

FRP INTERNATIONAL

the official newsletter of the International Institute for FRP in Construction

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[WWW.IIFC.ORG](http://www.iifc.org) is here!

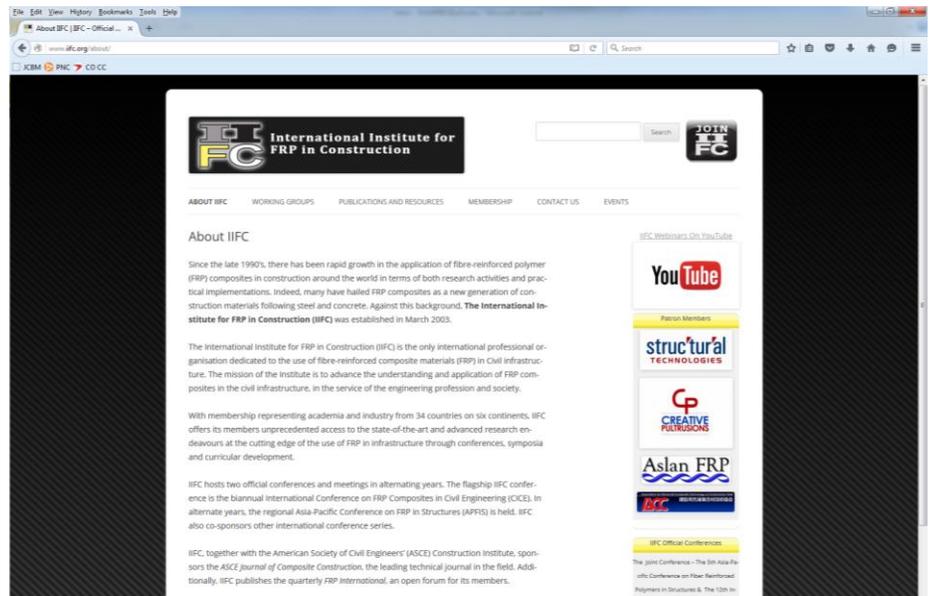
Following considerable revision, much simplification and absolutely no fanfare, IIFC has launched its new website and new web address:

www.iifc.org

The old web address (www.iifc-hq.org) will continue to redirect traffic to the new address from some time.

Features of the new IIFC web presence include:

- IIFC Webinars on YouTube (see update on page 2)
- Fully searchable database of archived IIFC conference proceedings using the search bar on the landing page
- Interactive calendar of events
- Optimised for viewing on mobile devices
- Google Analytics plug-in to help us respond to member needs



Within a few months, IIFC will also launch an ecommerce link at which members may securely pay their dues and register for upcoming conferences, update their profiles, and search the membership directory.

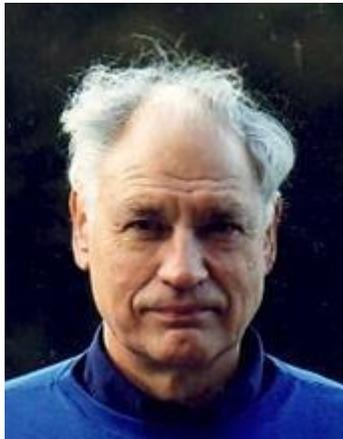
More features will follow. If you have ideas or requests for features, please contact the IIFC webmaster Dr. Peng Feng at fengpeng@tsinghua.edu.cn.

The IIFC ExCOM thanks Prof. Amir Fam, Ms Debbie Ritchie, Prof. Scott Smith, Dr. Peng Feng and Dr. Kent Harries for their guiding the website redesign and launch. The technical work was conducted by an independent contractor, Mr. Frank Kremm.

In Memoriam

Ralejs Teffers, 1933-2015

It is with great sadness that we report the passing, at the age of 81, of Ralejs Teffers, Professor Emeritus in the Division of Structural Engineering, in the Concrete Structures research group, at Chalmers University of Technology in Göteborg, Sweden.



