



FRP INTERNATIONAL

The official newsletter of the International Institute for FRP in Construction

VOL. 20, NO. 2, NOVEMBER 2023

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MESSAGES

Message from the President

Dear Colleagues,

As we celebrate the 20th anniversary of IIFC, I wish to welcome you all to this new edition of the IIFC Newsletter in its new design and format. I have been honored to have been recently elected as the sixth President of IIFC. I would like to take this opportunity to sincerely thank the outgoing Executive Committee, under the leadership of Professor Scott Smith. It has been a great pleasure to work with Professor Smith in my previous role as Senior Vice President, and I wish to thank him on behalf of IIFC for his leadership over the past five years, especially for his wise guidance in steering the institute and navigating through the challenging times of the global pandemic that disrupted many aspects of personal and professional lives for many in our communities. Professor Smith will now serve IIFC as a member of the IIFC Advisory Committee. I also wish to thank all members who have completed their terms on the Executive Committee, Advisory Committee, Honours Committee and Council.

Our IIFC community is strong, resilient, and growing. IIFC is not just an institute; it is a dynamic international hub with a strong sense of community. A major sign that we have recovered from the disruptive times of the pandemic and emerged even stronger is the stunning success of our most recent IIFC flagship conference, CICE 2023, which was held in Rio de Janeiro this year and was very well attended from all over the world.

The conference Chairs, Professors Daniel Cardoso and Kent Harries, and their team are to be commended for running an exemplary conference. A new Executive Committee has been elected to serve IIFC for the 2023-2025 term. The members of the new committee are identified in this newsletter and on the IIFC website (www.iifc.org). I look forward to working with the Executive Committee, the Advisory Committee, the Council, as well as the broader IIFC community as we continue to advance the institute and the application of FRP composites in the built environment.

FRP composites for construction have come a long way. As we start the third decade of IIFC, I see new frontiers emerging for FRP composites (e.g. 3D printing, recycling and sustainability, bio-based and natural fiber composites, off-shore structures, space structures) and with no doubt FRP can play a significant role in mitigation and adaptation of structures for climate change.

Finally, I wish to thank our new IIFC Newsletter Editor Prof. João Correia, and his team of Regional Editors for producing such a robust new issue of the newsletter in its new format. I trust you will find it informative and enjoyable to read. Also, please stay tuned for an upcoming exciting Special Collection of ASCE Journal of Composites for Construction commemorating the IIFC 20th anniversary.

Thank you.



Prof. **Amir Fam**
Queen's University
Canada

MESSAGES

Message from the Editor

I am delighted to address you as the new Editor of FRP International and I look forward to serve the Institute in this role. Alongside our Regional Editors, Martin Noël, Rebecca Gravina and Qian-Qian Yu, we are committed to collaborating closely with the IIFC community to share the most relevant activities of the Institute, events, advances in research and field applications of FRP composites.

At FRP International, our aim is to provide engaging and original content for our members, with a good balance between contributions from academia and industry, while ensuring broad regional coverage. We have a keen interest in disseminating the latest research projects, both completed and ongoing, as well as PhD theses. Additionally, we intend to feature technological advancements, such as new raw materials, processes, and products, along with real-world case studies, educational initiatives in FRP composites, and updates on new codes and standards.

We made an effort to enhance the newsletter's design, making it more visually appealing and reader-friendly, consistent with our new website. Furthermore, we have restructured the newsletter into five main sections, as follows: (i) Messages; (ii) IIFC News; (iii) Meet the People; (iv) Composites around the World; and (v) Publications.

In this issue, you will find a comprehensive report on CICE 2023, which marked a significant success and served as the first in-person conference to reunite our community after the pandemic. You will also receive invitations to attend forthcoming conferences, including FRPRCS-16, APFIS 2024, CICE 2025, and CICE 2027, as well as an opportunity to participate in the latest edition of the Photo Competition. In our new "Meet the People" section, we turn the spotlight on Prof. Jin-Guang Teng, the Founding President of IIFC, where you will discover an overview of his outstanding career, some personal insights, and his vision regarding the current and future challenges in our sector. The "Composites around the World" section includes a compelling case study of the Pedestrian Bridge over Ludwigsburger Straße, in Stuttgart, Germany, along with an overview of the recent French guidelines for FRP rebars in concrete structures.

I trust you will enjoy reading this issue of FRP International, and I extend a warm invitation to all members of IIFC to contribute to the newsletter by submitting concise articles (up to approximately 1000 words) accompanied by quality illustrations on any of the aforementioned topics.

Feel free to reach out to one of our editors with your ideas!

Prof. **João R. Correia**
Lisbon University
Portugal



IIFC NEWS

IIFC Events

Report from CICE2023, 11th International Conference on Fiber-Reinforced Polymer (FRP) Composites in Civil Engineering (CICE 2023)

The 11th International Conference in Fiber-Reinforced Polymer (FRP) Composites in Civil Engineering (CICE 2023) conference was held in the beautiful, fascinating, and vibrant city of Rio de Janeiro, Brazil, from July 23rd to 26th, 2023. The venue hotel was the recently refurbished Fairmont Rio Hotel, located at the famous Copacabana Beach, in one of the most spectacular beachfronts in the world.

This was the eleventh in a series of prestigious conferences that began in 2001, in Hong Kong, and has circled the world since; this was the first CICE to be held in South America. CICE is the official conference of International Institute for FRP in Construction (IIFC). The conference was jointly organized by the Pontifical Catholic University of Rio de Janeiro (PUC-Rio, Brazil) and the University of Pittsburgh (USA) and brought together the FRP research community and industry to share and discuss recent developments and future perspectives in the field. CICE 2023 was the first face-to-face meeting of this community since Paris in 2018.



www.cice2023.org

Prof. **Daniel Cardoso**
PUC-Rio, Brazil

Prof. **Kent Harries**
Pittsburgh University, USA



IIFC NEWS > IIFC EVENTS > CICE2023



Technical Program

Approximately 230 delegates, representing more than 30 countries, attended CICE2023. 190 papers and seven keynote lectures were presented.

The distribution of participants with respect to continents, countries and job sector are presented in Figure 1, considering their affiliation during registration.

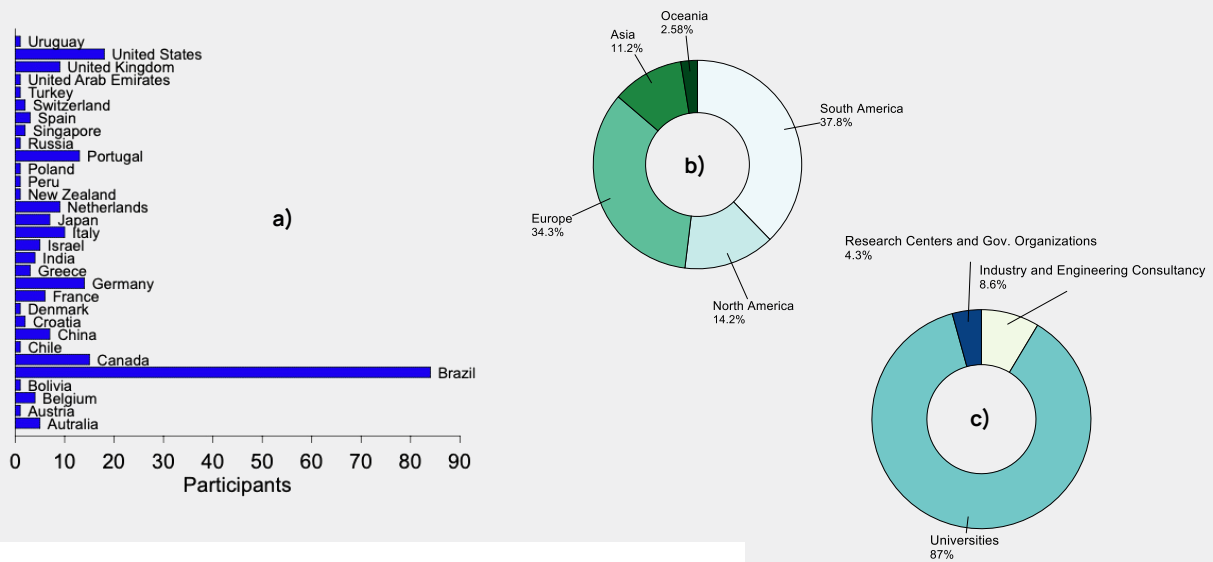


Figure 1. Distribution of CICE 2023 participants: a) by continents; b) by countries; c) by job sector.

