FRP INTERNATIONAL

The Official Newsletter of the International Institute for FRP in Construction

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Editor's Note

One of the themes of this issue of *FRP International* is related to the challenges and successes of developing FRP design specifications; a necessary step on the path to the sustained implementation of FRP materials and systems in civil engineering and construction. Another theme of this issue is related to outreach activities of IIFC committees and members to broaden the awareness of the application of FRP materials and systems in civil infrastructure. The first step in this activity involves fostering relationships with organizations that have membership beyond civil engineering and construction, such as the American Composites Manufacturers Association (ACMA).

As we approach CICE 2010, the official conference of the IIFC, to be held in Beijing, China on 27-29 September 2010, IIFC committee activity is again starting to ramp up. To this end the IIFC Honours Committee is seeking nominations for the IIFC Medal and IIFC Distinguished Young Researcher Award. The deadline for receipt of nominations is 20 December 2009. Please refer to page 2 of this issue for more details.

Finally, in an effort to expand the net of contributors to this newsletter, and lessen the load on existing editorial board members who volunteer their time to make this publication possible, I am announcing a *call for nominations* for additional editorial board members. Please email nominations of individuals that are interested in *actively* serving on the editorial board by the end of the year. Self nominations are welcome.

On behalf of the IIFC, I wish everyone a healthy, happy, and successful 2010!

Rudolf Seracino, Editor-in-Chief
Email: newsletter.editor@iifc-hq.org

Report on FRPRCS-9

The 9th International Conference on Fiber-Reinforced Polymer Reinforcement for Concrete Structures (FRPRCS-9) was hosted by the University of Adelaide and held at the Four Points Hotel located on the beautiful Darling Harbour in Sydney, Australia, on 12-15 July 2009. By all counts this was a successful international event and FRPRCS-9 exemplifies the continuing rapid improvements and expansion of the state-of-the-art in the field of FRP combined with concrete (and masonry).

Sydney Opera House

The set of conference proceedings, which consists of a book of all 1-page abstracts, as well as a CD with the full paper versions, contains a total of 275 papers from 33 countries. It is a testament to the international scope of this field and the dedication of the 209 delegates that, perhaps more than any previous FRPRCS Symposium, had to travel further than ever before, and in an uncertain economic climate, to participate in this important event. A diverse list of countries from all regions of the world were well represented with five or more delegates from Australia, Canada, China, Germany, Iran, Italy, Japan, South Korea, Spain, United Kingdom, and United States. Papers were presented on topics in the following general areas: life-cycle cost; durability; accelerated and real-time performance; fire resistance; innovation and developments; field applications and case studies; standarisation; codes and standards; ductility of repaired members; confined concrete; FRP retrofit for blast loading; seismic retrofit; fatigue resistance; bond; strengthening or repair of concrete or masonry structures; strengthening or repair of historical structures; hybrid structures; internal reinforcement; and members prestressed with FRP. The final technical program consisted of four concurrent sessions with 220 presentations from 180 different speakers and four keynote lectures given by C.J. Burgoyne, J.F. Chen, S.H. Rizkalla, and J.G. Teng. Various organizations and committees, including the IIFC, took the opportunity to meet during the Symposium.

Deric Oehlers at Opening Session

Several social events were integrated in the Symposium including the Welcome Reception where delegates and partners had the opportunity to meet friends and colleagues and get close to some of Australia's native fauna. Other events included a Sydney Harbour Cruise, and the highlight of the social program, the Symposium dinner underneath the world famous Sydney Harbour Bridge which included an educational presentation given by a local Aboriginal. Pre and post conference tours were also available to delegates and their partners including a day trip to the Blue Mountains & River Cruise, and a Hunter Valley Wine Tasting Tour.

Sydney Harbour Bridge

As always, the success of a meeting of this scale is in large part due to the support of many organizations, committees, and of course, the delegates. However, the FRPRCS-9 co-chairs would like to explicitly acknowledge to efforts of Stephen Foster of the University of New South Wales who assisted with many aspects of this Sydney-based conference.

