The CE Dept hosted the 8th KKNN Seminar on Civil Engineering on the 30th Nov and 1st Dec 1998. This annual seminar aims at providing a forum for researchers and academics from Kyoto University, Korea Advanced Institute of Science and Technology (KAIST), National Taiwan University and the National University of Singapore to interact, exchange ideas, share experiences and strengthen the friendship.

The response to the seminar from the four participating institutions was overwhelming with a record number of about 100 delegates. Altogether 75 top quality papers on various topics of structural and geotechnical engineering were presented and followed by lively discussions. Two awards for the best paper were given to young researchers for the first time in this seminar series. The recipients were Ms Ohta (from Kyoto University) for her paper entitled “Evaluation of Forms of Cable-Stayed Bridges based upon Aesthetic Measure,” and Mr R F Shen (from NUS) for his paper on “Centrifuge Modelling of Pile Response due to Excavation-Induced Soil Movement.”

The participants took time off to visit the laboratories and were highly impressed by the research quality, facilities and funding of the department. Because of the enriching experience of the seminar in both technical and social programmes, Prof C B Yun (from KAIST) expressed that he may have to hold the next KKNN seminar at the ancient capital of Korea to match the Singapore’s experience.

Exciting New Kid on the Block: High Performance Concrete Research Laboratory

The Water Infrastructure Programme (WIP) has as its major R&D thrust, the area of water reclamation. Among the technologies investigated is desalination. To support this work, the High Performance Concrete Research Laboratory was recently formed to serve as its cornerstone laboratory in the research and development of high performance concrete (HPC) composites suitable for use in the extremely aggressive environments found in large-scale desalination plants.

This R & D project is a collaboration between NUS and AquaGen International. The National Science and Technology Board (NSTB) has so far pledged more than $9.7 million in research funds to this project, bringing the total R & D funds to more than $16.1 million.

Besides developing the HPC mixes/composites for use in the construction of the plant, the laboratory will also collaborate in the construction of a 50 metre tall experimental desalination plant. This plant, which is the first of its kind in the world, is expected to cost another $30 million to build.

(Cont’d on pg 2)
High Performance Concrete Research Laboratory 
(Cont’d from pg 1)

In a nutshell, the scope of research for this R & D project can be grouped into 7 major areas. They are:
- Development of HPC mixes/composites using fibres and polymers for use under aggressive conditions.
- Study on thermal, mechanical and chemical resistance properties of HPC mixes/composites and its constituent materials.
- Study on the use of radioactive and other non-destructive tests as well as statistical and reliability analysis of data for use in quality control of HPC mix/composites.
- Desalination plant prototyping and heat-and-mass transfer and process simulation of in-situ behaviour.
- Analysis of plant structural and dynamic behaviour.

With the trends of increasing water demand coupled with decreasing clean potable water resources, desalination will certainly be a sought after technology in the next millennium. Although there are now reliable desalination techniques available, their costs can be quite prohibitive. This new experimental large-scale desalination plant if successful, will lower desalination costs significantly, and may one day enable Singapore to be self-sufficient in water.

On top of that, the High Performance Concrete composites developed can be used in the construction of many structures found in highly aggressive environments, for example underground conduits and marine structures.

Contact Person:
WIP: Assoc Prof Ng Wun Jenn, Tel: 874 2172; e-mail: cveweeth@nus.edu.sg
HPCRL: Assoc Prof Wei Tiong Huat, Tel: 874 4570, e-mail: cveweeth@nus.edu.sg

Water Quality Studies of the Singapore Straits

The growth of Singapore’s economy has led to significant coastal developments, with considerable impact on the state or health of surrounding waters. In view of the many changes to the Singapore coastline, both present and future, it is important to establish baseline conditions of the existing water quality. To develop a better understanding of the local, tropical marine ecosystem, a project is undertaken with a research grant of S$570,000, recently awarded by NUS to Dr Karina Gin and Assoc Prof Chan Eng Soon as Principal Investigators. In this project, an integrated approach will be followed to study the physical, chemical and biological processes, with a particular emphasis on primary production in the water column.

Perturbations to the marine environment are likely to effect fairly rapid responses from the microbial community and as such, changes in phytoplankton may be used as indicators of pollution. Field studies are conducted in collaboration with the Maritime and Port Authority of Singapore and supplemented with laboratory incubation experiments to test the effects of pollution on marine micro-organisms. Rapid methods of characterising and quantifying micro-organisms are also being developed, using a coupling of molecular techniques and flow cytometry. These studies are reinforced by the development of numerical models to predict the impacts of perturbations on the marine ecosystem. The research project is a collaborative effort among the CE Department, Microbiology Dept, Bioscience Centre and the Maritime & Port Authority of Singapore.

