FRP INTERNATIONAL

The official newsletter of the International Institute for FRP in Construction

VOL. 22, NO. 3, OCTOBER 2025

Table of Contents

MESSAGES

Message from the President

Dear Colleagues, it is with deep gratitude and renewed enthusiasm that I write to you as I begin a second term as President of the International Institute for FRP in Construction (IIFC). I am truly honored by the trust you have placed in me and in our Executive Committee members, both renewed and new, to continue guiding our institute for the 2025–2027 term.

Just a few months ago, we gathered in Lisbon for the 12th International Conference on FRP Composites in Civil Engineering (CICE 2025). With more than 420 delegates from 38 countries, the conference was a resounding success and a powerful testament to the global strength and growing impact of our community. On behalf of IIFC, I extend heartfelt thanks to our hosts at the University of Lisbon and to Professors João R. Correia, Susana Cabral, and José Sena-Cruz for their outstanding efforts in delivering an event that was both technically rigorous and socially engaging.

CICE 2025 highlighted what makes IIFC unique: it is not only the world's leading platform for sharing knowledge and innovation in FRP, but also a vibrant community that spans continents, cultures, and generations. I was especially inspired by the active participation of young researchers and students, whose creativity and energy are vital to shaping the future of our field.

Over the past two years, IIFC has moved well beyond the recovery phase from the pandemic and is now experiencing a period of remarkable growth and renewal. Our international presence has expanded, our activities have multiplied, and our sense of community has deepened.

This momentum reaffirms the importance of our mission: to advance the understanding, development, and application of FRP composites in the built environment.

Looking ahead, the challenges before us are immense, from climate change to aging infrastructure, but so are the opportunities. FRP composites are uniquely positioned to contribute to solutions aligned with the United Nations Sustainable Development Goals, particularly in advancing sustainability, resilience, and innovation in civil engineering. Whether through retrofitting existing structures, enabling rapid and durable construction, or pioneering new frontiers such as 3D printing and bio-based composites, our field is at the forefront of addressing global engineering challenges.

I would like to acknowledge the dedication of our Executive Committee, Council and Advisory Committee, whose tireless efforts strengthen our institute. I also extend a warm welcome to our newly elected Council members, our new Executive Committee members, and our new Editor of the IIFC Newsletter, Prof. Martin Noel, and I look forward to working with all of you to further build the impact and visibility of IIFC worldwide. I wish to take this opportunity to thank former Newsletter Editor Prof. João R. Correia who led a transformative effort of this Newsletter in the past two years. As we enter this next chapter together, let us continue to build on our successes, embrace new opportunities, and inspire the next generation of leaders in FRP for construction.

Thank you for your trust, your commitment, and your contributions to our shared mission.

Prof. **Amir Fam**
IIFC President

MESSAGES

Message from the Editor

As the new Editor of FRP International, and on behalf of our entire editorial team (José Sena-Cruz, Rebecca Gravina, and Lili Hu), I am very pleased to share this latest edition with you, the IIFC community. Before previewing the content contained in the following pages, I would like to extend my sincere appreciation and gratitude to our former Editor, IIFC Vice-President João Correia. Over the last two years, Professor Correia has elevated this newsletter into a modern, professional, and highly relevant periodical that captures the thriving and diverse world of FRP composites in construction. As a complimentary service of the IIFC Executive Committee, this newsletter aims to connect all of us through timely updates about important events, innovative research, practical case studies, and more. We gladly invite you to submit your ideas for a future issue—simply email any of the regional editors for more information. We look forward to continuing to provide a quality resource for the benefit of all IIFC members.

This issue follows the highly successful 12th International Conference on Fiber-Reinforced Polymer Composites in Civil Engineering (CICE) held in Lisbon, Portugal, from July 14-16, 2025. I am sure that those in attendance—426 participants from 38 countries!—will agree that the event was outstanding, filled with excellent technical sessions and complemented by a wonderful social program. Congratulations to the conference chairs (João Ramôa Correia, Susana Cabral Fonseca, and José Sena-Cruz) and the entire organizing committee! Be sure to read the summary report in the "IIFC News" section of this newsletter, along with related articles describing the awards for Best Paper and Best PhD Thesis that were announced at the conference. Moreover, two new awards were also introduced: the IIFC Outstanding Field Application Award and the Student Benchmark Competition. These excellent initiatives highlight the continued innovation in real-world applications of FRP composites as well as the importance of validating our design tools against experimental test data.

If you happened to miss CICE 2025, be sure to take note of several upcoming opportunities to connect in person. IIFC-supported conferences are premiere venues for engaging with the global FRP community and staying up-to-date in our dynamic field. Next year, IIFC is pleased to invite you to FRPRCS-17 in Girona, Spain, in July, and to APFIS/ISSCI in Beijing, China, in August. Make sure to also save the date for the following year when CICE 2027 will be held in Shanghai, China. Furthermore, we are very excited to officially announce the location of CICE 2029—read the following pages to find out more!

In this issue, you will also get to know Prof. Qingrui Yue from China in our "Meet the People" section. Prof. Yue is a co-chair of the APFIS 2026 conference and one of the early pioneers that introduced FRP composites in China in the 1990s. I am sure you will find it inspiring as he recounts the very early days of FRP adoption and what he considers to be the four stages of growth for CFRP applications in civil engineering.

In "Composites Around the World", we feature a research spotlight on the seismic strengthening of reinforced concrete bridge columns using a SMA-FRP hybrid system. This work, conducted at the University of Calgary, Canada, by Adel Al Ekkawi and Raafat El-Hacha, shows the benefits of an innovative hybrid system to enhance structural resilience. Finally, as always, you will find a list of recent issues from the ASCE Journal of Composites for Construction to keep you updated on the state-of-the-art research conducted by our colleagues around the world.

I hope that this newsletter is a benefit to you—thanks for reading!

Prof. **Martin Noël**
Editor

IIFC NEWS & EVENTS

IIFC Events

Report from CICE 2025, Lisbon, Portugal

The 12th International Conference on Fiber-Reinforced Polymer (FRP) Composites in Civil Engineering (CICE 2025), the official conference of the International Institute for FRP in Construction (IIFC), was hosted by Técnico - University of Lisbon, the National Laboratory for Civil Engineering, and the University of Minho. The event was held at the Técnico main Campus in Lisbon from July 14 to 16.

With 426 participants from 38 countries, supported by 15 sponsors and 8 institutional partners, CICE 2025 served as a premier platform for the global FRP research community and industry professionals to share significant advancements, address pressing challenges, and explore emerging opportunities in the field.

The conference programme featured a rich and diverse range of components, briefly summarized as follows.

Six keynote lectures by reputed speakers, including the recipients of the IIFC Medal and the IIFC Distinguished Young Researcher Award, offered transformative insights and inspiration, namely:

- Performance-based seismic retrofit of reinforced concrete bridges with FRP jackets, by Lesley H. Sneed, University of Illinois Chicago, United States;
- Shear strengthening of RC structures with NSM CFRP composites: Challenges and opportunities, by Joaquim Barros, University of Minho, Portugal;
- FRP composite/steel hybrid structures for offshore renewable energy, by Marko Pavlovic, Delft University of Technology (TUDelft), Netherlands;
- Studies on the behaviour and design theories of concrete structures reinforced or prestressed with FRP rebars, by Weichen Xue, Tongji University, Shanghai, China;
- IIFC Medal: Composites in structural engineering and architecture, by Thomas Keller, Federal Polytechnic School of Lausanne (EPFL), Switzerland;
- IIFC Distinguished Young Researcher Award: Reimagining structural resilience through FRP tendons and FRP bolts, by Thong Pham, University of South Australia, Australia.

Over the three days, a total of 373 presentations were delivered, across 50 regular technical parallel sessions, showcasing the latest research, developments, and field applications of FRP composites in civil engineering.

In addition, 13 special parallel sessions focused on emerging and specialized topics designed to complement and enrich the regular program.

At the end of the first day (July 14), the CICE 2025 Welcome Reception was held at the Técnico Innovation Centre, a splendid venue where natural beauty meets historic architecture, creating an inviting and inspiring atmosphere. The relaxed evening of cocktails and conversation was enlivened by a musical interlude from the talented Dixie Gang, adding a festive touch to the occasion.

On the second day, shortlisted candidates for the IIFC Best PhD Thesis Award presented their work, recognizing excellence in doctoral research (See page 25). On the evening of the second day (July 15), the organizing committee welcomed participants to the CICE 2025 Conference Dinner at the stunning SUD Lisboa Hall. The event began with a welcome cocktail in a breathtaking setting overlooking the Tagus River and the iconic 25 de Abril Bridge, followed by a memorable dinner experience.

Highlights of the evening included:

- A specially curated menu featuring traditional Portuguese cuisine, showcasing the rich culinary heritage of Portugal;
- A live Fado performance by the renowned singer Diamantina - Portugal's most iconic musical genre, known for its deeply emotional and expressive style and recognised by UNESCO since 2011 as Intangible Cultural Heritage of Humanity;
- The IIFC Awards Ceremony, presenting the IIFC Medal, IIFC Distinguished Young Researcher Award, IIFC Fellows, IIFC President's Award, IIFC Best PhD Thesis Award, IIFC Award for Outstanding FRP Field Applications, and Photo Competition Winners;
- And, finally, a closing musical moment with ambient music, providing the perfect backdrop for continued socialising and networking in a vibrant and inspiring atmosphere.

In line with previous CICE conferences, best paper awards were attributed to outstanding papers in two categories, namely "FRP in New Construction", and "FRP Strengthening of Existing Structures". The results are reported on the page 26.

CICE 2025 also featured a Student Benchmark Competition, an exciting initiative that complemented the regular conference program. This competition challenged students to predict, using numerical (FEM) simulations or analytical formulations, the behaviour of reinforced concrete beams strengthened with NSM-CFRP laminates under serviceability and ultimate limit states.

More details are found on the page 27 of this Newsletter.

Finally, to honour and preserve the legacy of past CICE editions, the organizing committee of CICE 2025 created a testimonial: a "torch" made of a composite profile, with bolted stainless steel memorial plates. The testimony was displayed during CICE 2025 and, on the final day of the conference, it was officially handed over to the organizing committee of CICE 2027.

João Ramôa Correia, Susana Cabral Fonseca, José Sena-Cruz

a) Técnico Innovation Center venue

b) Amir Fam (President of IIFC) at Opening Ceremony

c) Opening Ceremony

d) João Ramôa Correia, Susana Cabral-Fonseca, José Sena-Cruz (Co-chairs) at Opening Ceremony

a)

b)

d)

c)

e)

a) Group photo

b) Joaquim Barros – Keynote Speaker

c) Lesley H. Sneed – Keynote Speaker

d) Scott Smith (IIFC Advisory Committee Member) at Opening Ceremony

e) Dixie Gang band at Welcome Reception

a) Marko Pavlovic – Keynote Speaker

b) Weichen Xue – Keynote Speaker

c) Diamantina (Fado performer) at Conference Dinner

d) '25 de Abril' bridge

e) SUD Lisboa Hall

f) Conference Dinner

a)

d)

b)

e)

c)

f)

a)

c)

b)

d)

e)

a) Thomas Keller - IIFC Medal

b) Thong Pham - IIFC Distinguished Young Researcher Award

c) Shahim A. Sheikh - IIFC Fellow

d) Alper Ilki - IIFC Fellow

e) Weichen Xue - IIFC Fellow

a)

d)

b)

e)

f)

c)

a) Joaquim Barros - IIFC Fellow

b) Fabio Matta - IIFC Fellow

c) Rudolf Seracino - IIFC Award for Outstanding FRP Field Applications Winner

d) Tao Yu - The President's Award for excellent services to IIFC

e) Martin Noel - The President's Award for excellent services to IIFC

f) IIFC Student Photo Competition winners

a) Thomas Keller - Keynote Speaker (IIFC Medal)

b) Thong Pham - Keynote Speaker (IIFC Distinguished Young Researcher Award)

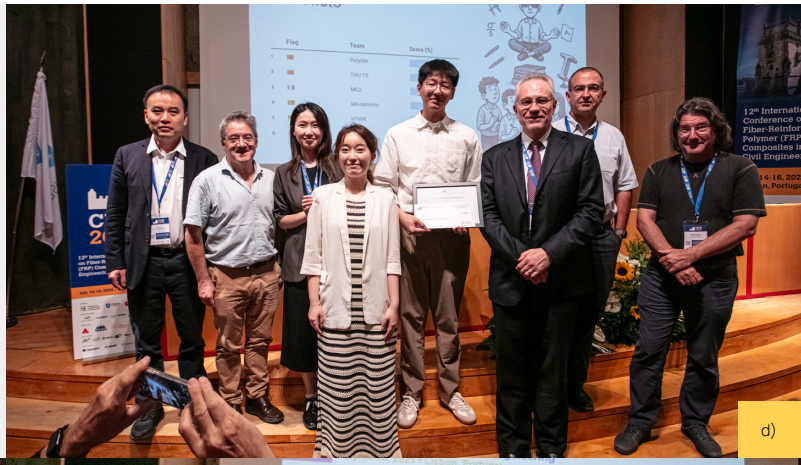
c) Conference venue

d) Shaojie Zhang - Student benchmark competition (Winner)

e) João Ramôa Correia, Susana Cabral-Fonseca, José Sena-Cruz – Certificate of Appreciation Award

f) Organizing Committee of CICE 2025

g) Torch officially handed over to the Organizing Committee of CICE 2027


d)


a)


e)


b)


f)


c)

g)

Invitation to FRPRCS-17, Girona, Spain

17th International Symposium on Fiber-Reinforced Polymer (FRP) Reinforcement for Concrete Structures I Girona, Spain – July 6-8, 2026

The International Institute for FRP in Construction (IIFC) invites abstract submissions for the 17th International Symposium on Fiber-Reinforced Polymer Reinforcement for Concrete Structures (FRPRCS17).