The seven keynote presentations were:

1. Kim Pickering (University of Waikato, New Zealand) - Being fair and the role of materials (Figure 2);
2. Sandro Amico (Federal University of Rio Grande do Sul, Brazil) - Overview of the composites industry focusing on materials, processes and trends;
3. Justine Beauson (Technical University of Denmark, Denmark) - The complex end-of-life of wind turbine blades - Challenges and opportunities in the recycling of composite materials;
4. Brahim Benmokrane (University of Sherbrooke, Canada) - Developments on FRP rebars as internal reinforcement in concrete structures and field applications;
5. Barzin Mobasher (Arizona State University, USA) - Advances in the textile reinforced concrete structural design and applications;
6. Elyas Ghafoori (Leibniz University of Hannover - LUH, Germany) - CFRP Composites for sustainable steel structures;
7. Riadh Al-Mahaidi (Swinburne University of Technology, Australia) - Enhancing seismic.

During the morning of the first day of conference, a visit to PUC-Rio was organized. The visit included a tour through the beautiful university campus surrounded by nature and the research facilities (Figure 3).



Figure 2. Opening keynote lecture, from Prof. Kim Pickering.



Figure 3. Visit to PUC-Rio's campus.

IIFC NEWS > IIFC EVENTS > CICE2023



Meetings

During CICE 2023, IIFC held its general meeting. The former president of the Institute, Prof. Scott Smith, reported the achievements during his years of administration and introduced the new president, Prof. Amir Fam. The new members of the Executive Committee were also introduced and presented their views and goals for the next years.

A Council and ExCom Meeting was also held by IIFC.

In the afternoon of first day, a hybrid meeting of the RILEM Technical Committee 292-MCC for Mechanical Characterization and Structural Design of Textile Reinforced Concrete was organized at the venue.



Figure 4. Members of the FRP community getting together at the reception cocktail.

Social Program and Awards

The participants of CICE 2023 had the opportunity to attend two social activities during the conference. On the first day of the conference, a reception cocktail was organized on the balcony of the conference floor at the Fairmont Rio Hotel.

A very happy moment when the members of this resilient, motivated and high-level FRP community could celebrate their reunion after five long years (Figure 4).

On July 25th, a conference dinner was offered to the attendees (Figure 5).

During the dinner, Prof. Scott Smith and Prof. Amir Fam introduced the new IIFC fellows and delivered the following awards (Figure 6):

- Distinguished Young Researcher Award: Prof. Elyas Ghafoori (Leibniz University of Hannover – LUH, Germany);
- IIFC Medal: Prof. Riadh Al-Mahaidi (Swinburne University of Technology, Australia);
- President's Awards: Prof. João Ramôa Correia (University of Lisbon, Portugal) and Prof. Alper Ilki (Istanbul Technical University, Turkey);
- Best Thesis: Inês Rosa (University of Lisbon, Portugal) for the thesis entitled 'Fire Behaviour of Concrete Structures Reinforced with GFRP Bars'.
- Best Paper Award #1: Sven Bosbach, Jan Bielak, Christopher Schmidt, Josef Hegger and Martin Classen for the paper 'Influence of Transverse Tension on The Compressive Strength of Carbon Reinforced Concrete', in the category of Textile Reinforced Concrete/Mortar;
- Best Paper Award #2: Jan Bielak, Martin Claßen, Raphael Walach, Thorsten Helbig and Josef Hegger for the paper 'Redefining the Limits of Concrete Bridge Construction with Non-Metallic Reinforcement', in the category of FRP in New Construction;



Figure 5. Conference dinner

- Best Paper Award #3: Juliane Therese R. Bacod, Hitoshi Nakamura, Kim Oliver U. Magtagñob and Takahiro Matsui for the paper 'Cyclic Loading Test and Analytical Evaluation of Circular Steel Columns Retrofitted by Externally Bonded Carbon Fiber Sheets in Graded Configuration', in the category of FRP for Repair and Strengthening of Existing Structures.

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IIFC Awards



Figure 6. Conference Awards:

- a) Distinguished Young Researcher;
- b) IIFC Medal;
- c) Best Paper Awards;
- d) IIFC Best Thesis.

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Closing Ceremony

The Closing Ceremony was chaired by Prof. Amir Fam, who presented certificates of appreciation to CICE 2023 co-chairs, Prof. Daniel Cardoso (PUC-Rio, Brazil) and Prof. Kent Harries (University of Pittsburgh, USA).

The participants were invited to attend the next conference of the series, to be held in Lisbon, Portugal, in 2025. An official conference photo is presented in Figure 7.

Other pictures are available at www.cice2023.org.



Figure 7. Official CICE 2023 conference photo.

Rio's Legacy

Behind the numbers, a conference is also about legacy and looking to the future. Three important outcomes of CICE 2023 are highlighted below:

- For the first time, a female professor presented the opening keynote lecture at the CICE conference series. Nonetheless, only about 30% of the delegates were female – a ratio we hope to improve upon in the future. A better-balanced gender representation is yet to be reached and it is the community's job to make this happen;
- Approximately 40% of delegates were students! They all had full access to the technical and social activities, where they had the opportunity to interact with renowned experts from all parts of the world! The students are the future and we must embrace and help open doors for them;

- In conference organizers embraced the Open Science movement (see about.zenodo.org). The CICE 2023 proceedings are entirely open access – free access, in perpetuity, to anyone with an internet connection (zenodo.org/communities/cice2023).



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Acknowledgments

CICE 2023 in Rio would not be possible without the support of the organizing institutions, sponsors, supporters, volunteers, staff members, organizing committee and authors and attendees.

A special thanks to all.

Organizers



Sponsors



Supporters



IIFC NEWS > IIFC EVENTS

Invitation to FRPRCS-16 New Orleans, USA

Make plans now to attend our face-to-face FRPRCS-16 meeting!

The 16th International Symposium on Fiber-Reinforced Polymer (FRP) Reinforcement for Concrete Structures (FRPRCS) is organized by ACI Committee 440 and will held on March 23 and 24, 2024 at the ACI Spring 2024 convention in New Orleans, Louisiana, USA. FRPRCS-16 will attract interest from researchers, practitioners, owners, and manufacturers involved in the use of FRPs as reinforcement for concrete and masonry structures. This includes the use of FRP reinforcement in new construction and FRP for strengthening and rehabilitation of existing structures.