Deric Oehlers, Michael Griffith, and Rudolf Seracino
The University of Adelaide, Australia
FRPRCS-9 Co-Chairs

The proceedings of FRPRCS-9 will soon be available to IIFC members via the Institute's website: www.iifc-hq.org

IIFC Call for Nominations

The IIFC honours committee now calls for nominations for the **IIFC Medal** and **IIFC Distinguished Young Researcher Award**. These awards will be given at its next official conference CICE 2010 in Beijing in September 2010. All IIFC members are invited to nominate appropriate candidates for these awards by **20 December 2009**. Nominations should be forwarded to the IIFC Honours Committee through its chairman, Professor Urs Meier at urs.meier@empa.ch. Information on these awards can be found at www.iifc-hq.org, and detailed nomination procedures for both awards can be found at www.iifc-hq.org/IIFC-awards-nominations.pdf.

In This Issue

IIFC Working Groups

IIFC WG on Education

The IIFC Working Group on Education was formed in 2007 with the objective of developing strategies to attain the educational and training objectives of the IIFC; providing guidance for the organization of special sessions, workshops, and seminars; developing educational modules on the use of FRP composites in construction; and providing a forum for exchange, discussion and consolidation of ideas and educational best-practices through the organisation of specialist workshops and special sessions at conferences.

Under the leadership of Dr Luke Bisby, University of Edinburgh (luke.bisby@ed.ac.uk), and in collaboration with the ISIS Canada Research Network, the Education WG has defined a suite of six targeted educational modules covering most aspects of the use of FRPs in construction. First editions of these modules are expected to be available for open use by the 3rd quarter of 2010. Interested parties are encouraged to contact Luke Bisby for additional information.

The development of the modules is being led by an international group of experts, with each module being led by a different member of the Education WG, as follows:

1. **FRP Composites for Construction – Materials and Mechanics**
   Dr. Luke Bisby, University of Edinburgh
   luke.bisby@ed.ac.uk
2. **Reinforcing Concrete Structures with FRPs**
   Dr. Fabio Matta, University of Miami
   fmatta@miami.edu
3. **Strengthening Concrete Structures with FRPs**
   Dr Scott Smith, Hong Kong University
   stsmith@hku.hk
4. **Strengthening Metallic Structures with FRPs**
   Dr. Tim Stratford, University of Edinburgh
   tim.stratford@ed.ac.uk
5. **Strengthening Masonry Structures with FRPs**
   Dr. Enzo Martinelli, Università degli Studi di Salerno
   e.martinelli@unisa.it
6. **Durability of FRP Composites for Construction**
   Dr. Raafat El-Hacha, University of Calgary
   relhacha@ucalgary.ca

The Education Working Group is of course happy to accept new members who are interested in *actively* contributing to the ongoing development of the IIFC's suite of teaching resources. Interested individuals are encouraged to contact the specific leader for each of the given topic areas.

In addition, the Education WG is planning to hold a special session at the CICE 2010 conference, in Beijing, China. This session will provide a venue for non-research presentations by individuals who are interested in disseminating and/or discussing their experiences in teaching FRP technologies in engineering curricula. The session will also feature a presentation on the current development and availability of the WG's six educational modules. Please contact Luke Bisby if you are interested in contributing to this special session.

IIFC WG on FRP Structures

The former working group on "FRP Components for Bridge Superstructures" has been replaced by a working group on FRP Structures. The new WG is a joint IIFC-IABSE working group, which has been founded at CICE 2008 in Zurich, and then approved by the IIFC Executive Committee on February 6, 2009, and the IABSE Technical Committee and Executive Committee on April 3-4, 2009.

The new WG is co-chaired by Prof. Dr. Thomas Keller (IIFC), EPFL-CCLab (thomas.keller@epfl.ch) and Dr. Dolores G. Pulido (IABSE). The WG provides a forum for discussion and promotes research collaboration in the fields of new all-FRP and hybrid-FRP structures for bridges and buildings. Currently, the WG has 51 members and regular meetings are planned at IIFC and IABSE conferences.

A first deliverable will be a state-of-the-art report "Fiber-Reinforced Polymers in Bridge Structures", planned for 2010. The document reviews FRP component applications in new all-FRP or hybrid-FRP bridges. Strengthening of existing bridges using bonded laminates or strips is not covered. However, upgrading by replacement of concrete, steel or timber components through FRP components, e.g. bridge decks, is included. At this stage, data collection is underway. Country by country, FRP bridge, FRP component and FRP code data is collected by the WG members.

