SECED NEWSLETTER

THE SOCIETY FOR EARTHQUAKE AND CIVIL ENGINEERING DYNAMICS

March 1990. Vol. 4, No.2

IN THIS ISSUE

We have no guest editorial in this issue but have in its place a brief report upon the recent UK earthquake. The article has been submitted by corporate members Dr. John Mills and Nigel Hinings of the Allott and Lomax Earthquake Engineering Group. Members will have noted the proposed meeting on this topic arranged by SECED chairman Dr. Chris Browitt.

The major content of this issue is taken up with reports of past meetings two of which include joint EEFIT/SECED gatherings.

The Membership Notes section includes a membership profile from Membership Sub-Committee member Amr Elnashai together with a questionnaire from John Maguire seeking to determine what sort of meetings the membership require. Members are requested to complete the forms and return direct to the Secretary.

Regular newsletter features appear as follows:

The Editor

The SECED Newsletter is published four times a year by the SOCIETY FOR EARTHQUAKES AND CIVIL ENGINEERING DYNAMICS and is available to all members of the society. Articles for inclusion should be sent to The Editor, SECED Newsletter, C.R.Sharman, Allott & Lomax, Fairbairn House, 23 Ashton Lane, Sale, Manchester, M33 1WP

Produced by Fairbairn Services Ltd.

CONTENTS

A Significant British Earthquake

On Monday, 2nd April, much of England and Wales was shaken by a magnitude 5.4 earthquake, centred on Bishops Castle in Shropshire.

In Shrewsbury, 32 kilometres from the earthquake epicentre, structural damage was reported by Dr. Mills and Mr. Hinings of Allott & Lomax who visited the area on Monday evening to be limited to the collapse of a small number of chimney stacks around the railway station and Ellesmere Road area. The railway station had been closed for an hour after reports that one of the elegant stacks on the Victoria building had moved. In Butchers Row the facade of a timber frame building was giving concern and was being monitored and in Dogpole a tall stack was leaning precariously, with work underway to make it safe.

Building Inspectors from the council, were reported to have identified up to 40 buildings damaged to some degree, and traffic was being diverted around the town centre to avoid danger from collapse and to protect damaged structures from further vibration from traffic. This cautious approach in the narrow streets of this county town was also partly due to concern about after shocks.

The earthquake, which is the fourth this century of comparable size, is of considerable interest to the UK earthquake engineering community and a presentation about the event will be given by Dr. Chris Browitt of the British Geological Survey at the Institution of Civil Engineers at 5.30p.m. on Wednesday, 25th April.

SECED MEETINGS

There follows reports from four past meetings. The first records the 10th January meeting held at Imperial College, when the EEFIT team reported on the field trip to San Francisco. The second reports upon the open meeting organised by EEFIT concerning their field trip in connection with the 1989 Newcastle Australia earthquake. This meeting was held at the Institution of Structural Engineers on the 2nd February as was the 28th February meeting on the UK Response to Eurocode 8 which is reported by Dr. B.O. Skipp.

Finally Ed Booth reports the 21st March meeting held at Imperial College in connection with the work of the National Center for Earthquake Engineering Research at Buffalo, New York and its relevance to the UK.

Earthquake Field Training Unit (EFTU)

Debriefing Meeting on the Loma Prieta Earthquake
Held at Imperial College on 10th January 1990

Reported by Dr. A. Elnashai.

The EFTU team from Imperial College was despatched to the San Francisco Bay area four days after the damaging magnitude 7.1 earthquake that occurred on 17 October in the Santa Cruz mountains. The team consisted of Amr Elnashai, Julian Bommer and Ahmed El-Ghazouli, members of the Engineering Seismology and Earthquake Engineering Section. The team spent four man-weeks in the affected area and collected seismological, geotechnical and structural information, which was collated and included in a field report.

A debriefing meeting was held on 29th November 1989, where preliminary findings were discussed. Professor Ambraseys opened the meeting by giving a brief statement on overall

damage statistics and distribution. "One of the main casualties of this earthquake is scientific credibility in the field of earthquake prediction", Professor Ambraseys stated.

The first field mission speaker was Julian Bommer, who discussed briefly the seismic history of the Bay area and where the Loma Prieta event fits in with the recent seismic activity along the San Andreas fault. He also discussed briefly the complicated pattern of ground cracks observed in the epicentral area, and the possibility of coseismic movement on adjacent faults other than the San Andreas. An interesting seismological observation from this earthquake was the abnormally high standard deviation in surface wave magnitudes calculated from stations with varying azimuth from the earthquake source. Julian Bommer showed that this is likely to be a consequence of variations in travel path as opposed to radiation directivity effects. This is emphasised by comparing the azimuthal distribution of magnitudes from this event and that from the Kern County earthquake of 1952. Despite the fact that fault slip surfaces were almost at right angles, the magnitudes were dispersed in a near similar fashion.

Effects of the earthquake on buildings were presented by Ahmed El-Ghazouli, who showed some slides of observed damage to engineered and non-engineered buildings. He categorised causes of damage into; inadequate lateral resistance, foundation failure, lack of anchorage between the building and its foundation, pounding of adjacent structures and excessive lateral displacement causing damage to non-structural components. In each case, he presented simple diagrams demonstrating the mechanism under consideration, followed by representative examples from the field.

The final part of the debriefing was given by Amr Elnashai, who discussed damage to bridges and freeway structures. He concentrated on three structures, namely the Oakland Bay Bridge, the Nimitz Freeway Cypress structure and the Oakland Struve Slough Bridge. The collapse of a 50 ft. stretch of the Oakland Bay Bridge was attributed to inadequate longitudinal support for the simple spans, where the observed 7 inch movement exceeded the 5 inch seat angle width.

The Cypress viaduct failure was attributed to the inadequate shear capacity of the bottom section of the upper deck, coupled with unusually long period vibrations at this location, due to the geology of the site. In the case of the Struve Slough Bridge collapse, the slides show that column sections were inadequate to resist the imposed shear forces. Shear failure of the column heads was succeeded by punching of the columns through the slab.

