

## Close collaboration between ICCMC and ISO

The ICCMC put another step forward in its close collaborations with renowned world professional bodies in the last year. A new ISO Sub-committee on "Maintenance and Repair of Concrete Structures", named ISO TC71/SC7 was officially launched in September 2004. This SC7 was jointly proposed by Korea and Japan as member countries of the TC71. This proposal was initiated by the ICCMC, the organization responsible for the publication of the Asian Concrete Model Code (ACMC 2001). Published in 2001, the ACMC 2001 is one of the very few codes covering maintenance, and as such will be used as the first draft for the ISO maintenance code to be prepared by the SC7.

The ICCMC made further influence on the ISO TC71 because of the newest design concept adopted in the ACMC 2001, namely the performance-based concept. The TC71's SC4 on "Performance Requirements for Concrete Structures" set up an Ad-hoc Working Group (WG) on performance-based design with Professor Ha-Won Song (Vice-Chairman of the ICCMC) and myself as its leading members. The purpose of the WG is to identify the ways for the ISO's umbrella code for design of concrete structures (ISO 19338 "Performance and assessment requirements for design standards on structural concrete") to cope with the performance-based design concept. Again the ACMC 2001 is the model to be used for this purpose.

These collaborative activities with the ISO TC71 clearly illustrate the increasing role of the ICCMC to disseminate the latest technological developments in the Asian region. I, as Chairman of the ICCMC, strongly hope to enhance this trend and urge all ICCMC members to work towards this goal.

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## PARI-ICCMC-JCI int'l seminar on maintenance of concrete structures and WG3 meeting

An international seminar on "Maintenance of Concrete Structures" was held on 23 March 2005 at the Port and Airport Research Institute (PARI). The seminar was jointly organized by PARI, ICCMC and JCI. Nine international committee members from Bangladesh, China, India, Korea, Thailand and Vietnam and 6 Japanese local committee members participated in the seminar and 7 lectures related to durability of advanced concrete materials, time-dependent performance prediction and



Standing L-R: Dr Ema Kato (JP), Dr Le Quang Hung (VN), Dr Tarek Mohammed (BG), Dr Wanchai Yodsudjai (TH), Mr Montree Churecoywan (TH), Mr Ken-ichi Hida (JP), Dr Hiroshi Yokota (JP), Dr Boonchai Stitmannathum (TH), Dr Hidenori Hamada (JP), Dr Dai Jianguo (JP), Dr Yoshikazu Akira (JP), Dr Masami Abe (JP), Mr Tohru Yamaji (JP), Dr Suvimol Sujjavanich (TH), Dr Satoru Shiraishi (JP), Prof Ekasit Limsuwan (TH), Dr Koji Takewaka (JP), Dr Zhao Tie-jun (CN)

durability design of concrete structures, and chloride penetration in concrete etc. were presented. Following the seminar, ICCMC Working Group 3 - Maintenance had a one day meeting on 24 March 2005. The following issues were discussed at the meeting:

- Framework of ISO International Standard for "maintenance and repair of concrete structures".
- Amendment of Level 2 document Part 3 "Maintenance" in ACMC2001, and
- Preparation of a state-of-the-art-report on durability evaluation and assessment techniques for concrete structures in each country.

Dr Hiroshi Yokota, the head of structural mechanics division, PARI, organized this meeting. For more info please visit <http://www.iccmc.org/>

## Next full committee meeting

ICCMC full committee meeting will be held at Qingdao Technological Institute, China on 29-30 October 2005. Prior to the meeting an **international workshop on durability of reinforced concrete under combined mechanical and climatic loads** (CMCL) jointly organized by Prof F.H. Wittmann and Prof Tie-Jun Zhao of Qingdao Technological Institute and Prof Tamon Ueda of Hokkaido University will be held 27-28 October 2005.

