelwork Fabrication 2000 being carried out jointly with the Steel Construction Institute. It is aimed broadly at improving the efficiency and profitability of the constructional steelwork sector.

BCSA also assists with the preparation of codes and standards. Staff from BCSA and its member companies sit on some 70 BSI and European technical committees. A technical advisory service is also provided, not only for members but also for specifiers, contractors and local and central government.

Liaison with Other Industry Organisations.

Co-operation with related organisations takes place through regular joint BCSA liaison meetings with bodies such as British Steel, Association of Consulting Engineers, National Association of Steel Stockholders etc. In addition, the Steel Construction Industry Federation has provided a forum for joint action by BCSA, British Steel and SCI.

In 1996 British Steel plc became an Associate Member of the Association and all BCSA Members receive free membership of the Steel Construction Institute: thus demonstrating the joint commitment of the three organisations to work even closer together in the future.

A magazine is published jointly with SCI under the title 'New Steel Construction'. The annual Structural Steel Design Awards Scheme is sponsored by BCSA, British Steel plc and SCI, and is administered by the Association.

The Future.

The industry's future must lie in the hands of individual members whose strengths and deficiencies will mark the limits of its advance. The recent 90th anniversary has encouraged the Association to look forward with renewed vigour. Already the steel construction industry's contribution for the Millennium celebrations are well in hand.

A. C. OAKHILL.

STRUCTURAL RELIABILITY IN BRIDGE ENGINEERING.

A Workshop on Structural Reliability in Bridge Engineering, sponsored by the National Science Foundation (USA) and others was held at the University of Colorado at Boulder in October 1996. The main purpose of the Workshop was to discuss the incorporation of reliability concepts and methods in highway bridge engineering (with special emphasis on bridge inspection, assessment, rehabilitation, design and management) and to identify a research plan for the future.

During the course of the Workshop, many similarities between the USA and UK in the issues and problems of bridge management and reliability became apparent.A personal view of the present situation and research needs as identified in the Workshop is given below. The needs are thought to be largely relevant also to the UK. Some are being addressed to some extent by current UK bridge management and research projects.

Present situation and research objectives

There are approximately 577,000 bridges in the USA of which some 40% are structurally or functionally deficient. The estimated cost of bringing this bridge stock up to 'standard' is $75 billion. This cost is in contrast to the $2.7 billion per year spent on bridge repair, replacement and management.

There is a need to make sure that the national highway system remains reliable and that highway transport suffers minimal disruption from bridge failures and bridge repair operations. The incentive is strong therefore to manage the bridge stock as effectively as possible using the limited resources available.

Overall main research objectives may be defined as follows:

* to identify future trends in the demand for and use of the national highway system and implications for bridge design and management (taken here to include inspection, maintenance, repair, rehabilitation, upgrading, replacement).
* to define the performance criteria for the design of new bridges and for the evaluation existing bridges.
* to provide engineers with improved structural design and evaluation techniques to enable them to design and manage bridges more effectively and efficiently so that bridge performance is improved over the next decade compared to the last decade.
* to provide engineers with improved techniques for the inspection and quantification of the condition of bridges and for predicting future deterioration and performance so that they can implement more cost effective options of future management.

Achievement of the above objectives should focus towards bringing benefits as follows:

* a more reliable highway system where costs of disruption caused by bridge engineering works are reduced.

* greater reliability of bridges including fewer failures, lower costs, more effective inspection, maintenance, repair, rehabilitation, upgrading and replacement processes giving longer lives/lower costs per year.

Research needs.

To achieve the above objectives and bring the benefits of more effective deployment of bridge management resources requires long term research programmes as follows:

(1) Global Issues

The future requirements for bridges and their implications need to be researched, e.g. the research programme in this area would include projects on:

* bridge loadings (are loadings going to increase in future in magnitude, frequency,
* the replacement needs and also upgrading requirements (for existing/higher loadings, for widening, more lanes, ...)
* acceptable cost and risks of collapse in the bridge population as a whole and acceptable risk of associated loss of life.

(2) Feedback of bridge performance in use

It is essential to maintain an inventory of the bridge stock together with up-to date so that the effectiveness of particular bridge designs and maintenance/repair strategies can be determined. Better knowledge of "what works and what does not work" will enable better bridge management decisions to be taken in the future. In this context a programme of research projects is needed on topics such as:

* the vulnerability of different types of bridges to failure, the timescales involved and whether the failures jeopardize safety or are only a matter of maintenance/repair costs.
* the strategy for the management of different types of bridge (when is best time to repair etc.)
* the performance of different types of bridges compared to the criteria used in design or evaluation (are present criteria unnecessarily conservative?)
* the loadings (traffic) on bridges and the environmental conditions which may bring about degradation.
* materials variability and the deterioration processes, especially fatigue and corrosion, and their effects/rates over time, and variability relationships to circumstances.

The projects should collect data in a form suitable for use as inputs to reliability analyses.

