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Meet the People

Prof. Scott T.Smith

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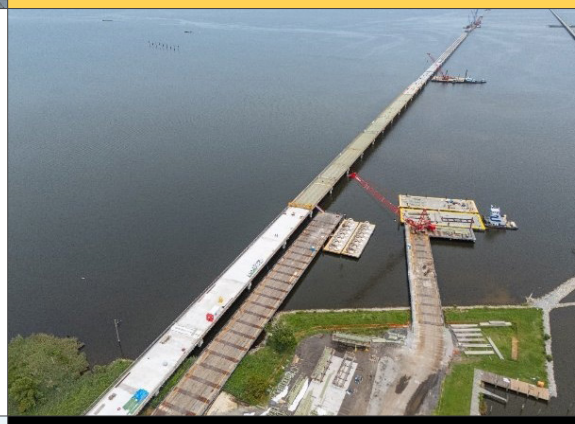
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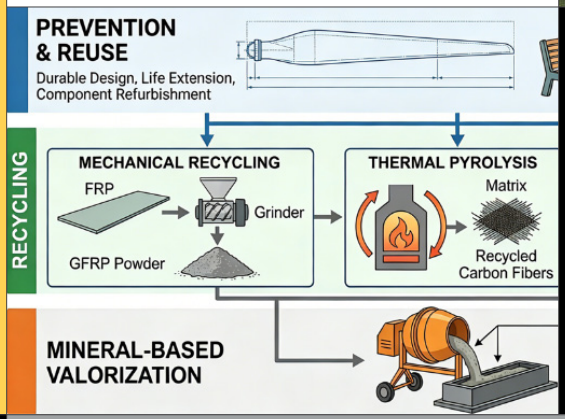
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MESSAGES

Message from the Editor

This edition of FRP International reflects both the energy of our global community and real-world use cases for FRP technologies in civil engineering. During the past few months, IIFC members gathered at two major events: FRPRCS-17 in Girona and APFIS 2026 in Beijing, followed by the International Summer School on Composites in Infrastructure. These meetings brought together researchers, practitioners, industry partners and students to exchange ideas, celebrate achievements and build new collaborations. They also introduced important community initiatives, including the inaugural Sami Rizkalla IIFC Lecture, the first Women in FRP session and dedicated activities for young researchers.

Looking ahead, this issue previews two important opportunities to reconnect: CICE 2027 in Shanghai and FRPRCS-18 (no spoilers here: check out the official announcement on page 16). I encourage our members to follow these events, contribute their work and continue the exchange of knowledge that makes the IIFC community so valuable.

Our task-group series continues with an overview from TG-2 on sustainable end-of-life scenarios for FRP composites. The article prioritizes prevention, life extension, reuse and repurposing over recycling and disposal, reminding us that achieving circularity will require coordinated progress in design, assessment, logistics, standards and end markets. This systems perspective is increasingly important as the volume of FRP products reaching retirement continues to grow.

In our Meet the People feature, we recognize Professor Scott Smith, whose career has combined influential research on FRP strengthening and anchorage with sustained leadership in international collaboration, education and professional service. His reflections offer an important reminder that technical progress depends not only on sound research, but also on the communities and relationships that help translate knowledge into practice.

This edition also showcases the scale at which FRP is now being implemented. Our case study on the Alligator River Bridge in North Carolina demonstrates how GFRP reinforcement can support the durability objectives of major coastal infrastructure, while also highlighting the manufacturing capacity, quality control, fabrication and construction coordination needed for successful delivery. We also feature a review of the new commentary accompanying CEN/TS 19101, an important resource connecting the scientific basis of the European technical specification with practical structural design.

I hope you enjoy this issue and find it useful in your research and practice. As always, I invite you to contact me or any of the regional editors with news, project highlights, research developments or ideas for future editions.

Disclaimer: The views and opinions expressed in this newsletter are solely those of the individual authors and do not necessarily reflect the official position of the International Institute for FRP in Construction (IIFC). IIFC accepts no responsibility or liability for content published on behalf of its members.

Prof. **Martin Noël**
University of Ottawa
Canada



IIFC NEWS & EVENTS

IIFC Events

Report from FRPRCS17, Girona, Spain

The 17th International Symposium on Fiber-Reinforced Polymer Reinforcement for Concrete Structures (FRPRCS17), one of the flagship conference series of the International Institute for FRP in Construction (IIFC), was held in Girona, Spain, from July 6 to 8, 2026. The symposium was hosted at the historic Convent of Sant Domènec and the Faculty of Humanities of the Universitat de Girona, in the heart of Girona's old town.

With **301 participants from 43 countries** and the support from **16 sponsors and institutional partners**, FRPRCS17 brought together researchers, engineers, practitioners, and industry experts to share recent advances, address current challenges and explore future directions in the field of FRP reinforcement and strengthening for concrete structures.

Over three days, the conference featured a rich programme of technical presentations, plenary events and community initiatives, reflecting the breadth and continuing evolution of the FRP field.

A major highlight of FRPRCS17 was the inauguration of the **Sami Rizkalla IIFC Lecture,** established to honor the extraordinary and transformative contributions of Professor Sami Rizkalla to FRP research, education and practice. The inaugural lecture was delivered by Professor **Jin-Guang Teng** of The Hong Kong Polytechnic University, who presented:

- FRP Composites in Construction: A Personal Journey of Three Decades and the Potential of FRP as a Mainstream Structural Material.

The symposium also featured keynote lectures by internationally recognized experts, namely:

- Enhancing Fatigue Service Life of Aging Concrete Bridges Using FRP, by Professor Lijuan (Dawn) Cheng, University of California, Davis, United States;
- Advanced Solutions Using Composites for Seismic Loss Reduction, by Professor Marco Di Ludovico, University of Naples Federico II, Italy.

Over three days, parallel technical sessions showcased the latest breakthroughs in FRP reinforcement. Attendees gained insights across key topics, including strengthening of concrete and masonry structures, innovative composite systems, FRP prestressed concrete structures, design codes and guidelines, durability, inspection and monitoring, successful applications and the performance of FRP systems under extreme events.

18 special sessions complemented the core programme and explored emerging topics and next-generation challenges. These included circular construction, decarbonization strategies and end-of-life challenges for FRPs, artificial intelligence and reliability assessment, smart FRP and TRM composites, thermoplastic composite reinforcement and hybrid reinforcement systems, among others.

FRPRCS17 introduced several strategic initiatives aimed at strengthening the international FRP community and supporting its future generations.

- A dedicated Meet the Editors panel provided practical guidance on scientific writing and navigating peer-reviewed publishing directly from editors of leading journals.
- The Young Researchers' Event explored career perspectives for the next generation of FRP researchers and professionals, emphasizing active participation in international professional and technical organizations.
- The conference also hosted the first Women in FRP session in IIFC history. Under the theme "She Reinforces", this milestone event celebrated the contributions and leadership of women in the FRP community through presentations and a round-table discussion promoting dialogue, mentorship and new collaborations.

The conference opened with an unforgettable cultural highlight: a surprise performance by the "Xoriguers de la UdG", the human tower group of the Universitat de Girona. Their spectacular castellers performance offered participants an authentic taste of Catalan tradition and added a distinctive local touch to the opening of FRPRCS17.

