J. Magazine (4 sides of A4)

THE SOCIETY FOR EARTHQUAKE AND CIVIL ENGINEERING DYNAMICS

SECED NEWSLETTER

April 1988 Vol. 2 No. 2

LETTERS TO THE EDITOR

WORK UNDERTAKEN BY SERC

I would like to take the opportunity to use the Newsletter to raise some points which time did not permit me to make during the SECD Informal Discussion on work undertaken by the SERC, held at the I.C.E. on 20th January. I feel that these are important points, and I know that many others who either attended the meeting or were informed about it, hold the same views.

Firstly, the presentations did not cover all of the current research in the fields of engineering seismology and earthquake engineering; apart from one of the speakers not being present, I know that at least at Imperial College there are currently three SERC funded research projects related to earthquake engineering which were not invited to be included in the presentation simply because they are not actually financed from the SERC's Earthquake Engineering fund.

This is a great pity since such a meeting could provide a unique, and very necessary, opportunity for practising engineers to be informed of research into engineering seismology and earthquake engineering in British universities and polytechnics, and also for them to communicate their needs to the researchers and to tell us what they would like to see coming from the research. However, it came to light during the discussions which followed the presentations that only four members of the audience were actually from industry, including the chairman! One of these four practising engineers expressed the opinion that the meeting had left him with the impression that the current earthquake engineering research did not assist consulting engineers in the tasks of determining design ground motions, site responses and the material response of structures in the aseismic design projects presently undertaken both in the U.K. and overseas. Again I felt very disappointed by this since the meeting had not communicated useful information to those representatives of the construction industry who were present. The time that was made available to each of the speakers was really far too brief for any serious and detailed presentation.

I can state very confidently that at least the project on which I am working, which is the strong motion data bank, is specifically orientated towards providing a service to engineers faced with earthquake resistant design problems, and I am sure that many of the other projects could also provide very useful information to the practising earthquake engineer.

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, Mr. D.A. Howells at The Institution of Civil Engineers, Great George Street, London SW1P 3AA.

This was the second time that SECED has held a meeting to discuss SERC sponsored research in engineering seismology and earthquake engineering. As time progresses and the various projects advance, doubtless another similar meeting will be called. I sincerely hope that when this time comes, the lessons from this experiment are learnt and that we organise ourselves better (and with more time) and most of all that great efforts be made to persuade representatives from the construction industry to attend.

Julian Bommer
Research Assistant
Department of Civil Engineering
Imperial College

DAMPING VALUES USED IN THE NUCLEAR INDUSTRY

I wish to respond to the item in the SECED Newsletter of October 1987, Volume 1, Number 3 concerning the damping values used in seismic resistant calculations.

As the comparison made was between damping values measured at very safe working stresses (ambient, is quoted) and those derived for extreme earthquake loading at high strain levels, we see no justification for the doubts raised nor the need for any action.

However I do agree that there is a lot of scope for development in many areas of our seismic resistant calculational methods and look forward to the fruits of W.S. Atkins efforts in this direction that Dr. Maguire's note implies.

John Colloff
Seismic Engineering Coordinator
British Nuclear Fuels plc

EARTHQUAKE PERFORMANCE OF NON-ENGINEERED STRUCTURES, SECED Meeting, 24th February 1988.
Introduced and reported by Dr. Robin Spence, Director, The Martin Centre for Architectural and Urban Studies, University of Cambridge

In introducing the meeting, Robin Spence (Martin Centre, Cambridge University, Department of Architecture) quoted new work indicating that occupants of weak masonry structures were 10,000 times more likely to be killed in an earthquake intensity IX than the occupants of a reinforced concrete frame structure designed to UBC level 2. The vast majority of the population of seismic areas could not afford the higher level of protection, and for the foreseeable future will be forced to live in buildings made from local cheap materials and using simple construction techniques. He suggested that the meeting should consider whether there was anything that engineers and allied professions could do to assist in upgrading vernacular dwellings at a very low cost, and how to evaluate alternative options.

Andrew Coburn (Cambridge Architectural Research Limited) showed examples of damaged non-engineered masonry structures from many countries. He argued that the key to improving performance was to understand the mechanisms of damage. These were wall separation at cornices, corner failure and splitting and overturning of walls. Roofs collapsed normally only after wall failure. In the epicentral zone, very rapid failure of the walls seemed to occur, possibly associated with high vertical accelerations. Thus important ways to improve performance were longitudinal wall ties (already used in some traditional structures). Casualties were closely related to the rapidity of failure, so means to delay roof collapse would save lives. He showed a range of low-cost improvements designed to achieve increasing levels of protection at increasing levels of complexity and cost. Builder training was an important feature of future upgrading as exemplified by the OXFAM/ODA programme in the Yemen after the 1982 Dhamar earthquake.