The papers/presentations not only will emphasize the experimental, analytical, and numerical validations of using FRP composites but also will aimed at providing insights needed for improving existing guidelines and developing design codes. New frontiers of FRP research were explored that provide information on emerging materials, systems, and applications for extreme events such as fire and earthquakes. The technical papers will also feature discussions on sustainability, novel applications, new technologies, and long-term field data that will result in greater acceptance and use of FRP composites technology by practitioners.

PUBLICATION

FRPRCS-16 proceedings will be published as an ACI Special Publication. All papers must be original and not simultaneously submitted to another journal or conference.

VENUE

The conference will be held on March 23 and 24, 2024 at the ACI Spring 2024 convention in New Orleans, Louisiana, USA. Registration begins after Nov. 6, 2023:

www.concrete.org under Events.

CONTACT

All questions regarding the event should be emailed to frprcs16@gmail.com

FRPRCS-16

CONFERENCE CO-CHAIRS:

Dr. **Ayman M. Okeil**
Louisiana State University, USA

Dr. **Pedram Sadeghian**
Dalhousie University, CANADA

Dr. **John J. Myers**
Missouri University of Science and Technology, USA

Dr. **Maria D. Lopez**
Modjeski and Masters Inc., USA



www.FRPRCS16.com



CONFERENCE VENUE: **HYATT REGENCY, NEW ORLEANS, LA, USA**

CONFERENCE TOPICS:

- FRP Materials: Properties, Tests and Standards
- Strengthening of Concrete Structures using FRP Systems
- FRP Reinforcement of Concrete Structures
- Seismic Resistance of FRP
- Reinforced/Strengthened Concrete Structures
- Advances in Uses of FRP in Masonry Structures
- Behavior and Design of FRP Prestressed Concrete Structures
- Effects of Extreme Events on FRP Reinforced/Strengthened Concrete/Masonry Structures
- FRP Bond and Anchorage in Concrete Structures
- Durability of FRP Systems
- Knowledge Gaps on Performance of FRP Systems in Structures
- Emerging FRP Systems
- FRP Design Codes and Guidelines
- Successful Applications of FRP in Large Infrastructure Projects

NEW ORLEANS TOURISM GUIDE: WWW.NEWORLEANS.COM



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Invitation to APFIS 2024, Adelaide, Australia

The Ninth Asia Pacific Conference on FRP in Structures (APFIS 2024), will be held in Adelaide, Australia, 8-11 December 2024. APFIS 2024 is jointly hosted by The University of Adelaide and University of South Australia.

APFIS is an international conference series that is supported by the International Institute for FRP in Construction (IIFC). It is relevant 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. Since then, it has been held in Seoul, Korea (2009), Hokkaido, Japan (2012), Melbourne, Australia (2013), Nanjing, China (2015), Singapore (2017), Gold Coast, Australia (2019), and Shenzhen, China (2022, online).

APFIS 2024 will contain a variety of technical and social activities. On the technical front, there will be keynote presentations, panel sessions, general session presentations, workshops, and site visits. There will also be special issues containing selected conference papers published by Journal of Composites for Construction and Advances in Structural Engineering. There will also be Best Paper Awards presented. On the social front, there will be a welcome reception, conference banquet as well as ample opportunities to network with colleagues and friends.



The conference will be held at the **Hilton Adelaide Hotel** (www.hilton.com/en/hotels/adlhitw-hilton-adelaide) in the picturesque city of Adelaide, Australia. Delegates (and accompanying partners) are invited to spend time exploring the city and surround. The banquet will be held at the iconic Adelaide Oval (www.adelaideoval.com.au/adelaide-oval-functions-events).

SCHEDULE

Date	Time of Day	Activity	Location
Sunday, 8 December 2024	Evening	Welcome Reception	Hilton Adelaide
Monday, 9 December 2024	Morning	Opening Ceremony	
	Morning and Afternoon	Technical Sessions	
Tuesday, 10 December 2024	Morning and Afternoon	Technical Sessions	Adelaide Oval
	Evening	Banquet	
Wednesday, 11 December 2024	Morning and Afternoon	Technical Sessions	Hilton Adelaide
	Afternoon	Closing Ceremony	

KEY DATES

First Announcement and Call for Abstracts	October 2023
Submission of Abstracts for Review Deadline	15 February 2024
Abstract acceptance	Rolling basis
Submission of Papers for Review Deadline	1 June 2024
Submission of Camera-Ready Papers Deadline	1 September 2024
Conference	8-11 December 2024

IIFC NEWS > IIFC EVENTS

Invitation to APFIS 2024, Adelaide, Australia

LIST OF TOPICS

The following is a non-comprehensive list of key topics covered by the conference.

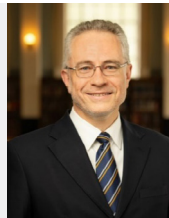
- Materials and products: properties, tests and standards
- Bond behaviour
- Confinement
- Strengthening of concrete, steel, masonry and timber structures
- Seismic retrofit of structures
- Concrete structures reinforced or pre-stressed with FRP
- Concrete filled FRP tubular members
- Hybrid FRP structures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

- Smart FRP structures
- New FRP materials/systems/techniques
- Inspection and quality assurance
- Durability and long-term behaviour
- Fire performance
- Life-cycle performance, longevity and sustainability
- Design codes and guidelines
- Case studies and practical applications
- Performance of FRP under extreme loading
- Green and natural composites
- Additive manufacturing
- Floating and offshore structures
- Space (extra-terrestrial) structures
- Health monitoring and quality control related to FRP systems

CALL FOR ABSTRACTS AND MINI-SYMPOSIA, CONFERENCE CHAIRS AND CONTACT INFORMATION

The conference website is live:
www.set.adelaide.edu.au/apfis2024

The website contains information about the call for abstracts and call for mini-symposia, as well as the conference in general. Please address all enquiries to apfis2024@adelaide.edu.au.



Chair
Prof. **Scott SMITH**
The University of Adelaide



Chair
Prof. **Yan ZHUGE**
University of South Australia



Chair
Dr. **Jun-Jie ZENG**
University of South Australia



Chair
Dr. **Tafsirojjaman**
The University of Adelaide



On behalf of the organising committee, we offer you a very warm welcome to Adelaide and we look forward to seeing you at APFIS 2024.

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Invitation to CICE 2025, Lisbon, Portugal

The 12th International Conference on FRP Composites in Civil Engineering (CICE 2025) will be held in Lisbon, Portugal, in 9-11 July 2025. The CICE 2025 will be jointly organized by the University of Lisbon, the National Laboratory of Civil Engineering and the University of Minho.

The conference will take place at the campus of Técnico (Figure 1), University of Lisbon, located in the heart of Lisbon (Figure 2).

You will find a city that is full of history, is safe and friendly, and has excellent climate and gastronomy.

Alongside the scientific programme, an exciting social programme will be organized, so that participants can enjoy a wonderful city resort just next to Lisbon (Figure 3).

Further information is available in the conference website: www.cice2025.org

We look forward to welcoming you in Lisbon – **SAVE THE DATE!**



Figure 1. The campus of IST-ULisboa.



Figure 2. The city of Lisbon.



Figure 3. The surroundings of Lisbon – Sintra, Cascais and Arrábida.

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Invitation to CICE 2027, Shanghai, China

Prof. **Xiang-Lin Gu** (conference Chair), Tongji University, China

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

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.



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

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



IIFC BUSINESS

IIFC Business conducted at CICE 2023

IIFC GENERAL MEETING

The IIFC General Meeting was held on July 24, 2023, at CICE 2023, Rio de Janeiro. The outgoing President, Prof. Scott Smith, presented his President's report, describing the main activities carried out by the Executive Committee for 2021-2023 and announced the new Executive Committee (ExCom) for 2023-2025.