Join leading researchers, engineers, industry practitioners, and students in the beautiful and historic city of Girona, Spain, from July 6 to 8, 2026. FRPRCS17 is the premier platform to present research advancements and exchange ideas on the use of FRP reinforcement in concrete and masonry structures.

Girona, a cultural and historic gem just north of Barcelona, is the perfect backdrop for this event. Renowned for its **medieval old town, Roman walls**, and the colorful houses that line the **Onyar River**, the city's unique blend of history, modernity, and Mediterranean charm, will make for an inspiring setting for technical discussions and networking.

In addition to the general program, the conference will feature 20 Special Sessions designed to spotlight the latest innovations, address key challenges, and showcase real-world applications.

Abstract submissions are **still open**, with an **extended deadline** set for **20 October 2025**.

For more details and to submit your contributions, please visit the official conference website.

WWW.FRPRCS17.COM

Prof. **Cristina Barris**
Conference Chair

Prof. **Eva Oller**
Conference Chair

Prof. **Antoni Cladera**
Conference Chair

Prof. **Maurizio Guadagnini**
Conference Chair

The Organizing Committee of FRPRCS-17 looks forward to welcoming you to Girona on 6-8 July 2026!

Participants will enjoy:

- A conference hosted in a **state-of-the-art venue**, fully equipped for technical sessions, exhibitions, and social events.
- Easy accessibility: Girona is connected by high-speed rail and close to **Barcelona El Prat Airport**, making travel convenient.
- A rich cultural experience: from exploring the **Jewish Quarter**, to walking along the ancient **city walls**, to sampling Catalonia's world-famous cuisine.
- Proximity to the **Costa Brava** coastline and the **Pyrenees Mountains**, offering opportunities for leisure and post-conference excursions.

Special Sessions at FRPRCS17:

- SS01 – Fabric Reinforced Cementitious Mortar (FRCM) Composites for Strengthening and Repair of Reinforced Concrete and Masonry Structures
- SS02 – Circular Construction with FRPs: Durability, Sustainability, and Material Reuse
- SS03 – Advancing FRP in Structural Engineering: A Tribute to the Legacy of Dr. Sami Rizkalla
- SS04 – Applied Artificial Intelligence and Reliability Assessment methods in structural concrete members reinforced with FRP
- SS05 – IIFC TG3: FRP in Extreme Settings
- SS06 – IIFC TG1: Decarbonizing Structures: FRP and FRCM Strategies for Concrete and Masonry
- SS07 – Experimental Tests on FRP Bars: Mechanical, Physical and Bond Properties
- SS08 – Recent Trends and Advances on Seismic Retrofit of RC Structures with Externally Bonded FRP
- SS09 – Smart FRP and TRM composites for self-monitoring applications
- SS10 – Performance of Textile-Reinforced Mortar (TRM) Systems under Medium and High Strain Rates
- SS11 – Advanced FRP Manufacturing Techniques
- SS12 – Fibre Reinforced Cementitious (FRC) composites for Strengthening RC Buildings and Infrastructure
- SS13 – Strengthening Floor Diaphragms with FRP: Experimental Advances and Design Integration
- SS14 – Thermoplastic Composite Rebar for Concrete Reinforcement
- SS15 – IIFC TG2: Challenges and opportunities for end-of-life fibre reinforced polymers in civil engineering
- SS16 – fib-ACI Joint Session on Specification and Design of Concrete Structures with Internal FRP Reinforcement
- SS17 – Shear behavior of concrete members reinforced with organic- and inorganic-matrix composites
- SS18 – Advances in the investigation of bond-dominated problems of organic and inorganic composites: new approaches, unexplored issues, and future challenges
- SS19 – Hybrid Reinforcement Systems (FRP + steel rebars) for Durable and Seismic-Resilient Concrete Structures
- SS20 – Designing Learning: Teaching Methods for Composite FRP Structures.

Invitation to APFIS 2026 & ISSCI 2026

BEIJING, CHINA

Asia-Pacific Conference on FRP in Structures (APFIS) is an international conference series that is open to researchers, academics, students, manufacturers, consultants, contractors and policy makers. Its aim is to showcase research, development and application of fibre-reinforced polymer (FRP) composites in the built environment. The inaugural APFIS conference was held in Hong Kong in 2007, and the most recent one was successfully held in Adelaide, Australia in 2024. The APFIS 2026 is being jointly organized by University of Science and Technology Beijing and Tsinghua University on **2-5 August 2026** in Beijing, China.

The International Summer School on Composites in Infrastructure (ISSCI) is an official activity of the International Centre for Composites in Infrastructure (ICCI) established at University of Wollongong, Australia. The inaugural ISSCI was held at University of Wollongong in 2016. Following the success of the previous summer schools, the 7th ISSCI will be held on the Tsinghua Campus on **5-7 August 2026** preceded by the APFIS 2026. Students participating in the summer school are encouraged to present their research at the young researcher's forum during the conference.

On behalf of the organizing committee, we offer you a very warm welcome to Beijing and we look forward to seeing you at APFIS 2026 and ISSCI 2026.

CHAIRS

Prof. **Qingrui YUE**

Academician of China Academy of Engineering

Dean of Research Institute of Urbanization and Urban Safety

University of Science & Technology Beijing

Director of the Yangtze River Delta Carbon Fibre & Composites Innovation Centre

Prof. **Peng FENG**

Dean of Shui-Mu College

Head of Department of Civil Engineering

Tsinghua University

CALL FOR PAPERS/ABSTRACTS

Full papers within 4 pages or 1-page extended abstracts are welcome for submission.

Please send your full paper(s) and/or 1-page extended abstract(s) to: apfis2026@cribc.com. All submissions will be peer-reviewed and the authors of the accepted submissions will be invited to give a presentation in the conference. The templates for full length paper and 1-page extended abstract can be downloaded from https://apfis2026.scimeeting.cn/en/web/index/32368_2807438. Please note that only full papers are eligible for best paper awards and will be considered for journal special issues.

Topics

The topics of the conference include but not limited to:

- FRP materials
- FRP hybrid/composite structures
- Reinforcement and strengthening
- Durability
- FRP under extreme load conditions
- FRP in offshore/energy/underground engineering
- Field applications and case studies
- Sustainable development of FRP structures
- All FRP structures
- FRP reinforced/strengthened metallic structures

Key Dates

- Early-bird register: 30 April 2026
- Finial submission: 30 June 2026
- Reception: 02 August 2026
- Conference: 03-05 August 2026
- Summer school: 05-07 August 2026

Contacts

Details & registration:
https://apfis2026.scimeeting.cn/en
Enquiry: apfis2026@cribc.com

Invitation to CICE 2027

SHANGHAI, CHINA

CICE 2027 – 13th International Conference on FRP Composites in Civil Engineering, Shanghai, 2027

On behalf of the organizing committee and the International Institute for FRP in Construction (IIFC), I would like to invite you to the 13th International Conference on Fibre-Reinforced Polymer (FRP) Composites in Civil Engineering (CICE 2027) to be held in Shanghai, China on July, 2027.

Since its launch in 2001 in Hong Kong, the CICE conference series has travelled to Adelaide (2004), Miami (2006), Zurich (2008), Beijing (2010), Rome (2012), Vancouver (2014), Hong Kong (2016), Paris (2018), Istanbul (2021), Rio de Janeiro (2023) and Lisbon (2025), and has become one of the most prestigious conferences on FRPs.

CICE 2027 will provide an international forum for scientists, engineers, industrial partners and practitioners to present and discuss the state-of-the-practice, recent advances and future perspectives in the use of FRP composites in civil engineering.

We look forward to welcoming you in Shanghai during CICE 2027.

Conference Chair
Prof. **Xiang-Lin Gu**
Tongji University, China

Announcing CICE 2029 in Niagara Falls, Canada

Announcing CICE 2029
Niagara Falls, Canada

We are pleased to invite you to participate in the **14th International Conference on FRP Composites in Civil Engineering (CICE 2029)**, to be held in the iconic city of **Niagara Falls, Ontario, Canada**, from August 21 to 23, 2029.

CICE is the official conference of the **International Institute for FRP in Construction (IIFC)** and is widely recognized as the premier event for researchers, engineers, practitioners, and industry leaders engaged in the use of FRP composites in civil infrastructure.

ABOUT THE CICE CONFERENCE SERIES

The **Conference on Composites in Civil Engineering (CICE)** is one of the longest-running and most prestigious international conference series dedicated to **Fiber Reinforced Polymer (FRP) composites in construction**. The success of past CICE conferences including **Adelaide (2004), Miami (2006), Zurich (2008), Beijing (2010), Rome (2012), Vancouver (2014), Hong Kong (2016), Paris (2018), Istanbul (2021), Rio de Janeiro (2023), and Lisbon (2025)** has solidified CICE's role as the leading global forum for the exchange of cutting-edge research and real-world applications of FRP technology.

CONFERENCE LOCATION

Niagara Falls is strategically situated at the border of the United States and Canada, offering easy access to major cities such as Toronto and Buffalo.

The city's **natural wonder, the majestic Niagara Falls, provides a truly awe-inspiring backdrop** for the CICE 2029 conference. In addition to being a bucket-list destination, it offers world-class amenities and vibrant cultural experiences.

CONFERENCE CHAIRS

- Professor Raafat EL-HACHA, Conference Chair, University of Calgary, Canada
- Professor John J. MYERS, Conference Honorary Chair, Missouri University of Science and Technology, USA

ORGANIZING COMMITTEE

- Oumaima AWASSA – University of Calgary, Canada
- Mark GREEN – Queen's University, Canada
- Shamim SHEIKH – Toronto Metropolitan University, Canada
- Dawn CHENG – University of California Davis, USA
- Kent HARRIES – University of Pittsburgh, USA
- Lesley SNEED – University of Illinois at Chicago, USA

The **International Scientific Committee** will consist of IIFC Council members and other internationally recognized experts from academia and industry.

CONFERENCE TOPICS

CICE 2029 will cover all aspects of research, development, and application of FRP composites in civil engineering. Topics will include, but are not limited to:

- Reinforcing concrete with FRP reinforcement
- Strengthening of concrete, steel, masonry, and timber structures
- FRP materials and products
- Bond behaviour and interfacial stresses
- Confinement of concrete
- Concrete-filled FRP tubes
- Seismic retrofitting
- Hybrid and all-FRP structures
- Smart FRP structures
- Anchorage systems and connections
- Fire, impact, and blast loading
- Durability and long-term performance
- Inspection, monitoring, and quality assurance
- Life-cycle performance
- Sustainability and recycling
- Bio-based composites
- Fabrication, processing, and testing methods
- Codes and design guidelines
- Field applications and case studies

CONFERENCE VENUE

Sheraton Fallsview Hotel, Niagara Falls, Ontario, Canada

This state-of-the-art venue features over 35,000 square feet of conference space with breathtaking views of Niagara Falls.

It is located in the heart of the tourist district, with indoor walkways connecting to attractions such as Casino Niagara and the Fallsview Indoor Waterpark. A wide range of accommodations is available within walking distance to suit every budget.

