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The SECED Newsletter is published four times a year by the SOCIETY FOR EARTHQUAKE 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

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Summary report of the Earthquake Field Training Unit (EFTU), Imperial College.

Following the Spitak earthquake, and with the agreement of the Soviet authorities, Imperial College sent to the affected area a member of its Earthquake Field Training Unit (EFTU), J. Bommer, who spent two weeks surveying the damage. The ESEE section at Imperial College has produced a preliminary report on the seismicity of the area and on the effects of the Spitak earthquake, that may be summarized as follows:

The main shock occurred at 07:41:25 on 7 December 1988 with a preliminary epicentre 41.0°N, 44.2°E constrained to a focal depth of 10 km. The magnitudes of the event are Ms = 6.7(±0.3) and Ms = 6.3(±0.4) and the seismic moment is 1.1(±0.6)x 1026 dyn-cm. A second shock of Ms = 5.9(±0.4) followed four minutes later. The aftershock sequence if characterised by a large number of events of small magnitude. The earthquake was associated with a fresh fault-break, oblique (RL) thrust striking N70W, that can be followed on the ground for at least 12 km, showing the south-west block downthrown by about 70 cm on average (maximum 200 cm) and a maximum right-lateral slip of more than 100 cm. The fault plane dips to the NNE where all aftershocks have been located.

The earthquake triggered a number of accelerographs and seismoscopes. Peak horizontal acceleration was about 18%g and vertical 13%g.

The earthquake triggered many landslides and rockfalls, and caused slumping of the Leninakan-Kirovakan railway embankment as well as minor, sporadic liquefaction.

The main shock and its strong aftershock caused widespread damage associated mainly with the high vulnerability of certain types of construction. The intensity of shaking attenuates rapidly to the south and north of the fault-break but it extends more to the west with considerable damage in Turkey.

The EFTU report on the Spitak earthquake (ESEE Report No. 89/1) is available from Julian Bommer, Department of Civil Engineering, Imperial College, London SW7 2BU, for £10.00 (payable to 'Imperial College').

issuing statements to the public and scientific community about British earthquakes. It keeps a data base of British earthquakes, and also a file of global events. Although it does not directly locate earthquakes outside the British region, it contributes readings made in Britain of earthquakes elsewhere to international data centres to help in global location.

The International Seismological Centre at Thatcham, near Newbury in Berkshire, has quite a different function. It is not a British organization, but as its name implies an internationally controlled and funded body with the task of carrying out the final compilation of earthquake readings from throughout the world, and working out definitive locations. Similar work is done rapidly by the National Earthquake Information Centre of the US Geological Survey, who run a Preliminary Determination of Epicenters Service, which locates about 800 to 1000 earthquakes each month with a few months delay. ISC, on the other hand, waits 22 months before starting analysis, to ensure that all readings including those from remote areas are available, and its monthly lists generally comprise between 2000 and 3000 events.

ISC publishes a monthly bulletin with all station readings on which its analysis is based and also a six-monthly Regional Catalogue of Earthquakes which includes only origin information such as time, location and magnitude, and any available information on felt effects or damage. This is the ISC publication most in demand from engineering and insurance organizations. ISC maintains its own data base of world wide information, including an Historical File of instrumentally located earthquakes from 1904. This file is made available to agencies like BGS, and can be searched for earthquakes in a particular region or selected by other criteria such as time, size or felt effects. This service is used extensively by engineering organizations.

ISC does not undertake any seismological recording but collates information supplied to it by national agencies such as BGS. At present ISC is not involved in storing information on strong-motion recordings, but it supplies seismological information to agencies that do, such as the Department of Civil Engineering, Imperial College.

Within Britain, BGS and ISC have complementary roles. It is best to direct seismological enquiries regarding British earthquakes to BGS, while questions of a more global nature are best answered by ISC.

(Introduced by B. Skipp and C. Browitt)
(Reported by J.R. Maguire)

This half-day meeting was held in the Civil Engineering Department of Imperial College, London and attracted a large audience of approaching 70 people. Six presentations were made, based around current testing and analytical techniques.

The first presentation was entitled "Resonant Column Testing of Sand - A New Model" by Dr. Malcolm Bolton of the University of Cambridge. This SERC sponsored research covered questions such as what is a resonant column? What is the resulting data like? What are the soil parameters? How do they vary? Does strain rate matter? Subsequently hysteretic models, prediction of dynamic response, extension to analysis of foundations and conclusions were then examined.

The second presentation was entitled "Laboratory and In-Situ Tests" by Dr. Jim Bennell of the University of North Wales, Maritime Sciences Laboratory. A review of testing at the Menai Bridge over the last 25 years was made. The main area of intrest was the engineering properties of soil gleaned from in-situ data, backed up by the laboratory work. Measurements of shear waves using various devices were described, as well as the use of pressuremeters, resonant column and crosshole devices.

