

CICE 2023

RIO DE JANEIRO – BRAZIL

11TH INTERNATIONAL CONFERENCE ON
FRP COMPOSITES IN CIVIL ENGINEERING



CONFERENCE PROGRAMME

JULY 23RD - 26TH 2023

CO-CHAIRS:

DANIEL C. T. CARDOSO

KENT A. HARRIES

RILEM TRM/TRC THEME CHAIR:

FLÁVIO A. SILVA



Welcome to Rio!

Welcome to the 11th International Conference on Fiber-Reinforced Polymer (FRP) Composites in Civil Engineering (CICE 2023)!

Welcome to the International FRP community's first face to face conference in five years!

CICE 2023 is the eleventh in a series of prestigious conferences that began in 2001, in Hong Kong, and has circled the world since; this is the first CICE to be held in South America.

CICE is the official conference of International Institute for FRP in Construction (IIFC) and brings together the FRP research community and industry to share and discuss recent developments and future perspectives in the field.

FULL CONFERENCE PROCEEDINGS

zenodo.org/communities/cice2023/



CICE 2023 WEBSITE

cice2023.org



CICE 2023 BY THE NUMBERS

332 abstracts received... 196 papers published... representing 519 authors... and 36 countries

PAST CICE CONFERENCES

2001 Hong Kong

2004 Adelaide, Australia

2006 Miami, USA

2008 Zurich, Switzerland

2010 Beijing, China

2012 Rome, Italy

2014 Vancouver, Canada

2016 Hong Kong

2018 Paris, France

2021 Istanbul, Turkiye

CICE 2023

RIO DE JANEIRO - BRAZIL

11TH INTERNATIONAL CONFERENCE ON FRP COMPOSITES IN CIVIL ENGINEERING

CONFERENCE CO-CHAIRS

Daniel C. T. Cardoso – Pontifical Catholic University of Rio de Janeiro, Brazil
Kent A. Harries – University of Pittsburgh, USA

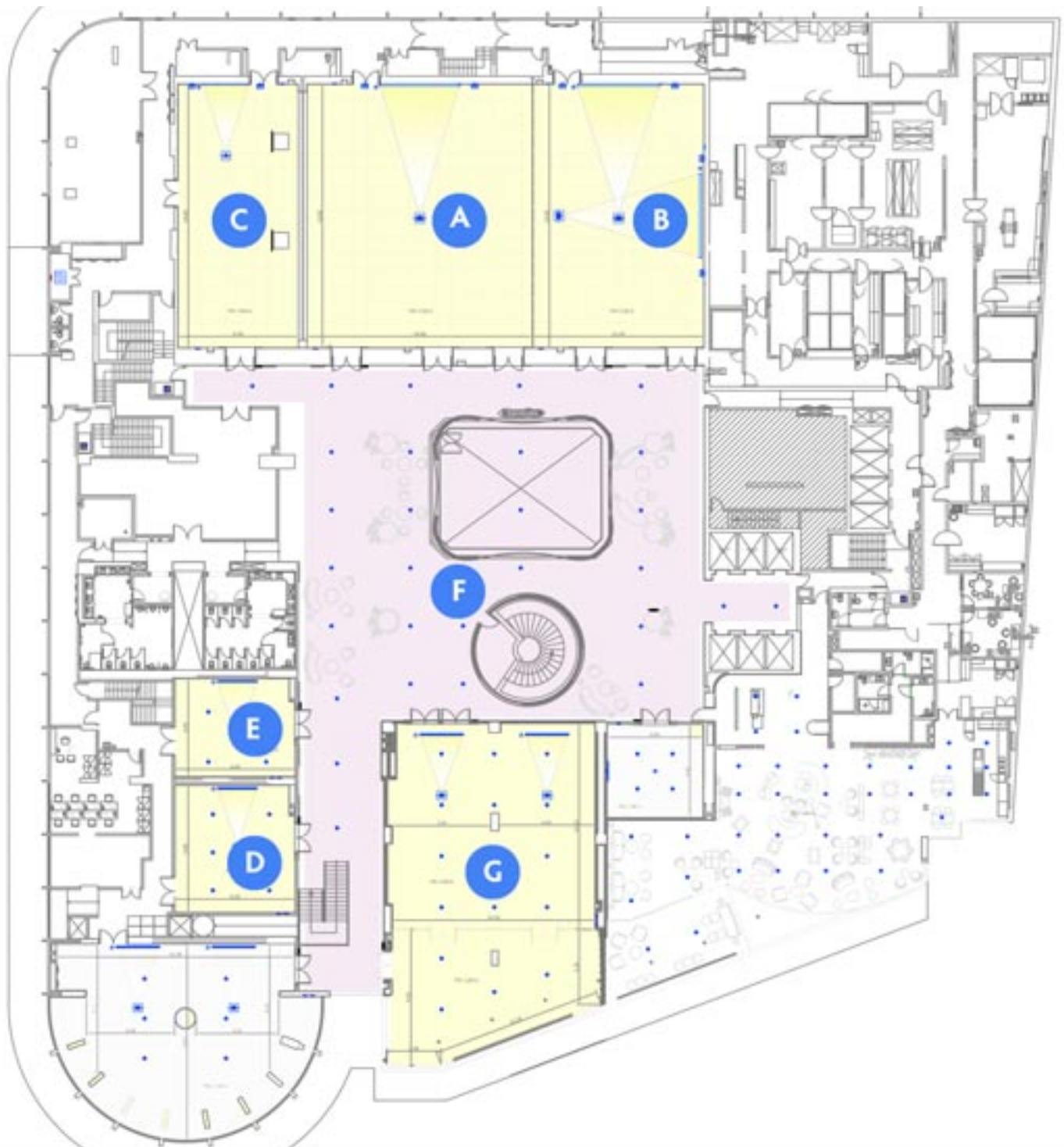
ORGANIZING COMMITTEE

Flávio A. Silva – Pontifical Catholic University of Rio de Janeiro, Brazil
Janine Vieira – Fluminense Federal University, Brazil
Martin Noël – University of Ottawa, Canada
TianQiao Liu – Beijing University of Technology, China
Rebecca Gravina – The University of Queensland, Australia

LOCAL ORGANIZATION

| | | |
|------------------------------|-------------------------------------|--|
| Ana Luiza de Moura Rodrigues | Jon Karl Weibull | Renan Felinto dos Santos |
| Bluma Gamerman | Julio Jorge Braga de Carvalho Nunes | Rennan Liberato Rodrigues |
| Bruno Jordão | Kíssila Goliath | Rita de Cassia N. Leite |
| Euclides Moura Neto | Lilia Cruz | Thiago Andrade Gomes |
| Felipe Souza Rodrigues | Luisa Frade | Vitor Monteiro |
| Geovane Silva | Marcello Tostes | Victor Nascimento Silva |
| Gilcyvania Costa | Natália Victoria dos Santos | |
| Gisele Cintra | Paulo Henrique Marangoni Feghali | Alessandra Leitão (Creactiveve Eventos) |
| Iranildo Silva Junior | Priscilla Shimba Carneiro Vieira | Marcus Moura (VOAR Multimedia) |
| Jessé Beserra | Rebecca Mansur de Castro Silva | |

HOTEL/CONFERENCE CENTRE MAP | 4TH FLOOR



- A - RIO DE JANEIRO II
- B - RIO DE JANEIRO I
- C - RIO DE JANEIRO III
- D - FLAMENGO
- E - BOTAFOGO

- F- FOYER
- G - ARPOADOR

| Sunday 23 July | | Monday 24 July | | | Tuesday 25 July | | | Wednesday 26 July | | | | |
|----------------|--|-------------------------------|------------------------------------|----------------------|---|--------------------------------|--------------------------------|---|---|--|-----------------------------------|---------------------------|
| | A | B | C | D | A | C | D | E | A | B | C | D |
| | Rio de Janeiro II | Rio de Janeiro I | Rio de Janeiro III | Flamengo | Rio de Janeiro II | Rio de Janeiro III | Flamengo | Botafogo | Rio de Janeiro II | Rio de Janeiro I | Rio de Janeiro III | Flamengo |
| | Conference Opening | | | | Keynote: Professor Sandro Amico | | | | IIFC Young Researcher Award Keynote: Professor Elyas Ghafoori | | | |
| | Opening Keynote: Professor Kim Pickering | | | | Keynote: Dr. Justine Beauson | | | | IIFC Medal Lecture: Professor Riadh Al-Mahaidi | | | |
| | Coffee Break | | | | Coffee Break | | | | Coffee Break | | | |
| I | 08h30 | 08h45 | 09h00 | 09h15 | 09h30 | 09h45 | 10h00 | 10h15 | 10h30 | 10h45 | 11h00 | 11h15 |
| | Visit PUC-Rio (open to all attendees) | | | | FRP Reinforcing Bar Codes | Concrete Strengthening - Shear | All FRP Structures | TRM/TRC Materials I | Special Session on Reuse of Wind Turbine Blades | Steel Repair with FRP I | TRM/TRC Design I | Confinement and FRP Tubes |
| II | 11h00 | 11h15 | 11h30 | 11h45 | 12h00 | 12h15 | 12h30 | 12h45 | 13h00 | 13h15 | 13h30 | 13h45 |
| | Special Session on Design of All FRP Structures using CEN/TS 19101 | FRP Reinforcing Bars - Bond I | Concrete Strengthening - flexure | TRM/TRC Materials II | IIFC Best Thesis Presentations | Steel Repair with FRP II | All FRP Structures - Damage | FRP Reinforcing Bars Bond II - Pull-out Testing | Bridges, Fatigue and Sandwich Structures | Biocomposites and Applications with Wood | FRP Reinforcing Bars - Durability | TRM/TRC Durability |
| III | 14h00 | 14h15 | 14h30 | 14h45 | 15h00 | 15h15 | 15h30 | 15h45 | 16h00 | 16h15 | 16h30 | 16h45 |
| | Lunch Break | | | | IIFC Council and ExCOM Meeting (by invitation) | | | | Lunch Break | | | |
| IV | 17h00 | 17h15 | 17h30 | 17h45 | 18h00 | 18h15 | 18h30 | 18h45 | 19h00 | 19h15 | 19h30 | 19h45 |
| | Keynote: Professor Barzin Mobasher | | | | Keynote: Professor Brahim Benmokrane | | | | Keynote: Professor Barzin Mobasher | | | |
| | Break | | | | Break | | | | Break | | | |
| V | 08h30 | 08h45 | 09h00 | 09h15 | 09h30 | 09h45 | 10h00 | 10h15 | 10h30 | 10h45 | 11h00 | 11h15 |
| | Special Session on Turkey Earthquake and Seismic Retrofit | FRP Reinforcing Bars - Shear | Concrete Strengthening - Anchorage | TRM/TRC Modelling | Concrete Strengthening - Columns | TRM/TRC Design II | All FRP Structures - Stability | All FRP Bridges and Flax Fibre FRP | Concrete Strengthening - Walls and Slabs | FRP Reinforcing Bars - Slabs and Arches | All FRP Structures - Durability | TRM/TRC Retrofit I |
| VI | 12h00 | 12h15 | 12h30 | 12h45 | 13h00 | 13h15 | 13h30 | 13h45 | 14h00 | 14h15 | 14h30 | 14h45 |
| | Coffee Break | | | | Coffee Break | | | | Coffee Break | | | |
| | RILEM TC Meeting - Pao de Acucar Room (by invitation) | | | | RILEM TC Meeting - Pao de Acucar Room (by invitation) | | | | RILEM TC Meeting - Pao de Acucar Room (by invitation) | | | |
| | Registration open at 1600 in Conference Lobby | | | | Registration open at 1600 in Conference Lobby | | | | Registration open at 1600 in Conference Lobby | | | |
| | Sunset | | | | Sunset | | | | Sunset | | | |
| | Reception | | | | Reception | | | | Reception | | | |

| |
|------------------------|
| LEGEND |
| Keynotes |
| IIFC events |
| Breaks |
| TRM/TRC (RILEM) |
| internal FRP (bars) |
| strengthening concrete |
| strengthening steel |
| pultruded and all FRP |
| other topics |

SESSION DESIGNATION

[day] - [session] - [room] - [paper order]
 Example: 24-III-C-2
 24 July, Session II, Room C, second paper
 All paper numbers are those from original EasyChair submission

Proceedings: <https://zenodo.org/communities/cice2023/>

Conference Dinner and Awards Ceremony (Room A)

KEYNOTE ADDRESSES

OPENING KEYNOTE – MONDAY AT 08H30



Kim Pickering
University of Waikato,
New Zealand

BEING FAIR AND THE ROLE OF MATERIALS

Materials Science and Engineering is of great importance; materials are what we use to support our daily lives and achievements. This is evidenced by human eras being named after materials (e.g iron/bronze ages), occurring as these materials have defined the capability of humans to address the challenges faced. Incredible performance has been achieved with materials including advanced composites, semiconductors, materials for medical prosthetics and superconductors which have transformed daily lives and human capability. However, currently we are on target to leave our planet much worse than it was when we as individuals came to it. Some have described the current era as the Anthropocene, relating to the impact humans have had on the planet and highlighting that all is not well for humankind and other species living on Earth. How we are using materials and how they are “flowing” through society is a huge problem; the current “take-make-use-waste” models of materials flows has to change to prevent irreversible damage. Effectively, we are stealing from future generations. This has been acknowledged in quotes including the following: “We don’t inherit the Earth from our ancestors, we borrow it from our children”¹. We are currently leaving things very late to act sufficiently to rein in the damage being inflicted on the environment. Advances, including those in materials are now needed to enable the required transition to a more “circular” flow. This talk will focus on transdisciplinary research incorporating the concept of a “circular economy/society” and materials targeted to support well-being and a transition to a fairer world.