For further info please contact Dr Dai Jianguo ([admin@iccmc.org](mailto:admin@iccmc.org))

## A quick look at future building codes for Singapore

*Note: This brief and informal article was written upon a request from the editorial staff. It contains mainly the writer's personal view.*

The SPRING Singapore (Standards, Productivity, and Innovation Board) is the national authority responsible for coordinating, establishing, and publishing all Singapore Standards. Thus, the development of building codes for Singapore naturally falls under SPRING's jurisdiction. However, whether the design or construction of a private building is allowed to proceed or not is determined by BCA (the Building and Construction Authority). BCA does not require a building to be designed using a particular code of practice. This means that any valid or internationally recognized building code can be used for design in Singapore. Most of the buildings in Singapore, however, have been designed using the British Standards, for example: the BS8110 for concrete structures. The reason is that many senior engineers were educated in the UK and the two universities in Singapore teach structural design using the British Standards. Some of the less common type of concrete structures, such as water tanks, prestressed slabs, and structures designed by overseas consultants might have been designed using other codes, such as: American codes, Australian codes, Japanese codes, Korean codes, etc.

The Singapore Codes of Practice are the adaptations of relevant British Standards. With the development of the Eurocodes, the British Standards will be dropped in the near future. For concrete structures, the relevant Eurocode - called EC2 (EN1992 – 2004) - has been published. By about the year 2010, the BS8110 will be dropped and it should not be used for design anymore. Other British Standards will also be dropped at appropriate dates. This will affect Singapore practice. For this reason, Singapore is now in the process of deciding which building code will be most suitable for use in Singapore in the future. The SPRING has formed ERAC (Eurocodes Review Advisory Committee) of which this writer is a member. The function of ERAC is to come up with a recommendation on which codes should be adopted as the main codes for Singapore. Two major codes were seriously considered: the Eurocodes and the American codes. The committee has not submitted the final recommendation yet.

One of the advantages of the Eurocodes is that all components come in one complete package (Eurocode 2 for concrete; EC3 for steel up to EC8 for Seismic design; and EC9 for aluminium). The disadvantage is that not all are ready at this moment and there are questions about code maintenance and updates. Who (which party) is going to maintain it and who is going to fund it? Currently the UK construction industry is pushing ahead with the finalization of the Eurocodes for the UK. With the existing historical connections between Singapore codes and the BS codes, Singapore can perhaps expect to receive some kind of support from the UK side to reduce cost of changing codes from the BS-based to EC-based codes. Continuing education for engineers will be needed, consultants may have to invest on new software, new design aid will have to be produced, etc.

The American codes, on the other hand, are ready to use and they are appropriately maintained and updated. The problem is that many of the details are not necessarily in SI units. Different codes are produced and maintained by different organizations. For concrete, it is the ACI; for steel, it is the AISC; for bridges, it is the AASHTO; for wind load, it can be the ASCE; for earthquake, it is IBC or still another, etc. The ERAC will have to consider all these and other factors before coming up with the final recommendation.

Whether it is the Eurocodes or American codes that are to be used in Singapore, it does not mean that other codes cannot be used. However, when ERAC recommends a particular code to be used as the main code, that new code will be taught in the two universities and new engineers will be familiar with the new code. Local practicing engineers will also be able to switch to the new code by taking short courses designed specifically for them. So over time, the majority of new buildings will automatically be designed using the new code. The decision to change codes, however, is affected mainly by economic issues and opportunities rather than technical ones.

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## Historical background and current state of code development in Pakistan

Since its independence Pakistan possessed a strong contingent of able and competent Civil Engineers. Two engineering colleges were serving the needs of western part of the country. In 1961 and later in 1974 several other engineering colleges and engineering universities were established. Today there are seven engineering universities in addition to several engineering colleges serving the needs of the nation and all have well-established Departments of Civil Engineering.

As for professional bodies, there is an Institute of Engineers Pakistan (IEP), a Pakistan Engineering Council (PEC) and Pakistan Engineering Congress. There are several well-established engineering departments in the local, provincial and federal government organizations, for example, Pakistan Railway, Communication and Works, WAPDA, Telecommunication, and Irrigation. Many public and private consultants are serving the community in the engineering field, such as, National Engineering Services Pakistan (NESPAK), Progressive Consultants (PC), National Environmental Consultants (NEC), National Development Consultants (NDC) and DESCON. There are several societies of various engineering disciplines.