TRANSPORTATION

Closest Airport:

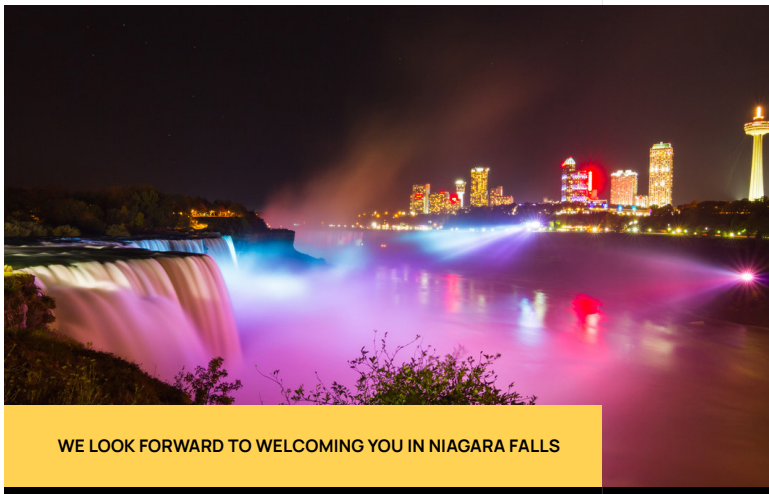
- Niagara Falls International Airport (IAG) – 9.7 km (6.1 miles)
- NFIA Driveway Bus: approx. 1.5 hours
- Taxi: approx. 25 minutes
- Rideshare (Uber/Lyft): approx. 25 minutes

Other Nearby Airports:

- Buffalo Niagara International Airport (BUF), USA – 32 km
  - NFTA Bus: approx. 2 hours
  - Shuttle Niagara:– approx. 11 minutes
- Toronto Pearson International Airport (YYZ), Canada – 79 km
- Billy Bishop Toronto City Airport (YTZ), Canada – 66 km

PRE-CONFERENCE SHORT COURSES (HALF-DAY)

1. Fire Response of FRP-Reinforced and Strengthened Concrete Structures
2. Design of FRP Reinforced Concrete Structures: Canadian vs. American Perspectives



WE LOOK FORWARD TO WELCOMING YOU IN NIAGARA FALLS

WHY ATTEND CICE 2029?

Technical Excellence

- Keynote lectures by global experts
- Presentation sessions, panel discussions, and mini-symposia
- Industry exhibition of the latest FRP products and monitoring technologies
- Daily exhibitions with coffee breaks hosted in the exhibition area

Stunning Location

- Niagara Falls is one of the most awe-inspiring natural wonders of the world
- Enjoy nightly illumination of the Falls, fireworks displays, scenic trails, historic sites, casinos, and cultural experiences

Social Experience

- Welcome reception and conference banquet
- Ample networking opportunities with global colleagues and professionals

CONTACT

All questions regarding the event should be emailed to: CICE2029@gmail.com

On behalf of the Organizing Committee, we extend to you a warm and heartfelt welcome to Niagara Falls. We look forward to your participation and to sharing an inspiring and memorable experience together at CICE 2029.

IIFC NEWS & EVENTS

IIFC Business

IIFC Council Meeting Highlights – July 2025

The International Institute for FRP in Construction (IIFC) held its biennial Council and Executive Committee (ExCom) meeting on 14th July 2025 at the University of Lisbon, Portugal, chaired by Professor Amir Fam and hosted in the Civil Engineering Building of the Technical University of Lisbon Portugal. The meeting brought together current IIFC Council and ExCom members.

Highlights included the selection of **Niagara Falls, Canada** as the host for **CICE 2029**, the election of **six new IIFC Fellows**, and the announcement of the **new Executive Committee**. Financial and membership reports confirmed the Institute's stable growth, while updates on upcoming conferences and by-law amendments signalled exciting developments ahead.

CICE 2029 Host Election

Niagara Falls, Canada selected, Dates: **21–23 August 2029**

FRPRCS-17 Conference Preview

Location: **Girona, Spain**, Dates: **6–8 July 2026**

Executive Committee Updates

New leadership team announced:

- President: Dr. Amir Fam
- Senior VP: Dr. Tao Yu
- Vice-Presidents: Dr. João Correia, Dr. Raafat El-Hacha
- Secretary: Dr. Jovan Tatar
- Treasurer & Newsletter Editor: Dr. Martin Noel
- Webmaster: Dr. Jose Sena Cruz
- Conference Chairs: Dr. Cristina Barris (FRPRCS), Dr. Qian-Qian Yu (CICE 2027)
- Members-at-Large: Dr. Farid Abed, Dr. Rebecca Gravina, Dr. Lili Hu, Dr. Akram Jawdhari, Dr. Chao Wu

Election of New IIFC Fellows

Six distinguished members were elected:

- Professor Joaquim Barros
- Professor Alper Ilki
- Professor Janet Lees
- Professor Fabio Mattas
- Professor Shahim A Sheikh
- Professor Weichen Xue

IIFC Award for Outstanding FRP Field Applications

DESCRIPTION OF THE AWARD

The IIFC Award for Outstanding FRP Field Applications is a new initiative of the Institute aimed at acknowledging and disseminating exemplary field applications involving the use of FRP composites. The award is attributed in the following two categories, concerning the structural use of fiber-reinforced polymer (FRP) composites in civil engineering applications:

- New FRP Structures
- FRP-Strengthening of Existing Structures

The category "New FRP Structures" recognizes outstanding structural design and construction projects of new structures (buildings, bridges or other infrastructure projects), either (i) exclusively made of FRP composites, or (ii) combining FRP composites with components made of other structural materials (in so-called hybrid structures), or (iii) using FRP reinforcement, namely in FRP-reinforced concrete structures.

The category "FRP-Strengthening of Existing Structures" recognizes outstanding structural design and construction projects involving the use of FRP composite systems to strengthen existing structures.

In this first edition, a total of 12 applications were submitted: (i) 9 in the category "New FRP Structures", 6 referring to all-FRP structures, and 3 referring to FRP-reinforced concrete structures; and (ii) 3 in the category "FRP-Strengthening". Given its relevance and quality, a summary of all applications is presented ahead in this article.

The following jury members were appointed by the President of IIFC[1]:

- Jin-Guang Teng
- Riadh Al-Mahaidi
- João R. Correia
- Jan Knippers
- Steven Nolan

Applications were evaluated according to the following criteria: (i) Structural Conceptual Design; (ii) Design and Construction Detailing; (iii) Rational Use of FRP Composites; (iv) Aesthetics; (v) Sustainability.

AWARDED PROJECTS

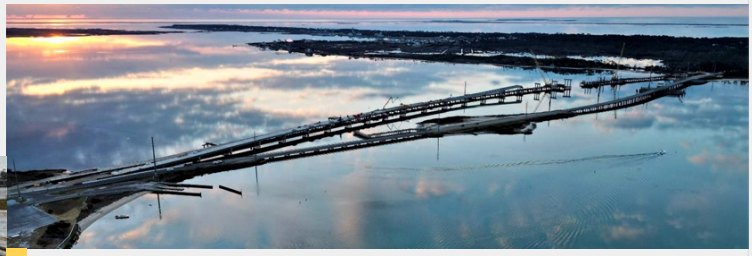
During CICE 2025, at the occasion of the Awards Ceremony, the results of the first edition of the IIFC Award for Outstanding FRP Field Applications 2025 were announced.

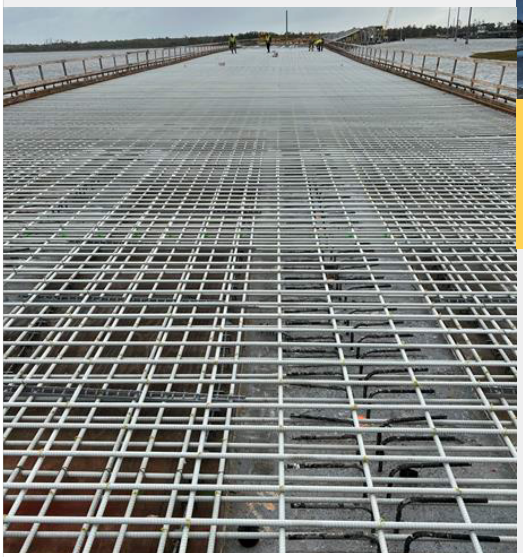
The **winner** of the first edition is the project **"Harkers Island Bridge Replacement"**, submitted in the category "New FRP Structures".

Given the quality of the applications that were received, the jury decided to attribute **honourable mentions** to the following 4 projects:

- **Paradis Bridge** (New FRP Structures)
- **The Oder Bridge** (New FRP Structures)
- **Dewdrops on Lotus Leaves Bridge** (New FRP Structures)
- **World's First Site Application of Post-Tensioned NSM CFRP for Strengthening an Existing Bridge** (FRP Strengthening)

Winner - New FRP Structures: Harkers Island Bridge Replacement





Submitter: Rudolf Seracino
Co-Authors: Trey Carroll, Peter Distefano, Joe Rose

Description: The first concrete bridge in North Carolina entirely reinforced with GFRP reinforcing bars and CFRP prestressing strands. Internal FRP reinforcement was used to create a bridge that will sustain the harsh saltwater environment with no maintenance over a design life of 75 years. The USD$60 million design-bid-build project is 975 m long with 28 spans and features a fixed navigational span. In total, more than 600 linear km of FRP materials were used.

Runner-up - FRP Strengthening: World's First Site Application of Post-Tensioned NSM CFRP for Strengthening an Existing Bridge

Submitter: Yail Jimmy Kim
Co-Authors: Woo-Tai Jung, Moon-Seoung Keum, Jong-Sup Park, Jae-Yoon Kang, Young-Hwan Park, Wonseok Chung

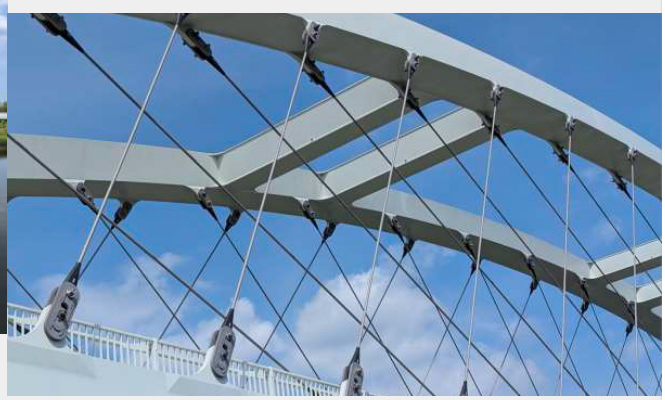
Description: This project presents the world's first site application of post-tensioned near-surface-mounted (NSM) CFRP composites for strengthening an existing bridge. The bridge is supported by four reinforced concrete T-beams and has been in service for over 56 years. After the upgrade, the bridge's capacity increases from 32.4 ton to 43.2 ton to accommodate live load. For research purposes, a dynamic load test is conducted to examine the improved performance of the strengthened bridge.

Runner-up – New FRP Structures: Paradis Bridge

Submitter: Liesbeth Tromp (Haskoning)
Co-Authors: Hakon Tryti Nilssen, Jon Inge Brattekas, Alf Egil Jensen, Oystein Mehle Eide, Stian Persson

Description: The full FRP pedestrian and bicycle bridge Paradis in Bergen, Norway features unique composite architecture with rounded corners. With a 42 m span, it is the largest and most complex of its type using vacuum infusion. The trusswork, made of hybrid laminates of CFRP and GRP, is infused in one step to ensure fiber continuity, resulting in an extremely low-maintenance, durable structure. Prefabricated in Arendal the bridge was transported to Bergen and installed at Paradis lightrail station. Weighing 47 tonnes, the bridge was lifted in place in 1 h, showcasing the benefits of lightweight civil engineering structures.

Runner-up – New FRP Structures: The Oder Bridge



Submitter: Arne Gülzow

Description: The Oder railway bridge between Küstrin-Kietz (Germany) and Kostrzyn (Poland) symbolizes European unity. Originally built in 1926, it was replaced with a sleek white network arch by Knight Architects and Schüßler-Plan. The optimized sbp design features carbon fiber hangers due to their excellent fatigue resistance.