KEYNOTE – MONDAY AT 14H00



Barzin Mobasher
Arizona State
University, Tempe, USA

ADVANCES IN THE TEXTILE REINFORCED CONCRETE STRUCTURAL DESIGN AND APPLICATIONS

Textile reinforced concrete (TRC) composites have received a significant attention in the past 20 years as emerging lightweight construction materials with strength and ductility that compete and outperform light gage steel and wood products in many applications. These composites offer long-term durability, ductility, high strength and are amenable to continuous production and formability, thus making it highly sustainable. Since the life cycle costs of structural systems is ideally measured in terms of raw materials, labor, energy, environmental impact, serviceability, and durability, the opportunity for the development and use of TRC is attractive since it addresses many of the life cycle cost parameters. Using effective manufacturing technique such as automated pultrusion process efficient production of TRC structural sections can be attained. A variety of textile types have been studied and characterized for mechanical and durability properties with AR- Glass, Carbon, PVA, Basalt, and polypropylene (PP) fiber based mesh reinforcement. Two-dimensional woven textile reinforcements can be formed into 3-D structural sections such as angles, channels, and W-sections. Test results of flexural and tension specimens are discussed in terms of closed loop tests and Digital Image Correlation (DIC) technique. The overview is extended to the development of structural analysis tools for tension, compression, and elastic plastic for flexural modeling, as well as local stability criterion for compression buckling of these structural sections are addressed. Effects of strain hardening, distributed cracking, connection methodology and failure mechanisms of the structural sections are discussed in detail. The presentation also addresses the development of generalized design tools for thin section strain hardening composites. Analytical closed form solutions for serviceability based design and analysis of composite systems such as beams, and panels as 1-D and 2D elements are introduced. It is shown that both material and structural design are concurrently accomplished using closed form solutions for moment-curvature response as well as tension stiffening and local compression buckling. Results are further discussed with respect to the section thickness, end conditions, connection geometry, textile type, and volume fraction. It is therefore imperative that new design tools, and guidelines be developed for composites with high strength, ductility, and stiffness.

KEYNOTES – TUESDAY AT 08H30

Sandro C. Amico
Federal University of Rio Grande do Sul, Brazil

OVERVIEW OF THE COMPOSITES INDUSTRY FOCUSING ON MATERIALS, PROCESSES AND TRENDS

The use of composites is steadily increasing since the 60's, finding their way into a variety of sectors, and being nowadays the material of choice in wind energy, marine and electrical & electronics. They have continuously evolved, from mere substitutes to indispensable, and, indeed, some newer applications are only possible due to their remarkable characteristics. This lecture will start with an overview of the current composites market, including major sectors, market value and share by region/country, and post-pandemic situation, based on JEC reports. The major fibre types, thermoplastics and thermosets polymer matrices, and manufacturing processes will then be presented. This will be followed by some recent work of the composites and nanocomposites group at UFRGS, including composites for Oil and Gas and energy sectors, and the development of a web-based composite mechanics software (Mech-Gcomp, www.ufrgs.br/mechg). The final remarks will summarize the addressed aspects and present some innovations, including in Building and Civil Engineering, and general trends in composite materials.



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

The recycling of wind turbine blades and of polymer composites in general has been studied for the last three decades, but recycling solutions are still rare. Wind turbine blades are components designed for a service life of at least 20 to 25 years. Their complex structure mainly made of glass fiber reinforced polymer composites is a challenge for recycling. This presentation gives an overview of the technical challenges related to the recycling of wind turbine blades and highlight the importance of a holistic approach to establish successful end-of-life value chain.

KEYNOTE – TUESDAY AT 14H00

Brahim Benmokrane
University of Sherbrooke, Canada

DEVELOPMENTS ON FRP REBARS AS INTERNAL REINFORCEMENT IN CONCRETE STRUCTURES AND FIELD APPLICATIONS

Extensive research and field practices have established the design principle of using fiber-reinforced polymer (FRP) bars to reinforce concrete structures. Material specifications and design aspects are now regulated through provisions governing certification testing, quality control/assessment, and FRP design. The Canadian Standards Association (CSA) updated two provisions related to FRP materials and design. The 2019 edition of CSA S807 includes modifications to quality and qualification requirements, material properties, testing procedures, and material mechanical and durability limitations. Section 16 of CSA S6 (2019) was also updated to provide more rational design algorithms for fiber-reinforced structures and highway bridges, allowing practitioners to fully utilize the efficiency and economic appeal of FRP bars. Additionally, the recent editions of CSA S900.2 (2021) on the structural design of wastewater treatment plants and CSA S413 (2021) for parking garages include provisions on the use of FRP bars as high-durable reinforcement. This presentation provides an overview of the recent changes in Canadian codes and standards and explains the reasoning behind them. It also highlights examples of recent field applications of FRP bars in various types of concrete civil-engineering infrastructure.

KEYNOTES – WEDNESDAY AT 08H30



Elyas Ghafoori
Leibniz University
Hannover, Germany

IIFC YOUNG RESEARCHER AWARD LECTURE

REPAIR AND STRENGTHENING OF STEEL STRUCTURES USING CFRP COMPOSITES: AN OVERVIEW

Since decades, carbon fiber-reinforced polymer (CFRP) composites have been used for strengthening of concrete structures, for which the required design theories and techniques have been well developed. However, strengthening of steel structures still requires further development of relevant theories and techniques. In this paper, the main differences in design requirements for CFRP strengthening of concrete and steel members are discussed. In addition, an overview on the research at EMPA on non-prestressed/prestressed bonded/unbonded strengthening systems using CFRP plates and rods for steel girders, plates and connections is given, and, a few projects for real application of the developed systems in steel bridges are briefly explained.



Riadh Al-Mahaidi
Swinburne University of
Technology, Australia

IIFC MEDAL LECTURE

ENHANCING SEISMIC RESILIENCE: VALIDATION OF FRP REPAIR TECHNIQUES THROUGH 6-DOF HYBRID TESTING

This paper highlights the role of 6-DOF hybrid testing as a validation tool for assessing the effectiveness of Fiber Reinforced Polymer (FRP) composite repair and retrofitting techniques in structures undergoing seismic events. By combining physical testing and numerical simulations, the advanced hybrid testing technique accurately replicates complex loading conditions, including axial, lateral, longitudinal, pitch, roll, and yaw forces. This comprehensive evaluation helps optimize the design and implementation of FRP solutions, enhancing the seismic resilience of reinforced-concrete structures. The paper presents some examples emphasizing the importance of hybrid testing in promoting the adoption of FRP composites and advancing seismic retrofitting practices in civil engineering.

SPECIAL SESSION ON TÜRKIYE EARTHQUAKES – MONDAY AT 15H00



Alper Ilki
Istanbul Technical
University, Türkiye

Three consecutive earthquakes (Mw 7.7, 7.6, and 6.4) struck Türkiye in February 2023, impacting 11 provinces with a population of over 16 million. The earthquakes and numerous aftershocks caused widespread devastation, resulting in the collapse or severe damage of over 250,000 buildings.

OUTLINE OF THE PERFORMANCES OF REINFORCED CONCRETE BUILDINGS DURING FEBRUARY 2023 TURKIYE EARTHQUAKES AND POTENTIAL USE OF FRPs TOWARDS MORE RESILIENT BUILDINGS

On-site investigations of affected buildings, identifying deficiencies and structural failures are presented. The potential of fiber reinforced polymers for enhancing building resilience, summarizing previous experimental studies and actual applications in light of the observed damages from the recent February 2023 Türkiye Earthquakes is explored.

OBSERVED PERFORMANCE OF A RC WALL-FRAME BUILDING DURING THE FEBRUARY 2023 TURKIYE EARTHQUAKE AND PERFORMANCE IMPROVEMENT USING FRPs

Results of nonlinear response history analysis are presented for an existing RC wall-frame building, which suffered collapse-level damage during the February 2023 earthquakes. Performance analysis results for two building configurations are compared; the existing building configuration generated upon on-site observations; and, a hypothetical configuration in which the structural walls and columns are retrofitted using externally-bonded FRP sheets. Analysis results reveal that in its existing configuration, mostly due to detailing deficiencies, a collapse-level performance was not unexpected; whereas FRP strengthening of the building would have resulted in collapse-prevention performance.

HIGHLIGHTED SESSIONS

MONDAY 09H45 ROOM A

FRP REINFORCING BAR DESIGN CODES

Chaired by Vicki Brown, Widener University and chair of ACI 440H subcommittee responsible for ACI CODE 440.11-22

MONDAY 11H00 ROOM A

DESIGN OF ALL-FRP STRUCTURES USING CEN/TS 19101

Chaired by Luigi Ascione, University of Salerno and leader of WG4 of CEN TC250, responsible for CEN/TS 19101.

TUESDAY 11H00 ROOM A

IIFC BEST THESIS AWARD PRESENTATIONS

HYBRID GLULAM-FRP BEAM WITH IMPROVED FIRE PERFORMANCE

Abdulrahman Zaben, The University of Queensland, Australia

FIRE BEHAVIOUR OF CONCRETE STRUCTURES REINFORCED WITH GFRP BARS

Inês Cruz Mina Rosa, University of Lisbon, Portugal

FRACTURE BEHAVIOUR OF PULTRUDED GFRP PROFILES: APPLICATION TO WEB-CRIPPLING PHENOMENA

Lourenço Rocheta de Almeida-Fernandes, University of Lisbon, Portugal

LIFE CYCLE ASSESSMENT AND CO-PROCESSING OF WASTE FROM DECOMMISSIONED IRISH WIND TURBINE BLADES

Angela Nagle, University College Cork, Ireland

IIFC MEETINGS

| | | |
|--------|--------------|---|
| Monday | 18h00 Room A | IIFC General Meeting – all are welcome! |
| Monday | 12h30 | IIFC Council Meeting – by invitation |
| Monday | 13h30 | IIFC Executive Committee Meeting – closed |