Day one concluded with a Welcome Reception at the Cultural Centre La Mercè, a beautifully restored former 14th-century convent in the heart of Girona. Accompanied by a welcome cocktail, the evening gave participants a chance to network and connect in a relaxed and historic setting.

Highlighting outstanding scientific contributions, the conference recognized research excellence across three categories:

- IIFC Best Paper Award - Strengthening: "Multi-scale durability assessment of concrete strengthening with CFRP systems" by Aloys Dushimimana, Christoph Czaderski, Luís Correia, José Sena-Cruz and Yunus Emre Harmanci
- IIFC Best Paper Award - New Construction: "Toward harmonization of durability evaluation of GFRP bars for concrete reinforcement", by Laura Juárez, Asunción Morales, Álvaro Ruiz, Francisco de Caso and Antonio Nanni
- RILEM Best Paper Award for Young Researchers: Tingting Yu for "Seismic Performance of EB-FRP in RC Diaphragms: Experimental Evaluation".

The conference concluded on the afternoon of July 8 with three technical visits to important engineering and construction projects in Barcelona. Among the highlights were the Sagrada Família, Antoni Gaudí's iconic masterpiece and an extraordinary example of architectural and structural innovation, and the construction works of the Barcelona Metro Line 8 extension. Together, these visits offered participants a unique perspective on Barcelona's rich legacy of engineering and architectural innovation, from Gaudi's pioneering vision to challenges of modern insfrastructure.

Cristina Barris, Eva Oller, Antoni Cladera, Maurizio Guadagnini

Co-chairs Cristina Barris, Eva Oller, Antoni Cladera and Maurizio Guadagnini, Amir Fam (President of IIFC), Josep Calbó (Rector of UdG) and Xoriguers de la UdG (castellers) at Opening Ceremony







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a)


a)


a)



b)


c)

a) Sami Rizkalla lecture: Professor Jin-Guang Teng (The Hong Kong Polytechnic University)

Keynote Lectures

b) Professor Lijuan (Dawn) Cheng (UC Davis, USA),
c) Professor Marco di Ludovico (University of Naples Federico II, Italy)

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Cloister moments from the FRPRCS17

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Conference moments









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a)



b)



c)



d)



d)

a) Meet the editors panel

b) Young researchers' event

c) Women in FRP

d) Welcome reception at Cultural Centre la Mercè

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Gala dinner

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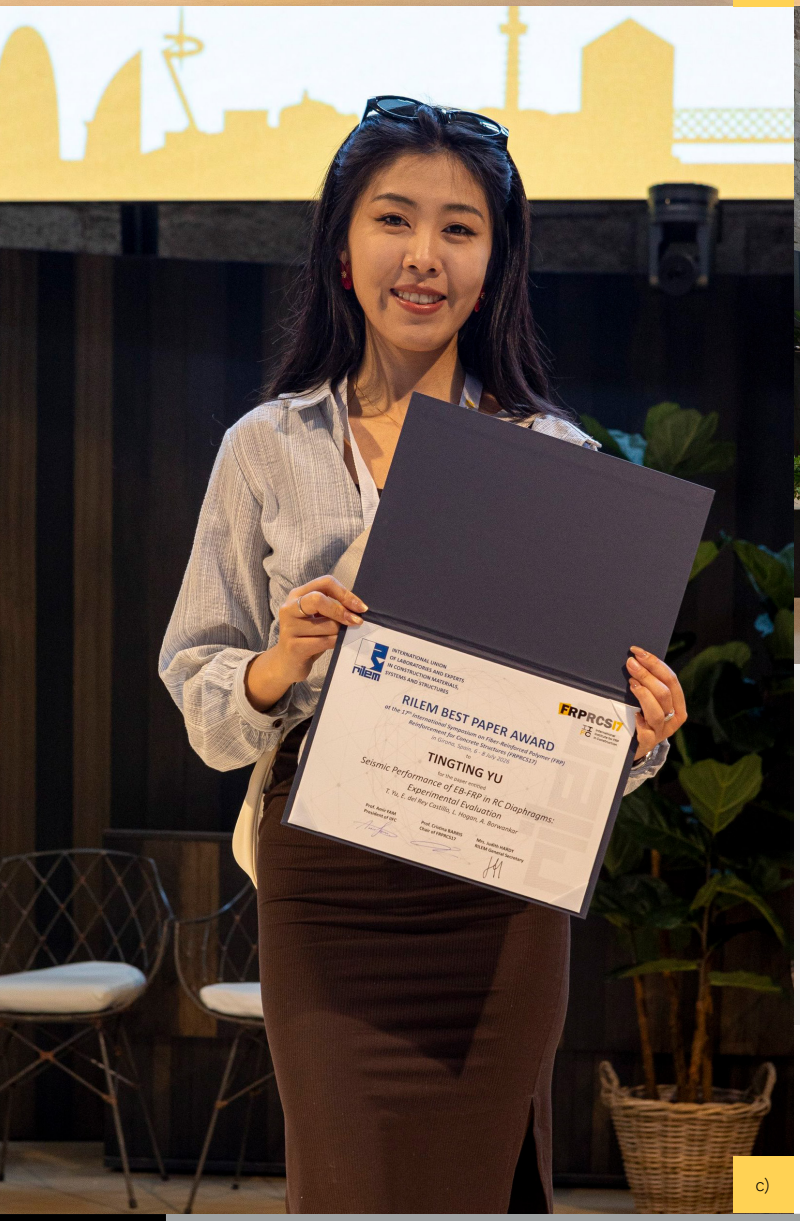
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a)



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d)

a) IIFC Best Paper Award – New Construction: Laura Juárez, Asunción Morales, Álvaro Ruiz, Antonio Nanni

b) IIFC Best Paper Award – Strengthening: Aloys Dushimimana, Luís Correia, José Manuel Sena-Cruz

c) RILEM Best Paper Award – Tingting Yu

d) FRPRCS17 Volunteers

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APFIS 2026 & ISSCI 2026

The 10th Asia-Pacific Conference on FRP in Structures (APFIS 2026) was held in Beijing from August 3 to 5, with 185 participants from 11 countries and regions.

This conference was jointly organized by Industrial Construction Press, the University of Science and Technology Beijing, and Tsinghua University. Professors Qingrui Yue (University of Science and Technology Beijing) and Peng Feng (Tsinghua University) served as co-chairs of the conference.

Focusing on FRP composite materials, this conference features 8 keynote lectures and 11 special technical sessions covering Interface, FRP strengthened structures, Composite materials and all FRP structures, Novel materials & intelligent construction, Mini symposium: numerical method & modelling, Long-term behaviour & extreme environments, FRP-confined concrete, FRP strengthened/reinforced metallic structures, FRP reinforced structures, and FRP tendons & cables. More than 90 papers/abstracts were presented across the parallel sessions.

After rigorous review and evaluation by the Award Committee, comprising keynote speakers and distinguished researchers, two papers were selected for the Best Student Paper Awards, and three for the Best Student Paper Runner-up Awards.