The presentation concluded by stating that most observed effects were identified long ago, as far back as 1865, when an earthquake occurred in the same area of the Santa Cruz mountains. Historical accounts from this event bear clear similarities with the observations from the Loma Prieta earthquake.

The 1989 Newcastle Australia Earthquake

Meeting held at the Institution of Structural Engineers
2nd February 1990

Reported by J. Pappin

On the 28th December 1989 a magnitude 5.4 earthquake occurred directly under Newcastle, a major industrial town situated on the east coast of Australia about 120 km north of Sydney. 12 people were killed making this the first earthquake in Australia to cause casualties.

Two members of the UK based Earthquake Engineering Field Investigation Team (EEFIT) went to study the results of this earthquake. They were Jack Pappin of Ove Arup and Partners and Adrian Chandler of University College London. They arrived in Newcastle ten days after the earthquake and spent four days in the damage area and one day at the Australian Seismological Centre in Canberra.

The earthquake was not able to be accurately located but Robin Adams of the International Seismological Centre, Newbury, estimated that it was between 5 to 10 km below the earth's surface. A single aftershock of about magnitude 2 occurred about 10 km west of Newcastle the following day. Newcastle is shown in the Australian code of practice to be in an area of lower than average seismicity. Two previous earthquakes have also occurred in the Newcastle area one in 1868 and again one in 1925 but they were smaller (about magnitude 5) than the 1989 event. The town is situated on coal measures and there has been extensive coal mining below it. The surface geology is dominated by alluvial sands and clays laid down by the Hunter River which flows through Newcastle. There are also rock outcrops in the east, south and west parts of the town.

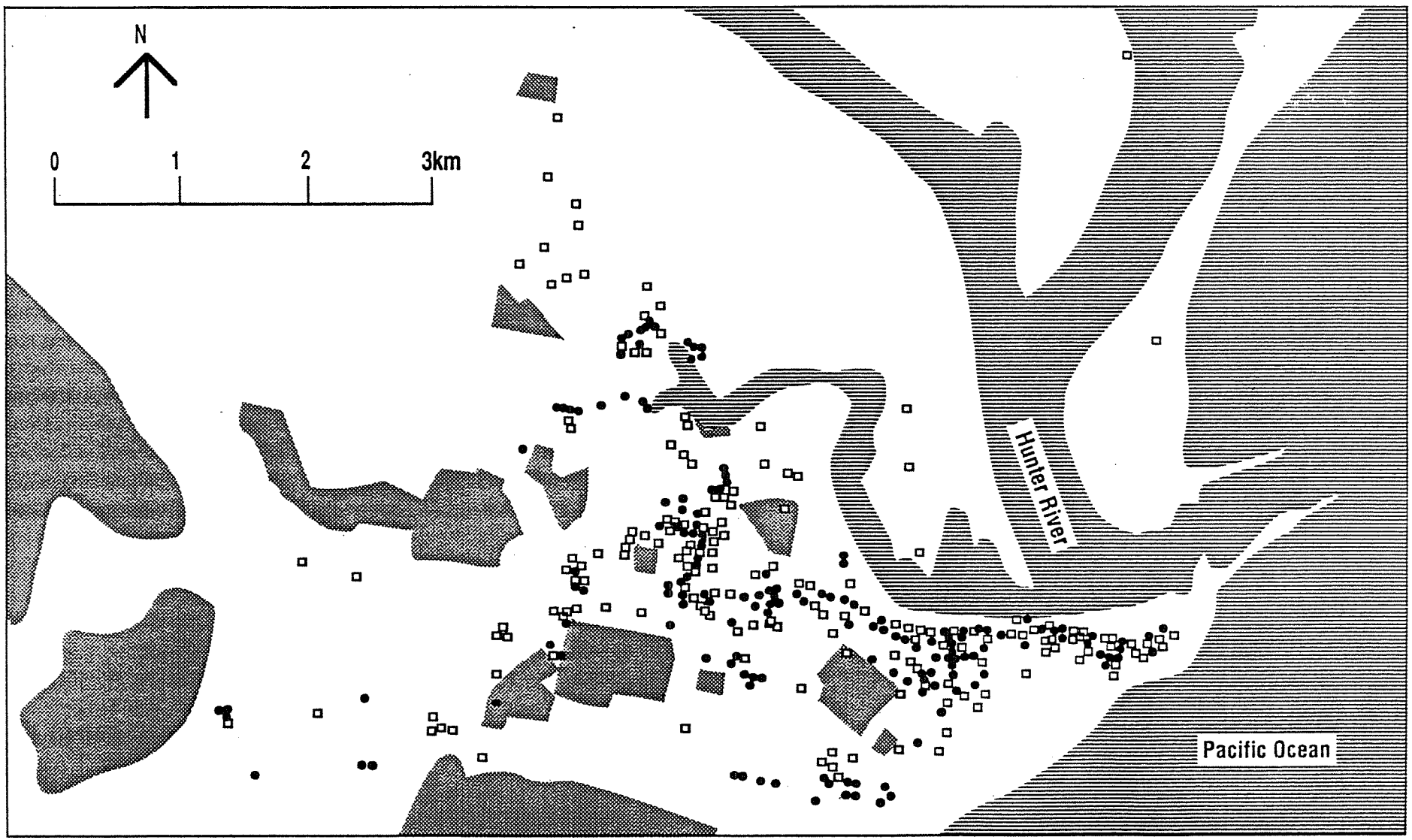
The predominant type of building damage was to unreinforced masonry with many parapets, gable ends, facades and chimneys collapsing. Multistorey buildings were much more vulnerable than single storey structures and consequently most damage was concentrated on schools, shops, warehouses and older two storey houses. Many houses are timber and these were generally undamaged. There was extensive minor damage to masonry infill of reinforced concrete frame structures and occasionally cladding was damaged. The basic frame structure was undamaged however. There were two notable exceptions, a working mans club which collapsed killing nine people and a motel which because of its highly asymmetric geometry suffered a torsional failure. The reasons for the dramatic collapse of the working mans club are not clear and at present no conclusions can be drawn from this structure.