CONFERENCE DINNER AND AWARDS PROGRAMME

Tuesday 19h00 Rio de Janeiro Ballroom

PAPER INDEX

| Paper Number | Session | Paper Number | Session | Paper Number | Session | Paper Number | Session | Paper Number | Session |
|--------------|----------|--------------|----------|--------------|----------|--------------|----------|--------------|----------|
| 5 | 24-III-B | 74 | 26-III-C | 138 | 26-III-C | 213 | 25-VI-D | 297 | 25-V-D |
| 6 | 25-VI-C | 76 | 26-II-B | 139 | 24-III-A | 214 | 25-II-E | 298 | 26-III-D |
| 9 | 24-VI-C | 77 | 25-V-E | 140 | 26-III-C | 215 | 26-III-C | 300 | 24-V-D |
| 10 | 24-VI-A | 78 | 25-II-C | 142 | 26-III-B | 216 | 24-II-C | 306 | 25-VI-D |
| 13 | 25-VI-D | 80 | 26-II-A | 143 | 24-III-C | 217 | 24-V-D | 307 | 25-III-E |
| 14 | 24-II-C | 81 | 26-II-A | 144 | 24-VI-D | 218 | 24-V-D | 308 | 25-III-E |
| 18 | 26-II-A | 85 | 24-VI-A | 145 | 24-V-B | 219 | 25-III-E | 311 | 25-II-E |
| 19 | 24-II-B | 86 | 25-III-D | 148 | 24-II-D | 223 | 26-III-C | 312 | 26-II-B |
| 20 | 25-V-C | 87 | 26-III-A | 149 | 24-III-C | 224 | 24-III-B | 315 | 26-II-A |
| 21 | 24-VI-B | 88 | 24-II-D | 150 | 25-VI-D | 228 | 25-III-C | 316 | 26-II-C |
| 22 | 25-VI-C | 92 | 25-III-E | 152 | 25-II-A | 229 | 24-VI-C | 317 | 26-III-D |
| 24 | 24-VI-B | 93 | 24-VI-D | 153 | 25-VI-E | 230 | 25-III-D | 318 | 25-II-C |
| 26 | 26-II-C | 94 | 24-II-B | 156 | 25-VI-E | 233 | 24-V-C | 323 | 26-III-A |
| 30 | 25-II-E | 95 | 25-V-E | 159 | 24-III-A | 234 | 25-III-D | 324 | 24-V-A |
| 31 | 26-II-B | 98 | 25-II-C | 163 | 25-VI-D | 235 | 25-II-E | 325 | 25-VI-C |
| 32 | 26-II-B | 99 | 25-V-C | 164 | 24-VI-D | 236 | 25-III-C | 326 | 24-II-B |
| 33 | 24-VI-A | 101 | 24-II-D | 167 | 25-II-D | 237 | 24-V-C | 327 | 24-II-D |
| 34 | 26-III-B | 102 | 25-II-D | 168 | 25-II-D | 241 | 26-II-D | 328 | 24-III-D |
| 35 | 24-VI-C | 103 | 24-V-B | 169 | 26-III-D | 242 | 25-VI-E | 329 | 24-V-A |
| 36 | 26-III-D | 105 | 25-III-C | 170 | 25-III-D | 243 | 24-VI-D | 330 | 24-V-A |
| 37 | 25-VI-C | 106 | 24-VI-C | 171 | 26-III-D | 244 | 24-VI-B | | |
| 38 | 24-VI-C | 107 | 24-V-B | 172 | 25-II-A | 246 | 26-III-B | | |
| 39 | 24-V-C | 108 | 24-II-D | 173 | 24-II-C | 247 | 24-VI-D | | |
| 40 | 26-III-A | 109 | 25-III-C | 174 | 25-VI-D | 249 | 26-II-D | | |
| 41 | 24-VI-A | 110 | 25-II-A | 177 | 24-III-D | 250 | 25-V-D | | |
| 42 | 26-III-B | 111 | 25-II-C | 180 | 25-V-D | 251 | 24-VI-B | | |
| 45 | 25-VI-C | 112 | 24-II-A | 181 | 24-III-D | 252 | 24-III-A | | |
| 46 | 25-V-E | 114 | 26-III-A | 182 | 25-V-C | 253 | 24-III-C | | |
| 49 | 24-V-D | 115 | 25-VI-E | 183 | 24-VI-A | 256 | 25-II-A | | |
| 51 | 25-II-A | 116 | 26-II-C | 184 | 25-VI-D | 257 | 25-VI-C | | |
| 53 | 24-V-D | 117 | 26-III-A | 186 | 25-V-C | 258 | 24-VI-C | | |
| 59 | 24-II-A | 119 | 24-II-B | 187 | 26-III-B | 260 | 24-II-C | | |
| 60 | 26-II-C | 120 | 26-III-A | 190 | 24-III-B | 261 | 25-V-D | | |
| 61 | 24-II-A | 123 | 25-III-D | 196 | 25-III-C | 264 | 26-III-C | | |
| 62 | 24-VI-D | 124 | 25-V-E | 200 | 25-V-D | 270 | 24-III-A | | |
| 63 | 24-VI-A | 125 | 26-II-B | 202 | 26-II-C | 271 | 24-V-A | | |
| 64 | 25-II-D | 126 | 25-V-C | 203 | 24-III-B | 272 | 26-II-A | | |
| 65 | 24-II-C | 127 | 24-V-C | 204 | 25-II-C | 280 | 25-VI-E | | |
| 66 | 24-VI-C | 128 | 25-II-C | 206 | 24-III-D | 281 | 24-VI-B | | |
| 67 | 26-II-D | 129 | 24-III-A | 207 | 26-III-B | 282 | 24-III-C | | |
| 68 | 25-VI-E | 130 | 24-III-B | 209 | 24-II-A | 292 | 25-III-E | | |
| 69 | 25-VI-E | 131 | 24-V-B | 210 | 26-II-D | 293 | 24-III-D | | |
| 70 | 25-II-D | 132 | 24-V-B | 211 | 26-II-D | 295 | 24-II-A | | |
| 71 | 25-V-E | 134 | 25-II-E | 212 | 24-III-C | 296 | 26-III-D | | |

SESSION DESIGNATION

[day] - [session] - [room]

Example: 24-III-C: 24 July, Session II, Room C

All paper numbers are those from original EasyChair submission

Proceedings: <https://zenodo.org/communities/cice2023/>

| Sunday 23 July | | Monday 24 July | | | Tuesday 25 July | | | Wednesday 26 July | | | | |
|----------------|--|------------------|--------------------|-----------------|----------------------|--------------------|------------------|-------------------|----------------------|--------------------|--------------------|------------------|
| | A | B | C | D | A | C | D | E | A | B | C | D |
| | Rio de Janeiro II | Rio de Janeiro I | Rio de Janeiro III | Flamengo | Rio de Janeiro II | Rio de Janeiro III | Flamengo | Botafogo | Rio de Janeiro II | Rio de Janeiro III | Rio de Janeiro III | Flamengo |
| 08h30 | Conference Opening | | | | | | | | | | | |
| 08h45 | Opening Keynote: Professor Kim Pickering | | | | | | | | | | | |
| 09h00 | Keynote: Professor Sandro Amico | | | | | | | | | | | |
| 09h15 | Keynote: Dr. Justine Beauson | | | | | | | | | | | |
| 09h30 | IIFC Medal Lecture: Professor Riadh Al-Mahaidi | | | | | | | | | | | |
| 09h45 | Conference Closing | | | | | | | | | | | |
| 10h00 | Coffee Break | | | | | | | | | | | |
| 10h15 | codes - 59 | shear - 94 | structures - 65 | materials - 88 | turbine blade - 256 | steel - 98 | design - 64 | confined - 30 | novel - 80 | NDE - 31 | bond - 316 | retrofit - 211 |
| 10h30 | codes - 61 | shear - 119 | structures - 173 | materials - 148 | turbine blade - 172 | steel - 128 | design - 70 | confined - 134 | novel - 315 | NDE - 32 | bond - 26 | retrofit - 241 |
| 10h45 | codes - 295 | shear - 19 | structures - 216 | materials - 108 | turbine blade - 152 | steel - 111 | design - 102 | confined - 235 | novel - 81 | NDE - 312 | bond - 202 | retrofit - 210 |
| 11h00 | codes - 112 | shear - 326 | structures - 14 | materials - 101 | turbine tower - 110 | steel - 204 | design - 167 | confined - 214 | novel - 18 | NDE - 76 | bond - 60 | retrofit - 249 |
| 11h15 | codes - 209 | structures - 260 | materials - 327 | materials - 327 | turbine recycle - 51 | steel - 78 | design - 168 | confined - 311 | novel - 272 | NDE - 125 | bond - 116 | retrofit - 67 |
| 11h30 | EN 19101 - 139 | bond - 224 | flexure - 212 | materials - 328 | Best Thesis I | steel - 318 | damage - 170 | bond - 92 | Break | | | |
| 11h45 | EN 19101 - 129 | bond - 203 | flexure - 253 | materials - 177 | Best Thesis II | steel - 105 | damage - 234 | bond - 307 | bridge/fatigue - 323 | biocomp - 42 | durability - 223 | durability - 169 |
| 12h00 | EN 19101 - 270 | bond - 5 | flexure - 149 | materials - 181 | Best Thesis III | steel - 109 | damage - 230 | bond - 292 | bridge/fatigue - 120 | biocomp - 187 | durability - 264 | durability - 171 |
| 12h15 | EN 19101 - 159 | bond - 130 | flexure - 282 | materials - 206 | Best Thesis IV | steel - 196 | damage - 123 | bond - 308 | bridge/fatigue - 117 | biocomp - 207 | durability - 215 | durability - 296 |
| 12h30 | EN 19101 - 252 | bond - 190 | flexure - 143 | materials - 293 | materials - 293 | steel - 236 | damage - 86 | bond - 219 | bridge/sand - 114 | wood - 34 | durability - 74 | durability - 298 |
| 12h45 | Lunch Break | | | Lunch Break | Lunch Break | | | | | | | |
| 13h00 | IIFC Council and ExCOM Meeting (by invitation) | | | Lunch Break | Lunch Break | | | | | | | |
| 13h15 | Lunch Break | | | Lunch Break | Lunch Break | | | | | | | |
| 13h30 | Lunch Break | | | Lunch Break | Lunch Break | | | | | | | |
| 13h45 | Lunch Break | | | Lunch Break | Lunch Break | | | | | | | |
| 14h00 | Keynote: Professor Barzin Mobasher | | | | | | | | | | | |
| 14h15 | Keynote: Professor Brahim Benmokrane | | | | | | | | | | | |
| 14h30 | Keynote: Professor Barzin Mobasher | | | | | | | | | | | |
| 14h45 | Keynote: Professor Brahim Benmokrane | | | | | | | | | | | |
| 15h00 | Break | | | | | | | | | | | |
| 15h15 | seismic - 329 | shear - 103 | anchorage - 237 | modeling - 49 | columns - 182 | design - 180 | stability - 124 | stability - 124 | columns - 186 | design - 200 | stability - 95 | stability - 95 |
| 15h30 | seismic - 330 | shear - 131 | anchorage - 233 | modeling - 217 | columns - 20 | design - 250 | stability - 46 | stability - 46 | columns - 99 | design - 261 | vibrations - 77 | vibrations - 77 |
| 15h45 | seismic - 271 | shear - 132 | anchorage - 39 | modeling - 53 | columns - 126 | design - 297 | luminosity - 71 | luminosity - 71 | columns - 99 | design - 261 | vibrations - 77 | vibrations - 77 |
| 15h50 | seismic - 324 | shear - 145 | anchorage - 127 | modeling - 300 | columns - 126 | design - 297 | luminosity - 71 | luminosity - 71 | columns - 99 | design - 261 | vibrations - 77 | vibrations - 77 |
| 16h00 | seismic - 324 | paper - 107 | anchorage - 66 | modeling - 218 | columns - 126 | design - 297 | luminosity - 71 | luminosity - 71 | columns - 99 | design - 261 | vibrations - 77 | vibrations - 77 |
| 16h15 | Coffee Break | | | | | | | | | | | |
| 16h30 | bridges - 85 | flexure - 244 | bond - 35 | retrofit - 247 | walls - 6 | sust. - 150 | durability - 68 | durability - 68 | walls - 6 | sust. - 150 | durability - 68 | durability - 68 |
| 16h45 | bridges - 183 | flexure - 281 | bond - 9 | retrofit - 93 | walls - 22 | slabs - 13 | durability - 69 | durability - 69 | walls - 22 | slabs - 13 | durability - 69 | durability - 69 |
| 17h00 | flax - 10 | flexure - 21 | bond - 38 | retrofit - 164 | slabs - 37 | slabs - 163 | durability - 115 | durability - 115 | slabs - 37 | slabs - 163 | durability - 115 | durability - 115 |
| 17h15 | flax - 63 | flexure - 251 | bond - 258 | retrofit - 144 | slabs - 45 | slabs - 184 | durability - 153 | durability - 153 | slabs - 45 | slabs - 184 | durability - 153 | durability - 153 |
| 17h30 | flax - 33 | flexure - 24 | bond - 106 | retrofit - 243 | slabs - 257 | slabs - 306 | durability - 242 | durability - 242 | slabs - 257 | slabs - 306 | durability - 242 | durability - 242 |
| 17h45 | flax - 41 | retrofit - 62 | bond - 229 | retrofit - 62 | underground - 325 | arches - 213 | durability - 156 | durability - 156 | underground - 325 | arches - 213 | durability - 156 | durability - 156 |
| 18h00 | IIFC General Meeting (Room A) | | | | | | | | | | | |
| 19h00 | Conference Dinner and Awards Ceremony (Room A) | | | | | | | | | | | |

| |
|------------------------|
| LEGEND |
| Keynotes |
| IIFC events |
| Breaks |
| TRM/TRC (RILEM) |
| internal FRP (bars) |
| strengthening concrete |
| strengthening steel |
| pultruded and all FRP |
| other topics |