After the APFIS 2026, the 7th International Summer School on Composites in Infrastructure (ISSCI 2026) were held in the campus of Tsinghua University from August 5 to 7. The ISSCI is an official activity of the International Centre for Composites in Infrastructure (ICCI) established at University of Wollongong, Australia, and the inaugural activity were held at University of Wollongong in 2016. Nearly 50 Students from different countries participated the summer school. Nine independent lectures were delivered by leading scholars and outstanding young researchers from worldwide. The topics covered FRP materials and manufacturing, basic theories of interface and confinement, structural strengthening and rehabilitation, FRP reinforced structures, and all FRP structures.


b)



b)



c)

a) The conference participants

b) Conference Chair: Prof. Qingrui Yue delivering opening speech

c) Conference Chair: Prof. Feng delivering opening speech

Lecturer	Title of the lecture
Prof. Jian-Fei Chen - Southern University of Science and Technology	Bond Mechanics of bonded interfaces between FRP and concrete
Prof. Scott Smith - Adelaide University	FRP Materials and Manufacturing
Prof. Peng Feng- Tsinghua University	Pultruded FRP and all FRP structures
Dr. Fabio Matta - University of South Carolina	Noncorrosive FRP reinforced concrete – theory, design, and a landmark field application
Dr. Cristina Barris - University de Girona	Serviceability limit state of FRP reinforced RC structures
Prof. Guang-Ming Chen - South China University of Technology	Novel bridge structures using FRP concrete-steel double-skin tubular members: Research and applications
Prof. Yu-Lei Bai - Beijing University of Technology	FRP-strengthening concrete structures
Dr. Lili Hu - University of Science and Technology Beijing	FRP strengthening metallic structures
Dr. Jia-Qi Yang - China University of Mining and Technology -Beijing	FRP-confined concrete



a) Presentations and discussions in parallel sessions

b) Best paper awards

c) ISSCI 2026



b)

b)



c)



c)

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CICE2027 – 13th International Conference on FRP Composites in Civil Engineering

Shanghai, China, July 12–14, 2027 · www.cice2027.com



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 12-14, 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

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FRPRCS-18 ANNOUNCEMENT



We are very pleased to announce that the 18th International Symposium on Fiber-Reinforced Polymer Reinforcement for Concrete Structures (FRPRCS-18) will be held at **İstanbul Teknik Üniversitesi (ITU)**, Istanbul, Türkiye, in 2028.

FRPRCS, the first international academic platform dedicated to the use of fiber-reinforced polymers for concrete structures, was launched in 1993 in Vancouver, Canada. Having since travelled around the world, the symposium (in its 35th year) will convene in the magnificent city of Istanbul in 2028.

Additional details will be shared soon, including plans for a strong technical and social program.

You won't want to miss it!

Conference Chair
Alper Ilki
İstanbul Teknik Üniversitesi

Conference Chair
Riadh Al-Mahaidi
Swinburne University of Technology

Conference Chair
Caglar Goksu Akkaya
İstanbul Teknik Üniversitesi

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IIFC NEWS & EVENTS

IIFC Task group updates

IIFC TG-2: Sustainable end-of-life FRP scenarios

End-of-Life Management of FRP Composites: A Hierarchy-Guided Review

Chao Wu*, Amr El-Nemr, Ali Hadigheh, Cristina Barris

1. INTRODUCTION

Fibre-reinforced polymer (FRP) composites are widely used in aerospace, automotive, marine, civil infrastructure, and renewable energy because of their high specific strength, corrosion resistance, and design flexibility [1–4]. However, their end-of-life management remains difficult because most FRPs are multi-material systems based on crosslinked thermoset matrices, which complicate disassembly, separation, and material recovery [2,5]. As early generations of composite-intensive products such as wind turbine blades, aircraft parts, pipes, tanks, and construction panels reach retirement, FRP waste volumes are increasing [4,6,7].

Historically, landfill and incineration were common disposal routes, but these are increasingly restricted by environmental policy, landfill limits, and circular economy objectives [5,8,9]. Much of the literature has therefore turned toward recycling technologies, especially thermal and chemical recycling [5,10–13]. Yet an exclusive focus on recycling risks narrowing the end-of-life discussion. In practice, FRP waste should be assessed through the waste management hierarchy, where prevention, life extension, reuse, and repurposing are prioritised before recycling, while energy recovery and disposal remain lower-order options [8,9]. This hierarchy is especially important for FRPs because the route that is technically feasible is not always the one that preserves the most value [5,9].

2. WASTE MANAGEMENT HIERARCHY APPLIED TO FRPS

The waste hierarchy provides a more balanced framework for FRP end-of-life management than a recycling-only perspective [8,9]. At the highest level, prevention and life extension aim to reduce waste generation through durable design, repairability, modularity, and lower manufacturing scrap. Although often discussed under circular design, these strategies are important because they delay waste formation and reduce treatment demand [9,14,15].

The next preferred routes are reuse, refurbishment, and repurposing, which generally retain more embodied value than material recycling [9,16,17].

This is particularly relevant for large FRP structures such as decommissioned wind turbine blades, which have been investigated for secondary use in bridges, street furniture, barriers, and architectural elements [9,16,17]. However, such routes depend on reliable condition assessment, logistics, standard compliance, and market confidence [9,16,17]. Recycling becomes important when component-level reuse is not feasible. Mechanical, thermal, and chemical recycling routes differ in maturity, cost, and value retention [5,18]. Energy recovery may recover some calorific value from the polymer matrix but destroys fibrous reinforcement and is often of limited benefit for GFRP-rich waste [5,19]. Disposal, particularly landfill, remains the least desirable option and should be reserved for unrecoverable residues [5,8].

3. CURRENT END-OF-LIFE ROUTES

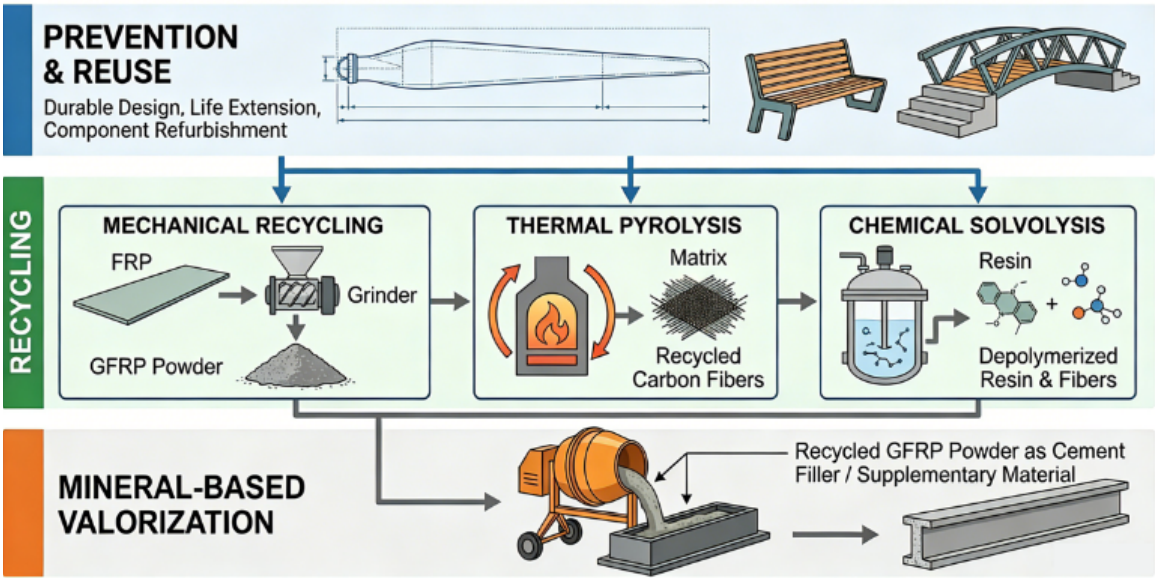
Among the higher-order routes, reuse and repurposing are increasingly discussed (Figure 1) because they preserve component-level value rather than reducing the material to fibre or filler form [9,16,17]. Their main limitation is that they are often case-specific and difficult to scale.