(3) Models and analytical reliability techniques

Based on feedback from performance in use ((2) above) and other data, e.g. testing, improved models of degradation processes and reliability need to be developed by research projects on, for example:

* fatigue
* stress corrosion cracking
* reliability of maintenance
* reliability of repair
* 'standardization' of reliability analyses
* systems reliability
* target reliabilities
* life prediction
* assessment of remaining life, life to repair.

(4) Inspection techniques

Research is needed to improve the reliability of inspection techniques. For example, projects are needed in the following areas:

* visual inspections: for different types of bridges, procedures, frequency, training of inspectors, management effectiveness, reliability improvements
* non-destructive examination techniques: when needed, capability, interpretation of results, training of operators.
* performance monitoring reliability: use of NDE systems/techniques which detect degradation events, e.g. cracking, loss of hangers, and provide a warning signal of occurrence from continuous monitoring, especially of events which may cause loss of safety.

(5) Costs

A research programme is needed to provide a basis for examining the various options for the future management of a bridge to maintain it in a safe and serviceable condition and also to obtain optimum value for money. The programme would include projects on, for example:

* costs and effectiveness of inspection techniques
* costs of different management options, e.g. repair now or later, do nothing, replace later, etc.
* costs of repair
* options during whole life to obtain optimum whole life costs relationships of importance of bridge in network to costs of repair, replacement, etc.

(6) Engineering design/evaluation

A research programme is needed consisting of projects designed to bring results from (2) - (5) above into a reliability-based framework of bridge evaluation and design.

* criteria for justifying repair/replacement
* data from (2) - (5) in forms suitable for use in reliability-based evaluations
* methods of dealing with system reliability

(7) Communication

A programme of research is needed to find ways and provide tools for practicing engineers to help them to adopt the outputs from (1) to (6) above. Projects are needed on topics such as:

* user friendliness of guidance on bridge evaluation.
* development of expert systems for inspection, diagnosis of causes of cracking, definition of repairs, e.g. of cracks in steelwork etc...
* use of case studies to assist engineers deal with the bridge management tasks.
* definition of the portfolio of information for each major bridge type which a bridge management engineer needs.
* the availability and user friendliness of the portfolios of information.
* education and continuing professional development to facilitate engineers adoption of improved techniques and processes.
* guidance documents as part of portfolio of information to assist better practice.
* development of software for bridge management and evaluation.

Conclusion

Programmes of research are needed under the following headings:

* Global issues
* Feedback of bridge performance
* Models and analytical reliability techniques
* Inspection techniques
* Costs
* Engineering design/evaluation
* Communication

The programmes are interrelated and each should consist of a number of research projects. The projects within each programme should be prioritized

Dr. J. Menzies F.ENG.

STRUCTURAL ENGINEERING INTERNATIONAL

May I remind all members of the on-going opportunity to have articles published in SEI. The rules for so doing are relatively simple and I would be pleased to hear from any who may wish to provide such material. I can be contacted by telephone or fax on the following number **0181-989-9082**.

DAVID DORAN - SEI. UK Correspondent.

INTERNATIONAL REPRESENTATION

As a result of the elections last September our representation on the International committees is now as follows :-

Mr. D.W. QUINION	Executive Committee. Vice President of IABSE.
Prof. D.A. NETHERCOT	Member of Technical Committee.
Prof. D.A. NETHERCOT	Chairman of Working Commission Two. [Steel, Timber and Composite Structures]
Mr. A.J. PICKETT	Member Working Commission Four. [Construction Management]
Mr. D.C.C. DAVIS	Member WorKing Commission Eight. [Operation, Maintenance and Repair of Structures]

N.B.

U.K. is not currently represented on Working Commissions 1, 3, 5. and 6. Should any member be interested in these vacancies please discuss with Bob Milne [0171-235-4535]. The activities of Working Commission 7 [Building Physics] are suspended for the time being.

Elections to Working Commissions take place in alternate years and do so this year. Please advise if you are interested and able to participate in the meetings and work of a particular Commission. Members may apply to attend any meetings of the Working Commissions in which they are interested. The present Working Commission structure is under review.

CALENDAR 1996 - 1997

02 - 05 July 1997	'NEW TECHNOLOGIES IN STRUCTURAL ENGINEERING'. LISBON, PORTUGAL New Technologies in Structural Engineering.

16-18 September 1997	INTERNATIONAL CONFERENCE, INNSBRUCK AUSTRIA. Composite Construction - Conventional and Innovative.
27 November 1997	BRITISH GROUP AGM / ANNUAL LECTURE / DINNER. Lecturer: R.O. Snell [BP Exploration] - Deep-Sea engineering for oil recovery.
04-05 June 1998	COLLOQUIUM, BERLIN. GERMANY. Saving Buildings in Central and Easter Europe.
02-04 September 1998	SYMPOSIUM. KOBE. JAPAN. Long Span and High Rise Structures.

PLEASE PASS THIS NEWSLETTER ON TO A COLLEAGUE WHEN YOU HAVE FINISHED WITH IT.

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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 Messrs Sandberg for the wording of this disclaimer].

EDITORIAL PANEL