The third presentation was entitled "Soil Testing Facilities for Earthquake Engineering" by Matthew Raybould of the University of Nottingham. Over the years a triaxial test facility has been developed, incorporating a digital servo-hydraulic control system. Parameters that can be measured include displacements (by LDVT), internal and base porewater pressure, back pressure, volume change, cell pressure and load. A current SERC project was outlined, looking at the Effect of Silt Content on the Dynamic Properties of Clay.

The fourth presentation was entitled "Site Response" by Dr. Jack Pappin of Ove Arup & Partners. The 1985 Mexico earthquake was studied, looking at how the earthquake motion was modified by the overlying soil deposits, leading to a spectral concentration of energy at 0.5Hz. A research exercise

Dr. Stubbs was required to be in attendance at the Hinkley 'C' Public Enquiry and Mr Bommel who was to provide the Data Bank demonstration, was still in Armenia.

Dr. Stubbs has however kindly offered to provide the substance of his talk in a future edition of this Newsletter.

We would also hope that demonstration of the Imperial College Data Bank may be arranged for a later meeting.

Report on SECED Meeting of 22nd February 1989

SEISMIC VULNERABILITY STUDIES OF MASONRY BUILDINGS
(Introduced by P.F. Sheppard, Institute for Structures,
Building Physics and Restoration, Ljubljana)
(Reported by Dr. David Key)

The seismic vulnerability of masonry buildings is of importance both to engineers and town-planning authorities. In many seismic regions most older residential buildings are constructed of unreinforced stone or brick masonry, and are subject to heavy damage or collapse in the case of strong earthquakes.

Thirty-one percent of the republic of Slovenia, northwest Yugoslavia, including the capital city of Ljubljana, lies in seismic zones of degree 8.0 and 9.0 on the MCS scale. These areas are inhabited by 44% of Slovenia's population, about half of whom live in "older buildings", i.e. those built before the first federal seismic code was introduced in 1964. The behaviour of these buildings in past earthquakes, together with extensive experimental. investigations, have formed the basis for recent seismic vulnerability studies in the city of Ljubljana. Work so far carried out includes: (1) urban renewal studies, defining possibilities for improved building exploitation through aseismic repair and strengthening, (2) compilation of lists of more important "older buildings", assessing their vulnerability, (3) vulnerability studies of special categories of buildings, e.g. school buildings and unreinforced-masonry tower

Dr. Bryan Skipp, Soil Mechanics Ltd
European seismology and ground motion

Dr. John Maguire, W.S. Atkins Engineering Services
Earthquake loading and analysis

Dr. John Mills, Allott & Lomax
Design and detailing of steelwork

Dr. David Key, CEP Research/Bristol University
Design and detailing of reinforced concrete

Dr. Skipp covered the present position with the code - a draft for comment is expected in June 1989, and this is likely to be very similar to a draft produced in May 1988 and given a restricted circulation. The assessment of hazard is the responsibility of individual nations, although the methodology to be used is not yet defined. In the UK the development of a hazard map is being handled by the DoE and is awaiting the award of a tender. It is considered unlikely that seismic design calculations will be required for normal buildings in the UK although building robustness regulations may need to be re-examined.

Dr. Maguire explained the philisophy of design adopted by the code, in particular the use of target reliability, the 'no collapse' requirement and serviceability limits. The code allows ground motion to be modelled as a response spectrum, time history or power spectrum. The use of the q factor covering ductility and energy absorbing capacity was explained and its effect on the derivation of equivalent static design forces. Analytical procedures and safety verifications were explained and typical loading calculations were presented.

Dr. Mills gave an overview of the steel design requirements. In particular the design of (energy) dissipative and non-dissipative structures was examined, and the differences in design forces (higher for non dissipative structures) and detailing requirements (more rigorous for dissipative structures). Some interesting and novel requirements for steel are the use of a 50% preload on high strength

of the Ibero Maghrebian Region
April 13-14 1989 Madrid
Prof. A. Udias, Catedra de Geofisica,
Ciudad Universitaria, 28040 Madrid, Spain

Engineering Seismology
16th May 1989

D.M. McCann, Regional Geophysical Research Group, British Geological Survey, Keyworth, Nottingham, NG12 5GG
(Tel: 06077 - 6111 ext. 3356)
(Further details of this meeting are given below)

2nd Mallett - Milne Lecture : Prof. G.W. Housner "Coping with Natural Hazards"
24th May 1989
The Secretary, S.E.C.E.D., The Institution of Civil Engineers, Great George Street, Westminster, SW1P 3AA

International Symposium on Foundations for Machines with Dynamic Loads
May 1989 Leningrad
Leningradski Promstroiproekt, 160 Leninsky pr., 196247, Leningrad, USSR

International Conference on Earthquake Resistant Construction and Design
June 13-16 1989 Berlin
Prof. S.A. Savidis, Grundbau Institu TU

to be held by IABSE (AIPC=Association Internationale des Ponts et Charpentes)
6-8 September 1989 Lisbonne, Portugal
Secretariat de L'AIPC, ETH-Honggerberg,
CH-8093 Zurich, Suisse