Contact Person:
Dr Karina Gin, Tel: 874 6301; e-mail: cveginyh@nus.edu.sg

Collaborative Research Project with UNIVERSITY OF MELBOURNE AND METEOROLOGICAL SERVICE SINGAPORE

A collaborative research project on “Earthquake Ground Motion Study by Downhole Measurements”, has been initiated with the University of Melbourne and Meteorological Service Singapore (MSS). To undertake this project, a seed grant of A$7500 has been awarded under the International Exchange Agreements Collaborative Research Awards, administered by the University of Melbourne.

In this collaborative research, the field data from MSS will be utilized to evaluate the ground motion predictive models for seismic waves modified by the softer rock in the upper level of the crust and seismic waves subjected to resonance effects in stratified soil layers. Assoc Prof T Balendra and Assoc Prof Koh Chan Ghee are the principal investigators from the department. This collaborative project is the first step in developing further research exchanges with the University of Melbourne for the advancement of expertise in earthquake engineering.

Contact Person:
Assoc Prof T Balendra, Tel: 874 2159; e-mail: cvebalen@nus.edu.sg
Collaborators: Prof G Hutchinson, Dr C Duffield and Mr J Wilson (University Melbourne), Mr T K Lim (MSS).
**LTA-NUS Joint Research Project**

**"Development of Performance Evaluation Procedures for Drainage Mix"**

The NUS Centre for Transportation Research is collaborating with the Land Transport Authority (LTA) to evaluate the drainage capacity and skid resistance of the drainage mix expressway pavements of Singapore. The joint research project entitled “Development of Performance Evaluation Procedures for Drainage Mix” will develop network level evaluation procedures for skid resistance and drainage capacity measurements. It is envisaged that this collaboration will contribute to improvements in the current drainage mix design and construction. In this project, two NUS inventions - a laboratory permeameter and a field permeameter - are being used. A static site-demonstration of the field permeameter was conducted on 4 March 1999. This was followed by a full-scale mobile site-demonstration of the field permeameter testing on 11 March 1999 along SLE. These two demonstrations have served to finalize the field testing procedure for the project. Field testing of all the expressway drainage mix pavements is now in full swing.

Contact Person:
Principal Investigator: Assoc Prof Fwa Tien Fang
Tel: 874 2276; e-mail: cvfwaft@nus.edu.sg
Collaborators: Assoc Prof Tan Siew Ann: Tel: 8742278; e-mail: cvetansa@nus.edu.sg
Assoc Prof Chan Weng Tat: Tel: 8742576; e-mail: cvcwt@nus.edu.sg

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**Use of lightweight composite materials** has gained wide acceptance in North America and Western Europe for infrastructure and building construction. Composite construction is less labour intensive and the structure is often more buildable compared to the conventional reinforced concrete structures. The Structural Steel Research Group (SSRG) in NUS is currently involved in several projects of composite construction and has developed a computational model to predict the limit-states behaviour of composite structures. A proposed test rig of 1000 tons capacity is currently being designed and built. The laboratory is capable of performing full-scale tests to verify the computer model developed. It is expected that the research findings along with those obtained from the previous research will provide sufficient data to formulate design guidance for these structural elements.

The main objectives of the proposed study are to investigate experimentally and analytically the limit-states behaviour of composite columns and of fibre-reinforced plastic (FRP) composite in order to develop an analytical model capable of predicting the behaviour of composite element. The study will also aim at developing a methodology for the analyses and design of retrofitted or repaired composite structures.

The use of Fibre Reinforced Planks composite materials is particularly useful for replacing wooden planks used in construction. It could result in significant savings because of lightweight of materials, ease of repair and retrofitting. This is particularly applicable in Singapore where there is acute shortage of materials and labour. It is expected that more engineers and contractors in Singapore will look towards the use of composite materials in construction, if proper design methods can be formulated and are made available. A grant of $111,760 has been awarded by NUS to Assoc Prof. J Y Richard Liew as Principal Investigator and Prof N E Shanmugam as project collaborator.