As part of this study the EEFIT team mapped the damage distribution. The areas of highest damage were in light industrial and shopping areas because of the high percentage of vulnerable buildings in these areas. In the worst areas up to 20% of structures were heavily damaged with a further 30% lightly damaged. In housing areas the damage levels were much lower but schools and colleges were particularly hard hit with over 50% being heavily damaged. There does not seem to be any clear correlation between damage and type of surface geology but there is some evidence of correlation of areas of damage and absence of underlying mining. The layout of mine boundaries and commercial centres are both aligned to major roads however, which could account for this correlation. To the north of Newcastle is an extensive area of heavy industry including a major steelworks and coal handling area. There was no reported damage here. Services also fared well with only about twenty water-mains broken and a three hour loss of power caused by damage to few substations.

An interesting feature of the earthquake was the high level of organisation of the rescue and recovery services. Badly damaged areas were closed and loose and damaged buildings partially or totally demolished to prevent further danger to the public. Fear of aftershocks was largely responsible for this work which was co-ordinated by the City Council Surveying Department. Notices were posted on all damaged properties listing them as requiring caution or being dangerous. One of the principal aims of the council was to reopen business areas as quickly as possible to minimise economic losses. In all, nine buildings were totally demolished and up to 10,000 buildings damaged, albeit mostly very slightly. The total repair bill is likely to be about £500m.

It is really too early to draw conclusions from this event but it is clear that proper detailing to parapets and other unsupported masonry would have greatly reduced the risk of falling masonry. Three people were killed by falling masonry and if this earthquake had occurred in a normal working week and not in a holiday period the loss of life could have been many times worse. There is no doubt of the relevance of this earthquake to the UK which has a similar seismological environment to that of eastern Australia.