Prof. Smith also announced the new and retiring Council members, whose profiles are presented in the following pages. Next, the incoming President, Prof. Amir Fam, presented his strategic vision for the Institute and introduced the new members of his team, who briefly introduced their portfolio and expected deliverables.

IIFC COUNCIL MEETING

A joint meeting of the IIFC Council and Executive Committee was also held on July 24, 2023, at CICE 2023, Rio de Janeiro. After a welcome and introduction by the outgoing President, Prof. Scott Smith, Prof. Raafat El-Hacha reported on the financial status of the Institute, Prof. Amir Fam presented the membership report and Prof. John Myers provided an update about FRPRCS 2024.



Prof. Scott Smith announced the new IIFC Fellow members, whose profiles are presented ahead, and also the election results of CICE 2027, which will be held in Tongji, Shanghai. A discussion was also held about the future of the institute and the future engagement of Council members in the various activities of IIFC.

IIFC FELLOW MEMBERS ELECTED AT CICE2023

The following Fellow members were elected at CICE2023:



Radhouane Masmoudi
University of Sherbrooke,
Canada



Hayder Rasheed
Kansas State University,
USA

IIFC BUSINESS > IIFC BUSINESS CONDUCTED AT CICE 2023

IIFC COUNCIL MEMBERS ELECTED AT CICE2023

The following Council members were elected or re-elected at CICE2023:



Riadh Al-Mahaidi
Swinburne University of
Technology, Australia



Amir Fam
Queen's University,
Canada



Issam Harik
University of Kentucky,
USA



José Sena-Cruz
University of Minho,
Portugal



Guang-Ming Chen
South China University of
Technology, China



Peng Feng
Tsinghua University,
China



Renata Kotynia
Lodz University of Technology,
Poland



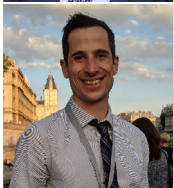
Yu-Fei Wu
Shenzhen University,
China



Raafat El-Hacha
University of Calgary,
Canada



Emmanuel Ferrier
Université Claude Bernard
Lyon 1, France



Martin Noël
University of Ottawa,
Canada



Shi-Shun Zhang
Huazhong University of Sci-
ence and Technology, China

The following members retired from the Council at CICE2023:



Thiru Aravinthan
University of Southern
Queensland, Australia



Younghwan Park
Korea Institute of Construction
Technology, South Korea



Luke Bisby
University of Edinburgh,
UK



Qing-Rui Yue
MCC,
China

IIFC BUSINESS > IIFC BUSINESS CONDUCTED AT CICE 2023

IIFC EXECUTIVE COMMITTEE FOR 2023-2025

The following members were elected for the Executive Committee for 2023-2025:



President

Amir Fam
Queen's University,
Canada



Senior Vice-President

Tao Yu
The Hong Kong Polytechnic
University, China



Vice-President

João R. Correia
University of Lisboa,
Portugal



Vice-President

Raafat El-Hacha
University of Calgary,
Canada



Secretary

Rebecca Gravina
The University of Queensland,
Australia



Treasurer

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University of Lisboa,
Portugal



Webmaster

José Sena-Cruz
University of Minho,
Portugal



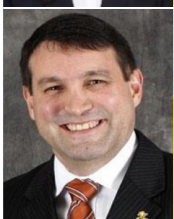
Member-at-Large

Qian-Qian Yu
Tongji University,
China



Member-at-Large

Elyas Ghafoori
Leibniz University Hanover,
Germany



Member-at-Large

John Myers
Missouri University of
Science and Technology, USA

IIFC BUSINESS

Call for Photo Competition

The International Institute for FRP in Construction is pleased to announce the 2023-2024 Annual Student Photo Competition! The competition is open to all IIFC student members (a \$25 student membership fee applies to non-members).

All current undergraduate and graduate students are welcome to join IIFC and encouraged to participate in the competition.

CONTEST RULES

Submit one high-resolution photograph depicting FRP composites along with a title and brief description before March 1 2024. All photos related to FRP for construction are eligible, including (but not limited to) manufacturing, testing, and application. You must own the rights to any photo submitted to the competition. By participating in this competition, you are granting permission to IIFC to use your photo on their website, publications, and promotional material.

CRITERIA

All photos will be evaluated according to the following equally-weighted criteria:

- Aesthetic quality
- Uniqueness/originality
- Highlighting an innovative feature or application of FRP composites

JUDGING

All photos will be evaluated by the international jury listed below. Public voting will determine the People's Choice Award.

JURY MEMBERS

- Prof. Martin Noël, University of Ottawa, Canada
- Prof. José Sena Cruz, University of Minho, Portugal
- Prof. João Correia, University of Lisbon, Portugal
- Prof. Qian-Qian Yu, Tongji University, China

PRIZES

Competition results will be announced by March 31, 2024. All finalists will be featured in a Special Photo Issue of FRP International, the official newsletter of IIFC. The following cash prizes will also be awarded:

- 1st place: \$500 USD
- 2nd place: \$300 USD
- 3rd place: \$200 USD
- People's Choice: \$200 USD

SUBMISSIONS

To submit your photo fill in a Google Forms accessible through the IIFC website:

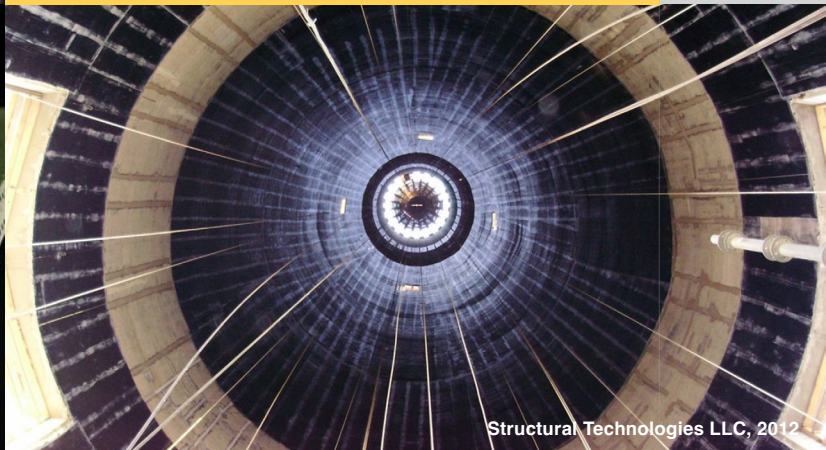
➔ www.iifc.org/awards



Vu Linh, 2018



Aida Cameselle-Molares, 2018



Structural Technologies LLC, 2012

MEET THE PEOPLE

Prof. Jin-Guang Teng

KEY FACTS

Name: Jin-Guang TENG

Education: BEng, Zhejiang University, 1983; PhD, University of Sydney, 1990.

Current affiliation: The Hong Kong Polytechnic University

Key roles and contributions: President of The Hong Kong Polytechnic University, and Chair Professor of Structural Engineering



Short Biography

Professor Jin-Guang Teng, President of The Hong Kong Polytechnic University and Chair Professor of Structural Engineering, is a Member of the Chinese Academy of Sciences, a Corresponding Fellow of the Royal Society of Edinburgh and a Fellow of the Hong Kong Academy of Engineering Sciences.