For information on all IIFC Working Groups visit:
www.iifc-hq.org/organization/working.html

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A&P SEISMIC RETROFITTING METHOD

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Since the Great Hanshin Earthquake of 1995, which killed over 6,400 people, 14 severe earthquakes with intensity level 6 (Japanese scale) have hit Japan up to 2007 causing major human loss. It is also predicted that a massive earthquake may strike the area between Tokyo and Osaka in the near future. Under these conditions, the Japanese government promotes and supports urgent seismic retrofitting for major transportation infrastructures. Therefore, most of the seismic retrofitting for these infrastructures is in the final stage. In many cases, continuous fiber sheet wrapping is adopted for structures with heavy traffic such as railway stations, because the condition for execution of the retrofit is very severe and restricted.

Aramid fiber and carbon fiber are used for the continuous fiber sheet reinforcement in Japan. In the field of seismic retrofit of railway infrastructure, the fiber sheet wrapping method was developed to achieve a ductility ratio of 10, so that its design requires large amounts of expensive materials, and the economic efficiency is considered relatively low. Despite this drawback, aramid fiber sheet wrapping has been applied in many cases, because it can be applied in a limited space, safe to the electric facilities, and superior in the ductility enhancement.

The Aramid Retrofitting System Association (ARSA) of Japan has developed the A & P Seismic Retrofitting Method in order to drastically improve the economic efficiency of the fiber sheet wrapping method. The concept of this method is as follows:

1. Divide a column into two regions (1) ductility strengthening region and (2) shear strengthening region, where highly ductile fiber sheet such as polyester fiber sheet is applied to the ductility strengthening region, and aramid fiber sheet with high stiffness to the shear strengthening region.

2. The highly ductile fiber sheet, whose fracture strain should be 5% or more, will not fracture until the ultimate state, resulting in keeping the lateral confinement of the ductility strengthening region, which brings the high deformation capacity of the retrofitted member. The highly ductile fiber sheet is a commonly available and inexpensive product, and the number of layer can also be reduced.

As a result, the A & P Seismic Retrofitting Method can be applied at approximately half the cost of conventional fiber wrapping methods to achieve the same performance.

The concept of the A & P Seismic Retrofitting Method has spread among the administrators of private-sectors for railway infrastructure, and application of this method is increasing. The Railway Technical Research Institute of Japan has issued guidelines for the design and construction of the A & P Seismic Retrofitting Method. Figure 1 is an example of the method which has been applied to a railway station owned by a private railway company in the Kanto area of Japan.

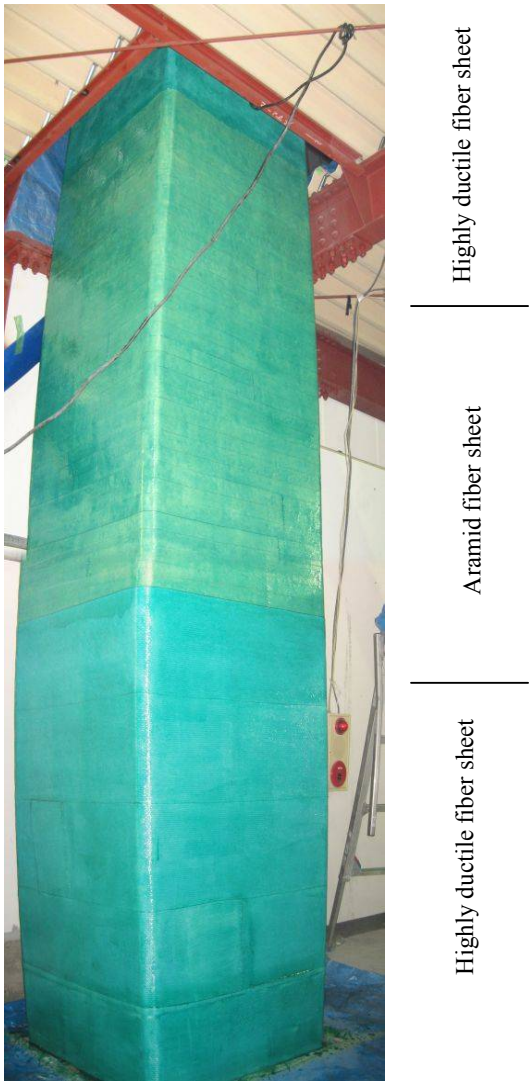

Figure 1. Example Application of the A & P Seismic Retrofitting Method.