Born in Rezekne, Latvia in 1933, Professor Chalmers left Latvia in 1944 for Sweden. He obtained his MSc in 1958, his, Tekn Lic degree in 1966 and Tekn Dr in 1973, all from Chalmers where, he was appointed Docent in 1973. Prof. Teffers was appointed Associate Professor in 1969, Professor in 1995 and Emeritus Professor in 2001. Professor Teffers was honoured with a Dr. ing. *h.c.* by the Latvian Academy of Sciences in 1996 and was made an Honorary Member for life of the *fédération internationale du béton (fib)* in 2002.

Author of over 280 publications, Prof. Teffers' primary areas of research included bond between reinforcement and concrete, fatigue of concrete and fiber composites (FRP) as reinforcement in concrete. He was a member of the EU TMR Network ConFibreCrete "Development of guidelines for the design of concrete structures, reinforced or strengthened with advanced composites" from 1997-2002. As a member of fib TG9.3/T5.1, Prof. Teffers was responsible for the introduction of FRP in fib *Bulletin 10 Bond of reinforcement in concrete*, which fifteen years ago was the very first fib publication to include FRP reinforcement.

We will remember Ralejs for his lasting contribution to our field, his enthusiasm in embracing new challenges and his gentle and inspiring personality.

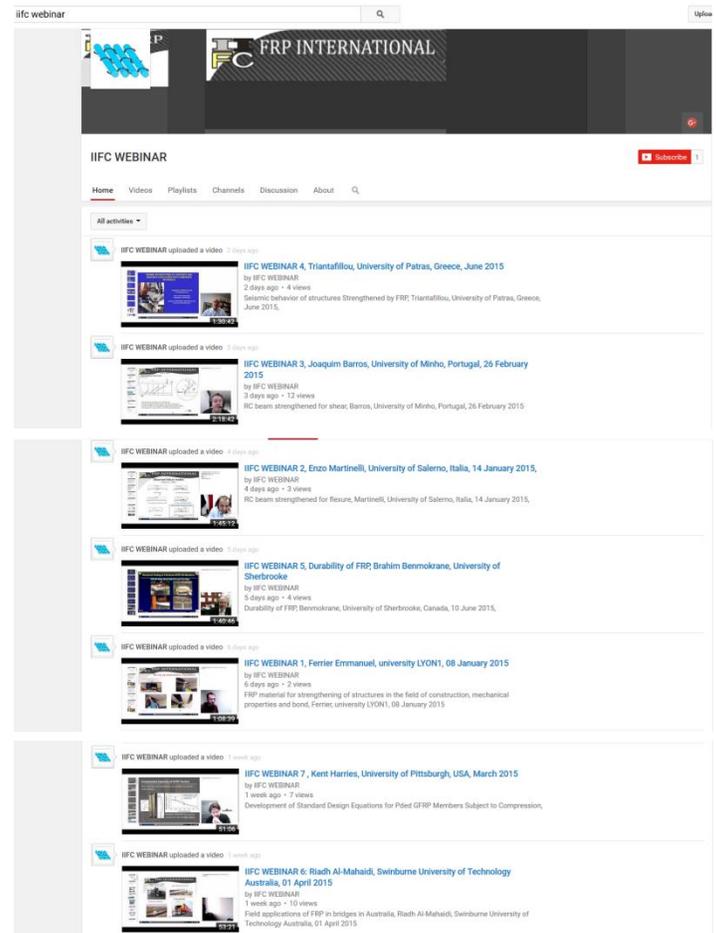
[includes material from brief reports by Stijn Matthys and Maurizio Guadagnini]

IIFC Webinar Update

Emmanuel Ferrier, Université Lyon 1, France
emmanuel.ferrier@univ-lyon1.fr

IIFC webinars are an excellent opportunity for students and researchers to get an update on focused topics in FRP in construction. These webinars are **FREE** and are now available on YouTube:

IIFC WEBINAR Channel:
 <https://www.youtube.com/channel/UCYmC-3GUlad2P1GdKkZVwkg>



Subscribe to the Channel for free and be informed of new webinars all along the year.

If you would like to volunteer to give a webinar, please contact Prof. Ferrier.

...if anyone is counting...