His main research areas include the structural use of fibre-reinforced polymer (FRP) composites in construction and steel structures. He is the sole originator or the main originator of a number of innovative technologies/concepts in structural engineering, including FRP-steel-concrete double-skin tubular members, FRP-reinforced seawater sea-sand concrete (SSC) structures, and FRP-coated steel reinforcing bars (rebars) (steel rebars with a filament-wound FRP skin). Many of his research findings have been adopted by relevant design codes/guidelines in China, the United States, Europe, the United Kingdom and Australia. The research awards he has received include the State Natural Science Award of China (Second Class) and the inaugural IIFC Medal from the International Institute for FRP in Construction (IIFC).

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

I conducted my PhD research under the supervision of Professor J. Michael Rotter on metal shell structures (e.g., steel silos, tanks and pressure vessels). I continued this research theme during my first few years as a Lecturer and then Senior Lecturer at James Cook University in Australia. After moving to The Hong Kong Polytechnic University in October 1994, I decided to explore a new research area that was more relevant to local needs. In August 1994, there was a collapse of a concrete canopy in Hong Kong that killed one person and injured quite a number of others. That collapse raised serious concerns about old buildings in Hong Kong and led me to look into structural strengthening technologies as a research direction. I was fortunate to have identified FRP strengthening of concrete structures as a promising area to start some new research. My first project in the FRP domain was funded by the University and commenced in 1996. I remember that I reviewed a great deal of literature before settling on this topic.

In your view, what are the main current and future challenges regarding the application of composites in civil engineering?

During the first stage of my research in the FRP area, I focused my energy mainly on the strengthening of concrete structures with externally bonded FRP reinforcement. The area of FRP strengthening was special in the sense that many applications were undertaken before the scientific basis for designing the strengthening systems had been well established. Extensive research was needed and has been done over the years to bridge the knowledge gap and develop sound design methods. FRP strengthening is now widely accepted as a mainstream structural strengthening technology.



Group photo of delegates attending the International Symposium on Bond Behaviour of FRP in Structures (BBFS 2005) held in Hong Kong on 7-9 December 2005.

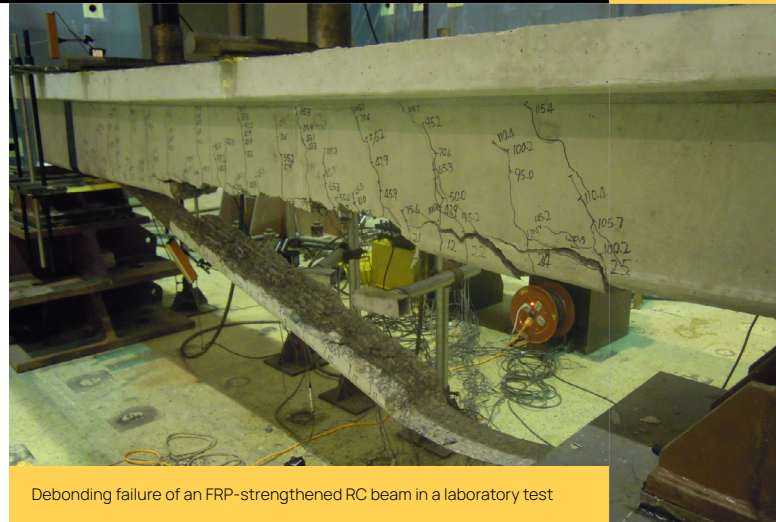
MEET THE PEOPLE > PROF. JIN-GUANG TENG

Later on, I gradually shifted my attention to the use of FRP composites in new construction. In the field of new construction, FRP composites are not yet a mainstream technology. I believe that our major current and future challenge is to make FRP composites a first-choice material in as many areas as possible through the innovative use of FRP composites to create high-performance structural members and systems, and through the development of sound predictive methods for the long-term performance of FRP composites.

Can you share the most rewarding moments or achievements in your professional career?

We want our research to impact practice and benefit society. The most rewarding moments for me are when our research outcomes have been translated into rules in design codes/guidelines or have been implemented in practice. For example, we were immensely pleased to learn that thanks to the hard work of a team led by Professor Guang-ming CHEN of South China University of Technology, the double-skin FRP-concrete-steel tubular member technology invented by me has recently been employed to build two arch bridges of 36 meters in net span in Guangzhou, China. I had the pleasure of serving as an advisor to the team.

In addition, I had the distinct pleasure and honour to lead the founding of the International Institute for FRP Composites for Construction (IIFC) and to serve as its founding President. I still remember vividly the first meeting we had on the subject in a hotel in Hong Kong where we were running the first CICE conference (CICE 2001). Through IIFC, I met many friends and collaborators, which has been a very rewarding experience. It has also been gratifying to see that the CICE conference series has travelled around the globe and is now the official conference series of IIFC.



Debonding failure of an FRP-strengthened RC beam in a laboratory test

How do you stay updated with the latest trends and developments on FRP composites?

Like other researchers, I stay updated with the latest trends and developments via many common channels: reading papers, attending conferences and seminars, and engaging in discussions with students and collaborators, among others. Given my current administrative role as the President of a university, the time available for me to engage in research activities has become very limited.

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

I think that there are three essential elements that determine the excellence of engineering research: originality, impact (including both scholarly and practical impact), and rigour. For a successful and impactful research career, I would like to make the following suggestions to young researchers:

1. Identify a promising research area of practical importance and enter it early to be among its pioneers
2. Focus on the most important questions in the area
3. Devise or employ innovative methodologies to tackle your problems
4. Collaborate/interact with the leading scholars in the area
5. Always devote your best efforts to achieve the highest possible standard of quality

Personal questions:

What is your favourite hobby outside of work?

Reading; Music; Poetry

What is your favourite book?

I cannot name a particular book, but I love the poetry by SU Shi, a Chinese writer, poet, painter, calligrapher, pharmacologist, gastronome, and statesman of the Song Dynasty.

What is your favourite film?

I am unable to name a particular film as my favourite film.



With some of my former PhD students in front of one of the two deck arch bridges built with FRP-concrete-steel double-skin tubular arch ribs. Among them is Prof. Guangming CHEN (third from the right), who led the R&D work for the two bridges located at the Guangzhou International Campus of South China University of Technology. The photo was taken in September 2023.

COMPOSITES AROUND THE WORLD

Industry

Case study: Pedestrian bridge over Ludwigsburger Straße, Stuttgart, Germany

Jan Bielak

RWTH Aachen University, Germany
bielak@imb.rwth-aachen.de

Martin Claßen

RWTH Aachen University, Germany
mclassen@imb.rwth-aachen.de

Raphael Walach

knippershelbig GmbH, Germany

Thorsten Helbig

knippershelbig GmbH, Germany

Josef Hegger

RWTH Aachen University, Germany

Location: Stuttgart, Germany

Owner: City of Stuttgart

Structural Design: knippershelbig GmbH, Germany

Expert Report/Approval: Institute of Structural Concrete, RWTH Aachen University, Germany

Proofing Engineer: Heinrich Bechert + Partner

INTRODUCTION

The planned pedestrian crossing on Ludwigsburger Straße in Stuttgart is a challenging curved concrete bridge combining a mix of FRP reinforcement types. By using non-metallic reinforcement in combination with high-strength concrete, the cross-sectional dimensions are kept to a minimum and additional sealing and protective layers are avoided. Spanning 34 m over two spans of 17.0 m each, the bridge utilizes a circular ring girder concept. 16 Stiffening ribs of only 15 cm regular width, placed at 2.4 m intervals, support a thin 10 cm deck slab. The structure comprises precast elements in a semi-integral design.