Email articles to:
newsletter.editor@iifc-hq.org

REPAIR USING STEEL FIBER REINFORCED POLYMER (SFRP) ON US150 BRIDGES IN KENTUCKY

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The US150 Bridge over Beech Fork River, located in Nelson County, KY, is a five-span bridge, and the bridge over Cartwright Creek, located on the border of Washington-Nelson County, KY, is a three-span bridge. The bridges, constructed in 1955, are continuous non-prismatic reinforced concrete deck on girder (RCDG) bridges.

In each bridge, cracks had developed in the four girders in each span and on the bottom of the deck slab in the end spans. Monitoring of crack growth and propagation was carried out concurrently with the planning and design of the retrofit measure.

Existing cracks were filled with high strength epoxy injected through crack injection ports placed along the length of a crack. The girders were then ground and cleaned to remove all loose concrete particles, debris, and other contaminants.

Steel fiber reinforced polymer (SFRP - 12x-12 Hardwire™) sheets were selected for the retrofit, which was completed in May of 2007 (See Figures 1 and 2). Crack gauges for post-construction monitoring were installed on all girders to evaluate the effectiveness of the retrofit. The monitoring will continue until May 2010.

Figure 1. Application of SFRP sheet.

Figure 2. Repaired Concrete Girders.

IIFC/ACMA Meeting

The IIFC will be well represented at the upcoming American Composite Manufacturers Association's (ACMA) Exposition and Convention COMPOSITES 2010. The convention will be held in Las Vegas, Nevada from February 9 to 11, 2010 at the Mandalay Bay Resort and Casino. The ACMA represents 850 of approximately 3000 composites manufacturers and suppliers to the industry. In the U.S. alone, the composites industry employs about 550,000 people and generates almost $70 billion in revenues per year. The theme for COMPOSITES 2010 is "Discover the Future of Composites Today." Each year, the American Composites Manufacturers Association's convention attracts over 3,500 industry professionals from every market segment of the composites industry. Throughout the three days of the event, these professionals come together to make purchasing decisions, learn about new products, applications and companies, attend education sessions and network.

The IIFC will staff a booth in the University Pavilion at the COMPOSITES 2010 exhibition and provide industry and academic attendees with information about IIFC and its membership in order to promote the IIFC to a larger and broader audience. Handouts at the booth will include information on membership, information on working with IIFC members and a directory of IIFC members interested in working with industry on research projects. Professor Ken Neale, IIFC President, will be organizing the booth and the exhibits.

In addition to the IIFC presence on the exhibition floor, the IIFC will be sponsoring an Educational Session entitled "Getting the most out of Collaborations with University Researchers." The session will highlight a number of successful collaborations between FRP researchers and their industry partners in the area of FRP composites for infrastructure markets. Teams of Academic/Industry speakers will talk together about their collaboration and its benefits to both parties. Recommendations on how best to facilitate these beneficial relationships will be provided.

The session will be chaired by Professor Larry Bank, Senior Vice President of IIFC. Two teams of speakers will participate: Professor Brahim Benmokrane of Sherbrooke University, Canada, and Mr. Bernard Drouin, Pultrall, Canada, will discuss their collaborations in the area of FRP rebars. Associate Professor Rudi Seracino of North Carolina State University, USA, and Mr John Carson, Chomarat North America, will discuss their research on carbon fiber grids in the prestressed/precast concrete industry.

IIFC members will also be well represented in the technical paper sessions that run the duration of the three day event. For more information contact Professor Larry Bank bank@engr.wisc.edu or visit http://www.acmashow.org/index.cfm.

OVERCOMING TECHNOLOGY AND IMPLEMENTATION GAPS FOR FOR GFRP REINFORCED CONCRETE STRUCTURES

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For the past decade, the role of industry/university cooperative research in North America has been key in transferring the use of internal fiber reinforced polymer (FRP) reinforcement for concrete from the laboratory to the field. In particular, the corrosion resistance, light weight, tailorable mechanical properties and affordability of glass FRP (GFRP) bars point to some applications where this solution becomes preferable to traditional steel, and a compelling response to the demand for sustainable construction.