Since being announced in the October 2015 *FRP International*, The IIFC Webinar YouTube page has had 227 views from all over the world.

Conference Announcement

8th International Conference on Fibre-Reinforced Polymer (FRP) Composites in Civil Engineering (CICE 2016), 14-16 December 2016, Hong Kong, China

Prof. Jin-Guang Teng and Dr. Jian-Guo Dai, The Hong Kong Polytechnic University, Hong Kong, China

Conference co-chairs

Marking the 15th anniversary of the CICE conference series, the 8th International Conference on Fibre-Reinforced Polymer (FRP) Composites in Civil Engineering (CICE 2016) will be held in Hong Kong, China on 14-16 December 2016. Since its launch in 2001 in Hong Kong, the CICE conference series has been held in Adelaide (2004), Miami (2006), Zurich (2008), Beijing (2010), Rome (2012) and Vancouver (2014). The 2016 conference will be jointly hosted by the Department of Civil and Environmental Engineering (CEE) and the Research Institute for Sustainable Urban Development (RISUD) of The Hong Kong Polytechnic University. Following the well-established tradition of the series, CICE 2016 will provide an international forum for all concerned with the application of FRP composites in civil engineering to exchange recent advances in both research and practice, and to strengthen international collaboration for the future development of the field.

Information on the conference may be found at <http://www.polyu.edu.hk/risud/CICE2016/index.html>

Conference Topics

The structural use of FRP composites in civil engineering has increased tremendously over the past two decades, primarily for the strengthening of existing structures but also increasingly for the construction of new structures. The following list of topics is not exhaustive, and all papers falling within the general scope of the conference will be considered:

- Materials and products
- Bond behaviour
- Confinement
- Strengthening of concrete, steel, masonry and timber structures
- Seismic retrofit of structures
- Concrete structures reinforced or pre-stressed with FRP
- Concrete filled FRP tubular members
- Hybrid structures of FRP and other materials

- All FRP structures
- Smart FRP structures
- Inspection and quality assurance
- Durability
- Life-cycle performance
- Design codes/guidelines
- Practical applications

Abstract Submission

Authors are invited to email abstracts of around 150 words by 1 January 2016 to: cice2016@polyu.edu.hk. Abstract acceptance is anticipated 1 February 2016 with full papers due 1 May 2016.

Mini-Symposia and Special Sessions

Interested researchers are invited to submit proposals for mini-symposia on topics of special interest for approval by the International Organizing Committee.



About Hong Kong

Hong Kong is located within the Pearl River Delta region, which is one of the most developed regions in China. Hong Kong is easily accessible by all means of transport. The international airport of Hong Kong is only 35 minutes away by taxi from downtown Kowloon where the campus of The Hong Kong Polytechnic University is located. Both Chinese and English are official languages in Hong Kong. More information about Hong Kong can be found at the following web site: <http://www.discoverhongkong.com/uk/index.jsp>

6th Asia-Pacific Conference on FRP in Structures (APFIS 2017)

The IIFC is pleased to announce that APFIS 2017 will be held 19-21 July 2017 in Singapore. The conference will be organised by MCC Singapore and the FRP Application Committee of CCES (Chinese Civil Engineering Society).

More information will follow in subsequent newsletters.



Conference Report

The 5th Asia-Pacific Conference on Fiber Reinforced Polymers in Structures (APFIS-2015)

and

Joint Conference of The 12th International Symposium on Fiber Reinforced Polymers for Reinforced Concrete Structures (FRPRCS-12)

Nanjing, 14-16 December 2015

Prof Zhishen Wu, Prof Gang Wu, and Prof Xin Wang, Co-Chairs

International Institute for Urban Systems Engineering and the School of Civil Engineering Southeast University, Nanjing, China
xinwang@seu.edu.cn

On behalf of the local organizing committee we would like to thank all those who helped make this conference a wonderful success, especially the authors, presenters and attendees. We would also like to thank the support of the International Institute for FRP in Construction (IIFC) and the members of the International Steering Committee of the Fiber Reinforced Polymers for Reinforced Concrete Structures (FRPRCS) conference series. It is worth noting that this was the first time the FRPRCS and the APFIS conference series were jointly organized.