SESSION DESIGNATION

[day] - [session] - [room] - [paper order]

Example: 24-III-C-2

24 July, Session II, Room C, second paper

All paper numbers are those from original EasyChair submission

Proceedings: <https://zenodo.org/communities/cice2023/>

| | | | |
|---|--|--|--|
| Monday 24 July - OPENING SESSION I: 08h30 to 09h30 | | | |
| Opening Keynote - Rio de Janeiro II | | | |
| Professor Kim Pickering, University of Waikato, New Zealand | | | |
| BEING FAIR AND THE ROLE OF MATERIALS | | | |

COFFEE BREAK

| Monday 24 July - SESSION II: 09h45 to 11h00 | | | |
|---|---|--|---|
| A - Rio de Janeiro II | B - Rio de Janeiro I | C - Rio de Janeiro III | D - Flamengo |
| FRP Reinforcing Bar Codes | Concrete Strengthening - Shear | All FRP Structures | TRM/TRC Materials I |
| chair: Vicki Brown | chair: Jose Sena-Cruz | chair: Francesco Micelli | chair: Flavio Silva |
| 59 THE NEW ACI CODE 440.11-22 - Vicki Brown, Carol Shield and Will Gold | 94 PERFORMANCE OF MODELS FOR PREDICTING THE SHEAR CAPACITY OF FRP-STRENGTHENED RC BEAMS - Amirhossein Mohammadi, Joaquim Barros and José Sena-Cruz | 65 BOX MODULUS USING FULL COMPOSITE STRUCTURES : MECHANICAL BEHAVIOUR OF COMPOSITE SLAB - Emmanuel Ferrier and Laurent Michel | 88 COMBINING CONTINUOUS 3D TEXTILES AND SYNTHETIC MICROFIBRES IN TEXTILE REINFORCED CEMENTS (TRCS): AN EVALUATION OF THE TENSILE RESPONSE AND CRACK FORMATION - Ciska Gielis, Michael El Kadi, Didier Snoeck and Tine Tysmans |
| 61 DESIGN OF GFRP-RC COLUMNS WITH THE NEW ACI 440.11-22 CODE - Mahrukh Midrar and Vicki Brown | 119 EFFECTIVENESS OF HYBRID FRP STRENGTHENING ON THE SHEAR BEHAVIOUR OF REINFORCED CONCRETE BEAMS - Taraka Malleswara Rao Balla, Rahul Reddy Morthala and Suriya Prakash Shanmugam | 173 ANALYSIS OF BRACING SYSTEMS ON THE FREE VIBRATION BEHAVIOR OF A PULTRUDED COMPOSITE COOLING TOWER - João Paulo D. de S. Pereira, Eliane Maria L. Carvalho and Janine D. Vieira | 148 BOND BEHAVIOR OF TEXTILE REINFORCED FINE-GRAINED ALKALI-ACTIVATED CEMENT CONCRETE - Biruk Haile Tekle, Dennis Messerer, Klaus Holschemacher and Amar Khennane |
| 295 INTERACTIVE SOFTWARE FOR ANALYSIS AND DESIGN OF GFRP REINFORCED CONCRETE COLUMNS PER ACI 440.11-22 CODE - Hayder Rasheed and Ahmad Ghabban | 19 NUMERICAL MODELING OF RC-BEAMS STRENGTHENED IN SHEAR WITH U-WRAP CFRP FABRICS - Amirali Abbasi, Zine El Abidine Benzeguir, Omar Chaallal and Georges El-Saikaly | 216 ANALYSIS GFRP STRUCTURAL BOLTED CONNECTION - Gustavo Fonseca, Anne Diniz and Janine Vieira | 108 DEVELOPMENT OF A YARN GUIDING AND IMPREGNATION TECHNOLOGY FOR ROBOT-SUPPORTED FIBER MANUFACTURING OF 3D TEXTILE REINFORCEMENT STRUCTURES - Danny Friese, Lars Hahn and Chokri Cherif |
| 112 USE OF FRP REBARS IN REINFORCED CONCRETE STRUCTURES: AN OVERVIEW OF THE 2021 FRENCH GUIDELINES - Sylvain Chataigner, Laurent Michel, Karim Benzarti, Emmanuel Ferrier, Elhem Ghorbel, Philippe Jandin, Anthony Pruvost, Marc Quiertant and Arnaud Rolland | 326 NEAR-SURFACE MOUNTED FRP REINFORCEMENT FOR SHEAR STRENGTHENING OF RC BEAMS: KEY PARAMETERS AND THEORETICAL DESIGN MODEL - Amir Mofidi, Lijuan Cheng, Omar Chaallal and Yixin Shao | 14 MAINTENANCE OF ALL FRP PULTRUDED STRUCTURES. A CASE STUDY - Ileana Ippolito and Salvatore Russo | 101 AN INNOVATIVE 3D BASALT TEXTILE AS REINFORCEMENT IN TEXTILE REINFORCED CEMENTS (TRCS): A FLEXURAL COMPARISON WITH 3D GLASS TRCS - Gilles Vandereecken, Michael El Kadi, Danny Van Hemelrijck and Tine Tysmans |
| 209 REINFORCED CONCRETE STRUCTURAL MEMBERS WITH FIBER REINFORCED POLYMER BARS (FRP): THE NEW BRAZILIAN DESIGN CODE - Daniel Carlos Taissum Cardoso and Claudia Maria de Oliveira Campos | | 260 AGING EVALUATION OF GFRP PROFILES USING NON-DESTRUCTIVE DYNAMIC TESTING - João Pedro de Castro Torres, Cássio Marques Rodrigues Gaspar and Daniel Carlos Taissum Cardoso | 327 ENHANCING TENSILE STRENGTH AND STRAIN-HARDENING CAPACITY OF TR-SHCCS USING BIAxIAL PVA MESH - Gauri Mahmesh Kumbhokar, Esmael Esmaeli and Omar Bakri Kasbah |

| Monday 24 July - SESSION III: 11h15 to 12h30 | | | |
|---|--|---|---|
| A - Rio de Janeiro II | B - Rio de Janeiro I | C - Rio de Janeiro III | D - Flamengo |
| Design with CEN/TS EN 19101 | FRP Reinforcing Bars - Bond I | Concrete Strengthening - Flexure | TRM/TRC Materials II |
| chair: Luigi Ascione | chair: Andre Weber | chair: Rami Eid | chair: Alva Peled |
| 139 DESIGN OF FIBRE-POLYMER COMPOSITE STRUCTURES (CEN/TS 19101): OVERVIEW, COMMENTARY AND WORKED EXAMPLES - Luigi Ascione, João Ramoa Correia, Thomas Keller, Jan Knippers, Toby Mottram, Carlo Paulotto and José Sena-Cruz | 224 BOND CLAUSE FOR FRP REINFORCEMENT IN FPREN1992-1-1 (2022) ANNEX R - André Weber | 212 EXPERIMENTAL ANALYSIS OF REINFORCED CONCRETE BEAMS STRENGTHENED WITH EBR-CFRP SHEETS UNDER INDOOR AND OUTDOOR ENVIRONMENT - Gláucia Dalfré, Guilherme Parsekian and Camila Pinto | 328 INFLUENCE OF TRANSVERSE TENSION ON THE COMPRESSIVE STRENGTH OF CARBON REINFORCED CONCRETE - Sven Bosbach, Jan Bielak, Christopher Schmidt, Josef Hegger and Martin Classen |
| 129 DESIGN OF FIBRE-POLYMER COMPOSITE STRUCTURES (CEN/TS 19101): BASIS OF DESIGN AND EFFECTS OF TEMPERATURE AND MOISTURE - João R. Correia, João Pacheco, John D. Sorensen, Mário Garrido, João Firmo, Thomas Keller, José Sena-Cruz, J. Toby Mottram, Luigi Ascione and Liesbeth Tromp | 203 EXPERIMENTAL INVESTIGATION OF CRACKING BEHAVIOUR OF GFRP-REINFORCED CONCRETE BY PRISM TENSION TESTS - Elayne Marques Silva, Kent Harries and Péter Ludvig | 253 EXPERIMENTAL STUDY ON CRACKING AND DEFLECTION BEHAVIOUR OF RC BEAMS STRENGTHENED WITH EBR CFRP LAMINATES UNDER DIFFERENT PRE-LOADING CONFIGURATIONS - Luis Ignacio Jimenez Astorga, Alba Codina le Boudal, Younes Jahani, Ricardo Perera Velamazán and Cristina Barris Peña | 177 BOND BETWEEN TEXTILE REINFORCED MORTAR (TRM) SYSTEMS AND CONCRETE SUBSTRATES - Ioanna Skyrrianou, Eftychia Valiakou, Szymon Cholostiakow, Christos Papakonstantinou and Lampros Koutas |
| 270 DESIGN OF FIBRE-POLYMER COMPOSITE STRUCTURES: SERVICEABILITY LIMIT STATES AND CREEP RUPTURE - Jose Sena-Cruz, Mário Sá, João R. Correia, J. Toby Mottram, Thomas Keller and Luigi Ascione | 5 BOND OF GFRP BARS IN REINFORCED CONCRETE THROUGH SPLICE IN BEAMS SUBMITTED TO BENDING - Jorge Luiz Alves Junior and Fábio Grisolia de Ávila | 149 EXAMINATION OF FRP FLEXURAL STRENGTHENING OF LOW PERFORMANCE CONCRETE ELEMENTS - Rami Eid, Haneen Rayan and Avraham N. Dancygier | 181 POLYMER IMPREGNATED TEXTILE REINFORCEMENT CURED IN CONCRETE BY MEANS OF ELECTRIC HEATING - Martin Scheurer, Gözdem Dittel, Kira Heins and Thomas Gries |
| 159 DESIGN OF FIBRE-POLYMER COMPOSITE STRUCTURES (CEN/TS 19101): ULS ANALYSIS OF A SPATIAL RETICULAR STRUCTURE - Salvatore Russo, Toby Mottram, Diego Talledo and Michelle Tondi | 130 OPTIMIZATION OF TENSILE PROPERTIES AND BOND BEHAVIOUR TO CONCRETE OF FIBRE REINFORCEMENT STRANDS PRODUCED WITHIN A DYNAMIC FIBRE WINDING PROCESS - Tom Rothe, Stefan Gantner, Julia Trusen, Norman Hack and Christian Huehne | 282 EXPERIMENTAL STUDY OF A HYBRID SYSTEM FOR ENHANCEMENT OF FLEXURAL STRENGTH OF REINFORCED CONCRETE BEAMS - Jeslin Quek, Alfred Kok and Pavithra Malalasekara | 206 EXPERIMENTAL AND ANALYTICAL INVESTIGATION ON DIRECT TENSILE TESTS OF DRY AND COATED FRCM GLASS-FIBRE-BASED SYSTEMS - Rebecca Grazzini, Giulia Misseri and Luisa Rovero |
| 252 DESIGN EXAMPLE OF A COMPOSITE ROAD BRIDGE - Liesbeth Tromp, Martijn Veltkamp, Ane de Boer, Johan de Boon, Mathieu Koetsier and Marko Pavlovic | 190 INVESTIGATIONS ON BOND PERFORMANCES OF GFRP REINFORCEMENTS USING DISTRIBUTED FIBER OPTICAL SENSORS - Chongjie Kang and Steffen Marx | 143 FLEXURAL BEHAVIOUR OF HOLLOW-CORE SLABS STRENGTHENED WITH PRESTRESSED CARBON FIBER REINFORCED POLYMER PLATES - Amr Abdel Havez and Adil Al-Mayah | 293 BOND BEHAVIOR BETWEEN FRCM AND MASONRY: A COMPARISON BETWEEN SINGLE-LAP AND TENSILE TESTS - Mohammad Minhajur Rahman, Iman Abavisani, Tommaso D'Antino, Francesco Focacci and Christian Carloni |