Contact person:
Principal Investigator: Assoc Prof J Y Richard Liew; Tel: 8742574; e-mail: cvjy@nus.edu.sg
Collaborator: Prof N E Shanmugam; Tel: 874 2288; e-mail: cveshanm@nus.edu.sg

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**Assoc Prof T Balendra** was invited to participate as a panel discussant at the International Workshop on International Framework for Structural Design, held in Shenzhen, China, from 22 March to 25 March 1999.

**Prof N E Shanmugam** has been invited to be a member of the International Scientific Advisory Committee of the 7th International Symposium on Structural Failure and Plasticity, to be held from 4-6 October 2000. The conference is organised by the Dept of Civil Engineering, Monash University, Australia and will focus predominantly on Structural Failure and Plasticity.

**Prof N E Shanmugam** has been invited to be a member of the International Scientific Committee of the CIMS 2000 Third International Conference on Coupled Instabilities in Metal Structures, to be held from 14-16 September 2000, organised by the Instituto Superior Tecnico, Lisbon, Portugal.

**Assoc Prof Yong Kwet Yew** has been re-appointed as a member of the Town Council for the Town of Sembawang for a period of 2 years effective 1 Feb ’99 to 31 Jan 2001.
The Centre for Construction Materials and Technology (CCMT) organised a half-day seminar on Concrete – High Performance and High Strength on 4 February 1999 at NUS. The seminar was co-sponsored by the Singapore Concrete Institute (SCI) and American Concrete Institute – Singapore Chapter (ACI – SC). The auditorium was packed to capacity (close to 90) with participants from government bodies, statutory boards, academia and the construction industry. The seminar speakers were Dr V. M. Malhotra, Senior Fellow, CE Dept. and Dr D. W. S. Ho, Senior Fellow, CE Dept.

The seminar began with welcome messages by Assoc. Prof. K Y Yong, Head of the Department and Assoc. Prof. K C G Ong, Director of the CCMT. Assoc. Prof. Yong received on behalf of CCMT some 30 books on concrete technology and related topics, which Dr Malhotra had kindly donated to CCMT. Two lectures were given by Dr Malhotra: High Performance/High Strength Lightweight Concrete and High Performance/High Strength High-Volume Fly Ash Concrete; and a third by Dr Ho on The 4 C’s for Durable Concrete. Participants also viewed two very interesting videos on fly ash concrete and durability of concrete.

The seminar provided a forum for concrete practitioners and researchers to meet and share views and experience during the refreshment break, which was sponsored by SCI and ACI-SC, and the discussion session at the close of the seminar.

Earlier in the week, CCMT also organised an evening talk delivered by Dr Malhotra on Innovative Applications of Superplasticizers in Concrete. This event, co-sponsored by W. R. Grace (S) Pte. Ltd. and the American Concrete Institute – Singapore Chapter, was held on 2 February 1999 at the Guild Hall, Guild House, NUS. The event was also very well attended with more than 70 participants enjoying a very fruitful and enlightening evening.

About 100 staff, postgraduate students, and their family members gathered at the Night Safari in the evening of 16th November 1998 to celebrate CE Staff Day. This outing started at 7.30 p.m. with a buffet dinner at the Safari Restaurant. The group had exclusive use of an air-conditioned dining room. While dining in comfort, the glass enclosure permitted participants good view of several animals in adjacent exhibits. Lucky draws, with 25 prizes, were prepared by the organizing committee. Participants had to search the bottom of their dining chairs to locate the winning tickets and answer questions related to the Department. This part of the lucky draw proved to be the most exciting, and the question & answer session drew much laughter. At the end, Mdm Oh Siew Choo had lady lucky on her side as she bagged a total of 3 prizes that evening. After the dinner, the group proceeded to the Night Safari. The package included a 40-minute narrated tram ride. Some staff and their families also took a leisurely stroll among the exhibits. The outing proved to be an eye-opening and enjoyable experience for all.
CONCRETE BEAMS WITH OPENINGS: Analysis and Design

by M. A. Mansur and Kiang-Hwee Tan

Assoc. Prof. M. A. Mansur and Tan Kiang Hwee of the department have written a book on the analysis and design of reinforced and prestressed concrete beams with transverse openings in the web. Published in January 1999 by CRC Press LLC of Florida, USA, the book is an outcome of the continued and focused research conducted by the authors at NUS over a time-span of almost twenty years.

Entitled “Concrete beams with Openings: Analysis and Design”, the book would serve as an invaluable source of information and a useful guide to architects, designers and practising engineers in systems approach to building design as little or no provisions or guidelines on the subject are currently available in most building codes. It gives a detailed coverage on the analysis and design of beams with small as well as large openings under bending, shear, torsion, and combined loadings. Openings in continuous beams, their effects on possible redistribution of internal moments and forces and, general guidelines and procedure for accomplishing a complete design are presented with numerical examples.