Robin Spence presented techniques for the evaluation of alternative upgrading proposals. He described the design of a spring mounted impulse table designed to compare alternative options. The table was 5 x 6 m in dimension and had a capacity of 50 tonnes, and could impart a maximum acceleration of 2.0g in a decaying sinusoidal pulse at a frequency of 3.5Hz. It was triggered by pushing sideways using a hydraulically driven mechanism and then instantaneously released. The table had been built in 1985 at the Earthquake Research Department in Turkey for a total cost of $21,000. Three stone masonry houses with different degrees of upgrading were tested to destruction by subjecting each to a sequence of pulsing and the relative performance under equivalent levels of ground motion were compared.

The information deduced from the table tests had been used to estimate the reduction in future losses which might be achieved by a comprehensive upgrading of traditional structures throughout the areas of highest seismicity in Eastern Turkey. It was concluded that the cheapest levels of strengthening, using three timber or r.c. ringbeams, would actually cost less to implement throughout the area than the cost of the expected future losses which would be saved. If the government were to finance such an upgrading programme, it would save money in the long term and, in addition, save thousands of lives.

In reply to a question from The Chairman (Dr. Roy Kunar), Dr. Spence admitted that vertical acceleration, not provided by the table, could be significant, but was mainly relevant to performance in the epicentral area, a small proportion of the affected areas.

Julian Bommer (Imperial College) showed slides of damage to vernacular buildings in El Salvador after the 1986 earthquake. The traditional 'bahareque' and timber-framed buildings used performed well, but losses had been heavy due to poor siting through landslides and foundation failures. Some r.c. buildings performed worse than adjacent vernacular structures.

Edmund Booth (Ove Arup and Partners) showed the damage typical of the 1984 Liege earthquake, where most visible damage appeared related to foundation failure, and chimney collapse was a common occurrence.

Jack Pappin (Ove Arup and Partners) showed that in the September 1985 Mexico City earthquake, damage to vernacular buildings in Mexico City was light compared with that to high-rise r.c. structures; however, in Guzman, closer to the epicentre, a very high proportion of the city's dwellings were severely damaged, yet no one was killed.

Colin Taylor (Bristol University) discussed the damage to traditional brick masonry structures after the 1985 Chile earthquake; quality was generally fairly high, but topographical effects and errors of detailing had caused failures.

David Smith (Scott and Wilson, Kirkpatrick and Partners) presented a new set of guidelines he was developing for earthquake resistant design of low-rise buildings with particular reference to the determination of the strength of infilled frame structures. The resistance of many types of non-engineered vernacular structures could be assessed by means of these rules, timber framed, bahareque, infilled r.c. frame for example. Other types of structures such as adobe and rammed earth could not be assessed.

Professor Richard Bassett (King's College, London) described some scale models tests carried out by final year students at King's, using a 1m x 1m shaking table, to assess the effects of varying wall configurations on strength and type of failure of weak masonry walls. The models were made from weak sand and wax blocks laid in a lime fly-ash mortar. They demonstrated that any wall openings dramatically reduced out of plane strength and that horizontal timber reinforcement was beneficial. A circular plan shape was much stronger than a rectangle.

There was a brief but lively discussion in which a variety of strengthening techniques were proposed including prestressing with rope, base isolation and the use of dome roof. Bryan Skipp hoped that adobe would not be ruled out because of the quality of the living environment it offered in hot climates.

The meeting was closed with a reminder about the forthcoming SECED conference by Dr. Chris Browitt.

EUROPEAN ASSOCIATION FOR EARTHQUAKE ENGINEERING

The first number of Volume 8 of the Bulletin of the EAEE appeared in February 1988. It is devoted to "EAEE Basic Information" and sets out the aims of the association and gives a short history and a plan of activities for the period 1986-1990. Eight working groups have been set up to study:

Calibration and harmonization of seismic codes
Strong motion records and data analysis
Vulnerability and seismic rise analysis
Prefabricated building structures in seismic regions
Low cost housing in seismic rural areas
Masonry structures in seismic areas
Seismic aspects of historical monuments preservation
Base isolation of structures for seismic areas

The address of the association is:

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101 Av. do Brasil
P1799 Lisboa Codex
PORTUGAL.

EARTHQUAKE RECONNAISSANCE MISSION REPORTS

Eleven Earthquake Reconnaissance Mission Reports prepared for UNESCO by Prof. N.N. Ambraseys during the period 1963 - 1980 are available as ESEE Publication No. 86.46(1986) in two volumes of 850 pages at £75.00 including handling charges and postage (surface mail) from Dr. S.K. Sarma, Department of Civil Engineering, Imperial College of Science and Technology, Imperial College Road, London SW7 2BU

Make cheques or money orders payable to "ESEE Section Imperial College, London"

Contents

Skopje Earthquake (Jugoslavia) 1963
Varto (Turkey) earthquake 1966
Mudurnu (Turkey) earthquake 1967
Dast-e-Bayaz (Iran) earthquake 1968
Karnaveh (Iran) earthquake 1970
Ghir (Iran earthquake 1972
Pattan (Pakistan) earthquake 1974
Friuli (Italy) earthquake 1976
Earthquake of 1977 (Romania)
Gisk (Iran) earthquake 1977
El-Asnam (Algeria) earthquake 1980