For example, enhanced durability is ensured in the case of bridge deck systems and parking garages exposed to deicing salts, as well as reinforced concrete (RC) structures that operate in coastal regions and are sometimes directly exposed to aggressive marine environments. Other significant niche applications include softeyes for tunnel excavation, where the low shear strength and brittleness of GFRP bars greatly facilitate the penetration of tunnel boring machines; and electromagnetically transparent structures, such as in magnetic resonance imaging (MRI) facilities.

Following are the summaries of two recent initiatives aimed at addressing relevant implementation and technology gaps that impair the safe and effective deployment of this technology in the US. The first initiative deals with code writing, arguably the university's finishing line in the technology transfer hurdles, with the development of limit-state (LRFD) specifications for the design of GFRP RC bridge decks and traffic railings. The second initiative aimed at investigating the use of GFRP bars as longitudinal and transverse reinforcement in compression members based on experiments on full-scale specimens: although limited by high costs and availability of high-capacity testing machines, full-scale experiments are critical to validate the technology, and to produce compelling evidence to underpin rational analysis and design methodologies. The efforts summarized herein were undertaken under the aegis of the NSF Industry/University Cooperative Research Center (NSF I/UCRC) for "Repair of buildings and Bridges with Composites" (RB²C), headquartered at the University of Miami (UM) and North Carolina State University (NCSU).

LRFD specifications for GFRP reinforced concrete bridge decks and traffic railings

GFRP bars are a competitive alternative to steel reinforcement for non-prestressed RC bridge decks and traffic railings (Figure 1) where corrosion of the reinforcement is of concern. The validity of this technology has been demonstrated through a number of field implementations in North America. Valuable experience has been gained by showing the viability of construction management practices when FRP reinforcement is adopted using traditional bid letting processes and competitive bidding from multiple FRP bar suppliers.

(a) Sierrita de la Cruz Creek Bridge, Texas, USA (courtesy of Hughes Brothers, Inc.)

(b) Bridge 1482301, Missouri, USA

Figure 1. GFRP bars for RC Bridge Decks and Railings.

Design principles are well established and mature for the development of the first-generation limit-state based design specifications written in mandatory language. In Canada, the use of FRP reinforcement is codified in Section 16 of the Canadian Highway Bridge Design Code, and is successfully making the transition from research to commercial projects. In the US, design guidelines have been published by the American Concrete Institute (ACI). In addition, in 2008, ACI Committee 440 approved two documents written in mandatory language that address material and construction specifications (ACI 440.6-08 and ACI 440.5-08, respectively).

While the use of FRP reinforcement in buildings in the US is within the jurisdiction of ACI, new bridges financed with Federal funds have to be designed following the American Association of State Highway and Transportation Officials (AASHTO) LRFD Bridge Design Specifications. Clearly, the lack of AASHTO limit-state based specifications that cover the design of FRP RC bridge deck systems is the last barrier to

sanction the acceptance of this innovative and already competitive technology.

In 2007, with the financial support of RB^2C's industry members, researchers at RB^2C assembled and led a task force to develop LRFD design specifications written in mandatory language. The task force included researchers, consultants, and representatives from State Departments of Transportation and the US Federal Highway Administration. A self-contained document was submitted to AASHTO Technical Committee T-6 (FRP Composites). While maintaining the AASHTO provisions for the definition of loads, load factors, and limit states, the document covers specific material properties and detailing of FRP reinforcement, and defines applicable design algorithms and resistance factors. A commentary is included to guide the designers in understanding the state-of-the-art experimental and theoretical background that underpin the design specifications. The proposed guide was approved by the Subcommittee on Bridges and Structures in May 2008, and will be published by the end of 2009.

Use of GFRP bars as longitudinal reinforcement in RC columns

An experimental campaign on full-scale GFRP reinforced concrete (RC) columns under pure axial load was undertaken to investigate whether the compressive behavior of longitudinal GFRP bars impacts the column performance, and to understand the contribution of GFRP ties to the confinement of the concrete core, and to prevent instability of the longitudinal reinforcement (Figure 2).