Among recycling routes, mechanical recycling is the most mature and usually involves shredding, crushing, and milling FRP waste into powders or short-fibre recyclates [5,18]. Although commonly associated with downcycling, it is attractive for mixed and contaminated waste streams. Recent studies suggest that mechanically recycled GFRP powder can be used in cementitious systems as filler or supplementary material, creating practical outlets for bulky blade waste where closed-loop recycling is unrealistic [20-22].

Thermal recycling, including pyrolysis and fluidised bed processing, decomposes the polymer matrix to recover fibres [5,10,23]. These routes are more promising for CFRP, where recovered carbon fibres may retain a useful proportion of their original properties [10,23]. However, process control, fibre damage, residue removal, and economics remain significant constraints [5,23].

Chemical recycling or solvolysis offers selective resin depolymerisation and can recover relatively clean fibres and, in some cases, resin-derived chemicals [11-13]. It is often presented as one of the most promising routes for high-value CFRP waste, especially aerospace scrap, but high solvent cost, reactor complexity, safety requirements, and scale-up challenges still limit broad deployment [11-13].

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4. MAIN BARRIERS TO HIGHER-VALUE RECOVERY

The limited adoption of higher-order recovery routes is not solely a technical problem. FRP waste is highly heterogeneous, varying in fibre type, matrix chemistry, fillers, coatings, inserts, and contamination, which complicates standardised processing [5,11]. Most legacy FRPs are also based on thermoset matrices that cannot be simply re-melted, requiring thermal or chemical treatment for matrix breakdown [5,18].

Logistics are another major barrier. Composite waste is often geographically dispersed, generated irregularly, and costly to dismantle and transport; this is particularly true for large wind blades and marine structures [7,9,17]. The economics are also weak, especially for GFRP, because virgin glass fibre is inexpensive and recycled outputs often have uncertain quality and low market value [5,18,23]. Even when technical recovery is possible, the absence of robust standards, certification pathways, and stable end markets limits industrial uptake [9,17,23].

5. A SYSTEM METHOD FOR FRP END-OF-LIFE MANAGEMENT

A practical FRP end-of-life strategy should follow the waste hierarchy explicitly [8,9]. A system method can be structured in six linked stages:

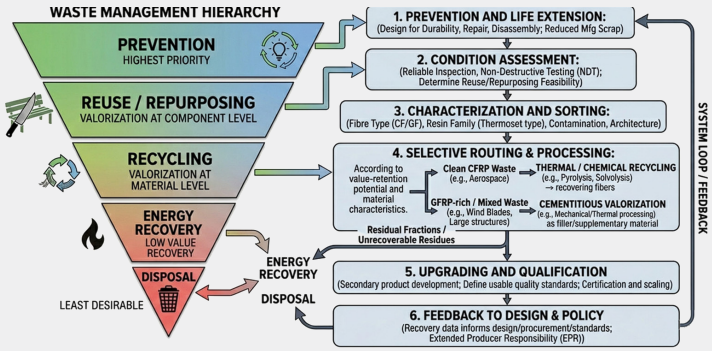
- Prevention and life extension through design for durability, repair, disassembly, and reduced manufacturing waste [9,14,15].
- Condition assessment to determine whether components can be reused, refurbished, or repurposed before destructive treatment [9,16,17].
- Characterisation and sorting by fibre type, resin family, contamination level, and component architecture using inspection, records, or digital tools [9,24].
- Selective routing according to value-retention potential: clean CFRP to pyrolysis or solvolysis, mixed FRP to robust thermal or mechanical recycling, GFRP mineral-rich fractions to cementitious valorisation, and only residual fractions to energy recovery or disposal [5,10-13,20-22].
- Upgrading and qualification of recovered outputs into usable secondary products with defined markets [18,23].
- Feedback to design and policy so recovery data informs product design, procurement, standards, and extended producer responsibility [8,9,24].

This framework reflects a key conclusion of the literature: the main challenge is not simply choosing a recycling technology, but integrating design, sorting, logistics, treatment, and end-market development into a coherent system [5,9].

6. EMERGING DIRECTIONS

Emerging technologies should be evaluated according to how much value they retain within the hierarchy. At the upper levels, design-for-repair, recyclable thermosets, vitrimer matrices, and digital product passports may improve future recovery more fundamentally than downstream treatment alone [9,14,15,24]. At the recycling level, advanced solvolysis, microwave-assisted treatment, electrochemical depolymerisation, and selective delamination may improve recovery for high-value CFRP streams [12-14,25]. For large GFRP waste streams, however, practical reuse and mineral-based valorisation may remain more realistic near-term pathways than closed-loop composite recycling [20-22].

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7. CONCLUSION

FRP end-of-life management should be framed through the waste management hierarchy rather than through recycling alone (Figure 2). Prevention, life extension, reuse, and repurposing should be prioritised where feasible because they preserve more embodied value than destructive treatment. Recycling remains essential, particularly for waste streams that cannot be directly reused, but its role must be understood within a broader system shaped by material heterogeneity, thermoset chemistry, logistics, economics, and market development. Overall, the literature suggests that effective FRP waste management will depend less on any single breakthrough technology than on a hierarchy-based, system-level approach.

REFERENCES

[1] Friedrich, K., & Breuer, U. (2015). Multifunctionality of polymer composites: challenges and new solutions. William Andrew.

[2] Irving, P. E., & Soutis, C. (Eds.). (2019). Polymer composites in the aerospace industry. Woodhead Publishing.

[3] Yang, Y., Boom, R., Irion, B., Van Heerden, D. J., Kuiper, P., & De Wit, H. (2012). Recycling of composite materials. Chemical Engineering and Processing: Process Intensification, 51, 53–68.

[4] Krauklis, A. E., Karl, C. W., Gagani, A. I., & Jørgensen, J. K. (2021). Composite material recycling technology—state-of-the-art and sustainable development for the 2020s. Journal of Composites Science, 5(1), 28.

[5] Oliveux, G., Dandy, L. O., & Leeke, G. A. (2015). Current status of recycling of fibre reinforced polymers: Review of technologies, reuse and resulting properties. Progress in Materials Science, 72, 61–99.

[6] Beauson, J., Madsen, B., Toncelli, C., Brøndsted, P., & Bech, J. I. (2016). Recycling of shredded composites from wind turbine blades in new thermoset polymer composites. Composites Part A: Applied Science and Manufacturing, 90, 390–399.

[7] Cherrington, R., Goodship, V., Meredith, J., Wood, B. M., Coles, S. R., Vuillaume, A., ... & Kirwan, K. (2012). Producer responsibility: Defining the incentive for recycling composite wind turbine blades in Europe. Energy Policy, 47, 13–21.