Distribution of damage in Newcastle

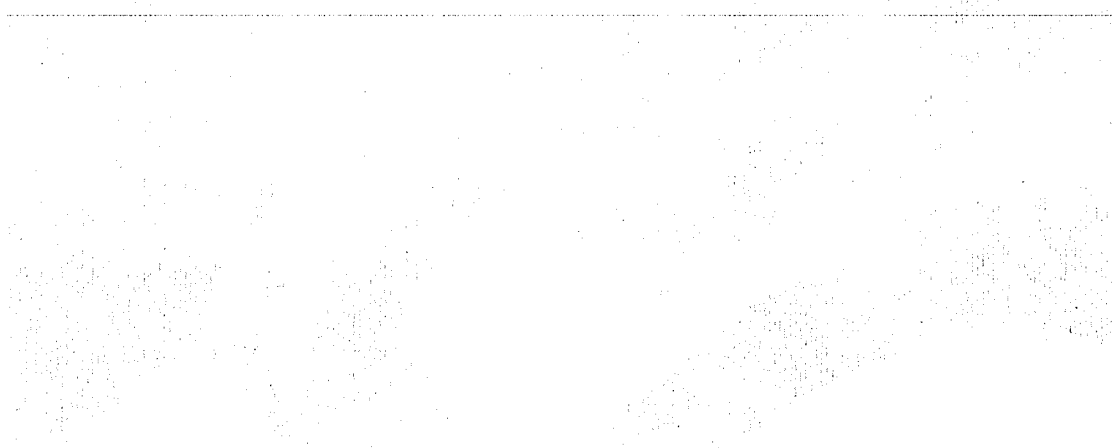


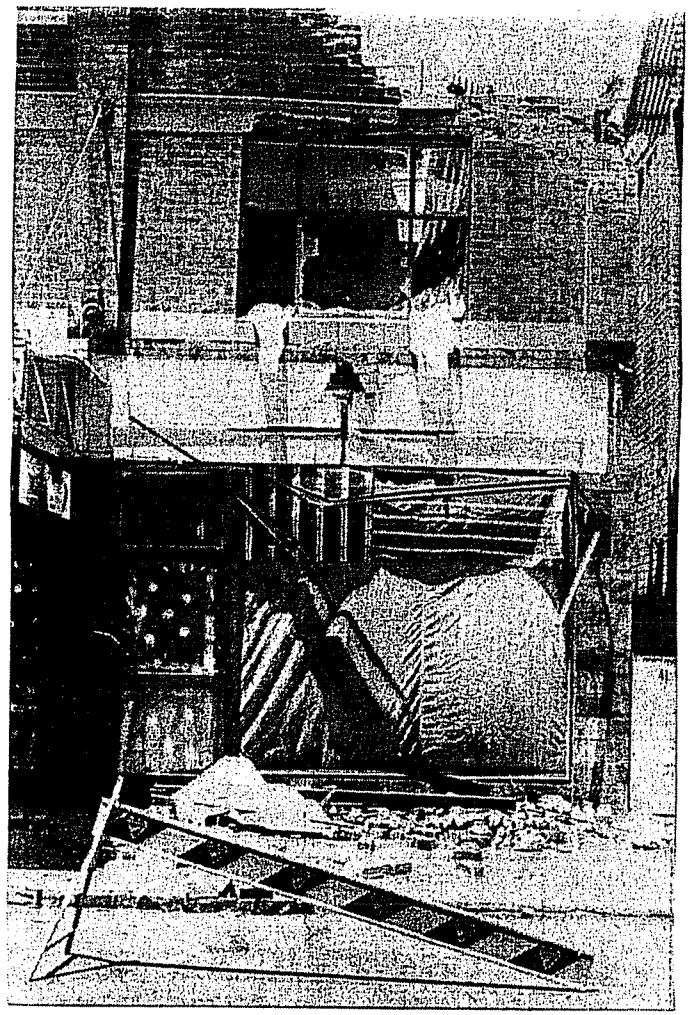
LEGEND

Parkland

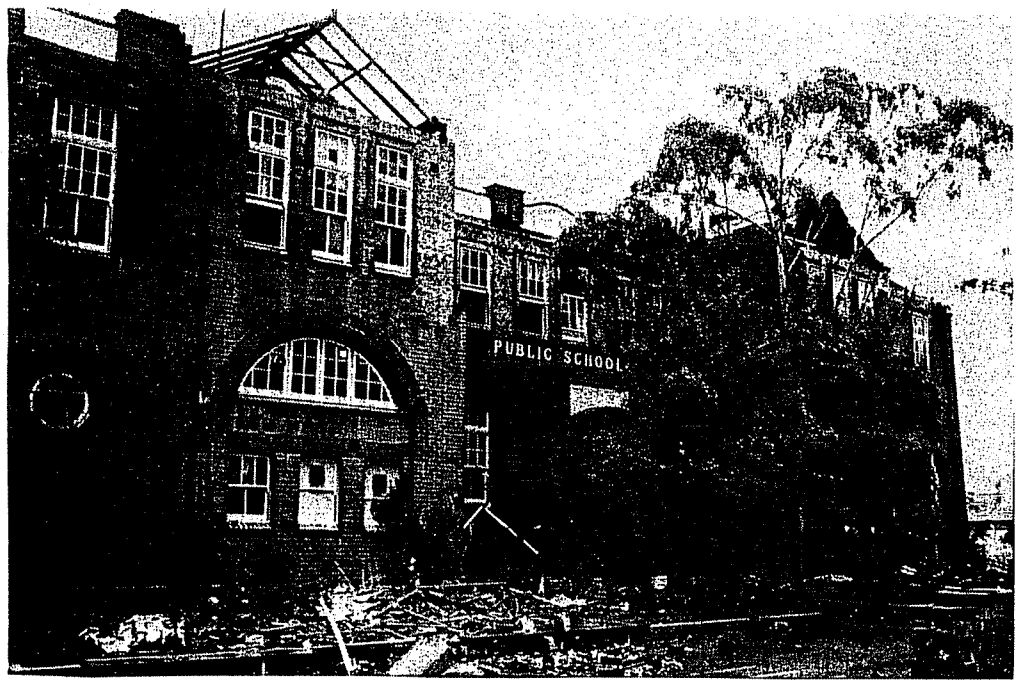
Slight to moderate damage

Heavy damage

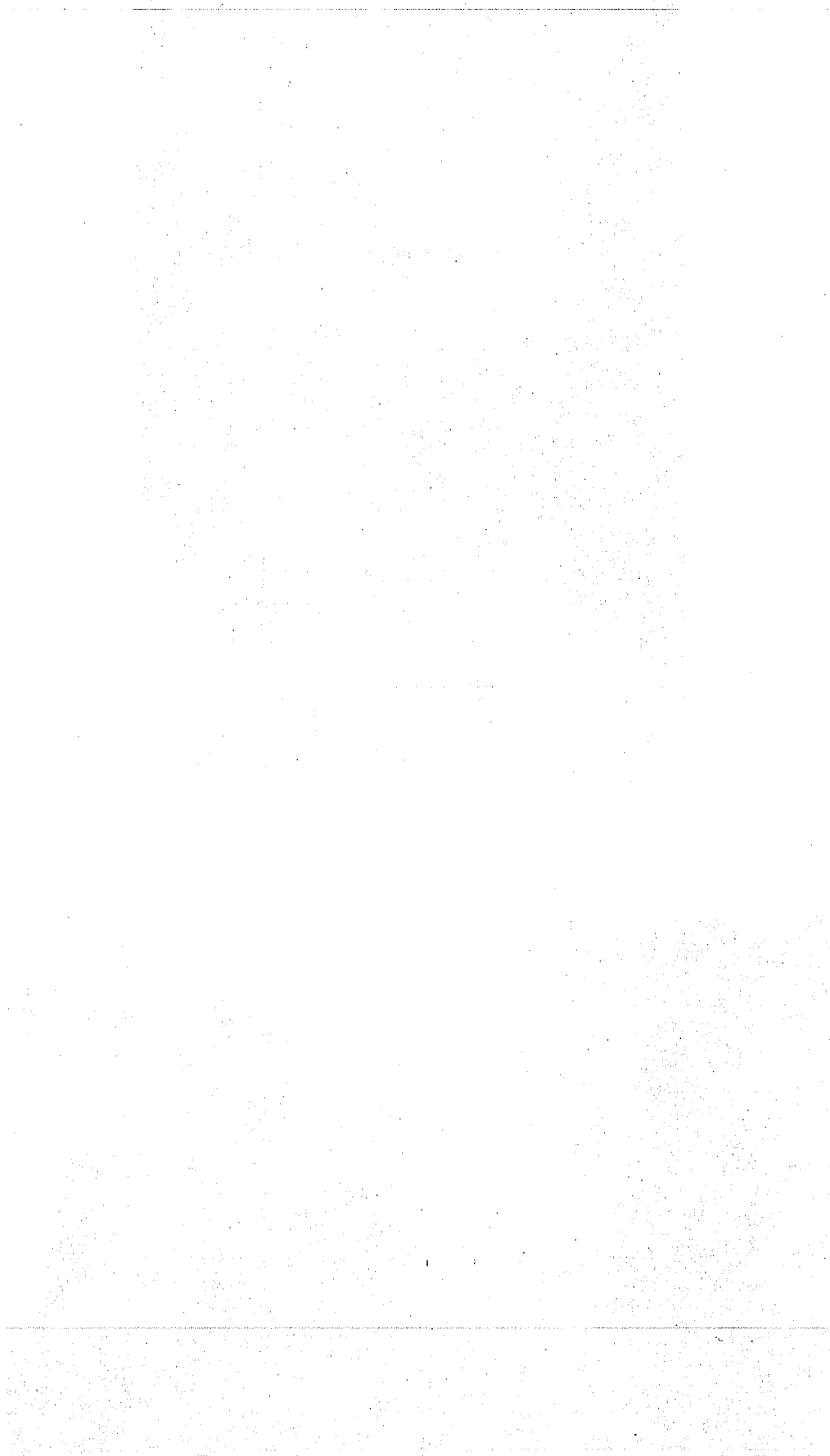




Damage to a traditional shop front



Damage to a state government junior school



Update on Eurocode 8

Joint Meeting with the Institution of Structural Engineers
held on 28th February 1990

Reported by Dr. B.O. Skipp

A full house at the Institution of Structural Engineers was given the latest news on the progress of Eurocode No. 8: Structures in Seismic Regions - Design, Part 1, General and Building, May 1988. In September 1989 the translations of parts 1.1, 1.2, 1.3 were sent to national standards bodies; part 1.4, Strengthening and Repair was awaited. The relegation of geotechnics to Part 5 is sadly noted.