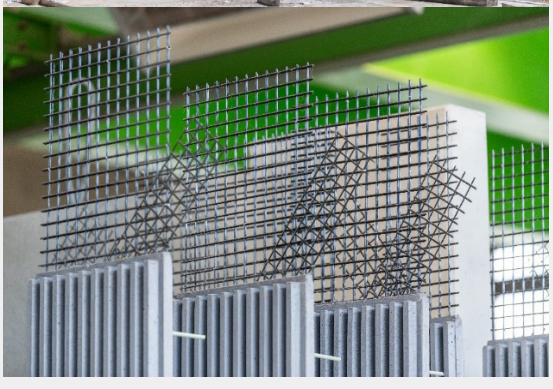
Network arches face high alternating stress amplitudes under eccentric loads, requiring oversized steel cables for durability. This results in thick, stiff cables. Carbon fiber hangers solved these issues, reducing material use, costs, and CO_2 emissions. This makes it the world's first railway bridge using high-performance carbon for key structural elements, ensuring efficiency and sustainability.

Runner-up – New FRP Structures: Dewdrops on Lotus Leaves Bridge

Submitter: Peng Feng
Co-Authors: Xinmiao Meng, Daobo Zhang, Yi Zheng

Description: A landmark project for the application of FRP sandwich structures, perfectly realizing the streamlined appearance of the enclosure system of a 210-m steel bridge. A total of 968 pieces of large-size and variable-thickness FRP curved sandwich panels in 9028.5 m^2 were parametrically designed via ANSYS and economically manufactured with hand layup or VARTM methods according to the different load levels. The connections between sandwich panel and support system were specifically designed to relieve the stress concentration and improve the construction efficiency. The integration of parametric modeling, design and manufacturing was pioneered in this project.

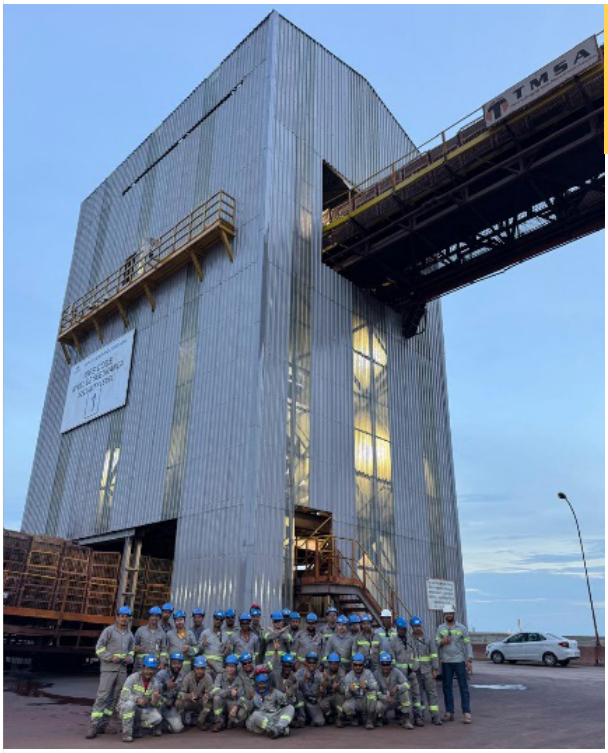
Additional applications on category “FRP Structures”



Carbon Sandwich Façade

Submitter: Hendrik Ros
Co-Authors: Martin Hiester, Jan Bielak, Marcus Hinzen

Description: The use of carbon as a reinforcement material in concrete allows for the creation of extremely slender and durable components thanks to its exceptional strength. This groundbreaking innovation significantly reduces concrete usage, particularly in exposed areas such as facades, thereby conserving valuable resources like cement and sand. Following an extensive research project, we successfully applied this technology in a pioneering flagship project, setting a new benchmark in sustainable construction. Our optimized concrete mix, combined with advanced manufacturing techniques, ensures a visually striking, durable, and resource-efficient facade system that meets the highest architectural and environmental standards.



Transfer House

Submitter: Filipe de Sá
Co-Authors: Victor Nogueira, João Marcelo Mendonça, Herci Inácio, Ricardo Aguiar

Description: This project involves the structural replacement of the Transfer House enclosure at the Porto do Açu iron ore terminal. The original corroded steel structure was replaced with a solution entirely made of pultruded GFRP, with all connections designed in stainless steel. Engineered to endure the aggressive marine environment, the new system ensures enhanced durability, reduced maintenance, and rapid assembly. The structure includes FRP frames, trusses, purlins, and roof panels, joined using bolted stainless steel connections. FE analysis confirmed compliance with structural safety and serviceability standards, proving FRP's effectiveness in industrial applications.

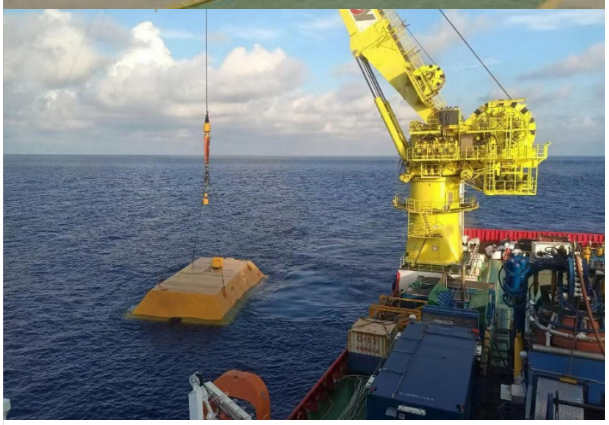
West Street Underpass

Submitter: Seraj Uddowla
Co-Authors: Ben Huh

Description: The Ministry of Transportation of Ontario (MTO) has pioneered the use of innovative materials in infrastructure, notably integrating GFRP in bridge construction. The West St. Underpass on Highway 11 in Orillia is the first project to use GFRP throughout the entire structure, excluding precast girders. This two-span bridge features GFRP reinforcement to enhance durability and resist corrosion from salt exposure.

Despite challenges like bar congestion, the project demonstrated GFRP's feasibility and cost-effectiveness, with reinforcement costs 16% lower than traditional steel.

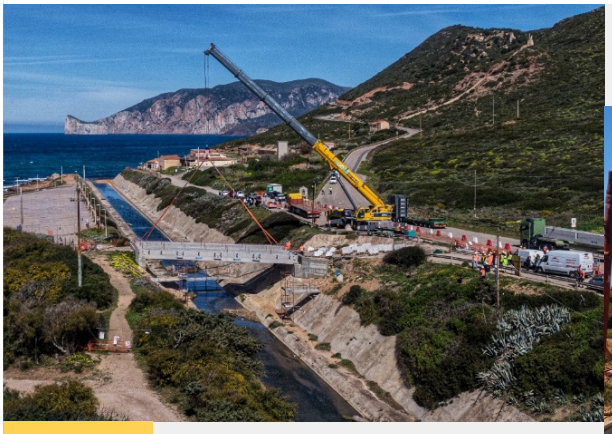
MTO's guidelines ensure quality and performance of GFRP-reinforced structures.



GFRP Protection Structure for Subsea Applications

Submitter: Jian-Fei Chen
Co-Authors: Jinkun Shi, Qu Yan, Wang Zhao, Xiaobin Liu, Ning Cui, Weijun Zhang, Ziyan Wen, Ruiying Li, Yongbiao Ye, Yiquan Li, Qingqiang Ding, Zhihao Hao, Lizhi Duan, Sheng Yang

Description: Subsea protective facilities require durable and cost-effective solutions to address challenges such as corrosive seawater exposure and external forces like dropped anchors. GFRP, known for its lightweight, high strength, and excellent corrosion resistance, offers a promising alternative to traditional steel for subsea applications. This project developed a segmented GFRP structure for protection of pipeline end terminations in an oil field in the South China Sea. Three full-scale GFRP protective structures were produced. One of them was used as a prototype for research. The other two were successfully installed in the field and have been in service since 2023.



Fontanamare Bridge

Submitter: Fausto Mistretta

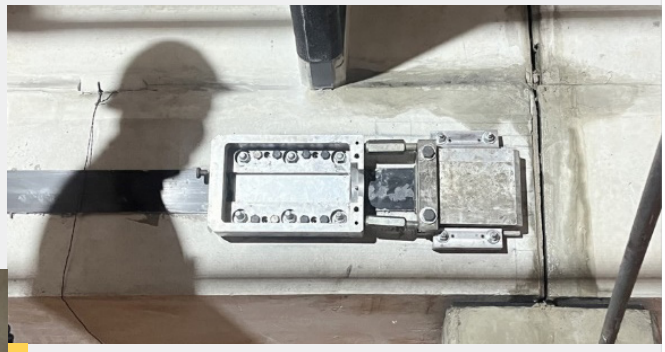
Description: This is the first prestressed bridge in Europe with reinforcement made of GFRP bars. The new bridge, spanning 24.0 m, is reinforced by GFRP bars on both the deck and the transverse beams, which allowed for a protective envelope around the core of the beams, whereas steel strands performed the precompression.

The assembly aimed to minimise on-site works and eliminate the use of formwork. The use of GFRP reinforcement and prefabricated structures with high-performance concrete in all the external skin of the infrastructure made it possible to build a bridge with outstanding durability and environmental sustainability.

Additional applications on category "FRP-Strengthening of Existing Structures"

Sam's Club

Submitter: Paulo Murgel
Co-Authors: João Batista Dumangin, Mauro Carvalho, Danilo Vasco, Gláucia Maria Dalfré



Description: This report presents the strengthening of beams and slabs at Sam's Club/Atacadão supermarkets using CFRP sheets and passive and prestressed CFRP laminates. The strengthening of beams and slabs at Sam's Club/Atacadão supermarkets using passive and prestressed CFRP laminates, together with CFRP sheets, demonstrated the effectiveness of advanced composite materials in structural rehabilitation. While passive CFRP strengthening is well-established in Brazil (e.g., Maracanã Stadium), this project showcased the successful use of prestressed CFRP laminates.

Pre-stressed BFRP Wrapped Rebar

Submitter: Zhang Wei
Co-Authors: Huang Yiqun, Lin Benqing, Liu Bofeng, Niu Gang, Qin Baojun

Description: The pre-stressed BFRP wrapped rebar external strengthening device can non-destructively strengthen shield tunnel segment joints. It includes two fixed ends, a BFRP wrapped rebar, and 8 BFRP leveling bolts. Tightening the rebar applies pre-stress, reducing joint opening, mitigating internal bolt stress, and enhancing joint stiffness. Corrosion-resistant BFRP ensures durability in humid environments. Installation (<10 min/device) requires no drilling, preventing microcracks. Suitable across tunnel lifecycles, it controls deformation, adjusts misalignment, and provides temporary reinforcement under adverse loads, improving safety and water-leakage control.

IIFC Best PhD Thesis Award 2025

The International Institute for FRP in Construction (IIFC) proudly announced the winner of its prestigious Best PhD Thesis Award for 2025, celebrating excellence in doctoral research that advances the field of fibre-reinforced polymer (FRP) composites in construction.

PURPOSE OF THE AWARD

Established to promote high-quality research, the award recognises outstanding contributions to FRP in construction. The winner receives:

- A formal Award Certificate
- A $1,000 USD cash prize
- Two-year complimentary IIFC membership
- An invitation to publish a short article in FRP International

FINALISTS

Five exceptional theses were shortlisted:

1. **Jitong Zhao** – TU Dresden, Germany
   Mineral impregnated carbon-fiber reinforcements based on geopolymer
2. **Chingxi (Severus) Gao** – Queen's University, Canada
   Experimental and numerical investigations of a full-scale steel and GFRP reinforced concrete bridge deck under pulsating and rolling load fatigue
3. **Tara Habibi** – EPFL, Switzerland
   Structural response of fiber-polymer composite bending-active elastica members under short- and long-term loading conditions
4. **David Martins** – University of Lisbon, Portugal
   Monotonic, cyclic and seismic behaviour of pultruded structures: from connections to full-scale frames
5. **Jorge Rocha** – University of Minho, Portugal
   Structural glass flexural strengthening with CFRP composites and Fe-SMA based on passive, active and hybrid techniques

JUDGING PANEL

The award was adjudicated by a panel of IIFC Executive Committee members:

- Prof. Rebecca Gravina
- Prof. Raafat El-Hacha
- Prof. Qian-Qian Yu
- Prof. Cristina Barris

WINNER ANNOUNCEMENT

The IIFC is delighted to announce Chingxi (Severus) Gao of Queen's University, Kingston, Ontario, Canada as the winner of the 2025 Best PhD Thesis Award for his outstanding research: "Experimental and numerical investigations of a full-scale steel and GFRP reinforced concrete bridge deck under pulsating and rolling load fatigue."