[8] Turkay, A., Kirkelund, G. M., & Lima, A. T. M. (2024). State-of-the-art circular economy practices for end-of-life wind turbine blades for use in the construction industry. Sustainable Production and Consumption, 47, 17–36.

[9] Bressanelli, G., Adrodegari, F., Pigosso, D. C., & Parida, V. (2022). Towards the smart circular economy paradigm: A definition, conceptualization, and research agenda. Sustainability, 14(9), 4960.

[10] Palmer, J., Ghita, O. R., Savage, L., & Evans, K. E. (2009). Successful closed-loop recycling of thermoset composites. Composites Part A: Applied Science and Manufacturing, 40(4), 490–498.

[11] Dang, W., Kubouchi, M., Sembokuya, H., & Tsuda, K. (2005). Chemical recycling of glass fiber reinforced epoxy resin cured with amine using nitric acid. Polymer, 46(6), 1905–1912.

[12] Morin, C., Loppinet-Serani, A., Cansell, F., & Aymonier, C. (2012). Near- and supercritical solvolysis of carbon fibre reinforced polymers (CFRPs) for recycling carbon fibers as a valuable resource: State of the art. The Journal of Supercritical Fluids, 66, 232–240.

[13] Rybička, J., Tiwari, A., & Leeke, G. A. (2016). Technology readiness level assessment of composites recycling technologies. Journal of Cleaner Production, 112, 1001–1012.

[14] Fresneda-Cruz, A., Chaine, C., Figueirêdo, M. B., Murillo-Cordia, G., Sanz-Martinez, A., & Julian, I. (2024). Potentials and limitations of microwave-assisted chemical recycling of fiber-reinforced composites from wind blades. Sustainable Energy & Fuels, 8(20), 4752–4766.

[15] Zheng, N., Xu, Y., Zhao, Q., & Xie, T. (2021). Dynamic covalent polymer networks: a molecular platform for designing functions beyond chemical recycling and self-healing. Chemical Reviews, 121(3), 1716–1745.

[16] Yu, X., Zhang, C., Li, J., Bai, X., Yang, L., Han, J., & Zhou, G. (2025). Reuse of retired wind turbine blades in civil engineering. Buildings, 15(14), 2414.

[17] Jensen, J. P., & Skelton, K. (2018). Wind turbine blade recycling: Experiences, challenges and possibilities in a circular economy. Renewable and Sustainable Energy Reviews, 97, 165–176.

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[18] Shuaib, N. A., & Mativenga, P. T. (2016). Energy demand in mechanical recycling of glass fibre reinforced thermoplastic composites. Journal of Cleaner Production, 120, 198–206.

[19] Cunliffe, A. M., & Williams, P. T. (2003). Characterisation of products from the recycling of glass fibre reinforced polyester waste by pyrolysis. Fuel, 82(18), 2223–2230.

[20] Liu, S., Tam, L. H., Ma, H., Guo, J., & Wu, C. (2025). Pozzolanic analysis of GFRP powder from retired wind turbine blades as supplementary cementitious material. Journal of Materials in Civil Engineering, 37(3), 04024543.

[21] Liu, S., Guo, J., & Wu, C. (2024). Improving the pozzolanic reactivity of recycled powders from retired wind turbine blades by removing the polymer phase through thermal treatment. Journal of Building Engineering, 96, 110387.

[22] Wu, C., Zhuang, X., Vigor, J. E., Yio, M. H., Cheeseman, C., & Wong, H. (2024). Pozzolanic reactivity of recycled powders from waste wind turbine blades. Journal of Materials in Civil Engineering, 36(9), 04024267.

[23] Pimenta, S., & Pinho, S. T. (2011). Recycling carbon fiber reinforced polymers for structural applications: Technology review and market outlook. Waste Management, 31(2), 378–392.

[24] Röttger, M., Domenech, T., van Der Weegen, R., Breuillac, A., Nicolaÿ, R., & Leibler, L. (2017). High-performance vitrimers from commodity thermoplastics through dioxaborolane metathesis. Science, 356(6333), 62–65.

[25] Leißner, T., Hamann, D., Wuschke, L., Jäckel, H. G., & Peuker, U. A. (2018). High voltage fragmentation of composites from secondary raw materials—Potential and limitations. Waste Management, 74, 123–134.

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MEET THE PEOPLE

Prof. Scott T. Smith



Education: Degrees in engineering, business, and education: BE (Civil) (1994) and PhD (1999) (specialising in structural engineering) (University of New South Wales, Australia); MBA and DIC (2018) (Imperial College London, UK); Graduate Certificate in Higher Education Teaching and Learning (2005) (University of Technology Sydney, Australia)

Current affiliation: Adelaide University, Australia.

Key roles and contributions: Dean International and Engagement (College of Engineering and IT), Professor of Structural Engineering, Chair of IIFC Advisory Committee

Know more:

Short Biography

Professor Scott Smith is Professor of Structural Engineering and Dean International and Engagement in the College of Engineering and IT at Adelaide University, Australia. His career has combined structural engineering research with international engagement, university leadership, education and academic governance. He has held academic appointments in Australia and Hong Kong and has developed extensive research, institutional and professional networks across Asia, Europe, North America and other regions.

His research has focused extensively on the application of fibre-reinforced polymer composites in civil engineering, particularly for the repair, strengthening and rehabilitation of concrete, metallic and timber infrastructure, for over 25 years. More recent research has extended into sustainable and hybrid construction materials, as well as materials and structural systems for off-earth (lunar and Martian) applications. He has secured more than AUD 14.4 million in research funding and produced more than 310 publications, with his work receiving more than 15,000 citations in Google Scholar and a Scopus h-index of 49.

In recognition of his contributions to the profession, he has been elected to Fellowships of eight institutions around the world (American Concrete Institute; American Society of Civil Engineers; Engineers Australia; International Association for Bridge and Structural Engineering; International Institute for FRP in Construction; Royal Society of NSW; Royal Society of SA; The Hong Kong Institution of Engineers).

He has won several research awards such as Distinguished Young Researcher Award from the International Institute for FRP in Construction (IIFC), Warren Medal from Engineers Australia, Howard Medal from the UK Institution of Civil Engineers, as well as best paper awards at CICE and APFIS conferences.

A consistent feature of his career has been the connection between research, international collaboration and translation into engineering practice. His research findings have contributed to design guidance and standards developed by organisations including Standards Australia and the American Concrete Institute, while his broader research activities have involved sustained collaboration with universities, industry and professional organisations internationally.

Professor Smith has also made a long-standing contribution to the international FRP community. He joined IIFC at its formation in 2003, served on its Executive Committee from 2006 to 2023 and was President from 2018 to 2023. He currently chairs the IIFC Advisory Committee.

In 2007, he founded the Asia-Pacific Conference on FRP in Structures (APFIS) series in Hong Kong. The series reaches its twentieth anniversary in 2027 and has become an influential international forum for the FRP community. Many researchers have participated repeatedly throughout their careers, first as students or early-career researchers and later as established academics and research leaders (Figure 1). This continuity reflects Professor Smith's broader commitment to international collaboration, research translation and the development of lasting professional communities.

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Figure 1. Ninth Asia-Pacific Conference on FRP in Structures (APFIS 2024), Adelaide, Australia, 8-11 December 2024, of which I had the honour of Chairing.