The first part of the meeting was chaired by Dr. B.O. Skipp who introduced the audience to the complexities of the commenting process which would be collated by a new BSI subcommittee; CSB 65 of which he was Chairman. He explained that the Eurocodes would be developed and in due course issued by the Centre European Normalisation (CEN). He outlined the various inputs which had been coordinated by the ICE EC8 Working Group since the predraft of 1985 and described how CSB 65 would operate and relate to the Eurocode Technical Committees. Comments were wanted as soon as possible, the work of CSB 65 on EC8 must be in the hands of CEN by the end of August 1990.

Dr. J. Maguire then illustrated the actions and analysis parts of EC8 by comparing them with the American Association of Civil Engineers Code ASCE 4-86 which although developed for nuclear power stations he felt was a sufficiently advanced code to be used as a benchmark. There were minor differences in the specification of action and a less onerous requirement for time histories in EC8. Dr. Maguire compared the ASCE and EC8 spectra for a hard site and 5% damping noting the smaller peak of EC8 (2-5 Hz compared with 2-9 in ASCE 4-86). EC8 gave little guidance on modelling. It referred to power spectrum methods but not explicitly to the complex frequency response approach. EC8 called for a complete model of the seismic wave field for multiply supported systems. There were some differences in the modal combination rules: the 10% and double sum rules of the ASCE code were absent. The spatial combination rule for structures in general was in effect: 100/30/20 compared with 100/40/40 of the ASCE and in EC8 the vertical component is ignored for buildings. A simpler method of dealing with soil structure interaction is proposed in EC8. Dr. Maguire noted that real time histories were not allowed in EC8 but this was conservative and the specification for time histories were not sharp. No guidance was given of dynamic E, stiffness/mass/damping as was in ASCE4-86 and the CQC modal combination method was absent from both codes. Novel features were the use of the behaviour factor 'q' to incorporate ductility into the linear analysis design spectrum, reference to power spectral methods, the requirement for a complete wave field for multiply supported systems and the modal combination rule. He was concerned about the appropriate spectrum for the UK and the 100/30/0 rule for buildings.

Mr. Edmund Booth reviewed the concrete related parts of EC8 comparing them with UBC88 and the New Zealand Codes. EC8 devoted 41% to concrete compared with 21% in UBC88 and 27% in the New Zealand Code. The chapter could be characterised by an attempt to describe the behaviour of reinforced concrete in terms of fundamental principles and constitutive laws. General principles were stated and deemed to satisfy rules given for most cases.

More complex but general rules are given in appendices. Rules are given for three ductility classes: High, Medium and "elastically responding". There are no restrictions on the use of low ductility structures in high seismic areas or tall buildings. He recognised many similarities to the New Zealand code but with simpler capacity design procedures. The regularity clauses were novel with their attempt to set out detailed criteria by which three regularity categories: Quasi-regular, Medium irregular and 'Not covered by code' were to be recognised. In EC8 regularity not only governs the methods of analysis but also affects the specified force level as in the Japanese BSL Code.

Furthermore theses regularity classes would appear, in 1988, to be still under discussion. Other novel features are found in Appendix A: Limiting concrete compressive strain and stress/strain curve as function of confinement. Appendix B: 'Transfer' structures, Appendix C: 'First principles' design of confining steel in shear walls. Section 2.6 RC frames with rigid masonry panels. The possibility of a 25% force reduction is offered with a special Quality Assurance Plan.

As for omissions, EC8 contains no special discussion measures appropriate for areas of low to moderate seismicity, no special provisions for columns not part of the lateral force resisting system and no guidance on the stiffness of concrete. The code was not as user friendly as it might be, was somewhat over academic and impractical with a question mark over the regularity clauses.

Dr. J.H. Mills reviewed the design and detailing of steelwork dealing with generalities of earthquake resistant structures, materials, behaviour factors (q), simplified rules, design criteria, structural types, detailing rules and specific controls. The code recognises non-dissipative structures (no account of non linear behaviour), and provides q=1. Strength to EC3 without ductility is specified. For dissipative structures having zones moving out of the elastic range under seismic load dissipating energy by ductile hysteritic processes, q>1.

Steels, welds, bolts are to EC3; the steel in dissipative zones being EN10026; bolted connections, grade 8.8 or 10.9 HS with grade 12.9 for shear connections only. Maximum yield value must be specified. Behaviour factor q is determined from the force/deflection (P/delta) relation using two multipliers alpha sub 1, the force at the first plastic hinge and alpha sub u, the maximum developed force at the hinge mechanism. Behaviour factor is then dependent on structural type (for dissipative types) although there is a simplified rule for highly regular buildings in defined low seismicity regions using rolled sections and conforming to listed structural types (excepting K frames) whereby q is taken as 1.5 without limitation on materials and detailing rules which follow. Design criteria distinguish between dissipative and non-dissipative zones. In dissipative zones overall stability must be maintained, lower yield strength is used in strength verification to EC3 and connections must have sufficient overstrength to allow cyclic yielding of the dissipative parts. In the non-dissipative zones the upper yield strength is used for the design of the non dissipative parts and there must be sufficient overstrength to allow cyclic yielding of the dissipative parts. Detailing rules for connections in dissipative zones are specified in general and in particular regard to frames and concentric truss bracings. Specific controls are laid down; drawings shall detail connections; specified maximum yield strength must not be exceeded by 10%; the difference between the maximum and minimum ratios of actual to design yield strength shall be less than 0.2; no change in structure involving a change of more than 10% in stiffness or strength is allowed and control of bolt tightening and weld quality shall be according to Chapter 7 of EC3.

The second part of the meeting resumed with Dr. W. Smith in the Chair when Dr. J. Menu who did not review in detail the provisions of EC8 with regard to masonry, made a number of general comments to the effect that in the UK if anything was going to be vulnerable to earthquakes it would most likely be masonry but that relatively inexpensive and simple constructional rules could ensure that most of the damage would be avoided.