List of Publications
(Oct. – Dec. 1998)


Promotion

Dr N E Shanmugam has been promoted to full Professorship in the Department of Civil Engineering with effect from 1 March 1999.

Professor N E Shanmugam received his BE (Civil) and MSc (Eng) in Structural Engineering from College of Engineering, Guindy (currently known as Anna University), University of Madras. He earned his PhD from University of Wales. His working experience before joining the National University of Singapore in December 1981 includes positions of Junior Engineer (Department of Highways, Government of Tamil Nadu), Associate Lecturer in Civil Engineering (College of Engineering, Guindy), Technical Teacher Trainee with the Ministry of Education, Government of India, Lecturer in Civil Engineering (Delhi University), Tutorial Fellow with the University of Wales and Senior Lecturer in Civil Engineering (Polytechnic of Wales). He also spent four months as a Visiting Professor in Florida Atlantic University, USA and six months as a Visiting Scholar in Purdue University, USA.

Professor Shanmugam’s research interest includes steel plated structures such as plate and box girders, ship double bottom structures, steel-concrete composite construction – long-span structures and connections, cold-formed steel structures, web openings in beams, elastic and ultimate load behaviour of steel structures etc. He is a co-recipient of George Stephenson Medal given by the Institution of Civil Engineers, London for one of his papers published in their proceedings. He has published more than 130 papers in international journals and conference proceedings, edited seven volumes of conference proceedings and contributed two chapters for the Civil Engineering Handbook (CRC Press) and one chapter for Handbook of Structural Engineering (CRC Press). He is the Editor of the South and South East Asia Regional Issue of the Journal of Constructional Steel Research, and a member of the editorial boards of Journal of Constructional Steel Research and Journal of Thin-Walled Structures. He has been invited by the Australian Research Council to assess research projects submitted by universities and other research organisations. He also edited six volumes of Steel Structures, the annual journal of Singapore Structural Steel Society. He has organised in Singapore the Second International Conference on Steel and Aluminium Structures (1991), Fourth Pacific Structural Steel Conference (1995) and Second International Conference on Thin-Walled Structures (1998) and sat as a member of the organising committee of a number international conferences and as International Advisory/Scientific Committee of fifteen international conferences on steel structures.

Professor Shanmugam is a Chartered Engineer (CEng), and a Fellow of the Institution of Structural Engineers, London, (FIStructE), American Society of Civil Engineers (FASCE), Institution of Engineers, Singapore (FIES), Institution of Engineers, India (FIEI), Member-at-large of the Structural Stability Research Council (SSRC), USA and a Member of the International Association of Bridge and Structural Engineering (MIABSE). He is active professionally by providing advisory services and organising courses on steel structures at basic and advanced levels to the practising engineers. He has been closely associated with the Singapore Structural Steel Society since its inception and served in the Council as the First Vice-President for six years, President for three years and Immediate Past president for two years. Professor Shanmugam is also active in a number of Committees of the Institution of Engineers, Singapore and is the Second Vice-Chairman of the IES/IStructE branch. He is serving in two PSB Technical Committees as Chairman and Deputy Chairman respectively.

New Comers

Dr Hu Jiangyong graduated from Tsinghua University, Beijing, China with BEng in 1991. She completed her PhD dissertation on Biological Pre-treatment of Polluted Reservoir Water in 1996 at Tsinghua University. She was awarded the prestigious Award of Progress in Science and Technology by China National Education Committee in July 1996.

Dr Hu is currently an assistant professor in the Hydraulic and Environment Division, specializing in the field of Water and Wastewater Engineering. Her main interest is in the research area of innovative water treatment technology, water reclamation and water quality. Prior to joining NUS, she worked at Tsinghua University as a lecturer. At the end of 1996 she joined NUS and worked in Wastewater Biological Group as a Post Doctoral Fellow, actively conducting research works in wastewater biological treatment, water reclamation and water biological characteristics. Dr Hu has around 20 technical papers published in various conferences and journals. She is also an active member of the Environmental Engineering Society of Singapore.