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

My interest in FRP composites began when I joined The Hong Kong Polytechnic University as a postdoctoral fellow in 1999, working with Professor Jin-Guang Teng, shortly after completing my PhD in Australia

What attracted me was the combination of fundamental structural mechanics with a very practical infrastructure problem. FRP offered properties quite different from conventional construction materials, and it created an opportunity to rethink how existing structures could be repaired and strengthened. The excitement and energy of Hong Kong were also major drawcards.

My early work contributed to the book FRP-Strengthened RC Structures in 2002 (Figure 2), also authored by Professor Jin-Guang Teng, Professor Jian-Fei Chen and Dr. Lik Lam. The field has continued to evolve considerably since then, which has sustained my interest for more than 25 years.

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

One of the lessons from several decades of FRP research is that demonstrating technical performance is only one part of achieving widespread adoption.

Engineers need confidence to specify the FRP material, contractors need the knowledge to install it correctly, owners need confidence in safety and return on investment, and the economic case needs to be clear.

The technical challenges of FRP composites in construction remain, including brittle behaviour, debonding, anchorage, fire performance, creep rupture and durability of some resin systems. Cost is also important.

FRP can have a higher initial cost than conventional materials, while procurement frequently remains dominated by lowest initial cost rather than whole-of-life value.

Standards, demonstration projects and education therefore remain essential for the success of the material in practice. We also need to be disciplined about where FRP is used. The objective should not be to replace steel or concrete simply because an alternative material exists, but to use composites where their particular properties create genuine structural, economic or environmental value.

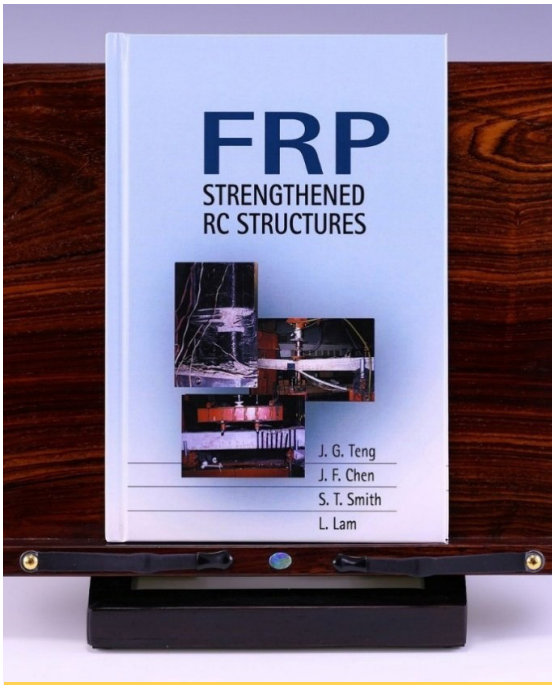


Figure 2. FRP-strengthened RC Structures, 2002: An early, influential book.

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

I see considerable opportunity at the intersection of composites, sustainability and intelligent infrastructure. Repair, strengthening and adaptive reuse will become increasingly important as the construction sector seeks to reduce embodied carbon, and lightweight FRP systems are well suited to many of these applications.

Hybrid construction is another important direction. Rather than considering FRP in isolation, we can combine it with other materials such as concrete, steel, timber, and ultra-high-performance concrete so that each material performs the function to which it is best suited.

I am also interested in smart composites and structural health monitoring, advanced manufacturing, more sustainable fibres and matrices, and end-of-life management. These developments move the discussion from asking whether FRP can replace a conventional material towards designing more efficient structural systems around the distinctive properties of composites.

Can you describe a particularly impactful project or initiative you have been involved with related to FRP composites and its outcomes?

One sustained area of my research has been the anchorage of externally bonded FRP strengthening systems. A fundamental limitation of bonded FRP is that premature debonding can prevent much of the available tensile capacity of the composite from being utilised. The research question was therefore relatively simple to state but difficult to resolve: how can we transfer greater force into the structure reliably and predictably?

Over a number of research projects, my colleagues, students and I investigated FRP anchors and their interaction with bonded strengthening systems (Figure 3). Experimental work demonstrated that appropriate anchorage can substantially increase the usable strain capacity of bonded FRP interfaces.

What makes this work particularly satisfying is the translation pathway. Research on FRP anchors and debonding has subsequently contributed to design guidance and standards, including work associated with ACI 440. It is a good example of fundamental structural mechanics and rigorous testing progressively becoming useful engineering knowledge.

What motivates you to continue working and contributing to the FRP composites area, even after so many achievements?

The field still contains important unresolved problems, but my motivation has broadened over time. Earlier in my career, I was particularly interested in understanding the mechanics of FRP-strengthened structures: bond, debonding, anchorage and structural behaviour. Those questions remain important, but I am now increasingly interested in what allows good research to become useful and how international research communities can accelerate that process.

Infrastructure challenges are inherently international. Ageing assets, decarbonisation, resilience and the need to use materials more efficiently are shared across countries, even though engineering practice, standards and local conditions differ. There is considerable value in researchers learning from one another internationally rather than developing solutions in isolation.

My involvement with IIFC and APFIS has reinforced this. Research advances through individual projects, however disciplines advance through communities. Developing people, strengthening international networks and helping knowledge move from research into engineering practice have therefore become increasingly important sources of motivation.

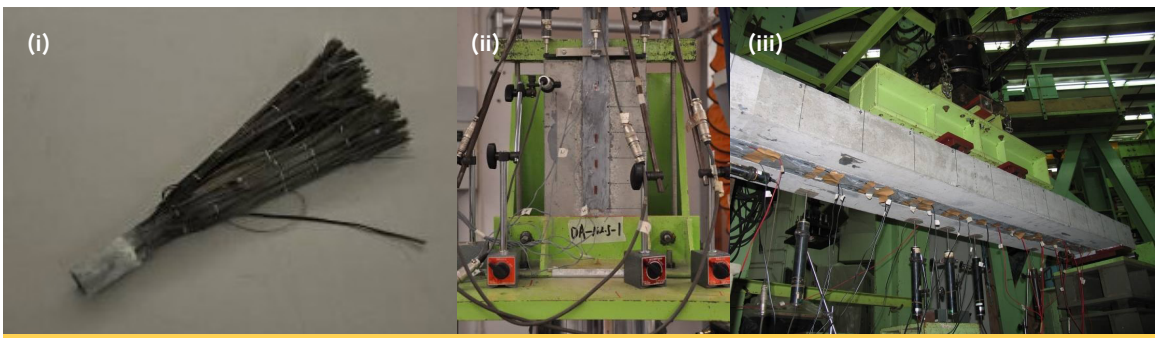


Figure 3. Development of FRP anchors and application to bonded FRP-to-concrete interfaces. Findings have helped inform design guidance for Standards Australia and ACI 440. (i) FRP anchor (ii) FRP-to-concrete joint containing an FRP anchor (iii) Application of FRP anchors to FRP-strengthened RC slab

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

I would start with a strong commitment to mastering a wide range of engineering fundamentals and more. Technologies change, but mechanics, careful experimentation and numerical modelling, critical thinking and the ability to distinguish an interesting result from an important problem remain fundamental.