Congratulations to Dr. Gao for his remarkable achievement and to all finalists for their innovative contributions to FRP research.

Best Paper Awards of CICE 2025

Among other initiatives, CICE 2025 included Best Paper Awards in two categories:

- **FRP in New Construction**
- **FRP Strengthening of Existing Structures**

The evaluation was conducted by a distinguished jury composed of Professors Qian-Qian Yu (Tongji University), Joaquim Barros (University of Minho), Martin Noel (University of Ottawa), and Nuno Silvestre (University of Lisbon). The following criteria were adopted:

1. From a total of more than 400 submitted papers, a preliminary shortlist of 40 papers was selected based on the reviewers' recommendations and the suggestions of the Scientific Committee.
2. Each jury member then carried out an individual blind review of these 40 papers, selecting three in each category. This process produced the final nomination lists: six papers in FRP in New Construction and six papers in FRP Strengthening of Existing Structures.

NOMINATED PAPERS – FRP IN NEW CONSTRUCTION

- Influence of fracture toughness on multi-axial loading interaction criteria for wrapped composite joints – Gisele Góes Cintra; Mathieu Koetsier; Vasileios Mylonopoulos; Marko Pavlovic
- Reaction wall tests on large-scale pultruded GFRP frames with metallic connections – Jose Gonilha; João R. Correia; Manuela Buttazzi; Francesco Ciani; Javier Molina; Simone Peloso
- Implications of design standard requirements for local buckling capacity of pultruded GFRP members – Kent Harries
- Material efficient CFRP-reinforced concrete floor slabs – Sven Engel; Jan Bielak; Martin Classen
- Harkers Island Bridge case study: North Carolina's first all-FRP reinforced and prestressed concrete bridge – Paul Acuna; Rudolf Seracino
- Static and creep behavior of fiber-polymer composite joints with 100% joint efficiency – Lulu Liu; Yun Sun; Thomas Keller

NOMINATED PAPERS – FRP STRENGTHENING OF EXISTING STRUCTURES

- Experimental investigation on behavior of prestressed CFRP strengthened CHS T-joints – Yuan Xu; Qianqian Yu; Xianglin Gu; Guowen Xu
- Size effect in reinforced concrete beams shear strengthened with externally bonded FRP – Hewawasam Haggalla; Tann Bradley; Sang-Wook Bae
- Innovative solution to prevent debonding of CFRP shear reinforcement on concrete I-girders – Muhammad Arslan Yaqub; Christoph Czaderski; Stijn Matthys
- Evaluation of convective heating and cooling approaches with infrared thermography to assess the bond between externally applied FRP and concrete – Shawn L. Platt; David G. Goodwin; Chase McCallum
- Fracture from Mode I dominated to mixed Mode I–II in CFRP repaired steel pipes – Jiayu Wu; Huayang Li; Feng-Chen An; Guan Lin; Jian-Fei Chen
- Modelling of the debonding process of mechanically anchored CFRP-to-substrate joints by an analytical approach – Hugo Biscaia; Tommaso D'Antino; Dilum Fernando; Jian-Guo Dai

3. Finally, each jury member ranked the nominated papers from 1st to 6th place. The winning papers were determined by the lowest total ranking score.
4. Based on this process, the awards were granted as follows:

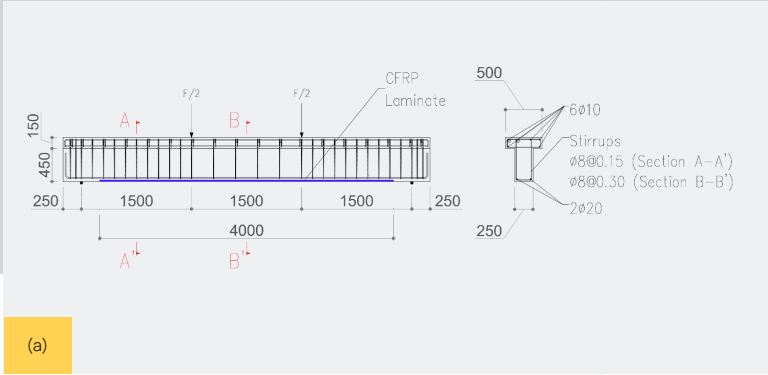
- **FRP in New Construction**: Material Efficient CFRP-Reinforced Concrete Floor Slabs – Sven Engel, Jan Bielak, Martin Classen (Institute of Structural Concrete, RWTH Aachen).
- **FRP Strengthening of Existing Structures**: Fracture from Mode I Dominated to Mixed Mode I–II in CFRP Repaired Steel Pipes – Jiayu Wu, Huayang Li, Feng-Chen An, Guan Lin, Jian-Fei Chen (Southern University of Science and Technology).

Student benchmark competition

CICE 2025 student benchmark competition: results and evaluation of SLS and ULS predictions for NSM-CFRP strengthened RC beams

J.A.O. Barros, ISISE, Full Professor, Dep. Civil Engineering, Minho University, Azurém 4800-058 Guimarães, Portugal, barros@civil.uminho.pt

L.G. Correia, ISISE, Postdoc, and Dep. Civil Engineering, Minho University, Azurém 4800-058 Guimarães, Portugal, lcorreia@civil.uminho.pt



(a)

The 12th International Conference on Fiber-Reinforced Polymer (FRP) Composites in Civil Engineering (CICE 2025), held on 14–16 July 2025 in Lisbon, Portugal, successfully hosted the Student Benchmark Competition (BSC). This international competition provided an opportunity for graduate students to validate predictive models of reinforced-concrete (RC) beams flexurally strengthened with near-surface mounted (NSM) carbon-FRP laminates at serviceability and ultimate limit states (SLS and ULS).

Following an extensive preparation phase and two full-scale experimental tests, the competition concluded with the announcement of the winners during the conference closing session.

BACKGROUND

First announced in December 2024, the BSC challenged student teams to submit analytical or finite-element (FEM) predictions of key SLS and ULS design parameters, including load capacity, mid-span deflection, and strains in CFRP, steel and concrete.

Two 5-meter-long identical T-section RC beams were cast on 6 January 2025 and tested to failure under four-point bending at the University of Minho laboratory on 23 and 26 June 2025. Each beam incorporated conventional longitudinal and shear reinforcement and was strengthened in flexure with three NSM CFRP laminates of 1.4 mm × 20 mm, symmetrically embedded in the soffit. Figure 1 shows a sketch of the geometry of the beams, reinforcement and strengthening configurations and loading conditions considered in this BSC.

The beams were tested under displacement control at 50 μm/s at the loaded section, with displacement transducers (LVDTs) to register the beam's deflection and digital image correlation (DIC) for accurate measurement of crack widths and spacing. Figure 2 shows photograph registration of the key phases of the event, namely of the casting of the RC beams, the strengthening and then the testing. The test was streamed online through youtube.

(b)

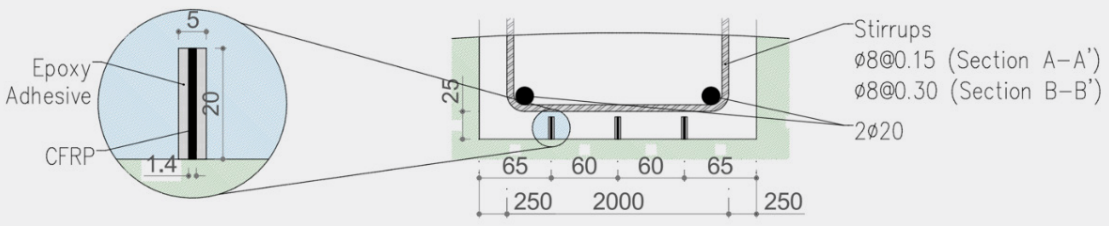


Figure 1. T-section RC beam of the BSC: (a) Longitudinal and transverse reinforcement; (b) detail of flexural strengthening with three NSM CFRP laminates. All dimensions in mm.

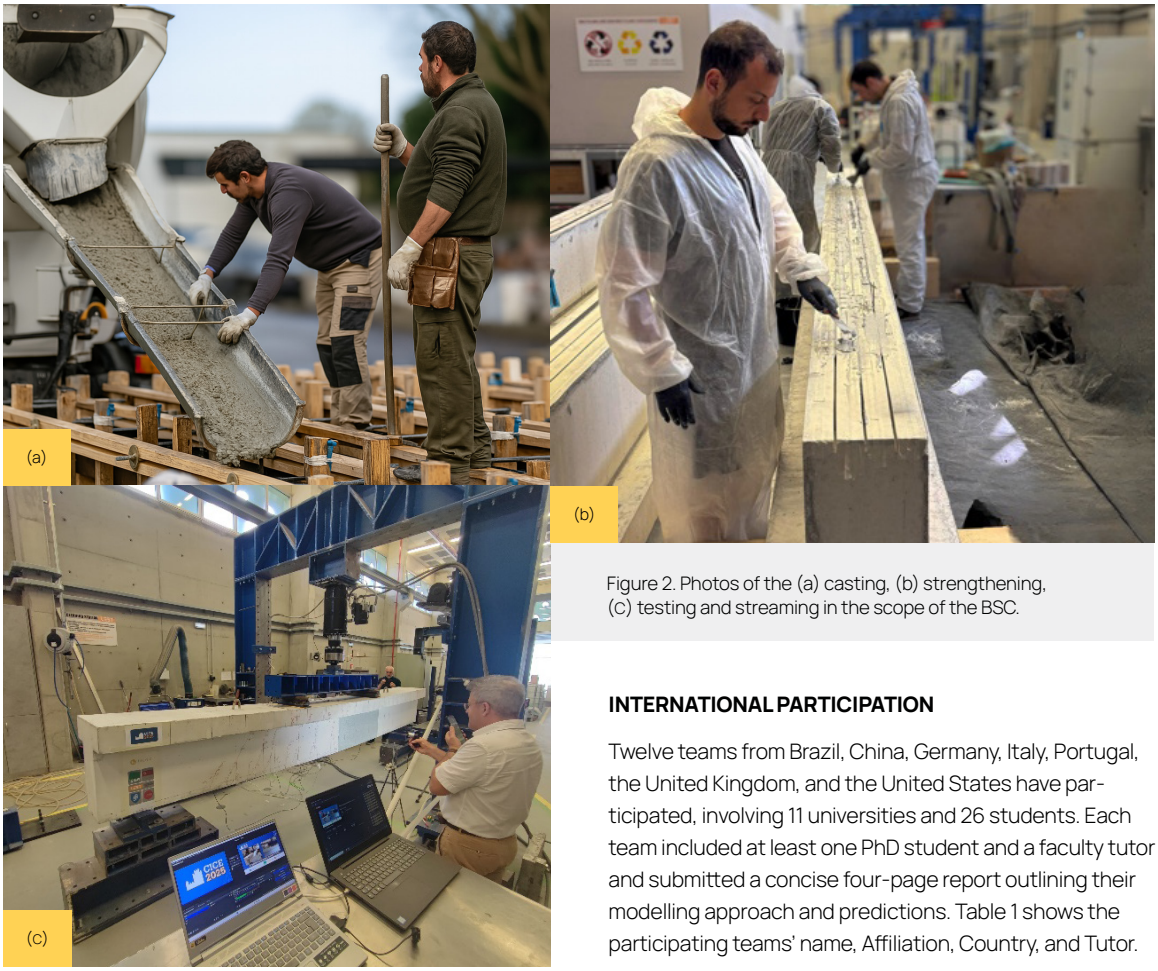


Figure 2. Photos of the (a) casting, (b) strengthening, (c) testing and streaming in the scope of the BSC.

INTERNATIONAL PARTICIPATION

Twelve teams from Brazil, China, Germany, Italy, Portugal, the United Kingdom, and the United States have participated, involving 11 universities and 26 students. Each team included at least one PhD student and a faculty tutor and submitted a concise four-page report outlining their modelling approach and predictions. Table 1 shows the participating teams' name, Affiliation, Country, and Tutor.

Table 1. Student Benchmark Competition: Teams, Affiliation, Country, and Tutor.