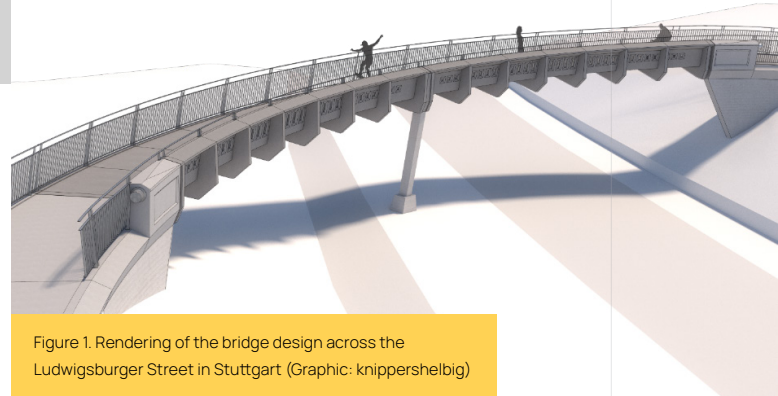


Figure 1. Rendering of the bridge design across the Ludwigsburger Street in Stuttgart (Graphic: knippershelbig)

GEOMETRY AND STRUCTURAL CONCEPT

The structural width of the bridge is 4.40 m, and the structural height 1.90 m. A clear bridge width of 3.20 m is kept constant over the curved course. The two spans of the superstructure will be precast and coupled together as semi-integral structure on site at the joints. To the abutment, a connection is made to the abutment wall and the cast-in-place concrete deck. The superstructure is supported on one point at the central support.

The deck slab, reinforced with two-layer CFRP grids, spans locally over the prominent radial ribs. These ribs which locally stiffen in the secondary load-bearing direction (Figure 2) are reinforced with preformed CFRP grids.



Figure 2. Bottom view of the bridge model with ribs and central support (Graphic: knippershelbig)

COMPOSITES AROUND THE WORLD > INDUSTRY > CASE STUDY: PEDESTRIAN BRIDGE OVER LUDWIGSBURGER STRASSE, STUTTGART, GERMANY

To support the opening moment in the frame corner, each rib is equipped with glass fiber composite (GFRP) bars as the main reinforcement in vertical, horizontal and diagonal direction.

The principal load-bearing action across the two spans in the longitudinal direction of the bridge (ring direction) is provided by a main girder consisting of a web, bottom chord and top chord. The rear wall arranged at the inner edge acts as a web, the function of the bottom chord is taken by the deck slab, and the top chord is formed by a thickened head of the rear wall, which is called hammer head. To transfer the torsional moments resulting from the eccentric support, the globally curved shape is used as a circular ring girder. The ribs transfer the torsional moment as a transverse moment into the chords.

The hammer head forms the tensile support for the reaction force acting radially outward, and the deck acts as a horizontal compression arch as support to transfer the lower reaction force acting radially inward. The hammer head contains an internal steel tendon without bond, which is subsequently prestressed against the abutment walls. Due to the geometric shape of the hammer head, radially inward deflection forces are generated in the hammer head during prestressing, which wedge and prestress it against the abutments. The inwardly inclined central column supports the compressive action in the arch by its horizontal force component.

The shear force resistance of the circular ring girder is disturbed by the web openings which become smaller and smaller in line with the shear force towards the supports. Secondary moments from the resulting Vierendeel action are resisted with discrete vertical GFRP reinforcement bars.

The connections between the two precast elements to each other and to the abutments are provided with stainless steel reinforcement bars arranged centric in the slab and in the hammer head to form the semi-integral action.

MATERIALS FOR THE SUPERSTRUCTURE

The reinforcement products used for the superstructure are shown in Figure 3: planar CFRP grids used in the slab and in the rear wall (a), preformed CFRP grids made of the same base material in the webs and as edge reinforcement (b) and concentrated supplementary reinforcement of the webs and the Vierendeel girder of the rear wall formed by straight GFRP bars of nominal diameters 16 mm and 20 mm \varnothing .

The concrete for the superstructure is of class C80/95, self-compacting with a maximum aggregate size of 4 to 5 mm and exposure class XF4.

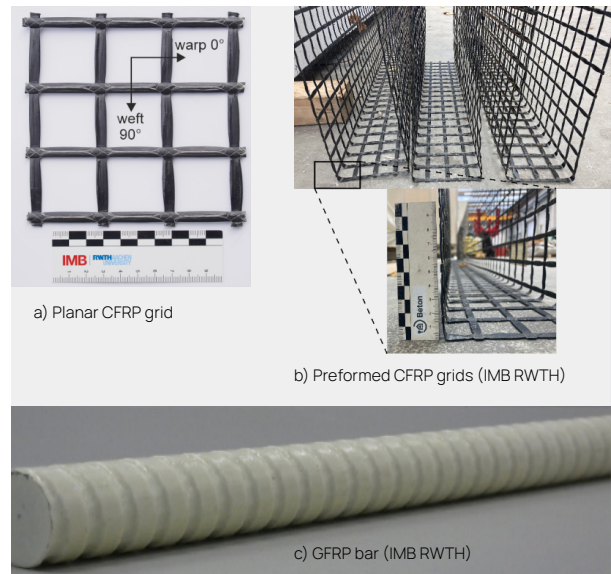


Figure 3. Non-metallic reinforcement for the bridge

EXPERIMENTAL TESTING AND MODELLING

In this project a mixed verification format consisting of small and medium experimental investigations (mainly tensile tests on preformed CFRP grid) and theoretical investigations as well as the use of existing results from approval and research projects was chosen. The core of the evaluation is the question of whether the nonlinear 3D finite element calculation model and the simplified strut-and-tie model for the supporting ribs can adequately predict the force distribution in the reinforcement and concrete, the overall load-bearing behavior and the deformation behavior. For the comparison, a representative rib segment consisting of web, slab, back wall, and hammer head was defined to be loaded to failure in a 1:1 full-scale test. The geometry of this test was only slightly simplified compared to the final bridge. Extensive internal and external measurement equipment was applied (Figure 4): Conventional displacement transducers, digital image correlation, strain gauges (DMS) and fiber optic sensors (FOS).

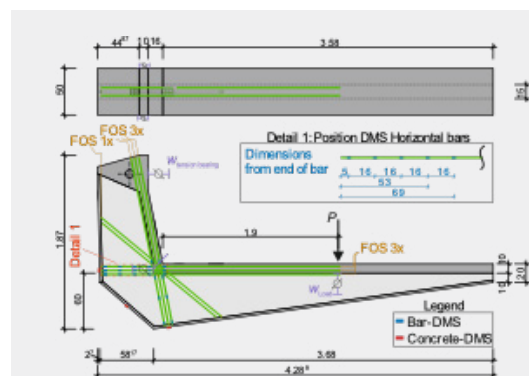


Figure 4. Measurement technology for the large-scale test (Graphic: IMB RWTH)

COMPOSITES AROUND THE WORLD > INDUSTRY > CASE STUDY: PEDESTRIAN BRIDGE OVER LUDWIGSBURGER STRASSE, STUTTGART, GERMANY

PRODUCTION AND TESTING

The test specimen was manufactured by positive casting with pre-installed reinforcement (Figure 5).