I would also become internationally engaged early in my career. Some of the most important opportunities in my career arose through working in different countries, collaborating with researchers with different perspectives and becoming involved in international professional communities. International engagement is about attending conferences and more; it is about establishing relationships that develop through repeated collaboration and mutual trust. Over time friendships develop and this is a particularly satisfying experience.

I would also engage with industry early and think about translation from the beginning of a project. Finally, I would read broadly, remain curious and recognise that a career is built not only through publications, but also through people, relationships and the opportunities you help create for others.

What is your favourite hobby outside of work?

My adopted hobby is the sport of Judo, of which I commenced in 1994 and currently hold the rank of third-degree black belt. What has sustained my interest is that Judo is not simply a physical activity; rather it is a disciplined system of learning and application built around respect, mutual welfare and benefit, and maximum efficiency.

There are strong parallels between Judo and engineering. In both, you first master the fundamentals and then learn how to apply those fundamentals in new and creative ways. In Judo, the "Gokyo" provides the technical foundation, although effectiveness comes from adapting and combining those techniques to suit different situations. Engineering is similar in that the underlying principles remain constant, while judgement and creativity determine how they are applied to solve new problems.

Judo also depends on balance, leverage, timing and biomechanics (Figure 4). Effectiveness comes from understanding how forces act, rather than simply applying greater force. Its international character is equally important to me where the techniques, terminology and traditions are shared across countries and cultures, thus providing a common language between practitioners around the world.



Figure 4. Mechanics in motion - A life-long Judo journey (that's me "lifting" my partner!).

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COMPOSITES AROUND THE WORLD

Case Study

Building for the Future: GFRP Reinforcement at the Alligator River Bridge (The Lindsay C. Warren Bridge) North Carolina

Nicole Fletcher
NC Department of Transportation

Rudolf Seracino
Department of Civil, Construction, and Environmental Engineering at NC State University, USA

Borna Hajimiragha
MST Rebar Inc.

Alireza Asadian
MST Rebar Inc.

INTRODUCTION

North Carolina is the third most hurricane prone state in the United States, and many coastal bridges are part of the critical lifeline for rural communities serving evacuation routes and access by emergency vehicles. Hence, the replacement of the Lindsay C. Warren Bridge over Alligator River represents an important step forward in the use of noncorrosive reinforcement to enhance the resiliency of major transportation infrastructure in the United States.

Located in a demanding coastal environment, the bridge is exposed to moisture, chlorides, and changing environmental conditions that can affect the long-term durability of reinforced-concrete structures. These conditions make corrosion resistance an important consideration in the selection of reinforcement.

Glass fiber-reinforced polymer (GFRP) reinforcement provides a noncorrosive alternative to conventional steel. Unlike carbon-steel bars, GFRP reinforcing bars do not rust when exposed to moisture or chlorides, helping address one of the most common causes of deterioration in steel reinforced-concrete infrastructure.

The project brings together NCDOT, engineers, material specialists, manufacturers, testing agencies, contractors, and installers to deliver a major bridge incorporating advanced composite reinforcement. It demonstrates not only the durability benefits of GFRP, but also the manufacturing, quality control, logistics, and coordination required to use the material at infrastructure scale.

THE OWNER'S PERSPECTIVE

The existing Lindsay C. Warren Bridge over the Alligator River was completed in 1960 and consists of 343 spans, totaling 15,064 feet [4.6 km] in length. Its approaches feature a reinforced concrete deck supported by steel strand prestressed concrete girders, while the main span is a swing span composed of a concrete filled steel grid deck on steel stringers, floor beams, and girders.

The structure has a deck rating of 5 out of 9, and superstructure and substructure ratings of 4 out of 9 requiring approximately $60,000 USD in maintenance costs every year. In addition to those annual costs, two rehabilitation projects were recently completed: a $3,000,000 USD project in 2010 and a $20,000,000 USD project in 2017.

Building on the recent success of the completely steel-free Harkers Island Bridge—to withstand highly corrosive coastal conditions—the North Carolina Department of Transportation (NCDOT) is incorporating FRP into many—though not all—components of the Alligator River Bridge replacement. Material requirements include approval of the manufacturing facility and FRP products through annual audits of the American Association of State Highway and Transportation Officials (AASHTO) – Product Evaluation and Audit Solutions (PEAS) program followed by a 3rd party independent auditing firm. Current project specifications require project-level sampling and testing of each production lot of FRP that is received onsite. The project-level QC is currently managed by North Carolina State University (in collaboration with the University of Miami).

The proposed bridge, utilizing a construction manager/general contractor (CM/GC) project delivery method in which a contractor is selected in the design phase, has a 100-year design life and will be situated on a new alignment parallel to the north side of the existing structure. The structure will include 135 spans totaling 17,541 feet [5.35 km] featuring a reinforced deck supported by prestressed Florida I-Beams (FIBs). The design provides a main navigational opening with a 170-foot [51.8-m] span, a minimum vertical clearance of 65 feet [19.8 m], and a minimum horizontal clearance of 140 feet [42.6 m]. Components constructed with GFRP include piles, pile caps, columns, bent caps, and bridge deck.

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Construction of the new Alligator River Bridge, where GFRP reinforcement is being used to support the project's long-term durability objectives (Photo courtesy of MST Rebar Inc.).



Preassembly of reinforcement cages at the Alligator River Bridge project site (Photo courtesy of MST Rebar Inc.).

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THE MANUFACTURER'S PERSPECTIVE

A project of this scale tests more than the performance of the reinforcement. It tests the manufacturer's ability to produce consistently, fabricate accurately, maintain traceability, and deliver reliably as construction priorities evolve.

For MST Rebar, the Alligator River Bridge is an opportunity to demonstrate that GFRP reinforcement can be supplied at the pace and level of technical control required for major bridge construction. Production remains ongoing and includes both straight and fabricated bars for several structural components.

The Alligator River Bridge stands not only as an engineering achievement but as proof that visionary owners and engineers, capable contractors, and dedicated manufacturers can work together to redefine what's considered possible, and to build infrastructure that serves not just today's needs, but generations to come.

Manufacturing at Infrastructure Scale

MST-BAR® is produced by combining continuous glass fibers with a high-performance polymer resin system under controlled manufacturing conditions. The process is designed to maintain consistent fiber alignment, fiber content, dimensions, surface characteristics, and mechanical properties.

Production for the project includes reinforcement sizes ranging from No. 4 to No. 10 [12.7 mm to 32 mm diameter]. MST Rebar currently produces an average of approximately 85,000 lb [38,100 kg] per week, with peak production reaching approximately 120,000 lb [54,430 kg] per week. During the most active periods, this capacity has supported approximately five truckloads per week. Because MST-BAR weighs approximately one-quarter as much as steel reinforcement, each truckload can deliver nearly four times the linear footage of comparably sized steel rebar.

These rates are more meaningful than a final quantity while the project remains underway. They demonstrate MST Rebar's ability to sustain production as project requirements, bar configurations, and delivery priorities change.

Quality Control and Traceability

Consistent GFRP performance depends on control of the fibers, resin system, curing, dimensions, surface characteristics, and production process. Each project production lot is uniquely identified and evaluated under MST Rebar's quality-control program. This allows the reinforcement to be traced from incoming raw materials through manufacturing, testing, packaging, shipment, and installation.

Hundreds of samples are completed and tested every week, and all the test data are documented and reported to the project team.