Country	Acronym	Name of the team	Affiliation	Tutor
Brasil	StrMinds	StrenghtMinds	Universidade Federal de São Carlo	Gláucia Maria Dalfré
China	MEP	Mysterious Eastern Power	Changsha University of Science & Technology	Hui Peng
China	THU T2	Tsinghua University Team 2	Tsinghua University	Peng Feng
China	THU T1	Tsinghua University Team 1	Tsinghua University	Peng Feng
China	PolyUer	PolyUer	The Hong Kong Polytechnic University	Tao Yu
Germany	HTWK	HTWK Leipzig	HTWK Leipzig	Wladislaw Polienko
Italy	P-FoRCe	Padova - FRP on RC elements	University of Padua	Klajdi Toska
Italy	MC2	Composite Materials in Construction - Politecnico di Milano	Politecnico di Milano	Tommaso D'Antino
Portugal	SNS	Smart NSM Simulators	University of Minho	Amirhossein Mohammadi
Portugal	BIE	Blind Insightful Engineers	University of Coimbra	Pedram Ayyobi
Portugal	MA-Uminho	MA-CICE2025-Uminho	University of Minho	Ali Ziaeinia
UK	B-LMT	Beyond Limits	Northumbria University	Mohammadali Rezazadeh
USA	NCSU	NC STATE UNIVERSITY	North Carolina State University	Rudolf Seracino

The above-mentioned teams submitted predictions for nine key parameters grouped at SLS conditions (considered for the mid-span deflection of 18 mm), namely: total load (F_t^{SLS}), CFRP strain (ε_f^{SLS}), steel strain (ε_s^{SLS}), concrete strain (ε_c^{SLS}), maximum crack width (w_{max}^{SLS}), and average crack spacing ($\bar{s}_{cr}^{SLS}$); and ULS conditions, namely: total load (F_t^{ULS}), mid-span deflection (u^{ULS}), and CFRP strain (ε_f^{ULS}). The average values of the teams' predictions are presented in Figure 3. For analytical predictions, the coefficient of variation (COV) ranged from 3 % for F_t^{ULS} to 55 % for ε_f^{SLS}, demonstrating remarkably low variability for ultimate force. For FEM predictions, the COV ranged from 5 % for ε_f^{SLS} to 130 % for w_{max}^{SLS}.

EXPERIMENTAL PROGRAMME

The experimental campaign was conducted at the University of Minho laboratory, where twin beams were incrementally loaded until failure. Deflection, strain, and crack progression were monitored in real time, with DIC facilitating non-contact measurement of crack widths and spacing.

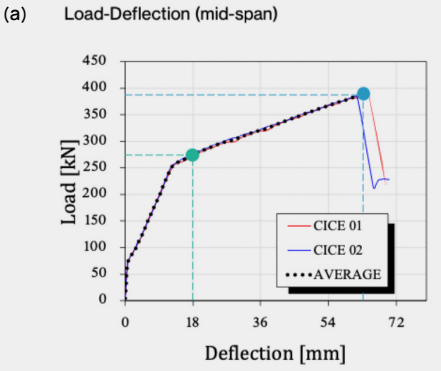
Both beams exhibited comparable structural responses, including matching mid-span deflection at each loading stage, as illustrated in Figure 4a. A load of 275 kN was recorded at SLS, while the failure mode—by FRP rupture—occurred at 388 kN with a corresponding mid-span deflection of 63 mm.

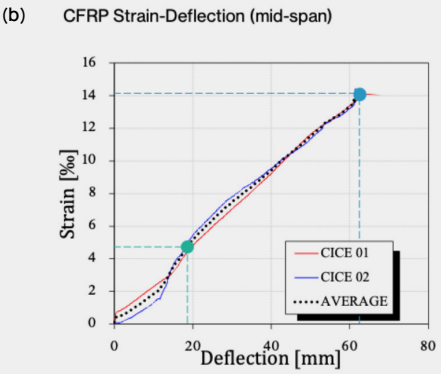
Figures 4b and 4c display CFRP and concrete strain, respectively, plotted against mid-span deflection. The ultimate CFRP strain reached 14.3‰, with strains of 4.5‰ for CFRP and 0.6‰ for concrete at SLS. Both beams demonstrated analogous behaviour throughout uncracked, cracked, and yielding phases prior to failure.

Analytical FEM

Parameter	Average (ANA)	COV (ANA)	Average (FEM)	COV (FEM)
$F_{t,SLS}$ [kN]	211.2	25%	306.2	8%
$\varepsilon_{f,SLS}$ [‰]	2.8	55%	4.2	5%
$\varepsilon_{s,SLS}$ [‰]	2.6	54%	4.7	34%
$\varepsilon_{c,SLS}$ [‰]	0.5	39%	1.2	59%
$w_{max,SLS}$ [mm]	0.4	41%	0.4	130%
$\bar{s}_{cr,SLS}$ [mm]	160.2	20%	109.9	58%
$F_{t,ULS}$ [kN]	387.5	3%	384.4	13%
u_{ULS} [mm]	78.4	47%	51.4	24%
$\varepsilon_{f,ULS}$ [‰]	12.1	43%	9.4	55%

Figure 3. Average values and COV of the teams' predictions for the nine evaluated parameters.





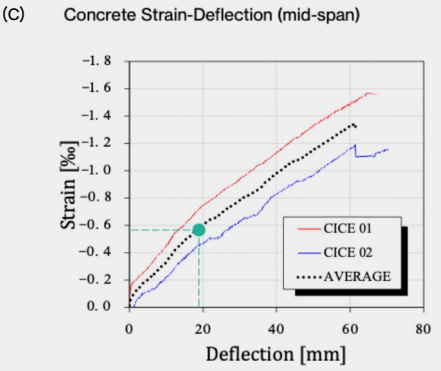
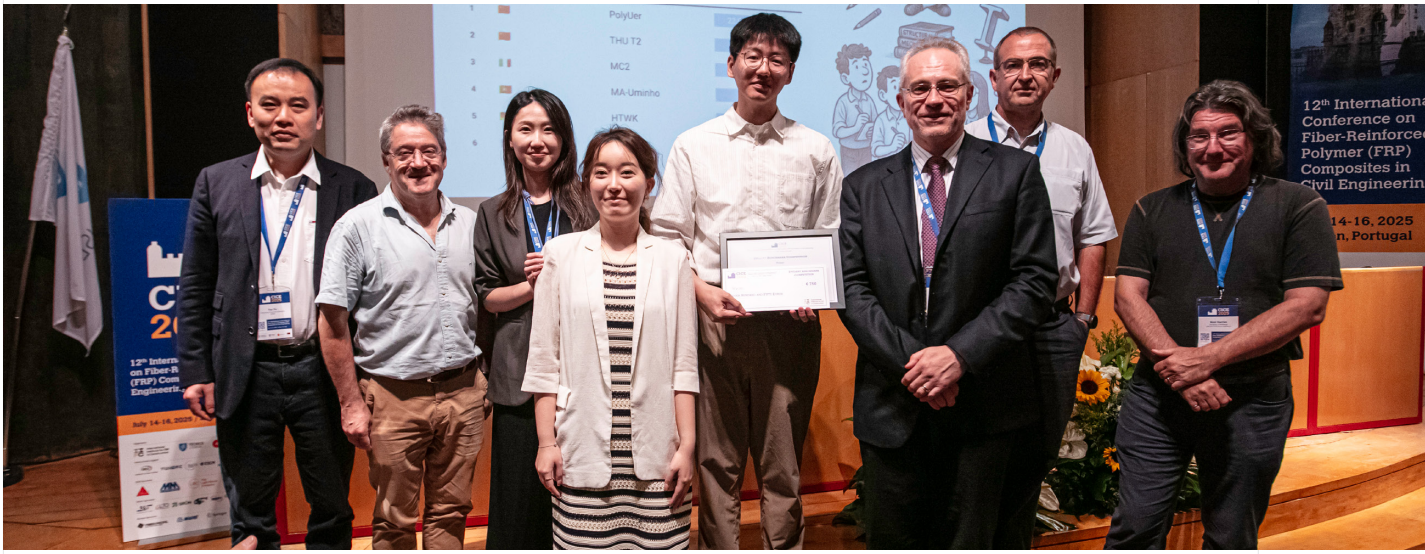


Figure 4. Experimental Results: (a) Load-Deflection, (b) CFRP Strain-Deflection, and (c) Concrete Strain-Deflection curves. The green dot marks the SLS stage at 18 mm midspan deflection; the blue dot shows the ULS stage at CFRP laminate failure.

Figure 5 shows the primary outcomes from the flexural tests. Alongside the experimental data, relative variations between the observed parameters and the average predictions—provided by candidate teams for both analytical and FEM methods—are included.



The largest error for the analytical model occurred in the steel strain at SLS (53%), and for the FEM prediction in the concrete strain at SLS (70%). On average, both FEM and analytical predictions were close to the experimental observations with a noteworthy 1% error in the ultimate load prediction for both methods compared to the measured results. These benchmark tests produced a comprehensive dataset for evaluating predictive approaches, indicating which parameters are more accurately predicted and which tend to have higher errors.

COMPETITION RESULTS

Each participant's score was determined according to the following expression:

$$Score = 0.1 \cdot err_{F_t^{SLS}} + 0.1 \cdot err_{\varepsilon_f^{SLS}} + 0.1 \cdot err_{\varepsilon_s^{SLS}} + 0.1 \cdot err_{\varepsilon_c^{SLS}} + 0.1 \cdot err_{w_{max}^{SLS}} + 0.1 \cdot err_{\bar{s}_{cr}^{SLS}} + 0.1 \cdot err_{F_t^{ULS}} + 0.1 \cdot err_{u^{ULS}} + 0.2 \cdot err_{\varepsilon_f^{ULS}}$$

The error for each variable was calculated as the absolute difference between the experimental parameter and the predicted value, divided by the experimental parameter. A lower score indicates a more accurate prediction.

During the CICE 2025 closing ceremony, the jury presented the results based on the combined prediction errors for nine evaluation parameters. In the Analytical Category, PolyUer from The Hong Kong Polytechnic University, with Tao Yu as tutor, was recognized as the winner. For the FEM category, THU T1 from Tsinghua University, with Peng Feng as tutor, was announced. The final scores for team PolyUer and THU T1 were 22% and 23%, respectively. Each winning team was awarded €750 and a two-year IIFC membership for all members.

ACKNOWLEDGEMENTS

The organisers extend their appreciation to the distinguished jury: Joaquim Barros (University of Minho, Portugal), Emmanuel Ferrier (Université Lyon I, France), Kent Harries (University of Pittsburgh, USA), and Scott T. Smith (University of Adelaide, Australia) for their rigorous evaluation. Special thanks also to Manzoor Rahman, Javad Shayanfar, Seif Osman, and Roozbeh Talebkhah for their significant technical support.

The organisers further acknowledge the essential support provided by the companies H Tecnic – Construções Lda and S&P Clever Reinforcement Ibérica Lda, and by the research and academic institutions ISISE – Institute for Sustainability and Innovation in Structural Engineering, University of Minho, Instituto Superior Técnico (IST), and LNEC – National Laboratory for Civil Engineering. Their contributions in supplying materials, providing laboratory facilities, and offering technical expertise were fundamental to the success of the competition.

Predictions *versus* Results (Relative Error)

Parameter	Experimental	Analytical (%)	FEM (%)
$F_{t,SLS}$ [kN]	275.0	-23%	12%
$\varepsilon_{f,SLS}$ [‰]	4.5	-35%	-2%
$\varepsilon_{s,SLS}$ [‰]	6.9	-53%	-13%
$\varepsilon_{c,SLS}$ [‰]	0.6	-25%	70%
$w_{max,SLS}$ [mm]	0.7	-22%	-22%
$\bar{s}_{cr,SLS}$ [mm]	342.0	-47%	-64%
$F_{t,ULS}$ [kN]	388.0	-1%	-1%
u_{ULS} [mm]	63.0	21%	-20%
$\varepsilon_{f,ULS}$ [‰]	14.3	-14%	-33%

Created with Datawrapper

Figure 5. Main results and relative difference between the experimental results and the teams' predictions for the analytical and FEM methods.

MEET THE PEOPLE

Prof. Qingrui Yue

Education: Tsinghua University

Current affiliation: Director of the Institute of Urbanization and Urban Safety at the University of Science and Technology Beijing, President of the China Steel Construction Society, and Vice President of the China Association for Disaster Prevention

Key roles and contributions: Professor Yue's pioneering research and groundbreaking work span the theoretical research, technological development, standard formulation, engineering application, and industrialization of:

- Engineering diagnosis and remediation
- High-performance fiber-reinforced composites
- Urban safety
- Steel structures and construction industrialization.

His **exceptional contributions** include:

- Leading over 20 major national R&D programs.
- Authoring more than 200 influential research papers.
- Spearheading the development of over 30 national and industry standards – a testament to his defining role in shaping China's engineering practices.
- Receiving three prestigious National Science and Technology Progress Awards, among China's highest state honors for scientific achievement.