Monday 24 July - SESSION IV: 14h00 to 14h45**Keynote Lectures - Rio de Janeiro II**

Professor Barzon Mobasher, Arizona State University, Tempe, USA

ADVANCES IN THE TEXTILE REINFORCED CONCRETE STRUCTURAL DESIGN AND APPLICATIONS**BREAK****Monday 24 July - SESSION V: 15h00 to 16h15**

| A - Rio de Janeiro II | | B - Rio de Janeiro I | | C - Rio de Janeiro III | | D - Flamengo | |
|--------------------------------|--|------------------------------|---|------------------------------------|--|-------------------|---|
| Turkiye Earthquake and Seismic | | FRP Reinforcing Bars - Shear | | Concrete Strengthening - Anchorage | | TRM/TRC Modelling | |
| | chair: Alper Ilki | | chair: Jan Bielak | | chair: Ravi Kanitkar | | chair: Tommaso D'Antino |
| 329 | OUTLINE OF THE PERFORMANCES/FAILURES OF REINFORCED CONCRETE BUILDINGS DURING FEBRUARY 2023 TURKIYE EARTHQUAKES AND POTENTIAL USE OF FRPS TOWARDS MORE RESILIENT BUILDINGS - C. Goksu, B. Sari, F. Gullu, K. Orakcal, A. Ilki | 103 | EVALUATION OF FRP-REINFORCED CONCRETE MEMBERS WITHOUT SHEAR REINFORCEMENT – ANALYSIS USING SHEAR CRACK PROPAGATION THEORY (SCPT) - Morvarid Fattahi, Maximilian Schmidt, Sven Bosbach, Martin Noel, Josef Hegger and Martin Classen | 237 | ANALYSIS OF INTERMEDIATE CRACK DEBONDING FAILURE OF EXTERNALLY BONDED FRP-TO-CONCRETE JOINTS WITH ANCHORS - Alba Codina, Cristina Barris, Mehdi Aghabagloo, Marta Baena and Lluís Torres | 49 | LAYERED FINITE ELEMENT (FE) MODELLING OF CEMENT COMPOSITES COMBINING CONTINUOUS TEXTILES AND SYNTHETIC MICROFIBRES: A FLEXURAL ANALYSIS - Michael El Kadi, Ciska Gielis, Danny Van Hemelrijck, Didier Snoeck and Tine Tysmans |
| 330 | OBSERVED PERFORMANCE OF A RC WALL-FRAME BUILDING DURING THE FEBRUARY 2023 TURKIYE EARTHQUAKE AND PERFORMANCE IMPROVEMENT USING FRPS - C. Tura, Y. Sahinkaya, M.F. Gullu, U. Demir, K. Orakcal, A. Ilki | 131 | ANALYZING THE SHEAR PERFORMANCE OF SFRC BEAMS WITH GLASS FIBER REINFORCED POLYMER AS LONGITUDINAL REBARS - Gabriela Mazureki Campos Bahniuk, Ricardo Pieralisi and Roberto Dalledone Machado | 233 | NUMERICAL METHODOLOGY FOR THE PREDICTION OF THE LOCAL BOND-SLIP LAW FOR CONCRETE ELEMENTS STRENGTHENED WITH FRP - Mehdi Aghabagloo, Marta Baena, Laura Carreras, Mario Barahona, Alba Codina and Cristina Barris | 217 | A SHEAR STRENGTH MODEL FOR REINFORCED CONCRETE BEAMS WITH U-WRAPPED FRM COMPOSITES BASED ON THE COMPRESSION CHORD CAPACITY MODEL - Carlos Ribas González, Tommaso D'Antino and Lesley Sneed |
| 271 | SMA HYBRID COMPOSITE BRACES APPLIED IN EARTHQUAKE RESISTANT STRUCTURES - Lucas Vignoli, Arthur Adeodato and Marcelo Savi | 132 | OBTAINING THE CRITICAL SHEAR CRACK KINEMATICS FROM A MULTI-SCALE MODEL AND THE GRG METHOD - Gilcynia Castro Corvelo Costa, Claudia Maria de Oliveira Campos and Daniel Carlos Taissum Cardoso | 39 | FINITE ELEMENT ANALYSIS OF CFRP REINFORCED CONCRETE SLABS INCLUDING CFRP ANCHORS - José Luis Jiménez Ulloa and Hernán Santa María Oyanedel | 53 | EXPERIMENTAL AND NUMERICAL ANALYSIS OF THE TENSILE BEHAVIOUR OF BASALT TEXTILE AT DIFFERENT STRAIN RATES - Amrita Milling, Giuseppina Amato and Su Taylor |
| 324 | A HYBRID STRENGTHENING SYSTEM USING CFRP AND FE-SUMA FOR SEISMICALLY DEFICIENT RC COLUMNS - Adel Al Ekkawi, Raafat El-Hacha | 145 | SHEAR STRENGTH PREDICTION OF FRP-FRC-BEAMS WITHOUT STIRRUPS - Thiago Gomes, Thomás Resende and Daniel Cardoso | 127 | BOND BEHAVIOR OF FRP FOR PURE AXIAL TENSION STRENGTHENING OF CONCRETE - Junrui Zhang, Ravi Kanitkar Enrique del Rey Castillo, Kent Harries, Rhys Rogers and Aniket Borwankar | 300 | NUMERICAL RESPONSE OF THE COHESIVE LAW AT THE CONTACT SURFACE BETWEEN NATURAL YARNS AND LIME-BASED MORTAR. - Francesca Roscini, Francesca Nerilli, Maurizio Guadagnini and Barbara Ferracuti |
| | | 107 | REDEFINING THE LIMITS OF CONCRETE BRIDGE CONSTRUCTION WITH NON-METALLIC REINFORCEMENT - Jan Bielak, Martin Classen, Raphael Walach, Thorsten Helbig and Josef Hegger | 66 | DURABILITY OF BOND-CRITICAL CFRP ANCHORED WITH FIBER ANCHORS UNDER ACCELERATED HYGROTHERMAL CONDITIONING - Sophia Rupp, Nikolas Zawodny and Jovan Tatar | 218 | MACHINE LEARNING-BASED PREDICTION OF SRG-CONFINED MASONRY COLUMN STRENGTH - Pariya Aghelzadeh and Lesley Sneed |

Monday 24 July - SESSION VI: 16h30 to 17h45

| A - Rio de Janeiro II | | B - Rio de Janeiro I | | C - Rio de Janeiro III | | D - Flamengo | |
|---|---|--------------------------------|--|-------------------------------|---|--------------------|---|
| ALL FRP Bridges and Flax Fibre Composites | | FRP Reinforcing Bars - Flexure | | Concrete Strengthening - Bond | | TRM/TRC Retrofit I | |
| | chair: Jovan Tatar | | chair: Joaquim Barros | | chair: Tommaso D'Antino | | chair: Christian Carloni |
| 85 | LONG-TERM PERFORMANCE OF A COMPOSITE TRUSS BRIDGE AFTER 25 YEARS IN SERVICE - Lulu Liu, Viviana Jacqueline Castro Quispea and Thomas Keller | 244 | NUMERICAL AND EXPERIMENTAL ANALYSIS OF BEAMS REINFORCED WITH LONGITUDINAL AND TRANSVERSAL BRFP BARS - Gean Warmling, Roberto Machado, Ricardo Pieralisi and Gabriela Bahniuk | 35 | DEBONDING PREDICTION OF A REINFORCING CFRP PATCH ON CONCRETE STRUCTURES - Thomas Methfessel and Wilfried Becker | 247 | SHEAR STRENGTH CONTRIBUTION PROVIDED BY INORGANIC-MATRIX COMPOSITES FULLY WRAPPED AROUND REINFORCED CONCRETE BEAMS - Veronica Bertolli and Tommaso D'Antino |
| 183 | OPTIDECK – THE SMART FRP PANEL FOR BRIDGE REDECKING – DEVELOPMENT AND EXPERIMENTAL VALIDATION - Maciej Kulpa, Mateusz Rajchel, Bartosz Piątek, Agnieszka Wiater and Tomasz Siwowski | 281 | MECHANICAL BEHAVIOR STUDY OF BASALT FIBER REINFORCED POLYMER BARS IN FIBER REINFORCED CONCRETE BEAM - Michele Miwa Fugiyama, Nadia Cazarim da Silva Forti, Lia Lorena Pimentel and Ana Elisabete Paganelli Guimarães de Avila Jacintho | 9 | EXPERIMENTAL STUDY ON THE BOND BEHAVIOUR OF CFRP-TO-CONCRETE INTERFACE UNDER CYCLIC LOADING - Abbas Fathi, Georges El-Saikaly and Omar Chaallal | 93 | LOW-COST CEMENT MORTAR OVERLAY REINFORCEMENT FOR SUBSTANDARD CONCRETE MASONRY IN COASTAL AREAS - Fabio Matta, Tommaso D'Antino, Mohammed Mousa, Lawrence Bank and James Biles |
| 10 | STRUCTURAL CREEP PREDICTION OF THE BRIDGE FULLY BUILT WITH FLAX-FIBER REINFORCED POLYMER COMPOSITES - Bowen Xu, Ali Shahmirzaloo, Rijk Blok and Patrick Teuffel | 21 | EXPERIMENTAL TESTS ON PRESTRESSED CONCRETE BEAMS WITH GFRP REINFORCING BARS - Francesco Micelli, Abdeljelil Belarbi, Giovanni Paolo Delle Donne, Lara Zerbe and Dario Vieira | 38 | NUMERICAL SIMULATION OF LAP-SHEAR AND PRESTRESS FORCE RELEASE TESTS OF FRP STRIPS GLUED ON CONCRETE: CONSIDERATIONS ABOUT THE ROLE OF MIXED-MODE FRACTURE PROCESSES - Enzo Martinelli, Matteo Breveglieri, Niloufar Moshiri and Christoph Czaderski | 164 | INVESTIGATIONS INTO THE EFFECTIVENESS OF A COLUMN CONFINEMENT WITH TEXTILE REINFORCED CONCRETE (TRC) - Wladislaw Polienko and Klaus Holschemacher |