General discussion ensued with about half of the audience being in possession of the EC8 document. Dr. Whalley wondered why loadings were not dealt with in the actions code, materials in EC2 and EC3 and the code generally be under the ISO banner. Subsequent discussion may be grouped as relating mainly to analysis, concrete, masonry and steel and a rounding code.

Dr. J. Menu noted that the form of EC8 spectrum was quite dissimilar to that of Idriss 1985 and is an underestimate at the 5% damping level, perhaps the suggested box values in the commentary of the code should be ignored.

Mr. E. Booth pointed out that the acceleration to which the spectrum would be anchored was decided by each country in its own way, there should be some common guidelines here.

Dr. S. Steedman deplored the scant treatment of soil dynamics and geotechnics especially in view of recent advances in those fields as applied to earthquakes.

Mr. H. Gulvanessian explained that the Building Research Establishment (BRE) would be producing National Application Documents for EC2 and EC3 which would then be published by BSI but there was a question with regard to one for EC8.

Dr. Menu questioned the figure of 0.7 factor for vertical acceleration and suggested that it be defined in terms of the style of the generating fault although strike slip was most common in the UK.

Dr. David Key was of the opinion that the attempt to define acceptable regularity was a mistake. He favoured staying with the two categories - regular and irregular leaving the rest to analysis.

Dr. J. Mills reminded the meeting that regularity considerations affected behaviour factor.

Dr. B. Skipp said that sometimes it was sensible to have an idea of a real time history because using an artificial time history tend to overestimate the number of effective cycles of shaking which might be used in a semi empirical liquefaction analysis. Perhaps the code might allow then judicious use of real time histories.

D. Smith commented that the RIBA might have something to say on regularity rules.

There were comments on the advanced nature of the concrete chapter and especially the large part dealing with q factors, confinement and the classification of shear walls by design approach all of which needed a lot of discussion in the profession. E. Booth agreed that the concrete section was very advanced and that the shear wall considerations are as up to date as in New Zealand all of which was good for design and which was a serious omission from US codes.

Mr. B. Haseltine supporting Dr. Whalley's earlier comment said that the masonry parts of EC8 are not particularly onerous at first sight but required an ultra simple structure so the simplified method may be virtually unusable. Mr. Gulvanessian explained that Mr. Haseltine was looking at masonry structures for the DOE as part of the DOE/ICE programme and that robustness studies were also underway all with a view to demonstrating that EC8 provisions might be avoided for ordinary UK buildings.

Dr. J. Mills was of the opinion that the reference to a Quality Plan should be deleted unless it was better specified.

Dr. A. Elnashai drew attention to the variations of yield strength of British steels, higher than on the Continent. How will this affect EC8 and what happens on site if yield values do not tie up with assumed q values?

The variation in rebar was commented upon.

Dr. P. Merriman asked how were q factors obtained and Mr. E. Booth referred to the substantial back up documents to EC8. He felt that they were largely derived from analytical studies.

Dr. B. Skipp noted a serious deficiency in the profession regarding the validation of design codes by monitored full scale structures. This had been identified as a worthwhile research objective in the DOE/ICE's strategy report produced three years ago by Dr. D. Key.

Discussion continued on the properties of steel with a comment that the overstrength factor used in the New Zealand code is 1.-1.2, is the EC factor correct for mild and high yield steel. Dr. A. Elnashai pointed out that due to statistical variations you may try for a strong column/weak beam but not get it in practice and Mr. M. Haseltine reminded the audience that cold worked high yield steels were not very ductile.

Some general points were made by Dr. B. Skipp concerning the degree to which a code of practice was a code of good practice and how far it should go in advance of current good practice. M. Cook raised the issue of cost and damage and how far was it sensible to design for ductility in the realisation that such a structure might be irreparable after its design earthquake. Dr. D. Key in reply said that it came back to the issue of earthquake resistant design rather than earthquake proof design. Mr. E. Booth noted that the alpha factor adopted controlled this.

Dr. A. Elnashai was of the opinion that the parts dealing with composite construction were rudimentary and could not the UK have a significant influence on this part?

The meeting closed with an appeal to get comments in to BSI before the end of March.

The work of the NCEER and its relevance to the UK

Meeting held at Imperial College on 21st March 1990

Reported by Ed. Booth

It must be rare for SECED to be addressed on the same evening by no less than two professors from British Universities. Perhaps that was what made this apparently somewhat esoteric subject the occasion for a lively and well attended meeting.

The basis for the meeting was an SERC funded visit in April 1989 by 8 British engineers to four of the universities playing a major part in the NCEER programme. Professor Stephen Brown, of Nottingham University, explained the background to the programme; dating from 1986, it aims to provide a co-ordinated approach to a complete range of earthquake research, from hazard assessment, through structural and geotechnical engineering to disaster research and planning. About 50 projects are started each year at an annual cost of some £9 million, provided partly by the National Science Foundation (roughly equivalent to SERC) and partly from state and industrial sources. This compares with the SERC seismic programme in 1989 of 12 projects costing £0.6 million.

Professor David Muirwood of Glasgow University described some of NCEER's geotechnical work. A major centrifuge has just been commissioned at RPI (one of the NCEER 'core institutions'); RPI also has facilities for combined, axial/torsional cyclic testing of soil samples, which produce interesting results. Cornell has been tackling the difficult area of the liquefaction potential of silts, and is producing results which suggest that existing empirical rules may be unsafe for these materials. The interesting work of Prevost at Princeton was also outlined. This includes SSI experiments on a small centrifuge, and production of 'black box' dynamic soils computer programs. The latter contain highly sophisticated soil models, which can nevertheless be driven with a minimum of understanding by engineers, who need provide only simple input data such as SPT values. Dave Muirwood expressed his reservations on this approach.

Dr. Tony Blakeborough of Bristol University described the shaking table at Buffalo, which is similar to Bristol, but, at 50 tonne capacity, can take over 3 times the payload. It has been used to investigate (inter alia) the response of secondary systems, frames braced with actively controlled tendons and model r.c. flat slab structures.

Dr. Amr Elnashai, Imperial College, talked of the extensive analytical and experimental programme into the seismic resistance of non-seismically detailed r.c. structures, which has yet, alas, to produce results translatable into the levels of earthquake motions that such structures can safely withstand. He also described the 7 storey high reactor wall at Lehigh, which has just been completed. It has excellent control facilities for pseudo-dynamic testing.