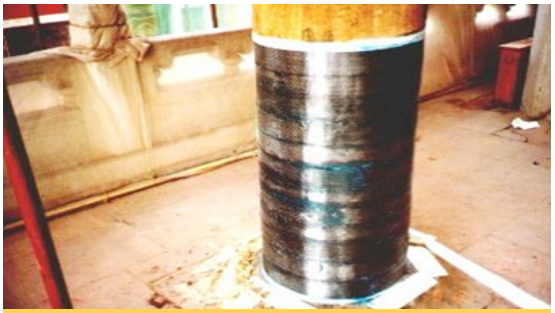
SHORT BIOGRAPHY

Professor Qingrui Yue, an esteemed Member of the Chinese Academy of Engineering (China's highest engineering honor), is a preeminent engineering structural expert. A graduate of Tsinghua University (BEng/MEng), he is internationally recognized as one of the world's earliest pioneers in FRP-strengthened steel structures and credited with pioneering the field of engineering structural diagnosis and remediation.

He directs the Institute of Urbanization and Urban Safety at University of Science and Technology Beijing, holds paramount leadership roles as President of the China Steel Construction Society and Vice President of the China Association for Disaster Prevention, and has long served as a top expert advisor to China's Ministry of Science and Technology.

Strengthening of a steel crane beam at Baosteel using CFRP

His exceptional contributions include leading over 20 national R&D projects (e.g. National Key Research and Development Program), publishing 200+ papers, formulating 30+ national/industry standards, and receiving three prestigious National Science and Technology Progress Awards – among China's highest scientific honors. His work has profoundly shaped China's engineering practices.



Strengthening of Tiananmen Rostrum wooden column using CFRP

When and how did your interest in FRP composites first develop?

My research on FRP began in the early 1990s. The core driving force behind my initiation of this research stemmed from the engineering diagnosis project of industrial building I was leading at that time. A common problem in practice was that after structural strengthening using traditional methods, the defects could not be fundamentally solved - cracks would reappear on the concrete surface in a short period of time, and the problem of steel corrosion would also recur subsequently. The industry had yet to form an effective and systematic solution. I led a team centered on young researchers. Initially, we started with the technical direction of improving concrete durability to carry out material research and development, and successfully developed a series of products such as surface treatment materials and interface bonding materials for new and old concrete. Inspired by international literature, we had an idea of conducting research on the application of CFRP in China. Subsequently, the team quickly launched relevant work and has continued to advance the research to this day with the sustained support of national scientific research projects.

What challenges have been encountered in the promotion and application of FRP, and how have they been overcome?

During the promotion and application of FRP, we faced multifaceted challenges. First, the industry was skeptical about the actual effectiveness and technical feasibility of CFRP for structural strengthening. Second, there was limited understanding of its performance under complex conditions such as durability, high temperature, corrosion, and dynamic loads, with key technical parameters and application boundaries still unclear.

To address these concerns, we pursued a multi-faceted validation strategy. We conducted systematic experiments to build foundational data on CFRP's mechanical and durability properties, while also studying international applications and research from Europe and Japan. Experience with epoxy resin in other fields provided cross-disciplinary insight. As industry understanding grew through practice and research, CFRP gradually gained acceptance.

Beyond technical issues, cost was a major barrier. In the 1990s, China's CFRP industry was still in its early stages, reliant on imported materials and limited to lab-scale R&D and trial production. Epoxy resin R&D was also immature, and high-performance variants often required import, driving costs higher. After 2000, domestic production gradually achieved technological breakthroughs, leading to improved capacity, quality, and a dramatic price drop—CFRP now costs about 1/20 of what it did in the 1990s—easing the cost constraint.

The promotion of technology cannot be separated from the power of the team. Are there any collaborators who have been of great help to you?

The development and adoption of FRP in civil engineering was never achievable by individual effort alone. Our efforts began with forming a close partnership with Professor Ye Lieping's research team at Tsinghua University. At the time, Feng Peng and Lu Xinzheng—then PhD students under Professor Ye—were deeply involved in early R&D on CFRP strengthening. We also collaborated with design institutes in Beijing, working closely with senior engineers to bridge the gap between research, design, and practical application—a crucial step for real-world implementation.

To broaden the technology's impact and engage more stakeholders, in 2000 we established the FRP Application Committee under the China Civil Engineering Society—the first academic society focused on FRP applications. The inaugural conference, attended by over 200 experts including Academicians Zhaoyuan Chen and Zhitao Lü, marked a significant milestone. Annual conferences since have continued to promote exchange and expand FRP technology's influence in China's civil engineering sector.

Can you describe some impactful projects you've been involved with related to FRP composites?

Several milestone projects remain deeply impressive. The first was the 1998 strengthening of an electronics industry building in Beijing—a multi-story frame structure strengthened with thousands of square meters of CFRP for beams, slabs, and floors. As China's first structural application of CFRP strengthening, it successfully met high technical and efficiency requirements for a national priority sector, laying a practical foundation for broader adoption.

The second landmark project was the strengthening of a ramp bridge on the Jin-Shen Expressway in Huludao in 1999, representing the first use of CFRP technology in China's bridge and transportation sector. The newly built ramp bridge developed extensive cracks, requiring urgent reinforcement. At the time, with no direct highway connecting Beijing and Shenyang, the journey to the site took hours via provincial and national roads, complicating preparation and technical support. Despite these difficulties, the project was completed successfully, paving the way for CFRP technology in transportation infrastructure.

Also, in 1999, the Tiananmen Rostrum wooden pillar strengthening was China's first CFRP application in timber structures. The wooden pillars have a diameter of approximately 1.2 meters. All of them are solid wood pillars made from whole logs. After years of use, the wooden pillars have developed cracks in multiple places. Traditional methods were unfeasible due to the rostrum's historical significance. CFRP's thin, wrappable properties solved the problem, making the project technically innovative and significant.

The 1999 strengthening of a 40-meter steel crane beam at Shanghai Baosteel marked the world's first application of CFRP on a steel structure. The heavy-duty crane beams in the steelmaking workshop had developed fatigue cracks, and conventional repair methods posed limitations. Our team validated the use of bonded CFRP sheets for the strengthening. The beam, strengthened in 2013, has remained in normal operation ever since. This CFRP-based technology is now widely adopted for fatigue strengthening of industrial crane beams.

Are there any emerging technologies or trends in the composites industry that you find particularly exciting or promising?

The development and application of CFRP can be divided into multiple progressive stages with significant potential for future expansion. The first stage is the mature technology of structural strengthening and retrofitting, which has formed a complete technical system and become a core method for improving structural performance.

The second stage focuses on applications in new structures, where CFRP solves key engineering challenges: in bridge engineering, it overcomes the limitations of traditional steel in long-span construction and enhances durability; in spatial structures, it optimizes mechanical performance and extends service life; in major underground projects with design lives exceeding 200 years, its corrosion resistance makes it ideal; in marine engineering, it meets strict durability requirements for offshore facilities.

CFRP technology has now entered a third stage of lightweight equipment applications, extending to emergency and major engineering equipment. In emergency scenarios, CFRP-based rapid repair bridges and devices improve rescue efficiency; in engineering equipment, its use in key components reduces weight by over 50%, optimizing energy consumption and operational performance.

Looking ahead, CFRP may advance to a fourth stage of applications in extreme environments, such as extraterrestrial and deep-sea construction. These scenarios demand material properties beyond conventional engineering requirements, and CFRP's light weight, high strength, and resistance to extreme conditions make it a potential key material for such fields.

If you were starting your career today as a young engineer/researcher, what advice would you give yourself?

Compared to our generation, today's youth are more knowledgeable and well-rounded. From my years of experience, I wish to share this advice: Even in an ordinary role, take consistent steps to achieve extraordinary results. Become a role model in conduct and a benchmark in work. Aim to accomplish at least one thing that benefits your family and country. It's fine to embrace simplicity and endure solitude, but never settle for a mediocre life. Whether in research or engineering, always align with national strategic needs and commit to solving critical industry challenges.

What is your favorite hobby outside of work?

Interestingly enough, after decades in the field, work has become second nature to me—something deeply ingrained in my bones. Even in my leisure time, my thoughts often revolve around work. To me, there seems to be little fundamental difference between holidays and ordinary days. That's why when I check the calendar, I usually just look at the date and rarely pay attention to what day of the week it is (laughs). That said, I don't necessarily advocate this kind of lifestyle. I believe it's important to maintain a healthy balance between work and rest—both are essential.

COMPOSITES AROUND THE WORLD

Research

Seismic strengthening of reinforced concrete bridge columns using SMA-FRP hybrid system: performance and effectiveness

Adel Al Ekkawi
Department of Civil Engineering, University of Calgary, 2500 University Drive NW, Canada
adel.alekkawi@ucalgary.ca

Raafat El-Hacha
Department of Civil Engineering, University of Calgary, 2500 University Drive NW, Canada
relhacha@ucalgary.ca

ABSTRACT

This study investigates a hybrid seismic strengthening system using carbon fibre-reinforced polymers (CFRP) and iron-based shape memory alloys (Fe-SMA) to improve the seismic performance of deficient reinforced concrete (RC) bridge columns. Three 1/3-scale circular RC columns, designed with inadequate transverse reinforcement to reflect pre-1971 bridge construction practices, were tested. One column served as an unstrengthened control, while the second was strengthened with vertically applied Fe-SMA plates along its plastic hinge zone. The third column combined vertical Fe-SMA plates with external CFRP jacketing. The Fe-SMA plates were thermally activated to induce prestressing. All columns underwent quasi-static lateral cyclic loading up to ±8.84% drift, with the CFRP-jacketed column retested under higher drift demands up to 17%. Key performance metrics included lateral strength, ductility, energy dissipation, damage, and failure mode. Results showed that the hybrid system significantly enhanced seismic resilience, confirming the combined effectiveness of Fe-SMA and CFRP in strengthening seismically vulnerable RC bridge columns.

RESEARCH OBJECTIVE

This study proposes a novel prestressed flexural strengthening system using SMA material and experimentally investigates its effectiveness on seismically deficient RC columns subjected to quasi-static lateral cyclic loading. Also, one of the studied columns is confined with a CFRP jacket to ensure a proper enhancement in the columns' displacement ductility and energy dissipation capacity. This approach aims to investigate the additional effect of passive CFRP confinement on the column when strengthened in flexure using prestressed vertical Fe-SMA plates.

Following this, the vertical Fe-SMA plates are removed, and the CFRP-jacketed column undergoes a second phase of cyclic loading, reaching severe drift levels beyond 17%. This phase assesses the residual lateral strength and ultimate resilience of the CFRP-jacketed damaged column under high drift demands.

TEST MATRIX

The study includes three RC columns, with one left unstrengthened for comparison. The other two columns are strengthened in flexure using vertical prestressed Fe-SMA plates applied along the columns' potential plastic hinge length. The third column has a CFRP jacket, in addition to the vertical Fe-SMA plates, applied along the column's length. This column is termed "FlexSMA-CC". To isolate the impact of Fe-SMA plates, the second column, named "FlexSMA," is left unconfined. The test matrix is shown in Figure 1.

ACTIVATION OF VERTICAL FE-SMA PLATES AND LOADING REGIME

The vertical Fe-SMA plates on all strengthened columns were heated above the austenite finish temperature (A_f=163ºC) using a flame torch, inducing prestressing effects through recovery stresses. The plates are heated to high temperatures to maintain levels above 163ºC for 5 to 7 minutes, ensuring a complete transformation from martensite to austenite in the Fe-SMAs. The loading setup applies quasi-static lateral cyclic loading using a 250 kN actuator, with an 160 kN axial load simulating gravity loads. The loading rate started at 0.25 mm/s and increased gradually to reach 2 mm/s, with drifts exceeding 8%.