MST-BAR® GFRP reinforcement installed in the bridge deck of the Alligator River Bridge project (Photo courtesy of MST Rebar Inc.).

This continuous testing provides ongoing confirmation that the specified physical and mechanical properties are maintained throughout production according to the requirements of ASTM D7957/D7957M-25 and ASTM D8505/D8505M-25. The strength of the quality-control program lies not only in the number of tests performed, but in the ability to connect each test result to the reinforcement delivered to the project.

Fabrication and Dimensional Control

Unlike conventional steel reinforcement, thermoset GFRP bars cannot be bent in the field. Stirrups, ties, and other bent shapes must therefore be manufactured to their final geometry before delivery.

This requires accurate detailing, controlled fabrication, dimensional inspection, and early coordination with the project team. The current scope includes more than 300 fabricated shapes, including large No. 10 [32 mm diameter] bent and straight bar reinforcement for bridge columns, pile caps, and other structural components.

Producing these shapes consistently and in sequence with construction is one of the project's more demanding manufacturing requirements.

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Delivery in Step with Construction

The lightweight of GFRP reinforcement provides practical advantages during transportation, unloading, handling, and installation - provided adequate space is available at the construction site, as is the case with the Alligator River Bridge replacement project. The lightweight reinforcement also allows large cages to be assembled and inspected at grade before being lifted into their final position. This can improve access for assembly and inspection, reduce the amount of tying and handling required at the point of placement, and simplify installation of large reinforcement cages. The lower weight is particularly beneficial for long bars and large fabricated shapes.

However, successful supply depends on more than material weight. Reinforcement must arrive in the correct sequence, clearly identified, and ready for placement. MST Rebar coordinates production and shipment with upcoming construction activities. Deliveries currently average approximately 2 truckloads per week and reach 5 truckloads per week during peak periods. Each bundle is identified by bar size, bar mark, shape, quantity, and production lot, allowing the contractor to locate and verify the required reinforcement before installation.

This combination of manufacturing flexibility, clear identification, and sequenced delivery helps reduce field uncertainty and supports continuity of construction.

Collaboration with the Project Team

The successful use of GFRP reinforcement requires close communication among the owner, engineer, contractor, installer, testing agencies, and manufacturer. MST Rebar works closely with Skanska, the general contractor, and Shelby Erectors, the rebar installer, to coordinate bar schedules, fabricated shapes, testing, packaging, construction sequencing, and delivery priorities. As project requirements evolve, manufacturing and delivery plans are adjusted accordingly to support the construction schedule.

The technical value MST Rebar brings to the project is therefore not limited to the reinforcement itself. It also includes the production planning, quality documentation, fabrication experience, and responsiveness required to move a complex reinforcement package from the drawings to the jobsite.



GFRP reinforcement cages for bridge columns and pile caps (Photo courtesy of MST Rebar Inc.).



MST-BAR® being stored on-site before assembly (Photo courtesy of MST Rebar Inc.).



The lightweight nature of GFRP reinforcement can simplify handling and installation (Photo courtesy of MST Rebar Inc.).



The lightweight nature of GFRP reinforcement can simplify handling and installation (Photo courtesy of MST Rebar Inc.).

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CONCLUSIONS

The Alligator River Bridge replacement project represents an important advancement in the use of GFRP reinforcement for major bridge infrastructure. Its significance extends beyond the amount of material supplied. The project demonstrates the coordination required to design, qualify, manufacture, deliver, and install a noncorrosive reinforcement system on a large public infrastructure project.

NCDOT established the durability objectives. Engineers developed the design and material requirements. Testing agencies verified performance. MST Rebar provided the controlled manufacturing, specialized fabrication, traceability, and responsive delivery needed to support construction.

The project remains underway, and the long-term performance of the bridge will ultimately provide the most important measure of success. Its design and construction already demonstrate, however, that GFRP has progressed from a specialized material to a practical reinforcement solution for durable, large-scale infrastructure.



One of the project's largest GFRP-reinforced footing cages is lifted for installation. (Photo courtesy of Jackson Nix, Shelby Erectors, Inc.)



Bridge columns and pile caps reinforced with MST-BAR® (Photo courtesy of MST Rebar Inc.).

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PUBLICATIONS

Book Review

"Design of Fibre-Polymer Composite Structures. Commentary to European Technical Specification CEN/TS 19101:2022"

João Ramôa Correia
Instituto Superior Técnico,
University of Lisbon, Portugal
joao.ramoa.correia@tecnico.ulisboa.pt



The European Technical Specification CEN/TS 19101:2022 was published in November 2022, by the European Committee for Standardization (CEN), representing a milestone in the advancement of fibre-polymer composite materials, particularly in Europe. This design standard, which is expected to be converted to Eurocode (11) by 2028, was the result of about 10 years of a collective effort developed within the Working Group WG4 of the Technical Committee 250 of CEN (CEN/TC 250).

Published in 2025, the book "Design of Fibre-Polymer Composite Structures: Commentary to European Technical Specification CEN/TS 19101:2022" was edited by João R. Correia, Thomas Keller, Jan Knippers, J. Toby Mottram, Carlo Paulotto, José Sena-Cruz, and Luigi Ascione, respectively members of the Project Team responsible for drafting CEN/TS 19101:2002 and convenor of WG4. Prepared alongside the technical specification, the book documents the technical background, scientific evidence, and engineering considerations that supported the development of CEN/TS 19101:2022.

The Commentary follows the structure of CEN/TS 19101:2022, allowing readers to consult individual topics directly together with the relevant clauses of the technical specification. In total, the book compiles 395 background reports, each co-authored by members of the project team and associated WG4 experts, and reviewed by at least two reviewers. These reports explain the rationale behind the provisions contained in the most relevant clauses of the technical specification, and provide references to the experimental, analytical, and numerical studies that informed its development.

Covering topics such as basis of design, material characterization, durability, structural analysis, ultimate limit states, serviceability, fatigue, detailing, connections and fire design, the book offers a comprehensive overview of the current state of knowledge in the field.

An important feature of the publication is its role in bridging research and engineering practice. Rather than presenting design provisions in isolation, it explains the assumptions, evidence, and discussions that led to their adoption, and it also points out aspects that warrant further research. In doing so, it offers readers – both practitioners and academics - valuable insight into both the opportunities and challenges associated with the structural use of fibre-polymer composites. The inclusion of detailed references also provides a useful starting point for further study and research.

It is worth referring that the book was published by CRC press in Open Access format (link), for which it received the support of JEC Composites, and also of EuCIA – The European Composites Industry Association.

KNOW MORE ABOUT THE BOOK

PUBLICATIONS

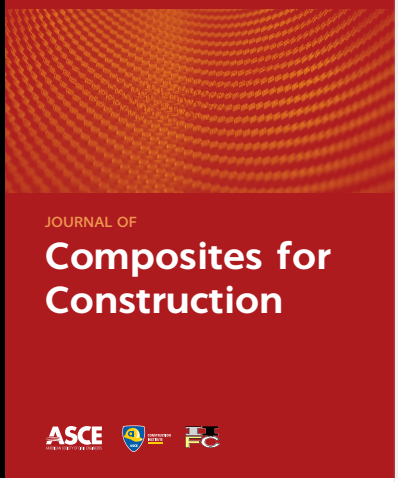
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