| Monday 24 July - SESSION VI: 16h30 to 17h45 | | | | | | |
|---|---|--------------------------------|--|--------------------------------|--|--|
| A - Rio de Janeiro II | | B - Rio de Janeiro I | | C - Rio de Janeiro III | D - Flamengo | |
| ALL FRP Bridges and Flax Fibre Composites | | FRP Reinforcing Bars - Flexure | | Concrete Strengthening - Bond | TRM/TRC Retrofit I | |
| chair: Jovan Tatar | | chair: Joaquim Barros | | chair: Tommaso D'Antino | chair: Christian Carloni | |
| 63 | DEVELOPMENT OF A RECYCLABLE FLAX FIBER REINFORCED POLYMER COMPOSITE - Shagata Das, Sagar Doshi, Emmanuel Millan, Damaris Mendez, Dan Luckenbill and Jovan Tatar | 251 | BEHAVIOR OF CONCRETE BEAMS REINFORCED WITH STEEL BARS OR WITH THERMOSET AND THERMOPLASTIC RESIN GFRP BARS - Tommaso D'Antino, Veronica Bertolli, Marco Andrea Pisani and Carlo Poggi | 258 | NATURAL OUTDOOR AND LABORATORY-CONTROLLED AGEING OF EPOXY ADHESIVES AND CFRP LAMINATES AFTER FOUR YEARS OF EXPOSURE - Aloys Dushimimana, Luis Correia, José Loureiro-Cruz, Susana Cabral-Fonseca, João M. Pereira and Jose Sena-Cruz | |
| 33 | THE EFFECT OF UV-WEATHERING AGING ON THE MECHANICAL PROPERTIES OF THE FLAX-FIBER REINFORCED POLYESTER COMPOSITES - Bowen Xu, Bart van den Hurk, Ali Shahmirzaloo, Rijk Blok and Patrick Teuffel | 24 | DESIGN AND OPTIMIZATION OF A GFRP AND STEEL HYBRID PRESTRESSED SFRC BEAM BASED ON NUMERICAL AND ANALYTICAL APPROACHES - Kamyar Bagherinejad Shahrbijari, Joaquim A. O. Barros and M. Isabel B. Valente | 106 | THE EFFECTS OF HIGH TEMPERATURE ON THE PERFORMANCE OF PRESTRESSED FRP TO CONCRETE BOND UNDER SERVICE FATIGUE LOADING - Monica Garcez, Leila Meneguetti and Rebecca Gravina | |
| 41 | RAPID DETERMINATION OF THE FATIGUE LIMIT BASED ON THE THERMOGRAPHIC METHOD FOR FLAX FIBRE POLYESTER RESIN - Ali Shahmirzaloo, Davide Leonetti, Faas Moonen and Rijk Blok | | | 229 | FATIGUE BEHAVIOR OF CFRP-CONCRETE JOINTS UNDER VARYING LOAD FREQUENCY - Massimiliano Bocciarelli, Angelo Savio Calabrese, Christian Carloni, Pierluigi Colombi, Tommaso D'Antino and Tommaso Papa | |
| | | | | | 62 | FEASIBILITY OF USING TEXTILE REINFORCED CONCRETE WITH POLYMER- AND MINERAL-IMPREGNATED CARBON FIBER TEXTILE AS EXTERNAL STRENGTHENING OF STEEL REINFORCED CONCRETE (RC) BEAMS - Rebecca M. C. Silva and Flávio de A. Silva |

18h00 to 18h45 - IIFC GENERAL MEETING - ALL ATTENDEES WELCOME (Rio de Janeiro II)

| Tuesday 25 July - SESSION I: 08h30 to 09h30 | |
|--|--|
| Keynote Lectures - Rio de Janeiro II | |
| Professor Sandro C. Amico, Federal University of Rio Grande do Sul, Brazil | |
| OVERVIEW OF THE COMPOSITES INDUSTRY FOCUSING ON MATERIALS, PROCESSES AND TRENDS | |
| Dr. 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 | |
| COFFEE BREAK | |

| Tuesday 25 July - SESSION II: 09h45 to 11h00 | | | | | |
|--|--|------------------------------|--|-------------------------------|---|
| A - Rio de Janeiro II | | C - Rio de Janeiro III | | D - Flamengo | E - Botafogo |
| Reuse of Turbine Blades | | Steel Repair with FRP I | | TRM/TRC Design I | Confinement with FRP Tubes |
| chair: Justine Beauson | | chair: Elyas Ghafoori | | chair: Barzin Mobasher | chair: Xiao Lin Zhao |
| 256 | BLADEBRIDGE: THREE DESIGN OPTIONS FOR A PEDESTRIAN BRIDGE MADE FROM DECOMMISSIONED 53 METER WIND TURBINE BLADES - Zoe Zhang, Gabriel Ackall, Russell Gentry and Lawrence Bank | 98 | CYCLIC LOADING TEST AND ANALYTICAL EVALUATION OF CIRCULAR STEEL COLUMNS RETROFITTED BY EXTERNALLY BONDED CARBON FIBER SHEETS IN GRADED CONFIGURATION - Juliane Therese R. Bacod, Hitoshi Nakamura, Kim Oliver U. Magtagfob and Takahiro Matsui | 64 | CHARACTERIZATION AND DESIGN OF CARBON-TRC COMPOSITES - Kissila Goliath, Daniel Cardoso and Flávio Silva |
| 172 | A FOOTBRIDGE MADE OF DECOMMISSIONED WIND TURBINE BLADE: CONCEPTUAL DESIGN, EXPERIMENTAL INVESTIGATIONS AND SITE IMPLEMENTATION - Tomasz Siwowski, Mateusz Rajchel, Maciej Kulpa and Agnieszka Wiater | 128 | NON-DESTRUCTIVE TESTING OF STEEL PIPES WITH FIBER REINFORCED POLYMER (FRP) REPAIRS EXPOSED TO OFFSHORE ENVIRONMENTS - Cintia Ferreira, Bruno Jordão, Priscilla Vieira, Geovane Silva and Daniel Cardoso | 70 | TRUSS-BASED 3D TEXTILE-REINFORCED CONCRETE BEAMS - Dor Simon, Alva Peled and Yiska Goldfeld |
| 152 | LARGE-SCALE TESTING OF A GFRP POWER TRANSMISSION POLE PROTOTYPE MADE FROM A DECOMMISSIONED GE37 WIND TURBINE BLADE - Ammar Alshannaq, John Respert, Yulizza Henao, Lawrence Bank, David Scott and Russell Gentry | 111 | ASSESSMENT METHODOLOGY OF A BONDED COMPOSITE REPAIR FOR OFFSHORE STRUCTURES - Quentin Sourisseau, Emilie Lepretre, Sylvain Chataigner, Xavier Chapeleau, Maxime Deydier and Stephane Paboeuf | 102 | INSULATING SANDWICH FAÇADE SYSTEM WITH TEXTILE REINFORCED CEMENT (TRC) COMPOSITES: STRUCTURAL CASE DESIGN AND LARGE-SCALE TESTING - Tine Tysmans, Matthias De Munck, Olivier Remy and Michael El Kadi |
| 110 | FLEXURAL BEHAVIOR OF POST-TENSIONED CONCRETE FILLED FRP TUBE FOR WIND TURBINE TOWER APPLICATIONS - Aws Hasak, Martin Noel, Mark Green and Amir Fam | 204 | DEVELOPMENT OF REPAIR SOLUTION FOR FATIGUE CRACKS USING SELF-PRESTRESSING FE-SMA/CFRP BONDED PATCHES - Sizhe Wang, Qingtian Su, Xu Jiang, Masoud Motavalli and Elyas Ghafoori | 167 | EFFECT OF PRESTRESSING ON THE FLEXURAL RESPONSE OF THIN-FLAT SLABS - Mohammed Hutaibat and Bahman Ghiassi |
| 51 | EVALUATION OF MECHANICAL PROPERTIES OF CONCRETE WITH RECYCLED FRP WIND BLADE WASTE MATERIAL - Meiran Abdo, Eleni Toumpanaki, Andrea Diambra, Lawrence Bank, Stephen Eichhorn and Gianni Comandini | 78 | MULTI-AXIAL ULTIMATE LOAD BEHAVIOR OF WRAPPED COMPOSITE JOINTS - Mathieu Koetsier, Jincheng Yang, Mees Wolters and Marko Pavlovic | 168 | EXPERIMENTAL INVESTIGATION OF THE STRUCTURAL BEHAVIOR OF CARBON FIBER TEXTILE REINFORCED CONCRETE SLAB ELEMENTS - Rami Eid, Offri Rashti, Alva Peled and Erez Gal |
| | | 318 | BUCKLING BEHAVIOR OF CFRP-STEEL COMPOSITE COLUMNS UNDER TEMPERATURE VARIATION - Xu Liang, Lili Hu and Peng Feng | | |

| Tuesday 25 July - SESSION III: 11h15 to 12h30 | | | |
|---|---|---|---|
| A - Rio de Janeiro II | C - Rio de Janeiro III | D - Flamengo | E - Botafogo |
| IIFC BEST THESIS | Steel Repair with FRP II | All FRP Structures - Damage | FRP Reinforcing Bars - Bond II |
| <p>chair: Rebecca Gravina</p> <p>HYBRID GLULAM-FRP BEAM WITH IMPROVED FIRE PERFORMANCE - Abdulrahman Zaben, The School of Civil Engineering, The University of Queensland, Australia</p> | <p>chair: Marko Pavlovic</p> <p>105 SIZE EFFECTS ON MODE I AND MODE II FRACTURE BEHAVIOUR OF COMPOSITE-STEEL BONDED INTERFACE: EXPERIMENTAL CHARACTERIZATION AND NUMERICAL VALIDATION - Jincheng Yang, Weikang Feng, Mathieu Koetsier, Marcio Moreira Arouche, Tjeu Peeters and Marko Pavlović</p> | <p>chair: Leonel Echer</p> <p>170 DETECTION AND LOCALISATION OF BARELY VISIBLE IMPACT DAMAGE IN FIBRE REINFORCED POLYMER COMPOSITES USING A SUPERVISED DEEP LEARNING ALGORITHM - Ali Tabatabaiean, Bruno Jerkovic, Felipe Vannucchi de Camargo, Leonel Echer, Elena Marchiori and Mohammad Fotouhi</p> | <p>chair: Christian Carloni</p> <p>92 A REVIEW ON THE BOND BETWEEN FRP BARS AND CONCRETE - Eduarda Nepomuceno, José Sena-Cruz, Luís Correia and Tommaso D'Antino</p> |
| <p>FIRE BEHAVIOUR OF CONCRETE STRUCTURES REINFORCED WITH GFRP BARS - Inês Cruz Mina Rosa, University of Lisbon, Instituto Superior Técnico, University of Lisbon</p> | <p>109 INFLUENCE OF SURFACE ROUGHNESS ON MODE II STATIC AND FATIGUE FRACTURE BEHAVIOUR OF COMPOSITE-TO-STEEL BONDED INTERFACE - Weikang Feng, Marcio Moreira Arouche, Siyuan Hou, Tjeu Peeters and Marko Pavlovic</p> | <p>234 EXPERIMENTAL INVESTIGATION ON INTERLAMINAR FRACTURE BEHAVIOR OF PULTRUDED FIBER-POLYMER COMPOSITES - Gisele Cintra, Janine Vieira, Daniel Cardoso and Thomas Keller</p> | <p>307 CALIBRATION OF THE GFRP-CONCRETE COHESIVE MATERIAL LAW USING PULL-OUT TESTS - Francesco Focacci, Charles Tucker Cope, Mohammad Minhajur Rahman, Tommaso D'Antino and Christian Carloni</p> |
| <p>FRACTURE BEHAVIOUR OF PULTRUDED GFRP PROFILES: APPLICATION TO WEB-CRIPPLING PHENOMENA - Lourenço Rocheta de Almeida-Fernandes, Instituto Superior Técnico, University of Lisbon, Portugal</p> | <p>228 EXPERIMENTAL AND NUMERICAL INVESTIGATION OF THE BOND BEHAVIOR OF CFRP-STEEL JOINTS UNDER FATIGUE LOADING - Tommaso Papa, Massimiliano Bocciarelli, Angelo Savio Calabrese, Pierluigi Colombi and Tommaso D'Antino</p> | <p>230 MODE II INTERLAMINAR FRACTURE TOUGHNESS OF UNIDIRECTIONAL INTERLAYER HYBRID FRP COMPOSITES FOR CIVIL ENGINEERING APPLICATIONS - Filipe Ribeiro, Luís Correia, Manuel Gomes and José Sena-Cruz</p> | <p>292 PULL-OUT TEST OF FRP BARS: THE EFFECT OF THE FREE END PROTRUDING PORTION OF THE BAR - Charles Tucker Cope, Mohammad Minhajur Rahman, Tommaso D'Antino, Francesco Focacci and Christian Carloni</p> |
| <p>LIFE CYCLE ASSESSMENT AND CO-PROCESSING OF WASTE FROM DECOMMISSIONED IRISH WIND TURBINE - Angela Nagle, School of Engineering & Architecture, University College Cork, Ireland, Ireland BLADES</p> | <p>196 EFFECT OF ADHESIVE DEBONDING OF CFRP AROUND WELD BEAD AND CRACK ON FATIGUE CRACK GROWTH IN STEEL PLATE - Atsushi Matano, Hitoshi Nakamura, Visal Thay and Takahiro Matsui</p> | <p>123 MATERIAL CRUSHING BEHAVIOUR OF PULTRUDED GFRP STUB COLUMNS: EXPERIMENTAL STUDY - Joao Alfredo Lazzari, José Gonilha, Nuno Silvestre and João Ramôa Correia</p> | <p>308 EFFECT OF THE BAR DIAMETER ON THE LOAD RESPONSE OF GFRP-CONCRETE PULL-OUT TESTS - Xudong Zhao, Mohammad Minhajur Rahman, Francesco Focacci, Tommaso D'Antino and Christian Carloni</p> |
| | <p>236 EXPERIMENTAL STUDY ON CYCLIC BOND BEHAVIOUR BETWEEN CFRP AND STEEL - Qian-Qian Yu and Hai-Bin Xu</p> | <p>86 FATIGUE STRENGTH AND STIFFNESS DEGRADATION OF THE WOVEN ROVING GFRP UNDER COMPRESSION-COMPRESSION CYCLIC LOADING - Akihiko Sato, Yasuo Kitane, Kunitomo Sugiura, Hideki Hibi and Yoshinao Goi</p> | <p>219 BOND BEHAVIOUR OF A STICK SHAPE CFRP REINFORCEMENT APPLIED ACCORDING TO THE NSM-ETS STRENGTHENING TECHNIQUES - Luis Correia, Joaquim Barros, Hossein Malekinejad and Pedram Ayyobi</p> |