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During 1960's Pakistan developed major engineering works like Indus Basin Project, which included construction of dams and link canals. The works were completed with the help of a consortium consisting of engineering firms from western countries like Canada, England, Belgium, and Germany. The civil engineering community since independence used the British and the American codes of practice. It was only in early 1980's when NESPAK with the collaboration of some government departments and private consultants drafted a national code of practice named BCP86. The distinct feature of the code was seismic zoning of Pakistan. The code has a legal status only within the government sectors. Since its first draft it has never been revised.

Currently the country has more than twenty thousand civil engineers; many of them have tertiary and post-graduate degrees from Europe, Canada, America, Australia and Far East. They are engaged in design, construction, repair and rehabilitation works of important nature. Mostly the American and the British codes of practice are in use. Depending on the funding from foreign sources other codes of practice like DIN, EURO, Japanese, Russian, Chinese and Australian standards are also used in actual practice. However, no unified and concerted effort is in progress towards developing a national code of practice.

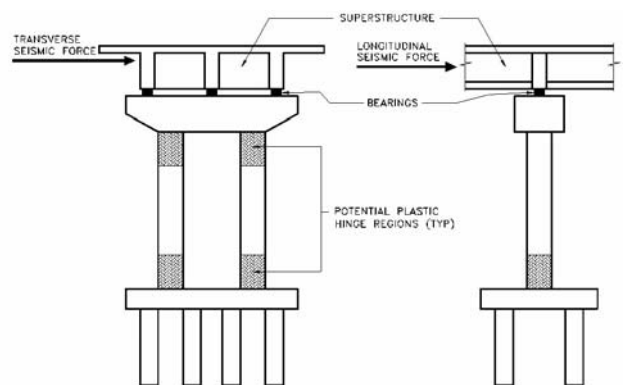
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## Integral bridges: research needs

Integral Bridges are characterized by monolithic connection between the deck and the sub-structure (piers and abutments). Such bridges are the answer for small and medium length bridges where bearings and expansion joints are either eliminated altogether or reduced to a minimum. Many such bridges have been designed by the author's firm during the last few years in India and Malaysia.

The design complexities of such bridges increase because of increased redundancy of the structure. Temperature change and creep and shrinkage (of concrete) are of major importance creating fairly large stresses in the various elements of the bridge structure. Present design codes do not address the tricky problem of various load combinations and load factors when such stresses should be considered. As an example, the Eurocode (final Draft of 1998-2, March 2005) mentions that seismic action effects need not be combined with action effects due to imposed deformation (caused by temperature, shrinkage, settlement of supports etc) for the purpose of strength verification. Such recommendations are not adequate for performance based seismic design criteria for 'serviceability', to which more thought requires to be given. For moderate earthquakes the load combinations and load factors need to be defined more precisely.



Potential location of plastic hinges  
Fig.1: Well Designed Structures Dissipate Seismic Energy by Inelastic Deformations in Localised Zones of Selected Members

Fig.1 shows a 'non-integral' bridge i.e. a bridge where lateral seismic forces are transferred through bearings to the sub-structure. Looking at the transverse section on the left, a double-column pier has more locations where seismic energy can be dissipated by plastic hinges. The tops of piles are generally not used as plastic hinges because of the difficulties in post-earthquake repairs. In the longitudinal direction shown on the right of Fig.1, the pier acts as a cantilever with limited capability of energy dissipation.

To conclude, model testing in a well-equipped Structures Laboratory as well as computer simulation is needed to determine more reliably the effects of creep, shrinkage and temperature strains as well as their combination with longitudinal seismic forces in the case of Integral Bridges.

*Read about the contributor, Prof Mahesh Tandon from page 4*

## Asian Concrete Federation

After a series of "Asian Concrete Forum" hosted by the Japan Concrete Institute in 2001, Korea Concrete Institute in 2002 and Indian Concrete Institute in 2003, the Asian Concrete Federation was established and its first officers elected at the 1st ACF conference hosted by the Thailand Concrete Association in October 2004. Representatives from 10 concrete-related organizations in India, Indonesia, Japan, Korea, Nepal, Philippines, Chinese Taipei, Thailand, Vietnam and ICCMC were present.