Edmund Booth (Ove Arup & Partners) referred to NCEER's investigations of the level of seismic risk in the areas of low seismic risk in the Eastern states, particularly New York. The hazard studies have been accompanied by work on the implications for existing structures which have not been designed for any degree of seismic or (in some cases) even wind resistance. The work has clear implications for Britain as it considers whether Eurocode 8 has any applicability to the UK.

In winding up, Professor Brown looked forward to fostering the links established with NCEER, and hoped that NCEER would send a return team to inspect our smaller scale but nevertheless interesting seismic research programme. The NCEER visitors should perhaps be invited to address SECED on their interesting and relevant work; we might be able to teach them a few tricks, too.

The report on the visit of Professor Brown's team is available from the SERC; it can be obtained by application to James Dawson, Secretary of SECED, and the society's offices, 25 Eccleston Square.

Future SECED Meetings are as noted below:

Wednesday 30 May at ICE	Reconstruction and Repair following the Loma Prieta Earthquake by Peter Yaner

Members are requested to complete the attached questionnaire and return to the Secretary.

CONFERENCE CALENDAR

TITLE	DATE	LOCATION	ORGANISER
Structures - Today and beyond 200	9.5.90 11.5.90	Glasgow	I.Struct.E
European Conference on Structural Dynamics (EURODYN 90)	5.6.90 7.6.90	Germany	Ruhr-Universitat Bochum
International Conference on Vibration Problems in Engineering	6.6.90 9.6.90	China	Chinese Soc. for Vibration Engineering
9th European Conference on Earthquake Engineering	Sept. 1990	Moscow	Soviet Comm. on Earthquake Engineering
2nd International Conference on recent 15.3.91 advances Geotechnical Earthquake Engineering and Soil Dynamics	11.3.91	St. Louis USA	University of Missouri - in Rolla
Measurement and Effects of Vibration (3rd SECED Conference)	Nov. 1991	See below	SECED

Stop Press - SECED Conference 1991

Following its conferences in East Anglia in 1985 and Bristol in 1988, SECED has made provisional arrangements to hold its next conference at UMIST, Manchester, on 18-20th September 1991.

The main theme will be "Earthquake, Blast and Impact (Measurement and Effects of Vibration)" and papers will be invited on:

- sources and measurement (earthquake, blast, shock, impact)
- response and measurement (displacement, stresses)
- industrial case histories (plant/equipment/structures)
- testing equipment (on site/in laboratory)
- construction effects (piling/demolition)
- analysis and design aspects
- code issues

- mitigation of effects.

A fuller announcement and call for abstracts will be published in the near future.

PUBLICATIONS

(*SECED and related)

1. *"Directory of Practitioners in Earthquake Engineering and Civil Engineering Dynamics" (Issue No. 2, April 1988)
   Price: £15.00 (Summer 1988) from Chris Sharman, Allott and Lomax.

2. *"Earthquakes and Earthquake Engineering in Britain"
   (1st SECED Conference, 18-19 April 1985, University of East Anglia)
   Price: £30.00 (Spring 1988) from Thomas Telford Ltd.

3. *"Civil Engineering Dynamics"
   (2nd SECED Conferences, 24-25 March 1988, University of Bristol)
   Price: £30.00 pub. Due beginning 1990 from Thomas Telford Ltd.

4. *"The Mexican Earthquake of 19th September 1985"
   (A field report by EEFIT(
   Price: £25.00 (Autumn 1988) from Thomas Telford Ltd.

5. *"The San Salvador Earthquake of 10th October 1986"
   (A field report by EEFIT)
   Price: £10.00 (1987) from RPT or Julian Bommer, Imperial College.

6. *"The Chilean Earthquake of 3rd March 1985"
   (A field report by EEFIT)
   £25.00 (Autumn 1988) from Thomas Telford.

7. *"EEFIT Constitution and Aims and Methods" booklet
   Price: Free Order from Secretary, SECED.

8. "Earthquake Design Practice for Buildings"
   (ICE Design Series - author David E. Key)
   Price: £35.00 (Spring 1988) from Thomas Telford Ltd.

9. "Dams and Earthquake"
   (A conference held at the ICE 1-2nd October 1980)
   Price: £35.00 (Spring 1988) from Thomas Telford Ltd.

10. "Earthquakes" (Bibliography 87/1)
    (Books, pamphlets and serial publications of interest to earthquake engineers)
    Price: £8.00 (Spring 1988, to ICE members) from Thomas Telford Ltd.

11. *"1987 Mallet-Milne Lecture"
    "Engineering Seismology" by N.N. Ambraseys. Volume 17 of Earthquake Engineering and Structural Dynamics (Special Issue).
    Price: £15.00 (Earthquake Engineering Subscribers, IAEE members, ICE members). £25.00 Institutions, £15.00 Personal. Send order to Dept. AC, John Wiley & Sons Ltd., Baffins Lane, Chichester.

12. *"1989 Mallet-Milne Lecture"
    "Coping with Natural Disasters" by G.W. Housner

Price: £10.50 to personal callers at Telford International Bookshop, ICE or direct from The Secretary, SECED, Institute of Civil Engineers, 25 Eccleston Square, London, SW1V 1NX. (Cheques payable to "Institution of Civil Engineers". Post free UK, plus 50p Europe, plus £1.00 elsewhere).

13. The Lomax Prieta Earthquake (Santa Cruz, California) of 17th October 1989; Seismological, Geotechnical and Structural Field Observations. A report from Imperial College, London.
Price: £25.00
Contact: Dr. Elnashai at Imperial.