Tuesday 25 July - SESSION IV: 14h00 to 14h45

Keynote Lectures - Rio de Janeiro II

Professor Brahim Benmokrane, University of Sherbrooke, Canada

DEVELOPMENTS ON FRP REBARS AS INTERNAL REINFORCEMENT IN CONCRETE STRUCTURES AND FIELD APPLICATIONS

BREAK

Tuesday 25 July - SESSION V: 15h00 to 16h15

| C - Rio de Janeiro III | D - Flamengo | E - Botafogo |
|--|---|---|
| Concrete Strengthening - Columns | TRM/TRC Design II | All FRP Structures - Stability |
| <p>chair: Emmanuel Ferrier</p> | <p>chair: Tine Tysmans</p> | <p>chair: Baolin Wan</p> |
| <p>182 CFRP-CONFINED RUBBERISED CONCRETE UNDER MONOTONIC COMPRESSION - Ioanna Skyrianou, Eftychia Valiakou, Lampros Koutas and Christos Papakonstantinou</p> | <p>180 TEXTILE REINFORCED CONCRETE STRUCTURES ADDITIVELY MANUFACTURED ON FREE-STANDING TEXTILE FORMWORK - Martin Scheurer, Tobias Neef, Gözdem Dittel, Viktor Mechtcherine and Thomas Gries</p> | <p>124 CHARACTERIZATION OF 3D GEOMETRICAL IMPERFECTIONS OF PULTRUDED GFRP PROFILES - Joao Alfredo Lazzari, Luís Filipe Lajes Martins, Nuno Silvestre, João Ramôa Correia, Álvaro Silva Ribeiro and Alexandre Pinheiro</p> |
| <p>186 EXPERIMENTAL STUDY ON RC COLUMNS STRENGTHENED WITH CFRP AND METALLIC ALLOY PLATES UNDER AXIAL COMPRESSION - Abhay Kumar, Sandeep Kumar Nara and Suriya Prakash Shanmugham</p> | <p>200 PERMANENT FORMWORK OF TEXTILE REINFORCED CONCRETE (TRC) FOR COMPOSITE CONCRETE SLABS - Mauricio Martins, Rodrigo Lameiras and Guilherme Alencar</p> | <p>95 NON-LINEAR BEHAVIORS OF PULTRUDED GFRP COMPOSITES - Tianqiao Liu, Shilong Zhen and Ruibao Wang</p> |
| <p>20 TOUCHLESS CONFINEMENT OF HISTORICAL MASONRY COLUMNS WITH FIBRE REINFORCED POLYMER SHEETS - Francesco Micelli, Alessio Cascardi and Maria Antonietta Aiello</p> | <p>250 FLEXURAL BEHAVIOUR OF CARBON/GLASS AND BASALT TEXTILE REINFORCED CONCRETE (TRC) I-BEAMS - Bahman Guaiassi and Gláucia Dalfré</p> | <p>46 A LOW-DIMENSIONAL MODEL FOR THE FLEXURAL-TORSIONAL BUCKLING ANALYSIS OF PULTRUDED FRP ANGLE SECTION COLUMNS - Leyser Pires Filho and Paulo B. Gonçalves</p> |
| <p>99 ON THE STRUCTURAL BEHAVIOR AND FIRE RESISTANCE OF CARBON FIBERS AND STEEL REINFORCED HIGH-STRENGTH AXIALLY LOADED CONCRETE COLUMNS - Yedidya M. Shachar, Rami Eid and Avraham N. Dancygier</p> | <p>261 TAILORED STRUCTURES WITH TEXTILE-REINFORCED CONCRETE - Philipp Preinstorfer, Michele W.T. Mak and Janet M. Lees</p> | <p>77 MACHINE LEARNING-BASED INVESTIGATIONS ON NONLINEAR VIBRATIONS OF CFRP COMPOSITE - Jia-Ao Hou, Chao Wu Yangping Yao, Renyuan Qin, Denvid Lau, and Lik-ho Tam</p> |
| <p>126 CYCLIC COMPRESSIVE STRESS-STRAIN MODEL FOR FRP-CONFINED ENGINEERED CEMENTITIOUS COMPOSITES (ECC) - Shuai Li, Tak-Ming Chan and Ben Young</p> | <p>297 HOLLOW CORE CARBON REINFORCED SLAB SYSTEM - Harald Michler and Nazaib Ur Rehman</p> | <p>71 EFFECTS OF MOISTURE ON SELF-LUMINOUS GFRPS - Michael Phelan and Baolin Wan</p> |

| Tuesday 25 July - SESSION VI: 16h30 to 17h45 | | |
|---|--|---|
| C- Rio de Janeiro III | D - Flamengo | E - Botafogo |
| Concrete Strengthening - Walls and Slabs | FRP Reinforcing Bars - Slabs and Arches | All FRP Structures - Durability |
| | chair: Chandan Gowda | chair: Joao Correia |
| 6 | 150 | 68 |
| RETROFIT AND REPAIR OF REINFORCED CONCRETE WALLS WITH FRP: A REVIEW OF EXPERIMENTAL INVESTIGATIONS - Jazalyn Dukes and Siamak Sattar | EMBODIED CARBON EMISSIONS AND PERFORMANCE OF BFRP AND STEEL REINFORCED BEAMS: A PROMISING STEP TOWARDS A SUSTAINABLE FUTURE - Chandan Gowda and Chris Hendy | EFFECT OF MARINE ENVIRONMENT ON THE INTERLAMINAR SHEAR STRENGTH OF PULTRUDED GFRP COMPOSITES - Priscilla Shimba Carneiro Vieira, Janine Domingos Vieira and Daniel Carlos Taissum Cardoso |
| 22 | 13 | 69 |
| MODEL UNCERTAINTY ANALYSIS OF CFRP-STRENGTHENED REINFORCED CONCRETE WALLS - Marcos Silva, Rafael Diaz, Luiz Carlos Almeida and Leandro Trautwein | PERFORMANCE OF GFRP STIRRUPS AS FRICTION SHEAR REINFORCEMENT IN CONCRETE COMPOSITE ELEMENTS - Basel Aljada and Ehab El-Salakawy | EFFECT OF MARINE ENVIRONMENT ON THE MECHANICAL PERFORMANCE OF FRP-STEEL JOINTS - Priscilla Shimba Carneiro Vieira, Bruno Jordão, Filipe Rocha Gomes de Sá, Geovanne de Almeida Santos da Silva and Daniel Carlos Taissum Cardoso |
| 37 | 163 | 115 |
| EBR VS EBROG FOR FRP STRENGTHENING OF RC SLABS: EXPERIMENTAL TESTS AND NUMERICAL MODELLING - Christoph Czaderski, Matteo Breveglieri, Niloufar Moshiri and Enzo Martinelli | EXPERIMENTAL INVESTIGATION OF FLEXURAL BEHAVIOR OF GFRP/CONCRETE COMPOSITE SLAB - Layane Souza and Rodrigo Lameiras | EFFECT OF OFFSHORE ENVIRONMENTAL CONDITIONS ON THE MECHANICAL BEHAVIOR OF GLASS FIBER REINFORCED POLYMERS (GFRPs) - Marcio Moreira Arouche and Marko Pavlovic |
| 45 | 184 | 153 |
| SIMULATION OF TWO-WAY SLABS STRENGTHENED IN PUNCHING WITH CFRP STRIPS - Asad-Ur-Rehman Khan, Shamsoun Fareed and Laiba Ayub | LIFE-CYCLE ASSESSMENT OF JOINTED PLAIN CONCRETE PAVEMENTS WITH GFRP DOWELS - Thiago Gomes, Felipe Souza, Franklin Toledo and Lourdes Souza | INVESTIGATION OF THE MOISTURE ABSORPTION BEHAVIOR OF GFRP EXPOSED TO MARINE ENVIRONMENT AND THE DEGRADATION OF ITS INTERLAMINAR SHEAR PROPERTIES - G. De A. Santos da Silva, P. Vieira, F.R.G. de Sá, B. Jordão, P.G.M. de Freitas, D.C.T. Cardoso, M. Tostes and C.G. Ferreira |
| 257 | 306 | 242 |
| ANALYTICAL PREDICTION OF FLEXURAL BEHAVIOUR OF RC SLABS STRENGTHENED WITH NON-PRESTRESSED AND PRESTRESSED CFRP LAMINATES - Aloys Dushimimana, Luis Correia, José Sena-Cruz, João Miguel Pereira, Ricardo Cruz and Susana Cabral-Fonseca | STATIC AND FATIGUE BEHAVIOR OF CONCRETE SLABS REINFORCED WITH GFRP BARS - Charles Tucker Cope, Mahammod Minhajur Rahman, Tommaso D'Antino, Francesco Focacci and Christian Carloni | INFLUENCE OF LOW-TEMPERATURE CYCLES ON UV/CONDENSATION-SALT SPRAY AGING OF GFRP PULTRUDED COMPOSITES - Henrique M. Alves, Fábio M. F. Zumba, Hector G. Kotik, Cesar G. Camerini and Douglas G. Caetano |
| 325 | 213 | 156 |
| STRENGTHENING UNDERGROUND REINFORCED CONCRETE STRUCTURE USING EXTERNALLY BONDED CARBON FIBRE REINFORCED POLYMER SHEETS - Oumaima Awassa, Raafat El-Hacha, Kevin Falkenberg | BEHAVIOR OF FRP-REINFORCED CONCRETE ARCHES - Z.Y. Xia, Tao Yu and Tao Jiang | EFFECTS OF FREEZE-THAW CYCLES AND THERMAL CYCLES ON THE MECHANICAL AND THERMOMECHANICAL PROPERTIES OF GFRP LAMINATES PRODUCED BY VACUUM INFUSION - Tarikul Hasan, João R. Correia, Mário Garrido, Susana Cabral-Fonseca, Marco Jorge and José Sena-Cruz |
| | 174 | 280 |
| | FIRST USE OF FRP REINFORCEMENT BARS IN URUGUAY: DESIGN AND EXPERIMENTAL TESTING OF FRP REINFORCED BEAMS AND COMPARISON WITH CONVENTIONAL STEEL REINFORCED BEAMS. - Bruno Bouchard, Mauricio Tarabba, Antonella Laureiro, Matías Sastre and Luis Segura | RESIDUAL TENSILE PROPERTIES OF GFRP PIPES AGED UNDER HIGH PRESSURE AND TEMPERATURE CONDITIONS - Marcella G. Lima, Gabriela R. Pereira, Hector G. Kotik, Cesar G. Camerini, Ana Lucia F. S. D'Almeida and Mariana Burrowes |