Prof Taketo Uomoto (Japan), past chairman of ICCMC, was elected the 1st president of ACF. Two vice chairmen are Prof Keun-Joo Byun (Korea), immediate past chairman of ICCMC and Dr Pichai Nimityongskul (Thailand). ICCMC current chairman Prof Tamon Ueda (Japan) was elected as the treasurer.

## Member profiles



*Professor Mahesh Tandon*

Prof Mahesh Tandon is an international expert in the field of Structural Engineering. Professor Tandon has been appointed Distinguished Visiting Professor at the Indian Institute of Technologies at Kanpur and Roorkee by the Indian National Academy of Engineering (INAE) and the All India Council for Technical Education (AICTE). Professor Tandon is a Fellow of INAE, and a member of its Governing Council. He is the Chairman of the National Information Center for Earthquake Engineering at IIT Kanpur and the President of Indian Concrete Institute. He has led the development of many codes on concrete and bridge structures in India. He has also attended the last meeting of ICCMC at Chiangmai, Thailand and has future plans of actively participating in the field of seismic design and bridge structures to bring his unique knowledge in these areas for the benefit of the model code.

Many of the structures designed by Prof Tandon and his firm Tandon Consultants Pvt Ltd have been widely acclaimed and have received recognition in India as well as internationally. Professor Tandon has to his credit a number of major design projects in Prestressed Concrete, Reinforced Concrete and Structural Steel in India, Malaysia, Thailand, Russia and several countries in Europe, the Middle East and South East Asia. These include major bridges, long span roofs, tall buildings and monumental structures.

His projects employ state-of-the-art technologies and the latest available techniques in design and construction. His structures have been described as highly creative, futuristic, environmentally sensitive & innovative.

Amongst the awards received by Prof Tandon are Lifetime Achievement Award by the Indian Concrete Institute (2003), National Award for Excellence in Consulting Engg Services (2004) by Consulting Engineers Association of India, and, awards given by Institution of Engineers (India), Indian Roads Congress, Indian Institute of Bridge Engineers, Indian Concrete Journal, Association of Consulting Civil Engineers, Alumni Association of College of Engineering Pune, etc

On-going projects are the Viaducts, Bridges and Stations of the Delhi Metro Rail, several Flyovers and Interchanges in Delhi, Hyderabad, Guwahati at important road crossings, and the structures of Delhi-Gurgaon Expressway, keeping in view rapid construction, durability, aesthetics and no disturbance to traffic. Monumental Building projects include the Indira Gandhi National Centre for the Arts in New Delhi and the Khalsa Heritage

Memorial Complex at Anandpur Sahib, Punjab. Other path-breaking projects include the structures of Amusement Parks in Delhi and Noida.

Prof Tandon has made significant contributions in the development of a culture for innovation in structural engineering both within and outside his organization by sharing his expertise and experience. His special areas of interest also include motivating the next generation to adopt Civil Engineering as their profession and vocation in life.



*Dr Tarek Uddin Mohammed*

Dr Tarek Uddin Mohammed joined the ICCMC in 2005 and currently serving as a member of ICCMC WG-3. Presently, he is Associate Professor at the Department of Civil and Environmental Engineering of The University of Asia Pacific (UAP), Dhaka, Bangladesh. His professional experience includes: Senior Research Engineer, Port and Airport Research Institute (PARI), 2001-2004; Engineering Consultant, NEWJEC Inc., International Civil Engineering Department, Osaka, Japan, 1997-2000; Research Associate, Asian Institute of Technology, School of Civil Engineering, 1994; and Lecturer, Chittagong University of Engineering and Technology, Department of Civil Engineering, Bangladesh, 1990-2002.

Dr Tarek's research scope covers durability of concrete, corrosion of steel bars in concrete, interfacial zones of concrete, alkali-silica reaction of concrete, brick aggregates, and life-cycle modeling of concrete structures. He has more than 60 publications, 25 of which were published in internationally renowned journals, such as ACI Materials Journal, ACI Concrete International, Cement and Concrete Research Journal, JSCE Journal Materials, Concrete Structures and Pavements, Concrete Library of JSCE, and Journal of Advanced Concrete Technology. He has made technical presentation in more than thirty-five international and national conferences.