Dr Chen Yongze graduated from the Department of Mechanics, Zhongshan University with a BSc degree in 1987, from the Department of Mechanics, Peking University with a MSc in 1990, and from the School of Civil and Environmental Engineering, Cornell University with a PhD degree in 1995. He was a postgraduate research oceanographer at the Center for Coastal Studies, Scripps Institution of Oceanography before joining the Department as an assistant professor last October. His research interests focus on water wave mechanics and nearshore processes. Currently he is teaching Coastal Structures and Engineering Mathematics at NUS.

Visitors to the Department

(Visitors who presented seminars are listed under seminars)

20 Jan Mr Goule of the International Office, University of Sheffield, visited the Faculty Wednesday, to discuss joint research initiatives and other possible areas of collaboration with Sheffield partners, especially in view of the available European/ASEAN funding. They are interested in research collaborations with the departments in the Faculty.

8 Feb Assoc Prof Sabarudin Mohd, Dean, School of Civil Engineering, Universiti Sains Malaysia and five members of the staff.

7 – 13 Mar Assoc Prof Mamoru Mimura, DPRI, Kyoto University, Disaster Prevention Research Institute.

8 – 14 Mar Prof Wu Sheng Xing, Vice Dean, Hohai College of Civil Engineering, Prof Lu Tinghao, Assoc Prof Yue Jianping, and Assoc Prof Wu Qingxi.
RESEARCH SCHOLARS

Mr ATTM Anowarul Bashar, 15 Dec 1998
Mr Goh Kok Hun, 29 Dec 1998
Mr Md Sirajul Islam, 31 Dec 1998
Mr Ashish Juneja, 4 Jan 1999
Ms Zhu Xia, 4 Jan 1999
Ms Zhang Yin, 4 Jan 1999
Mr Huang Xin, 4 Jan 1999
Ms Wei Liping, 4 Jan 1999
Ms Kong Ruiwen, 4 Jan 1999
Mr Li Maxin, 4 Jan 1999
Mr Li Tong, 4 Jan 1999
Mr Liao Binkui, 4 Jan 1999
Mr Shi Chunxiao, 4 Jan 1999
Mr Liu Ding, 4 Jan 1999
Ms Sajini Apok, 12 Jan 1999
Mr Sheikh Mahbub Alam, 13 Jan 1999
Mr Subir Kumar Saha, 2 Feb 1999
Mr Yogesh Gopal Amle, 5 Feb 1999
Ms Le Thi Hong Giang, 6 Feb 1999
Mr Nitin Muttil, 19 Feb 1999

RESEARCH ENGINEERS

Ms Lim Geok Khieng, 2 Jan 1999
Mr Xu Wenyu, 13 Mar 1999
Mr Chen Hong, 13 Mar 1999

NEW Appointments

Dr Hu Jiangyong, Assistant Professor, 26 Dec 1998
Dr Chan Sin Fatt, Senior Fellow, 1 Mar 1999 – 21 Mar 1999
Miss Tan Ai Chin, Corporate Support Officer IV, 4 Mar 1999

January – March 1999

14 Jan Construction Safety for Managers and Practising Engineers, Mr Goh Chye Guan, General Manager, Singapore Construction Safety & Consultancy Pte Ltd.

28 Jan The Role of Fly Ash, Silica Fume, Rice Husk Ash, and Metakaolin in Concrete, Dr V M Malhotra, (Manager, International Centre for Sustainable Development of the Cement and Concrete Industry, CANMET, Canada) Senior Fellow, Civil Engineering Department.

2 Feb Innovative Applications of Superplasticizers in Concrete, Dr V M Malhotra, (Manager, International Centre for Sustainable Development of the Cement and Concrete Industry, CANMET, Canada) Senior Fellow, Civil Engineering Department.

4 Feb (i) High Performance/High Strength Lightweight Concrete, (ii) Video on Mining the Sky and Durability of Concrete and (iii) High Performance/High Strength High Volume Fly Ash Concrete, Dr V M Malhotra, (Manager, International Centre for Sustainable Development of the Cement and Concrete Industry, CANMET, Canada) Senior Fellow, Civil Engineering Department.

11 Feb Development of New Incident Detection Methodologies for Expressways, Dr Cheu Ruey Long, Asst Prof, Civil Engineering Department.

27 Feb (i) Microstructure and Behaviour of Clays; (ii) Microstructure of Regional Clays and Implications, Prof Jacques Locat of Laval University, Quebec, Canada.

Properties of Singapore Lower Marine Clay, Assoc Prof Tan Thiam Soon, Department of Civil Engineering, National University of Singapore.