19h00 - Conference Dinner and Awards Ceremony - Rio de Janeiro Ballroom

| Wednesday 26 July - SESSION I: 08h30 to 09h45 | | | |
|--|--|--|--|
| Keynote Lectures - Rio de Janeiro II | | | |
| IFC YOUNG RESEARCHER AWARDEE: Professor Elyas Ghafoori, Leibniz University Hannover, Germany REPAIR AND STRENGTHENING OF STEEL STRUCTURES USING CFRP COMPOSITES: AN OVERVIEW | | | |
| IFC MEDAL LECTURE: Professor Riadh Al-Mahaidi, Swinburne University of Technology, Australia ENHANCING SEISMIC RESILIENCE: VALIDATION OF FRP REPAIR TECHNIQUES THROUGH 6-DOF HYBRID TESTING | | | |
| COFFEE BREAK | | | |

| Wednesday 26 July - SESSION II: 10h00 to 11h15 | | | |
|---|---|---|--|
| A - Rio de Janeiro II | B - Rio de Janeiro I | C - Rio de Janeiro III | D - Flamengo |
| Novel FRP Applications | Concrete Strengthening - NDE | FRP Reinforcing Bars - Bond III | TRM/TRC Retrofit II |
| chair: Lucija Stepinac 80 MECHANICAL CHARACTERIZATION OF NOVEL 3D FIBRE-REINFORCED HIGH-PERFORMANCE NATURAL FIBRE-REINFORCED EPOXY COMPOSITES - Henrique Fernandes Medeiros De Queiroz, Jorge Souza Neto, Daniel Kioshi Kawasaki Cavalcanti and Mariana Banea | chair: Martin Noel 31 CONDITION ASSESSMENT OF FRP STRENGTHENED CONCRETE BRIDGE DIAPHRAGMS USING NON-DESTRUCTIVE TESTING - Issa Fowai, Martin Noel, Beatriz Martin-Perez and Leandro Sanchez | chair: John J. Myers 316 DEVELOPMENT LENGTH OF GFRP BARS IN UHPFRC - Lukas Kaufman and Amir Fam | chair: Thanasis Triantafillou 211 NEW GENERATION OF TEXTILE REINFORCED MORTARS FOR IN-PANE STRENGTHENING OF MASONRY WALLS - Szymon Cholestiakow, Lampros Koutas and Christos Papakonstantinou |
| 315 PERFORMANCE OF 3D-PRINTED CARBON FIBER REINFORCED THER-MOPLASTIC LOOPED TENSILE ELEMENTS - Giovanni Pietro Terrasi, Ott Valentin and Vidrh Tadej | 32 INTEGRITY ASSESSMENT OF CFRP-CONCRETE INTERFACE ON EXTERNALLY STRENGTHENED BRIDGE DIAPHRAGMS USING DIRECT TENSION PULL-OFF TESTS - Issa Fowai, Martin Noel, Beatriz Martin-Perez and Leandro Sanchez | 26 BOND BEHAVIOR OF FRP BARS IN CONCRETE WITH CARBON NANOTUBES - Elvys D. Reis, Flávia S. J. Poggiali and Augusto C. da S. Bezerra | 241 STRENGTHENING MONUMENTS WITH TRC - David Sandmann, Harald Michler, Alexander Schumann and Steffen Marx |
| 81 FRP DECK SYSTEM USING TPMS LATTICE STRUCTURE - Lucija Stepinac, Josip Galic and Ana Skender | 312 INTERFACIAL PERFORMANCE BETWEEN CFRP AND CONCRETE BASED ON PZT-BASED MONITORING - Jun Deng and Miaoqiang Zhu | 202 EXPERIMENTAL INVESTIGATION OF SAND ADHESION TO SAND-COATED GFRP BARS - Elayne Marques Silva, Kent Harries and Péter Ludvig | 210 HOLISTIC APPROACH TO REHABILITATION OF SUBSTANDARD MASONRY INFILLED RC FRAMES - Szymon Cholestiakow, Lampros Koutas and Christos Papakonstantinou |
| 18 RECYCLING LARGE-SCALE 3D PRINTED POLYMER COMPOSITE PRECAST CONCRETE FORMS - Katie Schweizer, Sunil Bhandari, Roberto Lopez-Anido and Lu Wang | 76 FIBRE OPTIC-BASED PATCH SENSOR FOR THE MONITORING OF REINFORCED CONCRETE STRUCTURES - Yago De Souza Gomes, Mohamed Saidi, Anna Lushnikova and Olivier Plé | 60 BOND DURABILITY BETWEEN GFRP BARS AND FRESH AND SEA WATER CONCRETE UNDER SEAWATER IMMERSION - Eduarda Nepomuceno, José Sena-Cruz, Lúcio Lourenço and Eduardo Pereira | 249 BENDING AND SHEAR BEHAVIOR OF HISTORIC MASONRY WALLS STRENGTHENED WITH COMPOSITE REINFORCED MORTAR - Tommaso D'Antino, Veronica Bertolli, Alessandro Cagnoni, Angelo Savio Calabrese and Carlo Poggi |
| 272 TRACE THEORY FOR GFRP - MIXING TSAI'S MODULUS, ASYMPTOTIC HOMOGENIZATION AND MACHINE LEARNING - Yuri Macedo, Júlia Oliveira, Janaina Gomide, Laura Santana and Lucas Vignoli | 125 CONCRETE DAMAGE IDENTIFICATION FOR STRUCTURAL HEALTH MONITORING USING COMPUTER VISION - Abhijeet Kumar, Hector Martin and Lee Leon | 116 A REVIEW AND ANALYSIS OF REDUCED FRP BONDED BARS IN REINFORCED CONCRETE - John J. Myers | 67 SEISMIC RETROFIT OF RC SHORT COLUMNS WITH TEXTILE REINFORCED ALKALI-ACTIVATED OR CEMENT-BASED MORTARS - Lazar Azdejkovic and Thanasis Triantafillou |

| Wednesday 26 July - SESSION III: 11h30 to 13h00 | | | |
|---|--|--|--|
| A - Rio de Janeiro II | B - Rio de Janeiro I | C - Rio de Janeiro III | D - Flamengo |
| Bridges and Fatigue | Biocomposites and Wood | FRP Reinforcing Bars - Durability | TRM/TRC Durability |
| chair: Amir Fam 323 DESIGN, FABRICATION, AND TESTING OF A LIGHT WEIGHT HYBRID CONCRETE FIBRE REINFORCED POLYMER BRIDGE GIRDER - Darshana Rathnayaka, Dilum Fernando, Sergio Lopez Dubon, Marcelo Dias, Fergus Cuthill | chair: Eleni Toumpanaki 42 MECHANICAL PROPERTIES AND ADHESIONS OF FUSED FILAMENT FABRICATION (FFF) PRINTED BIOCOMPONENTS WITH CONTINUOUS VEGETABLE FIBER REINFORCEMENT - Natália Victoria Santos, Daniel K. K. Cavalcanti, Jorge S.S. Neto, Mariana D. Banea and Daniel C.T. Cardoso | chair: Antoine Pepin 223 TEST AND SAFETY CONCEPTS FOR REINFORCEMENT MATERIALS WITH TIME DEPENDENT RESISTANCES - André Weber | chair: Philipp Preinstorfer 169 LONG-TERM INTERFACIAL BOND BEHAVIOUR OF CARBON-FIBRE TEXTILE REINFORCED CEMENTITIOUS MORTAR - Shanshan Cheng, Min Yu and Jie Ji |
| 120 CALIBRATION OF FATIGUE LOAD MODEL FOR COMPOSITE ROAD BRIDGES - Lulu Liu, Johan Maljaars and Thomas Keller | 187 MECHANICAL PROPERTIES OF CURAUÁ FIBER REINFORCED POLYMER COMPOSITES FOR SHEAR CONNECTORS - Geovanna Oliveira and Rodrigo Lameiras | 264 DEGRADATION PROCESS OF CONCRETE STRUCTURES REINFORCED WITH FIBER REINFORCED POLYMER REBARS IN ALKALINE ENVIRONMENTS: LITERATURE REVIEW - Luis Felipe Oliveira Santos, Nádia Cazarim da Silva Forti, Daniel Carlos Taissum Cardoso, Lia Lorena Pimentel and Ana Elisabete Paganelli Guimarães de Avila Jacintho | 171 RESIDUAL PERFORMANCE OF ALKALI-ACTIVATED TRC AFTER EXPOSURE TO HIGH TEMPERATURES - Panagiotis Kapsalis, Catherine Papanicolaou and Thanasis Triantafillou |
| 117 ROLLING LOAD VERSUS PULSATING LOAD FATIGUE OF BRIDGE DECK REINFORCE WITH GFRP REBAR - Chongxi Gao and Amir Fam | 207 HYBRID COMPOSITES OF GLASS FIBERS AND SUGARCANE BAGASSE FIBERS FOR APPLICATION IN POLYMERIC TILES - Kássia Policarpo Martins, Artemisa de Oliveira Araújo, Sandra Maria da Luz and Vilson Dalla Libera Junior | 215 DURABILITY OF FRP REINFORCING BARS EXPOSED TO AN ALKALINE ENVIRONMENT WITH/WITHOUT ADDITIONAL SUSTAINED LOAD - Noémie Delaplanque, Sylvain Chataigner, Laurent Gaillet, Alvaro Saravia Flores, Marc Quiertant, Karim Benzarti, Arnaud Rolland and David Bigaud | 296 MINERAL-IMPREGNATED CARBON-FIBER (MCF) AS NOVEL ALTERNATIVE TO FIBER-REINFORCED POLYMER (FRP) FOR REINFORCING CONCRETE AND STRUCTURAL SAFETY AT ELEVATED TEMPERATURES - Jitong Zhao, Marco Liebscher and Viktor Mechtcherine |
| 114 FATIGUE OF WEB-CORE COMPOSITE BRIDGE DECKS: AN EXPERIMENTAL AND NUMERICAL STUDY - Olena Karpenko, Tjeu Peeters, Angeliki Christoforidou and Marko Pavlović | 34 EVALUATION OF BOND TEST METHODS FOR GFRP RODS GLUED IN GLULAM - Eleni Toumpanaki | 74 COMPARATIVE DURABILITY OF GFRP AND STEEL RC IN A SIMULATE MARINE ENVIRONMENT - Antoine Pépin and Shamim A. Sheikh | 298 REUSE OF RECYCLED CARBON FIBERS FOR REINFORCEMENTS - Harald Michler, Enrico Baumgärtel and Nazaib Ur Rehman |
| 87 FATIGUE PERFORMANCE OF INJECTED STEEL REINFORCED RESIN CONNECTORS IN GFRP SANDWICH WEB CORE PANELS - Angeliki Christoforidou, Martijn Veltkamp, Fruzsina Csillag, Liesbeth Tromp and Marko Pavlovic | 246 SHEAR ANALYSIS OF GLULAM-CFRP COMPOSITE BEAMS - Melissa Lago, Marcus Lobo, Lucas Costa, Filipe Luigi, Rita Cunha and Sandro César | 140 DURABILITY AND STRUCTURAL EVALUATION OF BRIDGE GIRDERS PRESTRESSED WITH GFRP TIES AFTER 41 YEARS OF MAINTENANCE - Andrey Lapshinov, Oleg Kornev, Vladimir Kakusha, Yuriy Zhidkov and Evgeniy Mikhaldykin | 317 FIRE PERFORMANCE OF EXTERNALLY STRENGTHENED CIRCULAR RC COLUMNS WITH DIFFERENT LAYERS OF PBO-FRCM - Salem Khalaf and Farid Abed |
| 40 MECHANICAL PROPERTIES OF SANDWICH PANELS OF PLASTER REINFORCED WITH FIBREGLASS FABRICS USING NUMERICAL ANALYSIS - Lais Costa Brito, Alexandre de Macêdo Wahrhaftig and Ricardo Fernandes Carvalho | 142 ANALYSIS OF FEASIBILITY OF USING CARBON FIBER AND EPOXY RESIN TO CONFECTION NODES OF WOODEN TRUSSES - Cibele Mota Menezes, Alexandre de Macêdo Wahrhaftig, Adriano Silva Fortes, Ricardo Fernandes Carvalho and Iago Gonçalves De Oliveira | 138 COMPARATIVE STUDIES ON THE DEFORMATION BEHAVIOUR OF FRP AND STAINLESS STEEL-REINFORCED CONCRETE BEAMS WITH A T-SHAPED CROSS-SECTION - Nora Susanne Bies and Matthias Pahn | 36 TENSILE PROPERTY OF RECYCLED CARBON FIBER STRAND FOR REINFORCEMENT OF CONCRETE - Hwei Xu, Minoru Kunieda and Hiroshi Moritomi |



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