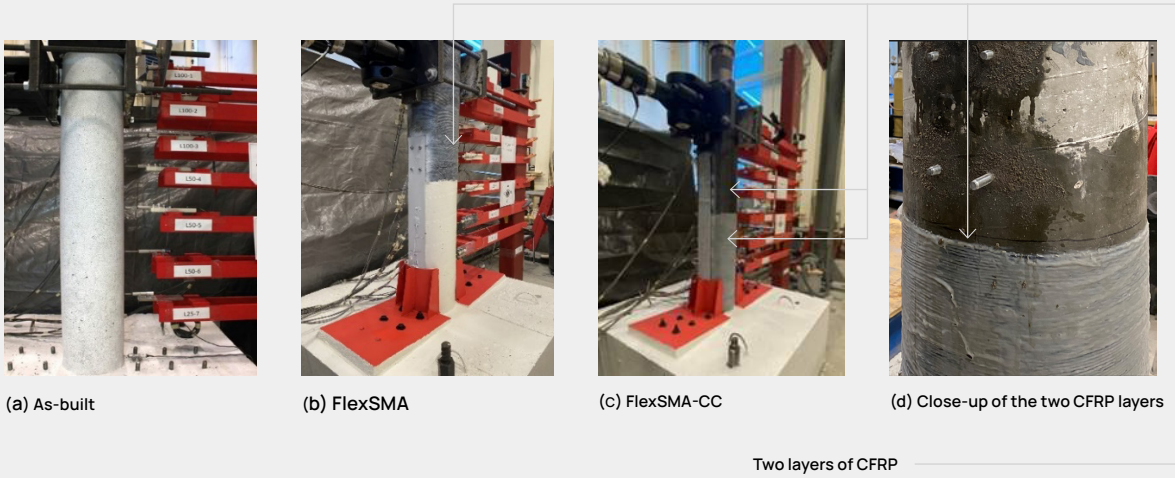


Figure 1. Columns' testing matrix

RESULTS AND DISCUSSION: LATERAL STRENGTH, DUCTILITY, AND ENERGY DISSIPATION

The as-built RC column showed the poorest seismic performance, with a nominal lateral strength of 91.5 kN (Figure 2), low energy dissipation (Figure 3), and a ductility index (μ_Δ) of 2.96—below the CSA S6-19 minimum of 4.0. Strengthening with vertical Fe-SMA plates alone improved strength by 35.3% to 123.8 kN (Figure 2), increased μ_Δ by 21.3% to 3.59, and boosted energy dissipation by 72.6% (Figure 3), confirming the Fe-SMA plates' effectiveness in significantly enhancing the column's lateral cyclic response. The hybrid FlexSMA-CC column, combining Fe-SMA plates and CFRP jacketing, exhibited even better performance: a 36.7% strength increase to 125.1 kN (Figure 2), a 78.6% gain in energy dissipation (Figure 3), and a 46.8% increase in μ_Δ to 4.3, thus surpassing the CSA ductility requirement. The CFRP jacket played a key role in preserving concrete integrity and promoting a ductile behaviour. While the as-built column failed in a brittle flexural-shear mode (Figure 4a), the strengthened columns delayed shear cracking and maintained ductile flexural failure modes (Figure 4b,c). Notably, at high drift levels, the as-built column suffered severe concrete crushing and reinforcement buckling, whereas the hybrid-strengthened column showed only minor cover damage, highlighting the system's effectiveness in protecting the concrete core and facilitating future repair.

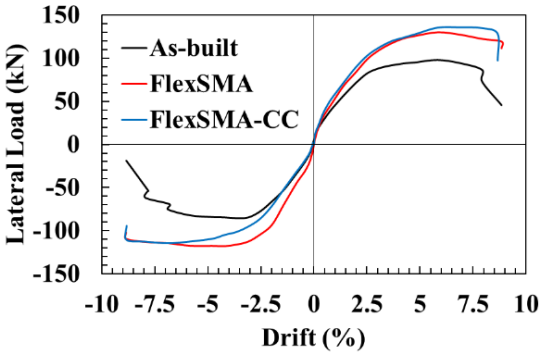


Figure 2. Lateral strength versus drift backbone curves (pull-push directions)

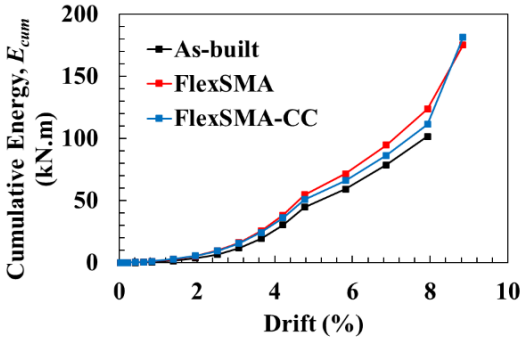
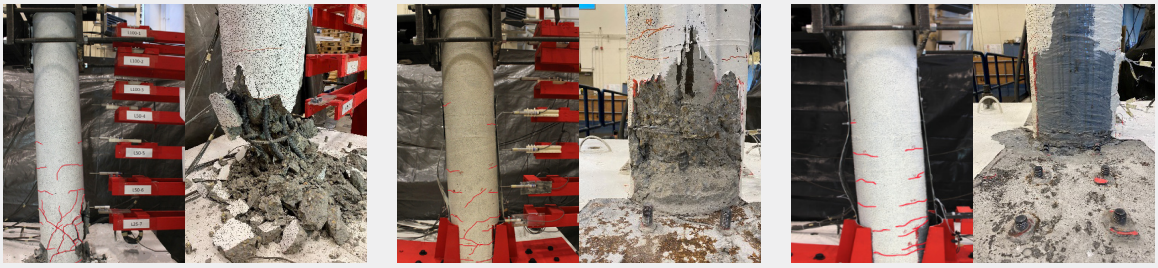


Figure 3. Rate of increase in E_cum with respect to the increase in drift level



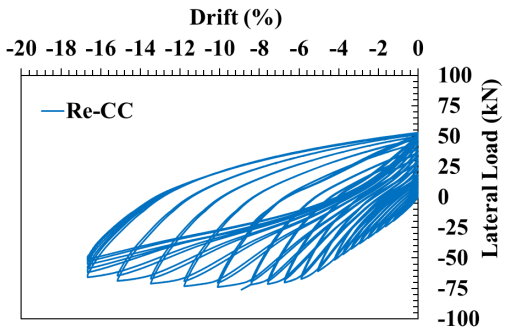
(a) As-built column (b) FlexSMA column (c) FlexSMA-CC column

Figure 4. Crack pattern of the column at the 39th cycle and their damage at the end of the test

PERFORMANCE OF CFRP JACKETED COLUMN RE-TESTED UNDER EXTREME DRIFT DEMANDS

The FlexSMA-CC column was retested without Fe-SMA plates (named as Re-CC), undergoing 54 additional cycles up to 17% drift. Despite prior damage, it maintained stable hysteretic behaviour (Figure 5a), with substantial lateral strength up to 8.84% drift and gradual reduction thereafter. From Figure 5b), at 8.84% drift, it retained -74 kN of strength—a 294.2% higher than the as-built column—and sustained -65.9 kN at 17% drift.

(a) Lateral cyclic hysteretic curve



(b) Backbone lateral load-drift curve

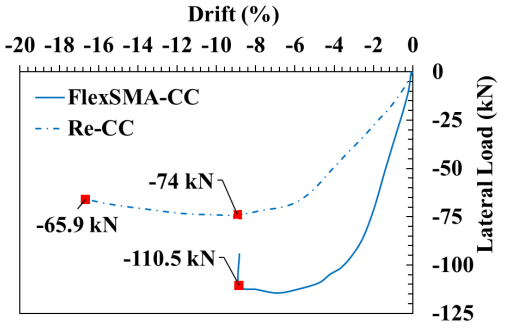


Figure 5. Lateral load versus drift curves.

Figure 6. Damage experienced by the Re-CC column

Damage was minimal, limited to the crushing of concrete cover and localized foundation distress (Figure 6). Correspondingly, the CFRP jacket prevented reinforcement buckling and shear failure, confirming its key role in enhancing ductility and preserving structural performance under extreme seismic demands.

NOTE: These findings are drawn from the study presented in: Al Ekkawi, A., and El-Hacha, R., (2025), "Seismic Strengthening of Reinforced Concrete Bridge Columns using SMA-FRP Hybrid System: Performance and Effectiveness," Proceedings of the 12th International Conferences in Civil Engineering, (CICE 2025), Lisbon, Portugal, July 14-16, 2025, 9p

PUBLICATIONS

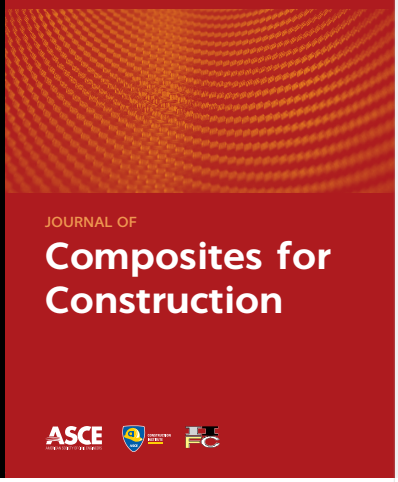
ASCE Journal of Composites for Construction – Recent issues

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: www.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: www.editorialmanager.com/jrncceng



VOLUME 29, ISSUE 5, OCTOBER 2025

VOLUME 29, ISSUE 4, AUGUST 2025

Shear Strength Model for Reinforced Concrete Beams with U-Wrapped FRCM Composites Based on the Critical Shear Crack Width Evolution
C. R. Ribas González, T. D'Antino and L. H. Sneed
https://doi.org/10.1061/JCCOF2.CCENG-5040

Seismic Testing and Modeling of Full-Scale Substandard RC Columns Retrofitted with Sprayed GFRM with and without Basalt Mesh under High Axial Compression and Shear Demand
Nima Kian, Ugur Demir, Ali Osman Ates, Oguz C. Celik and Alper Ilki
https://doi.org/10.1061/JCCOF2.CCENG-5227

Effect of Environmental Loads on Concrete Shrinkage and Strain in GFRP Bars in Slabs on Ground: Field Monitoring and Analysis
Muhammad Kalimur Rahman, Mohammed Fasil, Mesfer M. Al-Zahrani, Antonio Nanni, Mohammed A. Al-Osta and Hassan Alkhalifah
https://doi.org/10.1061/JCCOF2.CCENG-4970

Effect of Slenderness on Hybrid FRP-Strengthened RC Columns under Eccentric Compression: An Experimental and Analytical Study
Tarak M. R. Balla and S. Suriya Prakash
https://doi.org/10.1061/JCCOF2.CCENG-5075

Bond and Development Length of GFRP Bars Embedded in Shotcrete
Richard Sturm and Amir Fam
https://doi.org/10.1061/JCCOF2.CCENG-5195

Fatigue Performance of Hybrid FRP–Concrete–Steel Double-Skin Tubular Beams
Jun-Jie Zeng, Zhi-Hao Hao, Wen-Feng Liang, Guangming Chen and Yan Zhuge
https://doi.org/10.1061/JCCOF2.CCENG-5022

Flexural Behavior of Basalt Textile–Reinforced Engineered Cementitious Composite Plates after Exposure to Elevated Temperatures
Wanying Yuan, Weizhang Liao, Huifang Li, Ying Wang and Chao Ma
https://doi.org/10.1061/JCCOF2.CCENG-5111

Deflection and Cracking of Fiber-Reinforced Self-Consolidated Concrete Beams Reinforced with GFRP Bars under Cyclic Loading
Eman Ibrahim, Ahmed E. Salama, Abdoulaye Sanni Bakouregui, Ammar Yahia and Brahim Benmokrane
https://doi.org/10.1061/JCCOF2.CCENG-5049

Mitigating Degradation of GFRP Bars in Seawater–Sea Sand Concrete by Reducing Alkalinity under Accelerated Hydrothermal Seawater Aging
Zhan Jiang, Bin Zhang, Chenyang Zhao, Zhongyu Lu, Dongyang Li, Jinxia Zhao and Jianhe Xie
https://doi.org/10.1061/JCCOF2.CCENG-5112

Strengthening of Confined Masonry Walls with Openings Using Externally Bonded Reinforced Composites
Akshay Gupta and Vaibhav Singhal
https://doi.org/10.1061/JCCOF2.CCENG-5042

Strength and Deformability of FRP-Jacketed Large-Size Concrete Cylinders after Exposure to Long-Term Actual Environmental Effects
Ali Gurkan Genc, Medine Ispir, Busranur Karakaya and Alper Ilki
https://doi.org/10.1061/JCCOF2.CCENG-4515

Synergistic Effect of Nano-TiO2 and Organic Montmorillonite Modification of Epoxy Resin on the Characteristics of the CFRP–Concrete Interface
Zhen Lei, Hongyu Ran, Zhipeng Li and Xianming Shi
https://doi.org/10.1061/JCCOF2.CCENG-4918

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 any of the editors. Additionally, please use 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 theses are particularly encouraged.

All announcements are duplicated on the IIFC website (www.iifc.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.