Comparison of the Behaviour of Singapore clay with Bangkok Clay and Ariake Clay, Japan, Dr Hiroyuki Tanaka, PHRI, Japan.

3 Mar Geotechnical Aspects of the Tanjung Berhala East Wharf, Dr Chan Sin Fatt, Senior Fellow, Civil Engineering Department.

10 Mar Tertiary Education in China and Hohai University: Current Status and Forthcoming Reforms, Prof Wu Sheng-Xing, Hohai University, China.

11 Mar Effects of Construction of a Diaphragm Wall Very Close to a Masonry Building (Raffles Hotel), Dr Chan Sin Fatt, Senior Fellow, Civil Engineering Department.

12 Mar Finite Element Method of Reinforced Concrete and its Application in Structural Engineering, Prof Wu Sheng-Xing, Hohai University, China.

Some Research Topics in Structural Reliability, Assoc Prof Wu Qing Xi, Hohai University, China.

Advanced Surveying Technology in Hohai University, Assoc Prof Yue Jianping, Hohai University, China.

An Introduction to the Geotechnical Engineering Research Institute of Hohai University, Prof Lu Tinghao, Hohai University, China.

Long-term Deformation of Pleistocene Deposits due to Construction of Offshore Reclamation – Kansai International Airport, Assoc Prof Mamoru Mimura, DPRI, Kyoto, University.

17 Mar Design and Construction of Foundations for Suntec City, Singapore, Dr Chan Sin Fatt, Senior Fellow, Civil Engineering Department.

18 Mar Professional Engineers Board and Its Functions, Mr Ong See Ho, Registrar, Professional Engineers Board, Singapore.

19 Mar Biological Phosphate Removal – Theory, Kinetic and Non-Kinetic Models, Dr Fan Xiaojun, Research Fellow, Civil Engineering Department.

22 Mar Coastal Resources Management in Indonesia: How ‘Reformasi’ is Creating Opportunities for Better Governance, Mr Ian M. Dutton, Coastal Resources Centre, University of Rhode Island.
Engineering Colours Award Winners (1998/99)

<table>
<thead>
<tr>
<th>GOLD AWARDS</th>
<th>SILVER AWARDS</th>
<th>BRONZE AWARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leong Saw Wei (CE3)</td>
<td>Cheng Tze Wee (CE2)</td>
<td>Harun Halim (CE2)</td>
</tr>
<tr>
<td>Chia An Ching, Patrick (CE3)</td>
<td>Chin Kar Meng, Alvin (CE3)</td>
<td>Kho Kee How, Albert (CE3)</td>
</tr>
<tr>
<td>Chong Chern Yik (CE3)</td>
<td>Goh Hooi Sock (CE3)</td>
<td>Koh Cheng Hian (CE3)</td>
</tr>
<tr>
<td>Huang Wei (CE2)</td>
<td>Koh Yih Ming (CE3)</td>
<td>Koh Chit Joo (CE3)</td>
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<tr>
<td>Na Kok Peng (CE2)</td>
<td>Neo Han Leong (CE3)</td>
<td>Lee Leong Seng (CE4)</td>
</tr>
<tr>
<td>Santosh Sundararajan (CE4)</td>
<td>Yuen Sai Leong (CE3)</td>
<td>Lim Sin Hwei, Lydia (CE2)</td>
</tr>
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Forthcoming International Conferences and Workshops

<table>
<thead>
<tr>
<th>DATE</th>
<th>CONFERENCE/WORKSHOP</th>
<th>CONTACT PERSON</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 3 Dec 1999</td>
<td>5th International Symposium on Field Measurements in Geomechanics</td>
<td>Assoc Prof S A Tan (e-mail: <a href="mailto:cvetansa@nus.edu.sg">cvetansa@nus.edu.sg</a>, Tel: 874 2278)</td>
</tr>
<tr>
<td>15 – 17 Dec 1999</td>
<td>Fourth Asia-Pacific Conference on Computational Mechanics for the Next Millennium</td>
<td>Assoc Prof K K Ang (e-mail: <a href="mailto:cveangkk@nus.edu.sg">cveangkk@nus.edu.sg</a>, Tel: 874 2570)</td>
</tr>
<tr>
<td>28 – 30 Jun 2000</td>
<td>6th International Conference on Applications of Advanced Technologies in Transportation Engineering</td>
<td>Assoc Prof T F Fwa (e-mail: <a href="mailto:cvefwatf@nus.edu.sg">cvefwatf@nus.edu.sg</a>, Tel: 874 2276)</td>
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