He is a member of a number of institutes, including American Concrete Institute (ACI), Japan Concrete Institute (JCI), International Committee on Concrete Model Code for Asia (ICCMC), and Institution of Engineers, Bangladesh (IEB). He is associated with several technical committees of professional societies, such as ACI Technical Committee 201 - Durability of

*(continued on page 5)*

Concrete, ACI Technical Committee 222 – Corrosion of Metals in Concrete, ACI Technical Committee 233 – Ground Slag in Concrete, Member of JCI Working Group for Manual for Repair and Strengthening of Concrete Structures (English Translation), and Member of ICCMC Working Group 3. He received Young Researchers Award of Japan Concrete Institute in 2001.

Currently, he is doing research on corrosion of cement paste coated steel bars in concrete, methods of improving steel-concrete interface to make sustainable concrete for marine exposure, alkali-silica reaction induced strain in steel bars of concrete members, compressive strength and failure pattern of brick aggregates with different moisture conditions, compressive strength of concrete made with different local aggregates, identification of major construction problems causing earlier deterioration of concrete structures in Bangladesh, and identification of common causes of deterioration of existing concrete structures in Bangladesh.

### Level 3 document

Another level 3 document of ACMC 2001 “**Concrete and Reinforced Concrete Structures – Japanese Standard Specification for Materials and Construction**” will soon be published by ICCMC Working Group on Materials and Construction (WG2), chaired by Dr Takafumi Noguchi of University of Tokyo.



### News about members

► **Prof Keun-Joo Byun** of Yonsei University, Korea (ICCMC chairman 2002-4), has been elected President of the Korean Society of Civil Engineering (KSCE) for 2005.

► **Dr Le Quang Hung**, Deputy Director of the Inspection Department, Vietnam Ministry of Construction has recently been appointed as the General Secretary of the Vietnam Concrete Association (VCA). He also replaces **Prof Nguyen Tien Dich**, ICCMC-EC member as Chairman of the VCA's International Committee. The latter becomes Vice-chairman.

► **Prof Ha Won Song** of Yonsei University, Korea (ICCMC vice-chairman) and **Prof Tamon Ueda** of Hokkaido University (ICCMC chairman) lead the newly established ISO TC71/SC7 “Maintenance and Repair of Concrete Structures” as chairman and secretary respectively.

### Conferences

7th International Symposium on Fiber Reinforced Polymer (FRP) Reinforcement for Concrete Structures, 7-10 November 2005, New Orleans, USA. <http://frprcs7.ce.umn.edu>

International Symposium on Bond Behaviour of FRP in Structures (BBFS 2005), 8-10 December 2005, Hong Kong, Chin. <http://www.iifc-hq.org/>

2nd Asia Conference on Earthquake Engineering (ACEE 2006) to be held in the Philippines on 10-11 March 2006. <http://acee.dlsu.edu.ph/>

IABSE Conference on Operation, Maintenance and Rehabilitation of Large Infrastructure Projects, Bridges and Tunnels, 15-17 May 2006, Copenhagen, Denmark, May 15-17, 2006. <http://www.iabse.ethz.ch/conferences/copenhagen2006/index.php>

The Second **fib** Congress 2006, 5-8 June 2006, Naples, Italy <http://www.naples2006.com/>

Extending the Life of Bridges; Concrete + Composites, Buildings, Masonry + Civil Structures, 13-15 June 2006, Edinburgh, Scotland. <http://www.structuralfaultsandrepair.com>

The 8th International Concrete Conference on Concrete in Hot & Aggressive Environments, 27-29 November 2006, Bahrain. <http://www.engineer-bh.com/icce/intro.htm>

### Joining ICCMC

ICCMC membership is open to anyone interested in concretes. Visit our website to apply on-line or write to Dr Dai Jianguo (admin@iccmc.org) for more information.

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