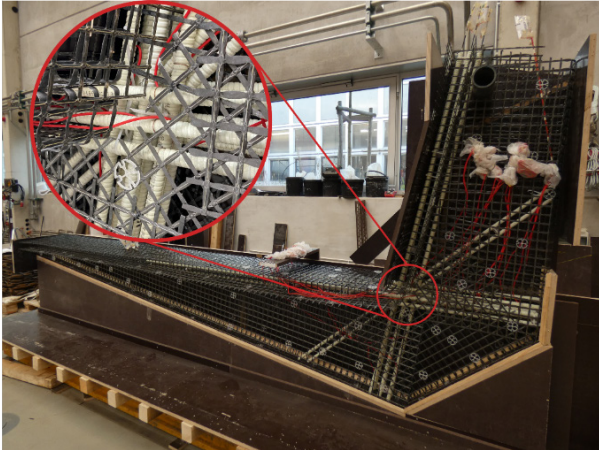


Figure 5. Finished reinforcement cage before closing the side formwork (Graphic: IMB RWTH)

Concrete casting was done in two steps, as it is assumed for the actual bridge precast elements. Overall, the quality of the final component (Figure 6) was satisfactory for further experimental investigation (Figure 7).

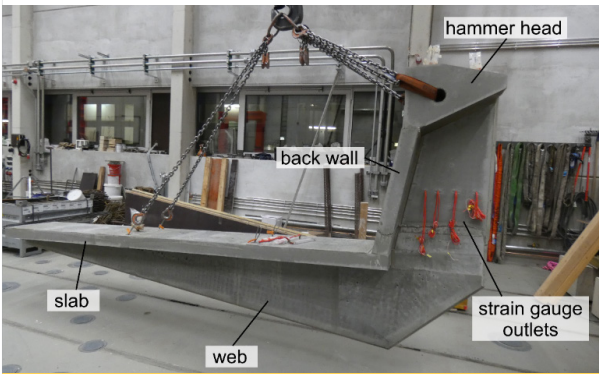


Figure 6. Component test specimen after formwork removal (Graphic: IMB RWTH)

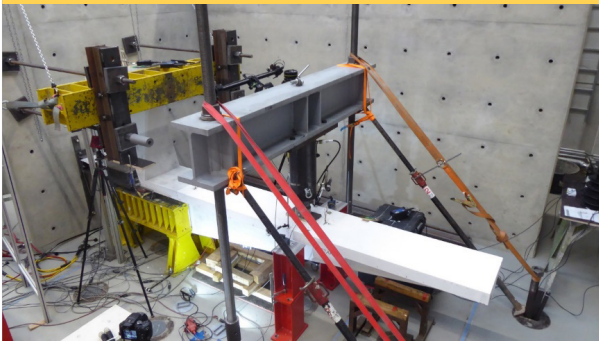


Figure 7. Test specimen before testing (Photo: IMB RWTH)

The failure in the test was announced by pronounced flexural and shear cracking in the web, slab, and back wall (Figure 8). The final failure was a bond splitting starting from the six horizontal GFRP bars in the web area, more precisely in the compression zone of the frame corner at a test load of 162 kN.

One result of the test is that the design values of the bond strength given by the bar manufacturer can only be applied to restrained cross-sections or slabs with confinement effect of the bars, in which global bond splitting is effectively excluded and/or the crack widths of the opening splitting cracks are effectively limited.

Neither flexural nor shear capacity were decisive in this short-term test on the component. The combination of different types of reinforcement did not lead to undesirable effects (spalling, premature fracture of better-bonded reinforcement, etc.).

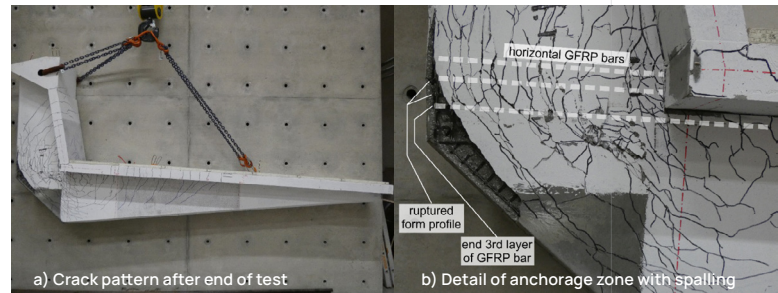


Figure 8. Crack pattern of the specimen after end of test (Photos: IMB RWTH)

CONCLUSION

In the presented project, the limits of what is currently feasible in the field of concrete components with non-metallic reinforcement were redefined to a certain extent at several points: In the complexity of the non-metallic reinforcement as a combination of bars and grids, in the reinforcement layout in the frame corner with opening moment, in the small cross-sectional dimensions in combination with a demanding geometry, and last but not least in the mixed verification concept.

This was only achieved through vital cooperation, perseverance and the will of the planners, engineers, client, experts and the approval authority to create something extraordinary.

The potential savings in concrete and thus in dead weight and reduction of the CO₂ footprint in carbon concrete construction can only be achieved if resolved geometries are planned in combination with haunches and prestressing.

COMPOSITES AROUND THE WORLD

Codes and Standards

Use of FRP rebars in reinforced concrete structures: the 2021 French guideline from AFGC is available in English online!

Sylvain Chataigner

Univ Gustave Eiffel, France

sylvain.chataigner@univ-eiffel.fr

Laurent Michel

Univ Lyon I, LMC2, France

laurent.michel@univ-lyon1.fr

Karim Benzarti

Univ Gustave Eiffel, France

karim.benzarti@univ-eiffel.fr

Emmanuel Ferrier

Univ Lyon I, LMC2, France

emmanuel.ferrier@univ-lyon1.fr

Elhem Ghorbel

Univ Cergy Pontoise, L2MGC, France

elhem.ghorbel@u-cergy.fr

Philippe Jandin

CEREMA, France

philippe.jandin@cerema.fr

Anthony Pruvost

CEREMA, France

anthony.pruvost@cerema.fr

Marc Quiertant

Univ Gustave Eiffel, France

marc.quiertant@univ-eiffel.fr

Arnaud Rolland

CEREMA, France

arnaud.rolland@cerema.fr

Fiber-Reinforced Polymer (FRP) reinforcing bars (rebars) present distinct benefits over conventional options such as carbon or stainless steel rebars: they are lightweight and corrosion resistant, exhibit outstanding mechanical properties, and are most often non-conductive and non-magnetic.

Numerous research studies, preliminary recommendations and design standards exist at both the European level (CNR-DT 203, 2006; Fib, 2007) and the international level (CSA S806-12, 2012; ACI 440.1R-15, 2014; AASHTO, 2018; ACI 440-11, 2022) regarding the utilization of these FRP rebars in reinforced concrete (RC) structures.

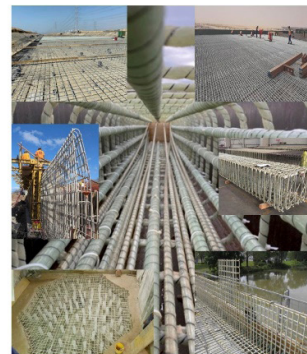
European normalization commissions are actively involved in integrating these reinforcements into the ongoing revision of Eurocode 2. However, it is worth noting that in France, there is currently no established reference framework to guide engineering firms and project owners in incorporating FRP reinforcement into their projects.



Working group: Use of FRP (Fibre Reinforced Polymer) rebars for reinforced concrete structures

Scientific and technical documents

Recommendations for the use of FRP (Fibre Reinforced Polymer) rebars for reinforced concrete structures



2023

Figure 1. Cover of the English AFGC guide version (AFGC, 2021).

COMPOSITES AROUND THE WORLD > CODES AND STANDARDS > USE OF FRP REBARS IN REINFORCED CONCRETE STRUCTURES: THE 2021 FRENCH GUIDELINE FROM AFGC IS AVAILABLE IN ENGLISH ONLINE!