15th Regional Seminar on Earthquake Engineering
September 1989 near Milan
Prof. A. Giuffre, Dipartimento di Ingegneria Strutturale e Geotecnica, Universita di Roma "Las Sapienza", Via A. Gramsci 53, 00197 Roma, Italia

International Conference on Reinforced and Prestressed Prefabricated Concrete Structures in Seismic Areas
September 1989 Romania
Prof. A. Negoita, Polytechnical Institute,
Bd. Karl Marx 38, 6600 Lasi, Romania

IUTAM Symposium on Nonlinear Dynamics in Engineering Systems
1989
University of Stuttgart, Pfaffenwaldring 9,
D-7000 Stuttgart 80, Germany FR

Ninth European Conference on Earthquake Engineering
September 1990 Moscow
Dr. B.E. Denisov, Secretary-General
Organising Committee of the 9th ECEE, USSR
Societ Committee on Earthquake Engineering,

with seismic shear waves.
S. Crampin

3. Evaluation of liquefaction potential and other geotechnical seismic phenomena in New Zealand.
J.R.A. Gammon

4. Advances in soil dynamics
P.J. Eldred, R.M. Nisbet, D. Ricketts and B.O. Skipp

5. Instrumental seismology and seismic hazard in the UK today
B.O. Skipp, R. Aspinall and M. Richey?

6. Liquefied Quaternary deposits as strong motion records
P.S. Ringrose and C.A. Davenport

7. Dynamic Soil-Structure interaction analysis: an example benchmark test
J.R. Maguire

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 & Lomax

2. *"Earthquakes & Earthquake Engineering in Britain"
(1st SECED Conference, 18-19 April 1985, Unviersity of East Anglia)

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

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

Issue JRM4/Feb 1989/140

BOOK REVIEWS

Historical Seismograms and Earthquakes of the World. Papers presented at the Symposium on Historical Seismograms and Earthquakes, held August 27-28 1985, Yokyo, Japan edited by W.H.K. Lee, H. Meyers, K. Shimazaki.

Academic Press Inc 1250 Sixth Avenue, San Diego, California

This a lot of book, and good value at that. The 'rapid manuscript reproduction' gives you 513 pages with as much as 700 words on a page for the modest sum of £28.

The book includes 51 of the 60 papers presented at the symposium which was held during the General Assembly of the International Association of Seismology and Physics of the Earth's Interior (IASPEI). Papers are set in eight groups following an introduction (I) by W.H.K. Lee; II Analysis of Historical Seismograms, III. Earthquake Catalogues and Data Bases, IV. Individual Historical Earthquakes, V. Earthquake History, VI Seismicity and Tectonics, VII. Filming and Processing Historical Seismograms, and VIII. Historical Seismograms from Various Observatories. The editors recognize the problems in imposing order to the varied collection and have chosen to concentrate on

and constraints of historiography are only touched upon.

Strong motion seismography is represented by a paper by Inoue and Matsumoto on the digitisation and processing of the JMA strong motion records in the period of 2 to 20 seconds from nine great earthquakes. It is rather a pity that there was not a paper on the reworking of some other more familiar strong motion records with benefit of hindsight but perhaps that seam has already been worked out.

The book is a treasure house to be dipped into; the reviewer has already made use of several papers and it is gratifying to see the weight of the UK presence with six contributions out of the fifty.

The papers are of a generally high standard, reflecting a proper refereeing procedure and the book is well produced with a dense but pleasing aspect and a useful index with more than 1200 main and sub entries.

"Stochastic Structural Dynamics - Progress in Theory and Applications"

Edited by S.T. Ariaratnam, G.I. Schueller and I. Elishakoff
(Elsevier Applied Science, 1988)

This book, which contains a series of original contributions in the area of Stochastic Dynamics, is dedicated to Professor U.K. Lin by some of his friends, colleagues and students on the occasion of his sixty-fifth birthday.

The eighteen papers which comprise the book are entitled:

1. Dynamic Snap-Buckling of Structures under Stochastic Loads.

2. Spatial Correlation in Structural Response to Wide-Band Excitation.

3. One-Dimensional Waves in Media with Slowly Varying Random Inhomogeneties.

16. Lyapunov Exponents of Stochastic Systems and Related Bifurcation Problems.

17. Random Vibration Applications to Soil-Structural Problems.

18. Modal Analysis of Nonclassically Damped Structural Systems.

This book is aimed mainly towards researchers and educators, and may only be of limited appeal to practising engineers in the field of Stochastic Dynamics. At a price of £65 for 375 pages (A5 size) it is possibly best to look at a copy before purchase.

J.R. Maguire
February 1989

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 - WS Atkins Engineering Sciences

Dr. D. Papastamatiou - Delta Pi Associates Limited

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

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S. SUTHARSHANA and W. McGUIRE

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P.-C. XU and A.K. MAL

Analysis of Continuous Buried Pipelines for Seismic Wave Effects: M.J. O'ROURKE and K. EL HMADI

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