Technical Program

The three day conference was held at the Jiangsu Conference Center, a pseudo-classic garden hotel in Nanjing City. In total, there were over 170 delegates

representing 25 countries. The technical sessions included 6 keynote lectures:

Prof Thanasis Triantafillou, University of Patras, Greece – *Seismic Retrofitting of Concrete and Masonry Structures with Textile Reinforced Mortar Jackets*

Prof Charles Bakis, The Pennsylvania State University, USA – *Epoxy and its role in the long-term performance of bonded FRP material systems*

Prof Tamon Ueda, Hokkaido University, Japan – *General design approach for ultimate deformations of members with FRP strengthening*

Prof Yufei Wu, RMIT University, Australia – *Development of constitutive models for FRP confined concrete structures*

Prof Rudolf Seracino, North Carolina State University, USA – *Inspection and monitoring of bond defects, debonding, and environmental degradation of externally bonded CFRP-to-concrete systems*

Prof Zhishen Wu, Southeast University, China – *Performance-based design of civil structures with advanced FRPs*



There were an additional 154 presentations in 23 sessions covering 13 topics including: material characterization; new materials/systems/techniques; durability and long-term performance; bond behaviour; confinement; seismic strengthening; capacity strengthening of concrete, metallic, timber and masonry structures; advanced numerical models and simulations; structures reinforced or prestressed with FRP systems; hybrid structures; all FPR structures; field applications and case studies; and high performance, longevity and sustainability of structures with FRP. The presentations were intellectually stimulating and resulted in much technical discussion.



Prof. Z.S. Wu at Opening Ceremony



Lively technical discussion from the floor

IIFC Best Paper Awards

Two best paper awards in the category of repair applications were selected from all of the submitted papers and announced at the conference. The following papers and authors were recognized and will be reprinted in *FRP International* in the coming months:

Small diameter CFRP strands for strengthening steel bridge girders

H. Kazem, S. Rizkalla, R. Seracino and A. Kobayashi

Shear strengthening of cracked RC structures under service loading condition – A case study

T. Imjai and M. Guadagnini

The award review committee was chaired by Prof Scott Smith, Southern Cross University, Australia, and included Dr Kent Harries, University of Pittsburgh, USA (editor of *FRP International*) and Prof Charles Bakis, The Pennsylvania State University, USA (editor of the *ASCE Journal of Composites for Construction*). The hard work of the committee is greatly appreciated.

Special arrangements have been made with the *International Journal of Sustainable Materials and Structural Systems* to publish a select group of papers developed from those presented at the conference in a Special Issue. Authors will be notified to submit substantially expanded papers for review and possible publication in this peer reviewed publication.

Social Program

The conference program included ample opportunity for networking, culminating in the official banquet at the end of the second day at the Laomendong Jinling Drama Workshop, in the design of a quaint Chinese opera house. In addition to 14 courses of traditional Nanjing cuisines, delegates were entertained with a variety of traditional shows including Peking Opera, Kunqu Opera and Baiju.



...the usual suspects on stage

Following the closing ceremony, delegates were treated to an interesting technical tour while taking in the sites of Nanjing, including the Nanjing Olympic Center home of the 2014 Youth Olympic Games, the Nanjing Eye foot bridge crossing the Yangtze River, and the National and Local Unified Engineering Research Center for Basalt Fiber Production and Application Technology where delegates were able to observe the production of basalt fibers.



Nanjing Olympic Center



Nanjing Eye

Conference Acknowledgements

We would like to thank the many staff and students at Southeast University who volunteered and provided much support to the organization and success of this conference, especially the secretary Mr. Jianzhe Shi and Ms. Fang Fang. The conference could not have been organized without them. It is also important to acknowledge to contribution of the members of the International Scientific Committee for their thorough review of all papers and maintaining a high technical standard. The non-financial sponsorship and collaboration of the following organizations are appreciated: American Concrete Institute (ACI); International Society for Structural Health Monitoring of Intelligent Infrastructure (ISHMII); China Civil Engineering Society (CCES); Chinese Society for Composite Materials (CSCM); China Chemical Fibers Association (CCFA); Japan Concrete Institute (JCI); and Japan Society of Civil Engineers (JSCE). The financial support from Jiangsu Green Materials Valley New Material T&D Co., Ltd (GMV), China, TEIJIN Ltd, Japan and The Japan Basalt Fiber Group are also appreciated.