Several years ago, the French Association of Civil Engineering (AFGC) established a dedicated working group to address this matter and develop national-level recommendations.

This group comprises various stakeholders, including academics, research centers, companies, project owners, engineering and inspection firms, certification bodies, and composite reinforcement manufacturers.

In December 2021, those national recommendations were completed and published in French (AFGC, 2021). After several enquiries from the international community, the guide was being translated in English.

It has just been released and is available for free download on the AFGC website (www.afgc.asso.fr). People just need to create a free account to get access to it.

The guide covers the characterization of FRP rebars, their durability and temperature behaviors, as well as design recommendations at ultimate and serviceability limit states for flexure, shear, punching shear, fatigue, and pile reinforcement.

Several design examples are detailed, and the process of quality control is also discussed. In addition, several case studies from different FRP producers are presented in appendix. At this stage, the guide offers recommendations and does not have any normative intent.

However, it should be noted that in Europe, standards are being developed regarding the design and certification aspects, including CE marking. Therefore, the AFGC guide may undergo revisions based on the progress of ongoing European standards and associated techniques.

ACKNOWLEDGEMENT

The authors would like to express their gratitude to all the contributors and members of the AFGC group for their valuable contributions and dedicated efforts in conducting this work. Special thanks are also extended to the AFGC for their support in organizing and facilitating the project, as well as for their assistance in the dissemination of the guide.

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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.

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VOLUME 27, ISSUE 4, AUGUST 2023

Flexural Strengthening of Concrete Structures Using Externally Bonded and Unbonded Prestressed CFRP Laminates: A Literature Review

Amr Abdel Havez and Adil Al-Mayah

<https://doi.org/10.1061/JCCOF2.CCENG-4053>

Punching Shear of Flat Slabs with Pultruded GFRP Stay-in-Place Structural Forms

Philopateer Boules, Amir Fam and Aikaterini

Genikomsou

<https://doi.org/10.1061/JCCOF2.CCENG-4076>

Significant Material and Global Warming Potential Savings through Truss-Based Topology Optimization of Textile-Reinforced Concrete Beams

Lior Nahum, Shabtai Isaac, Alva Peled and Oded Amir

<https://doi.org/10.1061/JCCOF2.CCENG-4073>

Investigation on the Impact Response of Concrete Beams Reinforced with Hybrid Steel-BFRP Bars

Liu Jin, Min Zheng, Renbo Zhang and Xiuli Du

<https://doi.org/10.1061/JCCOF2.CCENG-4185>

Evolution and Prediction of Tensile Properties for Ductile Hybrid FRP Bars in a Simulated Concrete Environment

Yu Zhang, Danying Gao, Lin Yang and Aofei Guo

<https://doi.org/10.1061/JCCOF2.CCENG-4093>

Punching Shear Behavior of FRP Grid-Reinforced Ultra-High Performance Concrete Slabs

JinJing Liao, Jun-Jie Zeng, Xin-Chao Lin, Yan Zhuge and

Shao-Hua He

<https://doi.org/10.1061/JCCOF2.CCENG-4148>

Shear Mechanisms in Fabric-Reinforced Cementitious Matrix Overlays: Experimental and Numerical Investigation

Pietro Meriggi, Francesca Nerilli, Sara Fares, Rebecca Fugger, Sonia Marfia, Elio Sacco and Gianmarco de Felice

<https://doi.org/10.1061/JCCOF2.CCENG-4115>

Fatigue Behavior in the Carbon-Fiber-Reinforced Polymer-to-Concrete Bond by Cyclic Pull-Out Test: Experimental and Analytical Study

Abbas Fathi, Georges El-Saikaly and Omar Chaallal

<https://doi.org/10.1061/JCCOF2.CCENG-4222>

Cyclic Stress-Strain Behavior and Model for FRP-Confining Engineered Cementitious Composite

Wanying Yuan, Qiang Han, Yulei Bai and Libo Yan

<https://doi.org/10.1061/JCCOF2.CCENG-4177>

Damage and Defects in Fiber-Reinforced Polymer Reinforced and Strengthened Concrete Elements

Pranit Malla, Seyed aman Khedmatgozar Dolati, Jesus D. Ortiz, Armin Mehrabi and Antonio Nanni

<https://doi.org/10.1061/JCCOF2.CCENG-4132>

Nonlinear Semianalytical Prediction of Debonding at the FRP-Generic Material Interface with Mechanical End Anchorages

Zhenzhen Wang, Zhi Zhou, Wanqiu Liu, Yung William

Sasy Chan and Jinping Ou

<https://doi.org/10.1061/JCCOF2.CCENG-3968>

PUBLICATIONS > ASCE JOURNAL OF COMPOSITES FOR CONSTRUCTION - RECENT ISSUES

VOLUME 27, ISSUE 3, JUNE 2023

Direct Strength Method-Based Approach for Strength Prediction of Pultruded GFRP Angle Columns

Anne C. M. Diniz, Maximiliano Malite and Daniel C. T. Cardoso

<https://doi.org/10.1061/JCCOF2.CCENG-4084>

FRP-Concrete-Steel Double-Skin Tubular Columns with UHPC/ECC: Concept and Compressive Behavior under Concentric Loading

G. M. Chen, Z. H. Lin, Q. Liu, Guan Lin, Y. Xiong and Y. Z. Guo

<https://doi.org/10.1061/JCCOF2.CCENG-4086>

Performance-Based Environmental Assessment of FRP-Confined Concrete Stub Columns: Investigation on FRP Types

Tianyu Xie, Bree Bennett and Phillip Visintin

<https://doi.org/10.1061/JCCOF2.CCENG-4083>

Hybrid Use of Externally Embedded FRP Reinforcement for Seismic Retrofitting of Substandard RC Columns

Engin C. Seyhan, Caglar Goksu, Ilyas Saribas and Alper Ilki

<https://doi.org/10.1061/JCCOF2.CCENG-3906>

Seismic Retrofit of Diagonal Tension Members in Steel Deck-Truss Bridges Using CFRP Sheets

Ngoc Vinh Pham, Kazuo Ohgaki, Masafumi Hattori, Takeshi Miyashita and Yuya Hidekuma

<https://doi.org/10.1061/JCCOF2.CCENG-4169>

Mechanical Testing of Connections Blind Bolted to the Thick Glass-Fiber-Reinforced Polymer Spar Cap of a Decommissioned GE37 Wind Turbine Blade

Ammar A. Alshannaq, John A. Respert, Lawrence C. Bank, David W. Scott and T. Russell Gentry

<https://doi.org/10.1061/JCCOF2.CCENG-4101>

Investigation of Global and Local Free Vibration of Slender FRP Beams

Cássio Marques Rodrigues Gaspar and Daniel Carlos Taissum Cardoso

<https://doi.org/10.1061/JCCOF2.CCENG-3894>

Evaluation of Existing FRP-to-Concrete Bond Strength Models Using Data Envelopment Analysis

Azad Yazdani, Khaled Sanginabadi, Mohammad-Sadegh Shahidzadeh, Sanaz Razmyan, Mohammad-Rashid Salimi and Davood Mostofinejad

<https://doi.org/10.1061/JCCOF2.CCENG-4103>

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.

Please share your ideas with one of the Editors:

João Ramôa Correia

joao.ramoa.correia@tecnico.ulisboa.pt

Martin Noel

MartinNoel@uottawa.ca

Rebecca Gravina

r.gravina@uq.edu.au

Qian-Qian

qianqian.yu@tongji.edu.cn

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