The specimens had square cross-section with a 0.61 m side, and length of 3.0 m. A total of five column specimens were tested: a steel RC specimen used as benchmark, and four GFRP RC specimens. The GFRP RC specimens were subdivided into two sets of two, each set identical to the other, but using two different types of bars with the same nominal cross section and different surface preparation (deformed shape using helicoidal wraps and sand coating, respectively). The intent was to verify that GFRP bars of comparable quality, but from different manufacturers, produce similar results. The steel RC column was designed having the minimum amount of longitudinal reinforcement and minimum tie cross sectional area at maximum spacing as mandated in the ACI 318-08 Building Code. The same amount of longitudinal reinforcement (1.0% of the gross cross sectional area), was also used for all the GFRP RC specimens. Two spacing options were studied for the GFRP ties, which had the same bar size as for the steel counterpart: the larger spacing of 305 mm on-center was defined to prevent buckling of the longitudinal bars, whereas the smaller spacing of 76 mm was selected as the minimum practical spacing.

The following conclusions were drawn.

- The behavior of RC columns internally reinforced with GFRP bars is very similar to that of steel RC columns when the longitudinal reinforcement ratio is 1.0%. The use of longitudinal GFRP bars is not detrimental to axial capacity nor deformability.

- The smaller (305 mm) spacing of the GFRP ties does not contribute to increasing the ultimate capacity, and strongly influences the failure mode by delaying the buckling of the longitudinal bars, propagation of unstable cracks, and crushing of the concrete core.

- The use of good quality GFRP bars with different surface preparation, as supplied by different manufacturers, does not affect performance.

- Further research is needed to study the response under eccentric loads, and to devise rigorous safety factors for design.

(a) Test Set-up.

(b) Ruptured Tie and Bulged Longitudinal Bar.

Figure 2. Testing of Full-Scale GFRP RC Columns.

The role of cooperative research continues to be crucial in identifying and shedding light on existing gaps, in developing new solutions, and in guiding promising technologies towards exploitation. In the summer of 2009, pursuant to this vision, UM and NCSU joined forces with West Virginia University and Rutgers University to create a larger NSF I/UCRC named "Center for Integration of Composites into Infrastructure" (CICI).

News from ACI Committee 440

ACI Committee 440 recently underwent a change in leadership, with Carol Shield replacing John Busel as Chair. John is Director, Composites Growth Initiative for the American Composites Manufacturers Association. In this role, he directs the development of codes and standards associated with the use of FRP composites, while representing the composites industry to government agencies, academic institutions and trade/professional organizations. He has over 26 years experience in the FRP composites industry with core responsibilities in design, tooling, and manufacturing of composites, in addition to market development for the composites industry for the past 14 years. John served ACI Committee 440 for the last 6 years as Chair and the previous 5½ years as secretary. Under John's leadership, the committee made great progress. Some of the highlights of his tenure as Chair include the publishing of the first two committee specifications: ACI440.5-08 *Specification for Construction with Fiber-Reinforced Polymer Reinforcing Bars*, and ACI440.6-08 *Specification for Carbon and Glass Fiber-Reinforced Polymer Bar Materials for Concrete Reinforcement*, the creation of two new documents: ACI440.3R-04 *Guide Test Methods for Fiber-Reinforced Polymers (FRPs) for Reinforcing or Strengthening Concrete Structures* and ACI440.4R-04 *Prestressing Concrete Structures with FRP Tendons* and the updating of three other committee documents: ACI440.1R-06 *Guide for the Design and Construction of Structural Concrete Reinforced with FRP Bars*, ACI440R-07 *Report on Fiber-Reinforced Polymer (FRP) Reinforcement for Concrete Structures*, and ACI440.2R-08 *Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures*.

John Busel

In addition, under John's leadership, the committee organized six conferences or sessions, including the 7th International Symposium on Fiber Reinforced Polymer Reinforcement for Concrete Structures (FRPRCS-7). John was rewarded with the Delmar Bloem Distinguished Service Award from ACI in recognition of his contributions as Chair of ACI Committee 440.

John is being replaced by Carol Shield, Professor of Civil Engineering at the University of Minnesota. Carol has spent the last six years as Secretary of ACI Committee 440. Will Gold, Senior Engineering Product Specialist at BASF has taken over the post of Secretary. The new committee leadership plans to continue improving the Committee design guides to keep them at state-of-the-practice, including the publication of a design guide for the repair of masonry structures. The committee also intends to be significant contributors to ACI's new repair code, as well as educate the practitioners and public about how composites support concrete sustainability.