New Publication **ACI SP-301 Modeling of FRP Strengthening Techniques in Concrete Infrastructure**

Edited by: Riadh Al-Mahaidi,
Swinburne University of
Technology, Australia

This CD contains 8 papers that were presented at a session sponsored by Joint ACI-ASCE technical committee 447 at the ACI Fall Convention, October 2011 in Cincinnati, Ohio. The papers cover the modeling for strengthening for flexure, shear, torsion, and confinement of concrete. Where applicable, the papers cover comparisons of modeling results with experimental tests performed around the world.

Document may be ordered at:

http://www.concrete.org/store/productdetail.aspx?ItemID=SP301CD&Format=OPTICAL_DISK

Technical Report

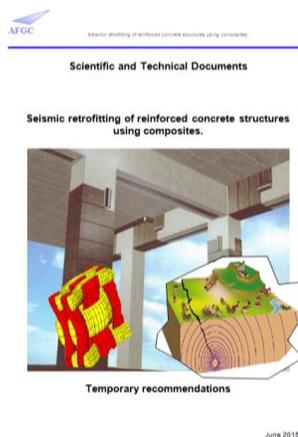
Seismic retrofitting of reinforced concrete structures using composites - Scientific and Technical Documents

Emmanuel Ferrier and Laurent Michel, Université Lyon 1, France

Marc Quiertant, Ifsttar, France

emmanuel.ferrier@univ-lyon1.fr

The French Civil Engineering Association (AFGC) was created in 1998 following the merger of the AFPC and AFREM. It is a place for exchanges between engineers and researchers concerned with civil engineering activities. The association offers its members numerous meetings during conferences, technical and scientific events and organises tours of great achievements. It sets up Working Groups (WGs) that host researchers, academics and engineers to take stock of the state-of-the-art on important topics in civil engineering and to explore areas of innovation. These WGs contribute to the development of technical documents published by the AFGC, which enjoy a broad consensus at the national level and are recognized internationally. The association is a link to French engineers and researchers working abroad and wishing to follow the evolution of French techniques and to maintain contact with the French civil engineering. In 2012 Profs Ferrier and Quiertant proposed to open a WG on seismic retrofitting. The technical secretary of the WG was Prof. Michel. After three years of work the group proposed a 130 page document pages on seismic retrofitting using fibre-reinforced polymers (FRP) materials: *Renforcement parasismiques de structures en béton armé par matériaux composites - Recommandations provisoires* or *Seismic retrofitting of reinforced concrete structures using composites*.



In various countries, including France, the regulations concerning buildings and civil engineering structures contain recommendations aimed at achieving acceptable seismic performance, that is, the structures designed must withstand minor earthquakes without damage, moderate earthquakes with minimum non-structural damage and major earthquakes without collapse. The seismic recommendations proposed in building regulations have thus been updated over the years to achieve this aim.

In France, the new earthquake zone map and changes in the regulations resulting from the adoption of Eurocode 8 (EC 8) have contributed to defining the performance objectives of new structures. For existing structures, at least in certain cases, reinforcement is required to reduce seismic risks. This notion is introduced in Eurocode 8 Part 3 and in the implementing decrees and orders. Seismic retrofitting can therefore be either voluntary or compulsory.

Based on the current construction rate, it would take one hundred years to completely replace France's housing stock. Seismic retrofitting of existing structures therefore appears necessary to ensure the required safety levels of building constructions and the security of people and property. This document presents recommendations for the seismic retrofitting of concrete structures using FRP. Research results have been used to draw up recommendations and design rules in the case of quasi-static loading, taking serviceability limit state (SLS) and ultimate limit state (ULS) conditions into consideration.