MEMBERSHIP NOTES

Committee 1988 - 89

Elected Members

Dr. W.P. Aspinall - Mass Data Systems

Dr. C.W.A. Browitt - British Geological Survey

Dr. J.R. Maguire - Lloyds Register

Dr. P. Merriman - BNFL

C.R. Sharman - Allott and Lomax

Dr. R.J. Stubbs - Health & Safety Executive

Representatives

Institute of Civil Engineers

Professor H.A. Buchholdt - Polytechnic of Central London

Institution of Mechanical Engineers

Professor G.B. Warburton - University of Nottingham

Institution of Structural Engineers

Dr. D.K. Key - CEP Research

Geological Society

Dr. D.M. McCann - British Geological Survey

Immediate Past Chairman

Dr. R.R. Kunar - BEQE

Co-Options

Dr. R.D. Adams - International Seismological Centre

E. Booth - Ove Arup & Partners

Dr. A.S. Elnashai - Imperial College

D.J. Mallard - CEGB

Dr. B.O. Skipp - Soil Mechanics Limited

Dr. B.R. Ellis - Building Research Establishment

Working Groups

Engineering Seismology - Dr. D.M. McCann

Soils and Foundation Dynamics - Dr. B.O. Skipp

Structural and Civil Engineering Dynamics - Dr. B.R. Ellis

Sub-Committees

Steering Committee:	Dr. Browitt, Dr. Kunar, E. Booth and D. Mallard
Mallet-Milne Lecture	As Steering Committee
Newsletter:	C.R. Sharman, Dr. Aspinall and Dr. J. Maguire
Membership:	Dr. Elnashai and Dr. McCann
Conference:	Dr. Kunar (Chairman), Dr. Stubbs (Treasurer) Dr. Maguire (Co-ordinator), C.R. Sharman (Technical)

SECED Membership

After many attempts, initiated by the SECED Committee and frustrated by others, we have not only a list of SECED members, but also a breakdown by data of joining and location. The following is a profile of the existing membership. Comments from individuals, and indeed corporates, and suggestions are invited, to increase the membership and members' involvement in SECED business.

The total number of members is believed to be somewhere between 185 and 198. However, we are informed by our Secretary that the number may be slightly higher, due to the time lapse between joining and appearing on the database.

An interesting, and gratifying, observation is that about 10% of SECED members are students, which is, apparently, higher than most other societies. This gives us all hope for continuing expansion of SECED if we can retain a healthy proportion of the student members (committee members debated on why the computer listing identified student members by the letter 'K', but the outcome was inconclusive).

Some interesting observations are made on the breakdown of members by date of joining. Of the existing membership, only one person joined before 1962, presumably Professor Ambraseys, the founder member.

The years 1963, 1970 and 1981 are lean years, with one member only retained. I have not attempted to resurrect information on who was the Chairman then! Years of plenty include 1973, 1979 and 1985, with 9, 7 and 28 members retained, respectively. The previous year, 1989, holds the record of 37 retained members, presumably since the database has not yet been updated! and because we had a large combined Engineering Seismology/Earthquake Engineering MSc groups at Imperial College who were cornered into signing a free membership application form. However, the trend since 1983 shows a real, healthy and sustainable growth in membership, which we hope to capitalise on.

The breakdown by location makes very interesting reading. Top of the league is London, with 44 members, out of which 17 come from SW3, 5, 7 and 10. Hard on London's heels are Bristol and Warrington, with 10 members each, followed by Greece! with 8 members, thus beating Nottingham, 7 members, into fifth place. Whereas the outcrops in Bristol, SW7, Warrington, Nottingham and Greece may be attributed to Bristol University, Imperial College, the Nuclear Industry, Geoffry Warburton and Nick Ambraseys, I am not sure who is to be thanked for the Glaswegian contribution of 5. The two members shown against Wokingham are thought to be Brian Skipp, both of them! Interestingly, our membership stretches to Sydney, Australia, as well as Canada (Ontario and Quebec) Cyprus, France, Holland, Yugoslavia, Singapore, Saudi Arabia and the Transvaal! with one member each. We are doing a bit better in California, with 2 recruits, and Italy, with 4.
The above figures lead me to three conclusions, first that SECED, on average, is expanding, through retaining new members, by between 10 and 20%, which seems to be an impressive record. Secondly, we should be able to attract, and retain, more students. And finally, that we should be doing significantly better on the overseas front. For instance, we do not have a single Portuguese or Spanish representative. As a member of the under-utilised two-man membership sub-committee, I would welcome your suggestions relating to the above.

Amr Elnashai

SECED QUESTIONNAIRE

What sort of meetings do you want?

Recently several individual SECED members have expressed preferences for either longer or shorter meetings, either in the afternoon or in the evening. What are your preferences? Your committee will be better able to serve you if you could spare a few moments to fill in the questionnaire below and return it to James Dawson, SECED Secretary, at the ICE. Thanks in anticipation!

Preferences (please tick)

☐ Afternoon meetings ☐ Evening meetings ☐ either

☐ Several short (10-20 min.) presentations

☐ One long (40-60 min.) presentation

Questions/Suggestions

What starting time preferred? .....

Alternative format? .....

Other suggestions/comments .....

.....

.....

.....

Your name ..... (please print)

SECED MEMBERSHIP APPLICATION FORM

Name (block capitals please) : _____
Home Address (block capitals please) : _____

_____ Telephone : _____
Name & Address of organisation with whom employed (block capitals please) :

Decorations, Degrees, Diplomas, Membership of Professional Bodies :

Date of birth : _____

CORPORATE SUBSCRIBER

Name of Organisation (block capitals please) : _____
Address (block capitals please) : _____

_____ Telephone : _____

We, being Corporate Subscribers, do hereby nominate the three undermentioned individuals to be our Nominated Representatives under the Constitution.

Name (block capitals please) : _____
Home Address (block capitals please) : _____

_____ Telephone : _____
Name (block capitals please) : _____
Home Address (block capitals please) : _____

_____ Telephone : _____
Name (block capitals please) : _____
Home Address (block capitals please) : _____

_____ Telephone : _____

STUDENT MEMBER

Name (block capitals please) : _____
Home Address (block capitals please) : _____

_____ Telephone : _____
Confirmation of student status : (To be signed by tutor or supervisor)
I confirm that this applicant is currently a full-time student
Date _____ Signature _____
Institution and position _____

Current Rates (1988-89)

Individual :	**£10**
Corporate :	**£50**
Student:	**Free**

Please return form to :

The Secretary
SECED
Institution of Civil Engineers
1-7 Great George Street
London SW1P 3AA
(01-630-0726)