Calendar of Events

2009

2nd Asia-Pacific Conference on FRP in Structures (APFIS 2009), Seoul, Korea, 9-11 December 2009.
www.apfis2009.hanyang.ac.kr

2010

Composites 2010 – The Composite Exhibition and Convention, Mandalay Bay, Las Vegas, USA, 9-11 February 2010.
www.acmashow.org

3rd International Workshop on Civil Structural Health Monitoring: Conservation of Heritage Structures Using FRM and SHM (CSHM 3), Ottawa-Gatineau, Canada, 11-13 August 2010.
www.ishmii.org/CSHM3/CSHM3home.html

5th International Conference on FRP Composites in Civil Engineering (CICE 2010), Beijing, China, 27-29 September 2010.
http://www.cice2010.net

2011

10th International Symposium on Fiber Reinforced Polymer Reinforcement for Concrete Structures (FRPRCS-10), Tampa, USA, 3-7 April 2011.

4th International Conference on Durability and Sustainability of FRP Composites for Construction (CDCC 2011), Quebec City, Canada, 20-22 July 2011.
www.civil.usherbrooke.ca/cdcc2011

Announcements

Abstracts for the topic **'FRP Structures'** are invited for 'Structural Engineering International' SEI 4/2010 (November). Fiber reinforced polymer (FRP) composites have been referred to as the new generation of construction materials and their application in the construction, repair and strengthening of civil infrastructure has seen a rapid increase over the past two decades. In light of the ever increasing importance FRP composites in the field of structural engineering, a special SEI issue on FRP structures is planned. Coverage includes external strengthening, seismic retrofitting, all-FRP structures, durability, case studies, codes, etc. Please submit your abstract of 300 words and 1-2 figures to the Publications Manager: bose@iabse.org. **Submission Deadline: January 5, 2010**.

The proceedings of the US-Japan Workshop on **Life Cycle Assessment of Sustainable Infrastructure Materials** are now available at
www.hucc.hokudai.ac.jp/~m16120/workshop2009/.

IIFC Photos – FRPRCS-9

Renata Kotynia taking in the sites of Sydney.

Canadians braving the Sydney Harbour Bridge climb.

IIFC members and families enjoying the Sydney Harbour Cruise.

FRPRCS-9 delegates getting ready for a night on the town in Sydney.

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International Institute for FRP in Construction

Application for Membership

Mail to: IIFC Administrative Center • c/o University of Manitoba
Agricultural and Civil Engineering Building • A250-96 Dafoe Road
Winnipeg, Manitoba, R3T 2N2, Canada
Tel: 1 (204) 474-8506 • Fax: 1 (204) 474-7519
Email: iifc@iifc-hq.org • Website: www.IIFC-hq.org

Title: _____ Gender: _____ Date of Birth (dd/mm/yy): ____/____/____

Surname: _____ First/middle names: _____

EMPLOYER/COMPANY: _____

CORRESPONDENCE ADDRESS: _____

_____

Tel. _____ Fax. _____ Email. _____

EDUCATION / EXPERIENCE - PLEASE ATTACH A CURRENT RESUME OR CV

I/we wish to join the International Institute for FRP in Construction (IIFC) as a (please tick one box)

☐ Fellow (US$100) ☐ Member (US$100) ☐ Associate Member (US$50) ☐ Student Member (US$25)

☐ Collective Member* (US$750) ☐ Patron Member (US$1500)

* If applying for a Collective Membership, please nominate two representatives to receive the privileges:

Representative A Surname: _____ First/middle names: _____

Title: _____ Gender: _____ Date of Birth (dd/mm/yy): ____/____/____

Tel. _____ Fax. _____ Email. _____

Representative B Surname: _____ First/middle names: _____

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METHOD OF PAYMENT (Payable in US Funds)

Cheques and money orders to be made payable to "IIFC"

☐ Check / Money Order

☐ Visa ☐ Mastercard

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Credit Card No. *Expiration Date*

_____

Name on Credit Card

_____

Signature of Cardholder

For Office Use Only

Date of Receipt: _____
Application Outcome: _____
Membership Number: _____
Date of Approval: _____
Transaction Date: _____
Amount: _____
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By submitting this application you agree to share your contact information provided with fellow IIFC members and any conference / organization associated with IIFC.