The aim of this document is to provide in-depth information on the use of FRP for the seismic retrofitting of existing structures. The field of application of these recommendations covers the design of reinforced concrete components that need to be repaired or reinforced using composite materials (based on carbon, glass and/or aramid fibres). The document proposes five chapters with one chapter devoted to case studies and one to design equations with examples. The final chapter covers detailing for seismic retrofitting. The design methods presented refer to the Eurocode 8 regulations and lie within their framework. The structural component on which the FRP is to be installed must be sound and free of any pathologies that could reduce the capacity of its surface to transfer forces to the composite in the long term. It is therefore essential to assess the existing condition of the concrete.



Two New ASTM Standards for Pultruded FRP Composites

ASTM D7992 / D7992M - 15

Standard Practice for Elevated Temperature and Moisture Conditioning of Pultruded Fiber Reinforced Polymer (FRP) Composites Used in Structural Designs

Significance and Use. The elevated temperature and moisture conditioning procedures prescribed in this practice are designed to provide a standard procedure to be used to evaluate and compare the effect of elevated temperature and moisture conditioning under controlled laboratory conditions on pultruded FRP composites to be used in structural design applications. The conditioning procedures prescribed in this practice are designed to obtain reproducible results to compare and evaluate these materials but are not intended to produce equilibrium conditions or actual service conditions for these materials.

Scope. In general, it is feasible that the mechanical properties of FRP composites will be affected by environmental conditions such as exposure to moisture at elevated temperatures. In order to make reliable comparisons between different materials under elevated temperature and moisture environmental conditions, it is necessary to standardize the elevated temperature and moisture conditions to which specimens of these materials are subjected prior to and during testing. This practice defines procedures for elevated temperature and moisture conditioning of pultruded FRP composites intended for use in structural design applications. The conditioning medium representing elevated temperature and moisture exposure described in this standard practice is distilled water maintained at $37.8 \pm 1.5^\circ\text{C}$ ($100 \pm 3^\circ\text{F}$) for 1000 hours.

<http://www.astm.org/Standards/D7992.htm?A>

ASTM D7792 / D7792M - 15

Standard Practice for Freeze/Thaw Conditioning of Pultruded Fiber Reinforced Polymer (FRP) Composites Used in Structural Designs

Significance and Use. The freeze/thaw conditioning procedures prescribed in this practice are designed to provide a standard procedure to be used to evaluate and compare the effect of 100 freeze/thaw cycles under controlled laboratory conditions on pultruded FRP composites to be used in structural design applications. The conditioning procedures prescribed in this practice are designed to obtain reproducible results to compare and evaluate these materials but are not intended to produce equilibrium conditions or actual service conditions for these materials.

Scope. In general, it is feasible that the mechanical properties of FRP composites will be affected by environmental conditions such as freeze/thaw cycling. In order to make reliable comparisons between different materials under freeze/thaw environmental conditions, it is necessary to standardize the freeze/thaw conditions to which specimens of these materials are subjected prior to and during testing. This practice defines procedures for freeze/thaw conditioning of pultruded FRP composites intended for use in structural design applications.

<http://www.astm.org/Standards/D7792.htm?A>

[thanks to John Busel for bringing these to our attention]



ASCE Journal of Composites for Construction

The American Society of Civil Engineers (ASCE) Journal of Composites for Construction (JCC) is published with the support of IIFC. As a service to IIFC members and through an agreement with ASCE, *FRP International* provides an index of ASCE JCC. The ASCE JCC may be found at the following website:

<http://ascelibrary.org/cco/>

ASCE JCC subscribers and those with institutional access are able to obtain full text versions of all papers. Preview articles are also available at this site. Papers may be submitted to ASCE JCC through the following link:

<http://www.editorialmanager.com/jrncceng/>

ASCE Journal of Composites for Construction

Volume 19, No. 6. December 2015.

Bonding Behavior of Wet-Bonded GFRP-Concrete Interface

Lei Zhang, Wen-Wei Wang, Kent A. Harries, and Jun Tian

Depth Detection of Bond Defects in Multilayered Externally Bonded CFRP-to-Concrete Using Pulse Phase Thermography

Nehemiah J. Mabry, Kara J. Peters, and Rudolf Seracino

Compressive Behavior of Prestressed High-Strength Concrete-Filled Aramid FRP Tube Columns: Experimental Observations

Thomas Vincent and Togay Ozbakkaloglu

Axial Stress-Strain Model of CFRP-Confined Concrete under Monotonic and Cyclic Loading

Najwa F. Hany, Elie G. Hantouche, and Mohamed H. Harajli

Flexural Behavior of Sandwich Panels with Bio-FRP Skins Made of Flax Fibers and Epoxidized Pine-Oil Resin

Kenneth Mak, Amir Fam, and Colin MacDougall

Innovative CFRP-Prestressing System for Strengthening Metallic Structures

Elyas Ghafoori and Masoud Motavalli

Strengthening of the Net Section of Steel Elements under Tensile Loads with Bonded CFRP Strips

D. M. Penagos-Sánchez, F. Légeron, M. Demers, and S. Langlois

Characterization and Comparative Durability Study of Glass/Vinylester, Basalt/Vinylester, and Basalt/Epoxy FRP Bars

Brahim Benmokrane, Fareed Elgabbas, Ehab A. Ahmed, and Patrice Cousin

Study of GFRP Steel Buckling Restraint Braces

Kailai Deng, Peng Pan, Xin Nie, Xiaoguang Xu, Peng Feng, and Lieping Ye

A Novel Anchor Method for Multitendon FRP Cable: Manufacturing and Experimental Study

Xin Wang, Pengcheng Xu, Zhishen Wu, and Jianzhe Shi

Experimental Investigation of the Hysteretic Performance of Dual-Tube Self-Centering Buckling-Restrained Braces with Composite Tendons

Z. Zhou, Q. Xie, X. C. Lei, X. T. He, and S. P. Meng

Dynamic Bond Stress-Slip Relationship between Basalt FRP Sheet and Concrete under Initial Static Loading

Dejian Shen, Yong Ji, Fenfang Yin, and Jinyang Zhang

Simple Method for Predicting Temperatures in Insulated, FRP-Strengthened RC Members Exposed to a Standard Fire

W. Y. Gao, Jian-Guo Dai, and J. G. Teng

Simulating the Behavior of FRP-Confined Cylinders Using the Shear-Friction Mechanism

P. Visintin, Y. Chen, and D. J. Oehlers

Optimized FRP Wrapping Schemes for Circular Concrete Columns under Axial Compression

Thong M. Pham, Muhammad N. S. Hadi, and Jim Youssef

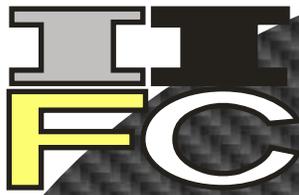
Experimental Study of the Seismic Behavior of Predamaged Reinforced-Concrete Columns Retrofitted with Basalt Fiber-Reinforced Polymer

Gao Ma and Hui Li

IIFC Conference Proceedings Indexed



The IIFC is pleased to announce that Elsevier is now indexing post-2012 IIFC conference proceedings in the Scopus and Compendex indices.



FRP INTERNATIONAL

the official newsletter of the International Institute for FRP in Construction

FRP International needs your input...

As IIFC grows, we seek to expand the utility and reach of *FRP International*. The newsletter will continue to report the activities of IIFC and focus on IIFC-sponsored conferences and meetings. Nevertheless, we also solicit short articles of all kinds: research or research-in-progress reports and letters, case studies, field applications, book reviews or anything that might interest the IIFC membership. Articles will generally run about 1000 words and be well-illustrated. Submissions may be sent directly to the editor. Additionally, please utilize *FRP International* as a forum to announce items of interest to the membership. Announcements of **upcoming conferences, innovative research or products** and **abstracts from newly-published PhD dissertations** are particularly encouraged. All announcements are duplicated on the IIFC website (www.iifc-hq.org) and all issues of the *FRP International* are also available in the archive at this site.

FRP International is yours, the IIFC membership's forum. The newsletter will only be as useful and interesting as you help to make it. So, again, please become an *FRP International* author.

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